Smart MOOC
Social Computing for Learning and Knowledge Sharing

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Abstract: Massive Open Online Courses(MOOCs) make use of educational technologies to deliver learning materials, supposedly open for everyone, usually with a capacity to serve a substantial number of learners regardless of their geographical locations. A recent advancement in mobile technologies and wireless communications in Africa has produced a conducive digital environment enough to support mobile learning. However, only a handful of an audience in Africa participates in online learning correlated to their massive engagement in social networking. Internet-based social media programs make most of the connections with the audience for social purposes and yet far less with educational intentions. Participation in mobile learning is still unnoticeable. Awareness about MOOCs remains very low in comparison to that in social media in the region. Therefore it remains unclear though, in which ways, social media may help to boost mobile learning through its utilization of programs towards audience in Africa. This paper argues the best possible approaches aiming to enhance MOOC activities in Africa through the involvement of social networks.

1 INTRODUCTION

Africa is known for its increasing pace in embracing mobile devices and wireless communications as the active mode of communication in recent years. An enormous number of smartphones, tablet computers, and other similar mobile devices is being reported in many African regions. Many mobile devices connect to the internet at more frequent intervals than ever before. An average online time per device has increased well above one hour per day in the last five years, leading to high rate of growth of internet users. Mobile devices have rapidly penetrated in many countries, nearly becoming ubiquitous in Africa in contrast to the sluggish ownership of PC and laptops (ITU, 2016). Smartphones and tablet computers in particular, are becoming a primary tool for informing various aspects of life to students, professionals, customers, and all groups of people in general, notably changing the way students get access to information, communicate with one another and inform others.

Massive Open Online Courses (MOOCs) are considered being successful in Asia, Europe and the Americas compared to Africa regarding audience awareness, learner participation and overall achievement in online education. MOOCs often offer university courses openly to anyone, anywhere with an internet connec-

tion as a primary requirement. Despite the potential opportunities of free access to distance learning, only a tiny number of students in Africa registers in Coursera, edX, openHPI and other similar primary MOOC providers since their inception in 2012 (Renz et al., 2017).

For example, openHPI has registered hundreds of thousands of learners making it virtually a large university through its interactive web-based platform as well as native apps (Meinel and Willems, 2013). However, there are relatively low MOOC activities observed in Africa despite the reported high prevalence of social media in the region opposite to our expectations of finding some significant e-learning footprints due to their high ownership of mobile devices. One of the reasons for minimum MOOCs activities in Africa is low recognition of e-learning platforms and other web-based educational portals compared to those of social media.

Social media's high popularity in Africa is boosted with their known ability to provide functions that enable users to create, comment, express opinions and even share the content with other users in their web-based platforms or native apps. The digital environment for supporting populous social media is matching with the pace of mobile devices penetration as well as the prevalence of wireless communications in Africa.

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A similar conducive digital environment is also available for online learning. Learning practices where mobile technologies are used is called mobile-learning which crosses multiple contexts, through social and content interactions, using personal electronic devices with emphasize on time convenience of the learner.

This paper presents social-based approaches aiming to promote online participation in MOOCs via social media in particular with settings that reflect Africa. Social networking sites consume a large part of internet activities as well as online time among students while are somewhat far less intended for education purposes but rather inter-personal and self-representation (Pfeiffer and Ahorlu, 2014). We try to set the non-formal and perhaps incidental context on Facebook, YouTube, Twitter, WhatsApp and other similar social media to bring new impulses to e-learning.

2 RELATED WORK

A literature review reveals an increasing ownership of mobile devices among students as well as the growth of internet usage in Africa. The impact of mobile devices together with availability of internet connection significantly change the way of acquiring information in Africa. In recent years, some researchers have studied the influence of social media in facilitating education processes.

A study titled *Exploitation of Online Social Networks among University Students: A Case Study of the University of Dodoma* conducted surveys and collected data regarding the nature of content in social networking sites that students engage while in the campus. A questionnaire survey administered to a sample of university students yielded responses that show Facebook, Twitter, Google+, Blogs, and Wikis are popular in the university's premises. Students intensively use Facebook to communicate, Wikis for references and Blogs for information retrieval about course work activities while Twitter for connecting to the lecturers. (Shao and Seif, 2014).

An exploratory research investigated how students use social media in Africa. The researcher collected data relating to educational activities in Facebook platform in *Facebook as a learning tool? A case study on the appropriation of social network sites from mobile phones in developing countries*. The research shows how users, particular students, appropriate social networking sites from their mobile devices as the educational tool in an informal learning context (Pimmer et al., 2012).

A different study regarding the influence of social media conducted in Asia which reports that importance

of social communication in learning. Data analysis shows positives of social media in education outweigh the negatives. A similar study bargains that social media could promote learning practices where available information and skills can easily be shared from a local community to a global scale (Subrahmanyam et al., 2008)(Cheung et al., 2011).

Furthermore, a study in *Online social networks: Why do students use Facebook?* shows the effect of social media in academic performance by revealing that majority of the students who took survey responded by acknowledging the positive impact of social networking sites in their learning. However, they also pinpointed the negatives of Facebook solely stating it as a non-educational tool (Cheung et al., 2011).

3 METHODOLOGY

Based on the literature review on the related work section, we decided to first present statistics involving the status of ownership of mobile devices, usage of internet and engagement of social media in Africa as well as the current pace of online learning in MOOCs. We also conducted two experiments; 1. To determine the popularity of online learning practices in social media against non-educational topics. The popularity test is set up using a web crawler instructed to browse the entire Twitter website searching for specific *tweets* to determine their frequency. 2. To create new accounts on social networking sites that contextually loaded with learning materials borrowed from MOOCs aiming to study user perception based on the incorporation of MOOC content into social media.

The literature review gathered data that were statistically analyzed using descriptive statistics like frequencies, percentages and graphs to provide an insight of MOOCs in relation to social media in Tanzania, the most populous country in East Africa. The results of the data analysis are presented in findings section followed by discussion section which outlines various approaches based on the findings.

4 FINDINGS

This section presents statistics on penetration of mobile phones, usage of the internet, popularity of social media and status of e-learning in Tanzania. Talks and online discussions on Twitter website focusing on online learning worldwide are also presented in the last part of the section.

4.1 Penetration of Mobile Phones

The provision of fixed wired communications in Tanzania homes and schools is currently in stagnation mode, consequently many students hardly access the internet via cable or WiFi. Limitation of high-speed internet connection hinders online learning, particular in the dissemination process of educational content and other learning materials. Interestingly, wireless communications have recorded extensive coverage of over 80% among 55 million people in the country as demonstrated in Table: 1. Data from *TCRA*, a communications agency shows an increasing number of mobile phones with ownership of 7 in 10 people. Most subscribers have multiple SIM cards, and over 50,000 of new mobile subscriptions are registered monthly since 2011 (TCRA, 2017).

Table 1: Summary of communication statistics describing mobile subscription and tele-density in Tanzania.

Year	2012	2014	2016
Fixed	161,063	142,950	129,597
Mobile	25,827,518	34,108,851	40,044,156
Penetration	61%	71%	80%

Internet penetration rate at the end of 2017 is 40%, covering 18 million people who mostly use smartphones, tablet computers and other similar mobile devices as demonstrated by Table: 2 to access internet. It is highly practical for a student to own a mobile device rather than a PC, furthermore the access to the internet is via a cell tower rather than copper cables or WiFi, thus making a smartphone apparently a potent tool in communication. Regarding internet traffic, students and young adults contribute about 15% of the total online activities (Renz et al., 2017). Access to social networking sites, news channels, and entertainment portals are taking a huge portion of personal time of most students, with social media alone being the most frequent online activity (ITU, 2016) (Act, 2014).

Table 2: Summary of internet services by estimated number of users by technology type in Tanzania.

Type of Service	2012	2014	2016
Fixed Wireless	777,481	1,913,082	1,218,693
Wireless	6,031,323	11,320,031	18,014,358
Fixed Wired	712,095	984,198	629,474
Penetration	17%	29%	40%

4.2 Popularity of Social Media

Social media refer to chatting, text posting, Audio/Videocasting and other activities on social networking sites such as Facebook, Twitter and What-

sApp have been served in the country by mobile operators on much-reduced data prices due to lack of internet neutrality law in Tanzania. The costs incurred by users for accessing populous Facebook, YouTube and WhatsApp for instance in the past five years is small compared to other websites. As a result, more students and even professional manage to afford social networking while only a few retain an opportunity to reach online educational portals (Marsden, 2012). This practice has partly contributed frequent searches, massive installations of native apps and intense use of social media to smartphone owners as portrayed in Figure. 1 (Shao and Seif, 2014).
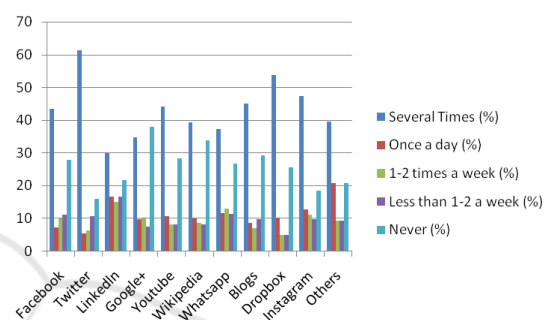

Figure 1: Frequency use of social media among respondents. Source: Shao and Seif, 2014.

In a survey involving a sample of 60 students from both rural and urban regions, findings are that over 90% of online activities are not related to education context. Nevertheless, over 80% of those events are happening in social networking sites (Pfeiffer and Ahorlu, 2014). Statistics show less than 05% were topics related to education. Most of the students, however, hinted about the usefulness of social media for personal use in helping their educational processes. For example, reference searches, Q&A sessions, sharing of course works, storage of learning materials and other educational activities are on rise through social media.

Results from the web crawler in Twitter showed less than 1,000 *tweets* related to online learning as well as MOOC related *hashtags* were tweeted worldwide in one hour run as compared to 1,345 *tweets* discussing *Game of Thrones* - an entertainment television drama series. We also obtained 7,739 tweets for *Democracy*, 6,051 for *Technology* and 117,759 for *News* to cover different categories of tweets in non-educational context. The analyzed data is visually presented in Figure. 2 that shows Twitter users rarely mention online learning (selected *hashtags* on the right side of the figure) in general even when correlated to just a single TV show program. Furthermore, none of the tweets were recorded from Tanzania while 221 users were discussing the non-educational topics such as politics and sports news. A complete set of crawling results is
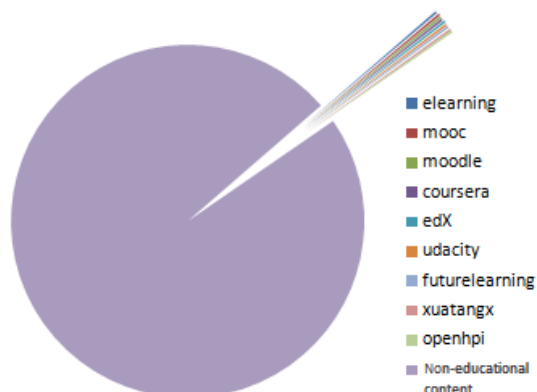
provided in the Github repository[1].

Figure 2: Share of tweets discussing online education corresponding to non-educational content such as TV drama series.

In summary, social media is becoming a ubiquitous technological stage for discussing various aspect of life, and have managed to find an active user in almost every mobile device that connects to the internet. Online reported events related to entertainment, politics and interpersonal communications are taking a toll on Facebook, YouTube, Twitter and other popular social networking sites while online educational activities are far left behind.

4.3 Status of e-Learning and MOOC

MOOCs are still underused, with low recognition among internet users in Africa, despite its relatively huge young population. Our popularity test has demonstrated only a handful of online talks on e-learning and MOOCs as shown in Figure. 2 above. It is hard to determine the exact provision of MOOC in Tanzania due to lack of immediate statistical data, we therefore decided to compile data from MOOC providers based on geographical locations of enrolled learners as published by Coursera - the most popular MOOC. Learning analytic shows minimum interests in MOOCs in many African countries as compared to that of Asia, Europe and North America. A similar pattern is also observed in the openHPI dashboard as shown in Figure. 3 (Renz et al., 2017) (Oyo and Kalema, 2014).

These findings support the argument that e-learning tools such as MOOC need to utilize social media to enhance user's experience in online education. Social media intervention is critical because with the right approach every user of social media can participate in MOOCs at least through mobile technologies.

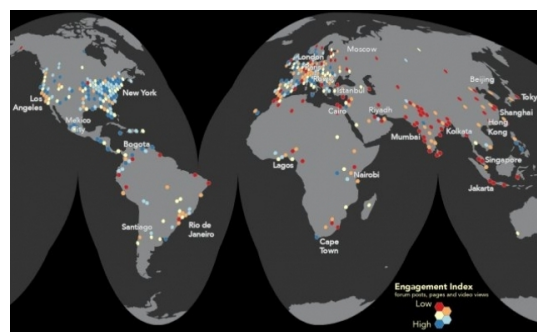[1]https://github.com/raadbintareaf/Twitter-Crawler

Figure 3: Distribution of MOOC learners in Coursera platform.

5 DISCUSSION

The findings immediately point out the technological development of mobile communications and high improvement in internet connections in many African regions that used to be far behind a decade ago. With Massive Open Online Courses - MOOC becoming a preferable e-learning tool, there are vivid potentials for high education in Africa. Nevertheless, we have observed only a few footprints of e-learning, in particular tiny usage of MOOCs in the region. One of the drawbacks detected in many MOOCs platforms is their low support for mobile devices as compared to computers. We put forward our notion that expected success of online learning in Africa is subjective to use of mobile devices, i.e mobile learning is currently a more convincing approach rather than web-based applications.

The increasing pace of mobile devices and wireless communications create a conducive digital environment enough to boost mobile learning which brings academic instructions and learning materials much closer to the learners through mobile devices rather than computers and other digital media. It is also much easier to share the educational content with other learners in social media. Mobile learning is also expected to emphasizes the on-time convenience of the learner, i.e., provides additional flexibility and perhaps higher frequency in accessing learning materials.

Social media are credited for their ability to disseminate their content at a much higher speed and in an efficient way compared to other websites among internet users. The social media usually provide sharing functions at hand that enables users to forward interesting content to their friends or public in general. In this context, the applications, therefore, may help as well to distribute MOOCs materials. Educators and researchers are continually experimenting with social media technologies hoping to stimulate critical

thinking skills, collaboration, and knowledge construction through social computing (Griesemer, 2012),(Al-Zoube and El-Seoud, 2009).

Due to a large number of students involved in social media, we see chances for improving recognition of MOOCs by integration with social networking sites. This approach is intended to increase the awareness of MOOCs among students, however, may fail to engage them directly within MOOC platforms. A different approach in social computing refers to means of posting excerpts of MOOCs directly into social media aiming to simulate learning with social media and perhaps draw the attention of students toward MOOC.

The rate of searching, downloading and sharing MOOCs mobile apps is also small in contrast to that of social media apps installed in smartphones of students. While using social media apps, students frequently seem to browse and engage themselves with pre-presented content to their mobile screens - most of the content we see in our profiles in social media are based on our browsing experiences and might be difference from one user to another. This process usually delivers custom-made and personalized content to the user which exposes the user to a vast pool of information that was never requested at first place. Further involvement in a specific topic is possible once the user responds by pressing a button or clicking a link to the next page. By infusing learning materials in social media, MOOCs become a part of social media content and thus might grab the attention of students who take further actions in MOOC platforms.

The findings suggest that students are eager to participate in online education on their mobile devices, even though are currently inclined to social media. However, the experiments based on the infusion or introduction of MOOC learning materials directly into social media brought significant interests in coincidental learning. Coincidental learning is a type of learning that occurs in settings without prior arrangements or plans by the system user. For example, a social media user might start learning merely of the interest of the information presented at first sight.

The awareness and penetration of MOOC into social media in Africa might solve the persistent challenges facing education systems such as limited educational resources and high costs. The scarce of educational resources yields a large number of excluded students from universities and institutes. Figure. 4 shows an expectation of MOOCs in accommodating excluded students who missed out the opportunity to pursue higher education either in the state-sponsored or private sector

Social computing illustrates the concern with the intersection of social behavior and computational sys-
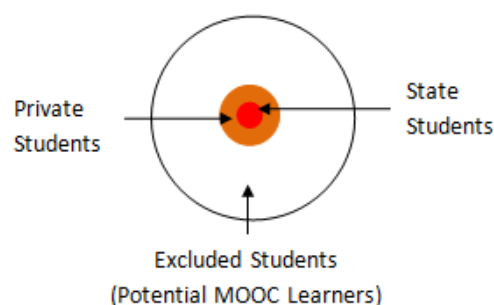

Figure 4: Expectation of MOOCs by mobile learning.

tems. Social computing is based on creating or sharing social contexts not limited alone to the use of smartphones and educational technologies in particular. Relevant interest in the realm of social computing lies in the involvement of social media and mobile devices in the context of education delivery in Africa. Social computing is our foremost approach to combine e-learning together with smartphones to yield mobile learning.

As the last point, we urge the use of existing internet technologies as well as the present digital atmosphere to improve access to web-based e-learning in Africa, merely because the current pace of mobile devices can make improvements in education as it has already achieved success in online social networking.

6 CONCLUSION

This paper explores the increasing pace of social networking among internet users with mobile technologies. Smartphones and tablet computers prove to be the most popular modern digital devices in Africa. Currently, mobile devices find use in executing daily online activities such as access to social media rather than conventional computers. Our research reveals that little information about MOOCs is known to internet users in Africa apparently due to low awareness, in particular when compared to social media. The internet usage in the region is only overwhelmed with social networking activities, mostly being in non-educational context.

Online learning and closely related MOOC vocabularies are rarely mentioned or discussed in social media in comparison to politics, entertainments, and other forms of non-educational topics. We, however observed that users of social media tend to be open and fair enough to respond to information presented to them, once perceived as useful in their own interests. Many students frequently bring and share non-educational content, however some bring topics related

to their education practices into social networking sites expecting to get clarification and feedback from other students and even professors in Africa. Furthermore, we have observed that social media are becoming active communication platform in Africa.

Provision of academic instructions and learning materials through infusion into social media platforms seems to boost the awareness as well as improve the participation of non-existing learners to MOOC platforms. We have stimulated coincidental learning that introduces excerpts from MOOC into social media profiles and detected learning activities among users. In this setup, we have helped the discovery of online university courses to users previously unaware of MOOCs. This paper tries to bring the best possible approaches in associating MOOC with social media, particularly to African context. The delivery of a smart MOOC is subjective to the integration of social computing together with knowledge sharing among learners and teachers.

The intervention of social media, mobile devices together with MOOCs potentially position mobile learning as a leading contender for overcoming technological challenges faced by MOOCs in Africa. However, caution is advised toward approaches discussed so far, in fact, users of social media may lack interests in MOOCs. Mobile learning is also unlikely to handle cumbersome information. Moreover, methods like infusion of learning materials into social networking sites may not be effective because users see social media as for inter-personal and self-representation, not precisely designed for serious learning.

7 FUTURE WORK

In the future, we plan to build a prototype model supposed to use social media to enhance user's learning experiences. The model incorporates academic instructions extracted from MOOC directly into social media profile to provide users with learning experiences through mobile devices such as smartphones and tablet computers. The researchers shall in practice be able to record user's experience based on the coincidental learning simulated by e-learning materials. Recording of user activities such as likes, comments, and sharing is critical to determine the level of interest in learning as well as gaining insight into the effectiveness of MOOC in social media settings. To evaluate our system, we plan to conduct a series of user survey focusing on testing the awareness of MOOCs to social media users. Feedback will guide us to refine our approaches and improve the prototype.

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