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Understanding mobile learning using a social embeddedness approach: A case of instant messaging

Aaron Bere
RMIT University, Australia

Patient Rambe
Central University of Technology, Free State, South Africa

ABSTRACT

The progressive development of mobile smart phones and instant messaging create opportunities for use of cost effective collaborative learning platforms in higher education. This paper presents a mobile learning (mLearning) initiative within the higher education context of a developing country. This qualitative study follows a case study approach. Thematic content analysis was conducted based on data mined from participants' interactions on the mLearning cyber space. The paper draws on the social embeddedness discourse and it examines the evidence of context-driven use and social embeddedness in student adoption of mLearning using instant messaging in higher education. Findings suggest opportunities for collaborative learning manifested in knowledge sharing, development of academic communities, instant communication in ambivalent contexts plagued by networked connectivity costs, knowledge gaps and geographical barriers among interactants. The mLearning initiative proposed in this study could create collaborative learning environments that can promote active learning opportunities.

Keywords*: Social embeddedness; instant messaging; WhatsApp; mobile learning; engagement*

INTRODUCTION

In recent years, use of mobile technologies proliferate various service sectors including banking, tourism, farming, disaster management, health, and education (Karimi, 2016). Such increased popularity of mobile technologies has been influenced by the significant increase of mobile subscriptions and availability of low budget mobile devices (Karimi, 2016). As a result, mobile technologies such as smartphones are the most popular form of Information and Communication Technology (ICT) especially in resource constrained communities like developing countries (Bere and Rambe, 2016; Murire and Cilliers, 2017).

The potential for effective teaching and learning using mobile technologies is growing (Bere and Rambe, 2016; Sanga et al., 2016; Abidin and Tho, 2018). This is due to the benefits of mLearning, including the ability to allow knowledge sharing without being limited by space and time, capacity to facilitate the development of critical thinking skills, collaborative learning, problem solving, and development of life-time communication skills (Abidin and Tho, 2018). Additionally, mLearning supports flexible learning platforms that allow both students and course facilitators access to multiple types of learning material and shift from power based learning environments to settings compelled by the notion of a community of learners (Rambe and Bere, 2013). These benefits lead to the development of the perceptions that mLearning platforms can improve teaching and learning performances (Abidin and Tho, 2018).

Despite the aforementioned positive aspirations about mLearning, the literature also highlights challenges to the adoption of these learning environments (UNESCO, 2011; Ng'ambi and Bozalek, 2013). The incapacity of educators and students to adopt mobile technology in innovative ways

that transform higher education results in failure to reap the educational benefits of using these technologies. Ng'ambi and Bozalek (2013) highlight educators' limited ability to deploy new ICTs such as mobile phones to educational uses that transform and impact student learning experiences. Despite the wide experimentation with new ICTs such as mobile phones in higher education, there is limited evidence to support the innovative appropriation of mobile technologies to transform learning practices and best practices of mobile-enhanced pedagogies (UNESCO, 2011; Murire and Cilliers, 2017).

While acknowledging the inability of educators and students to use new technology innovatively, this paper attributes failure to use new ICTs like smartphones in transformative ways, to the lack of corresponding dialogue on the various, novel ways of using mobile technologies, and limited conceptualisation of social cultural sensitivities that influence the acceptance of technology, notwithstanding the difficult and social constructions of technology by users (Avgerou, 2008). For example, Sahay and Robey (1996) contend that the awareness of social objectives of emerging ICTs, such as smartphones, is reliant on grasping the nature of their social context, their reliance on human activity and various processes of technology implementation. The local setting impacts the meaning making processes allotted to technologies, the numerous interpretations of their varied application and contradictory ways of using them. In a social embeddedness discourse, attention is devoted to understanding IT innovation as a socially and locally founded practice of technology development and organizational change (Avgerou, 2008). The objective of this paper is to investigate the effectiveness of mobile learning using instant messaging through examining the possibilities of collaborative learning. To achieve this, the social embeddedness approach is adopted, which subsequently unpacks the implication of adopting these digital technologies in higher education. The study is guided by the following research question: What evidence in the use of instant messaging in mLearning suggests its context-driven use and social embeddedness?

This paper contributes to the social embeddedness discourse by examining the evidence of context-driven use and social embeddedness (that is, deeply contextual and situated application of mobile technologies within a socio-cultural and economic setting) in student adoption of mobile technologies using instant messaging in higher education. The rest of the paper is presented as follows: the literature review discusses insights involving mLearning and instant messaging in developing countries. A theoretical framework that unravels the developmental value of social embeddedness approach is rendered. The methodology, research design, data analysis, presentation and discussion of findings follow. Finally, the implications of embracing mLearning using instant messaging are examined.

LITERATURE REVIEW

The synthesis of literature covers the mLearning and instant messaging phenomena.

Mobile Learning

The mLearning phenomenon refers to the utilisation of handheld technologies such as personal digital assistants (PDAs), smartphones, iPads, and Tablets, to support teaching and learning (Bere, 2012). It allows students to learn anywhere and anytime. The mLearning environment enriches the learning process through the support of active learning tools, collaborative learning technologies, and flexible learning approaches (Karimi, 2016). This platform promotes collaborative learning, which encourages active learning experiences through interaction rather than other teaching and learning modes that views a student as a passive receiver of knowledge (Mtega et al., 2012; Bere and Rambe, 2016). Due to these factors, mLearning adoption is growing.

The potential of ICT, particularly mobile phones to support mLearning in developing countries has been widely reported in the literature (Rambe and Bere, 2013; Hadullo, Oboko and Omwenga,

2018). In 2011, UNESCO launched projects in Nigeria and Senegal that explored the use of mobile phones for professional development by educators particularly the adoption of mobile phones to improve pedagogical delivery and provision of educational materials (UNESCO, 2011). The study highlighted educators' enthusiasm for professional development mediated by mobile phones, the capacity of educator familiarity with using mobile phones to ease their adoption of mobiles, and the need for additional institutional support for educators to change their teaching behaviour. Although this study resonates with social embeddedness of technology through its interrogation of the intersection of institutions, human social practices and technological capacities, it is based on fragmented anecdotes of mobile usage across various contexts. For this reason, we were left wondering about detailed, context-driven case studies on mLearning adoption in higher education, the focus of the current study.

In a study that investigated how Tanzanian university educators and students adopt mLearning, Mtega et al. (2012) found that although the majority utilised the mobile technologies for academic engagements, most of them relied on traditional mobile applications such as short message service (SMS) and calls. The study also reported that although educators used their mobile phones to create, download and upload learning content for students, many of them were unaware of the potential of mobile phones to support teaching and learning. Such lack of knowledge leads to the underutilisation of mobile technologies in higher education. While the study explored the technological affordances in view of the educators' capabilities, it is silent about the socio-technical backgrounds of mobile users in the study. Our study involved geographically distributed, historically under-privileged students with varied exposure to and prior knowledge of academic use of sophisticated phones.

Instant Messaging

Murire and Cilliers (2017) indicated that higher education students are the most active smartphone users. Students often use their mobile phones to communicate using instant messaging applications (Murire and Cilliers, 2017). The popularity of smartphones and instant messaging applications among higher education students create new opportunities for mLearning (Bere, 2012; Rambe and Bere, 2013).

Instant messaging refers to online chat applications that provide real-time text transmission over the Internet (Bere and Rambe, 2016). These applications are accessed using very low Internet data, unlike alternative messaging applications like SMS that are costly (Hsieh and Tseng, 2017). The majority of instant messaging applications offer several features including group chat, graphics exchange, video and audio messages, and emotions (Hsieh and Tseng, 2017). Apart from messaging capabilities, instant messaging applications such as WhatsApp, Viber, WeChat, and messenger, support voice over IP calls at very low costs. Due to their affordability, many smartphone users adopt instant messaging as their primary communication option (Hsieh and Tseng, 2017).

WhatsApp is the most popular instant massaging worldwide, while WeChat dominates the Asian market (Bere and Rambe, 2016). Recent studies have investigated the potential use of instant messaging to support mLearning in higher education due to its potential to support active learning, social inclusion, and collaborative learning (O'Brien and Freund, 2018). Hadullo, Oboko and Omwenga (2018) argue that content support, student characteristics, instructor characteristics, and institutional factors are critical success factors for the implementation of mLearning using instant messaging. This study presents a mLearning initiative using WhatsApp instant messaging at a South African university.

Strategic uses of smartphones and instant messaging applications are reported among some underprivileged students in resource constrained settings. For instance, Rambe and Bere (2013)

highlight that mobile instant messaging (MIM) served as a productive way of supporting educator-regulated group communication and enhancing underprivileged students' preparation for exams in resource constrained communities. However, MIM did not permit students to relay group responses to peers thus undermining peer-based group interaction, suggesting the challenge of developing appropriate mobile designs to perform certain tasks. Although the study is anchored in underprivileged students as is the case with the current study, it did not employ a social embeddedness approach as its theoretical lens to allow for the situated understanding of human relations with technology and its context of use.

Ngaleka and Uys (2013) employed conversational analysis to examine South African university students' conversations using WhatsApp over smartphones. Their study concludes that WhatsApp supported synchronous collaborative conversations among students without losing track of the conversations. However, the differential access and ownership of high-end phones with appropriate applications undermined the participation of students without these phones. This study resonates with our study given its emphasis on the relationship between mobile phones and the acquisition of literacy skills.

Bere and Rambe (2016) examined the factors that influence adoption of MIM in South African higher education by extending the technology acceptance model. Findings of the study reveal that adoption of mLearning using instant messaging is influenced by flexible learning caused by factors including device portability, academic collaborations between students and facilitators, costs, and extent of learner control. Device portability and student academic collaboration positively influenced usefulness of mLearning using instant messaging. Attitude towards mLearning use was determined by flexible learning conditions. Other determinants of attitude towards use were perceived ease of use and perceived usefulness. Perceived usefulness and attitude towards use influenced mLearning adoption which subsequently leads to enhanced student learning performances. Although this study provides determinants for academic use of MIM in a developing country, it relied on quantitative approaches guided by a closed ended questionnaire. This survey research lacked openness due to limited options of responses. mLearning using instant messaging is a new phenomenon, therefore, it requires in-depth and detailed examination which could be achieved using the case study approach.

Murire and Cilliers (2017) also conducted a quantitative study that investigated factors, which affect social media adoption such as WhatsApp MIM for instructional purposes among South African lecturers. The unified theory of acceptance and use of technology (UTAUT) was the theoretical framework underpinning the study. Findings of the study reveal that performance expectancy, social influence, effort expectancy and behavioural intention have a positive influence on adoption of mLearning using instant messaging and continued use by academics at South African universities. The facilitating conditions factor was not statistically significant. South African lecturers expressed interest in adopting MIM for teaching and learning. Consequently, South African lecturers believe that adoption of MIM for academic gains could improve pass rates which subsequently addresses the South African critical skills shortage gap.

In Table 1 below, we provide a summary of peer-reviewed studies published in journals from 2010 to 2018 involving mLearning using instant messaging projects implemented in Africa.

Table 1: *Summary of mLearning using instant messaging research in Africa from 2010 to 2018*

Reference	Research design	Data analysis	Sample size	Main findings
Makoe (2010)	Pilot study	Content analysis	23	• mLearning using instant messaging promotes collaborative learning. • mLearning collaborative learning is appropriate in South Africa because most native people believe that interaction is a strong factor for determining values and social interaction.
(Rambe and Bere, 2013)	Case study	Thematic content analysis	77	• mLearning using instant messaging has potential to improve student participation. • The digital technologies encourage the development of learning communities that enhances knowledge creation and learner-centred pedagogies. • Mature adult students resist mLearning using instant messaging during family time.
Bere and Rambe (2016)	Survey study	Trend analysis using factor analysis	223	• mLearning using instant messaging promotes the development of flexible learning context. driven by the device portability, communication cost, collaborative capabilities of the device, and learner control.
Farmer, Liu and Dotson (2016)	Observational study	Descriptive analysis	N/A	• The participation between males and females in mLearning using instant messaging is balanced. • Male participants are more likely to use a variety of communication modes including text, videos and images. • New topics and ideas were introduced frequently suggesting effective learning in these mLearning contexts.
(Murire and Cilliers, 2017)	Survey study	Factor analysis	116	• Academics are familiar with emerging technologies and could incorporate instant messaging in teaching and learning. • mLearning using instant messaging has the potential to increase communication and interaction among lecturers and students.

Reference	Research design	Data analysis	Sample size	Main findings
				• Several attitudes of the students including performance expectancy, social influence, effort expectancy, and behavioural intention positively influence the adoption of mLearning in higher education.
Bere (2018)	Survey study	Partial least squares approach to a structural equation modelling analysis	223	• The adoption of mLearning using instant messaging could improve the performance of teaching and learning. • The task-technology fit in the context of mLearning is influenced by: technology characteristics; task characteristics; and individual characteristics including perceived ease of use, and perceived usefulness.
Ngesi et al. (2018)	Descriptive case study	Content analysis and discourse analysis	44	• mLearning using instant messaging does not have negative effects on the teaching and learning performance of the English language. • Most students use shorthand and informal writing in their day to day use of instant messaging, however, findings revealed that students apply the traditional rules of formal writing when using these technologies for teaching and learning.

THEORETICAL FRAMEWORK: Social Embeddedness

Social embeddedness discourse places at the heart of its analysis the complex intersection of social constructions of technology, organisational behaviour, human social practices and situated contexts of technology innovations. Acknowledging the value of situated socio-economic and cultural contexts of technology adoption, Hodgkinson-Williams and Dick Ng'ambi (2009) argue that the implementation of projects that focus on digital inclusion are complex in nature. Digital inclusion projects involve unstructured problem-solving skills that emphasise understanding the interaction of technology, people and processes. Such technology adaptation presupposes an in-depth understanding of the human socio-cultural practices and strategic uses of technology in diverse situated contexts. Similarly, in virtual networks, social embeddedness of collaborative engagement necessitates among other issues, the prevalence of shared goals among interactants regarding the product (artifacts, social objects), institutionalised norms for effective participation (appropriate treatment of others) and ground rules for making contributions (how to contribute, what to contribute), (Bere and Rambe, 2016). In more specific contexts such as educator-mediated interaction via mLearning settings, the shared goals and norms of participation may be imposed by

educators although students could be co-opted to participate when they conceive the academic value of such involvement. In resource-poor contexts, the extent of the student contribution to mobile interaction is often a function of not only their knowledge base (human capacities), but the variations in access to networked resources (institutional structures), sophistication of devices in use (technology) and shared social practices (texting abilities and ability to converse with multiple interactants).

Overall, social embeddedness describes "the process of innovation in situ, tracing the cognitive, emotional, and political capacities that individuals nurtured in their local social institutions bring to bear on unfolding innovation attempts" (Avgerou, 2010). This perception conceives technologies as artifacts that are socially constructed and intensely entrenched in socio-cultural settings. Technologies' social influence differs depending on their social and cultural understandings by stakeholders. As Sahay and Robey (1996) perceive, implementers and users of ICT provide technology with social meanings. As a result, these social interpretations affect the way in which ICTs are adopted. Correspondingly, Makoe (2010) argues that livelihoods of individuals do not change due to the existence of new technology; they change in light of the way new technology becomes embedded in their lives.

RESEARCH QUESTIONS

Since the social embeddedness paradigm suggests that successful appropriation of emerging technologies (in this case mLearning using instant messaging) is dependent on the ways these technologies are socially interpreted and adapted to particular situated contexts (Avgerou, 2008), the relationship between student use of instant messaging applications and the context of their use need to be unravelled. More so, since social embeddedness unravels the connection between technology, its situated contexts of adoption and human socio-cultural practices of technology adaptation, the learning opportunities and complexities of mobile-mediated learning cannot be overlooked. Lastly, given that social embeddedness also values the mutual interdependence of social institutions, organisational behaviour and human actions, the implication of adopting instant messaging for purposes of mLearning needs to be explored. In view of this discussion, the following research question is posed:

> What evidence in the use of instant messaging in mLearning suggests its context-driven use and social embeddedness?

In light of the foregoing discussion, the objectives of this paper, therefore, are to: explore evidence of social embeddedness and context-driven use; assess the educational use of instant messaging through mLearning; and investigate the collaborative learning prospects and challenges of implementing instant messaging for teaching and learning.

METHODOLOGY

A qualitative research methodology was adopted to meet the objectives of this research. It followed a case study approach to investigate the adoption of mLearning using instant messaging by undergraduate students in South Africa. The qualitative case study research approach is suitable for this research due to two main reasons. First, the qualitative case study research approach is capable of establishing the meaning subjects give to their life experiences by immersing the investigators in the activities of people in order to obtain an intimate familiarity with their social worlds (Fouch`e and Schurink, 2011). Second it allows the collection of detailed data that would not normally be easily obtained by quantitative methodologies (Fouch`e and Schurink, 2011).

The study employed cluster sampling. This sampling technique is deemed appropriate when the challenge is to draw a sample from a widely dispersed population such as a large class (Bryman and Bell, 2015) comprising students residing in geographically remote locations. Therefore, to minimise the cost and time of conducting the research, the key sampling element is not the components of the population to be sampled but the groupings or aggregations of those units (that is, clusters) (Bryman and Bell, 2015). Cluster sampling was appropriate in this study because it facilitated large and detailed data samples (Bryman and Bell, 2015).

Qualitative data based on students' WhatsApp interactions in the form of their text postings was mined. This data collection method enabled the collection of raw data generated over a long period of time by participants operating in their social contexts. As a result, unbiased data was collected for data analysis.

RESEARCH DESIGN

In this study, the researchers identified several dynamics based on their professional practice, including low student academic participation in the face-to-face classroom, student eagerness to use mobile technologies for social interactions using instant messaging, and their inadequate understanding of how instant messaging could be made beneficial for teaching and learning. To address these aspects, a student-peer and lecturer-student mobile learning consultation initiative using WhatsApp instant messaging was implemented. Overall, mLearning initiative complimented traditional teaching and learning methods resulting in a blended learning environment.

The researcher recruited students from an IT project management course willing to download WhatsApp on their mobile devices for teaching and learning purposes. Consultative cohorts (chat groups) encompassing 8-10 participants including the facilitator were formed. Participants' chats were predominantly text-based. A total of 9 cohorts from 74 students engaged in an IT project management course problem solving and other academic-related activities with peers and course lecturers in their respective clusters outside the classroom.

In each cohort, students asked questions, and raised queries and complaints related to the IT project management course. The facilitator posed a single uniform question to all cohorts on a typical consultation day. The directive from the facilitator to students was to use the created cyberspace exclusively for academic purposes. However, no grading was awarded for participating in the mLearning project. The interactions happened after hours between 6-8pm twice per week. They lasted for about 7 months.

DATA ANALYSIS

Data based on students' WhatsApp interactions in the form of their text postings was mined, saved, and printed, after seven months of cyber cohort interaction via WhatsApp. Thematic content analysis was adopted to make sense of the collaborative learning possibilities and establishment of the challenges of implementing instant messaging for teaching and learning. According to Taylor-Powell and Renner (2003), thematic content analysis allows meaning-making through identification of themes. These themes are then structured into coherent classifications followed by identification of sub-category themes until all relevant themes are identified and labelled. The themes, products of inductive categorisation, were developed from the downloaded WhatsApp text postings, which were then grouped based on the similarity of ideas and themes, resulting in the emergence of core principal and inter-related categories. Through the process of constant comparison (required by thematic content analysis) the sub-categories that emerged from raw data (WhatsApp messages) were constantly compared to social embeddedness concepts (main themes and categories) drawn from theoretical framework literature for consistency. This matching was continually done until all sub-categories were matched to categories and themes as required by the constant comparison

method. The themes, categories and sub-categories developed are shown in Table 2. As shown in Table 2 all sub-categories that emerged from raw data were aligned and matched to their corresponding social embeddedness themes (human capabilities, social interpretations, technological contexts and organisational behaviour /practices) and vice versa.

Table 2: *Social embeddedness analytical framework*

Theme	Category	Sub-category emerging from raw data
Human capacities	Cognitive Emotional Political	Knowledge sharing Pleas for assistance Disruptive behaviour
Social interpretations (of technology)	Local interpretations Context of use/application Social immersion	Fostering academic communities Immediacy Socialisation
Technological contexts	Physical divide Networked connectivity Skewed academic networks	Geographic barrier Connectivity costs Knowledge gaps
Organisational behaviour	Multiple classes Cohort heterogeneity	 Depth of understanding

PRESENTATION AND DISCUSSION OF FINDINGS

As already stated, the current study sought to address the following research question: What evidence in the use of instant messaging in mLearning suggests its context-driven use and social embeddedness? Context-driven use manifested in the ways in which student appropriation of instant messaging was shaped and constrained by the broader academic conditions such as geographical barriers between educators and students, connectivity costs and knowledge gaps between students and educators. Evidence of social embeddedness of technology manifested in the different human capacities activated in student use of instant messaging including the various interpretations of technology, which students brought to bear upon their use of this platform. The cognitive, emotional and political capacities that emerged in student use of instant messaging included knowledge sharing, pleas for academic support and disruptive behaviour by students. The students interpreted technology (mLearning using instant messaging) as a platform for fostering an academic community, promoting immediate conversations (immediacy) and socialisation. These issues are drawn upon and explored under the categories and sub-categories developed in the data analysis section.

Capacities

The study explored evidence in student academic use of instant messaging which suggested the social embeddedness of this technology. Social embeddedness of technology manifested in student use of instant messaging to share knowledge, in their pleas for educator assistance and in their disruptive behaviour. When aligned with social embeddedness theory categories, these social practices resonate with cognitive, emotional and political capacities respectively. The social practices are discussed under their respective categories in subsequent sections.

Cognitive Capacity: Knowledge sharing

Cognitive capacity manifested in knowledge sharing, that is, student psychological investment in collective generation of knowledge, willingness to engage with learning content, and commitment to participate in informal academic networks. Since the majority of students owned smartphones they utilised WhatsApp instant messaging to engage with peers and educators for academic gains in their cyber cohorts. WhatsApp instant messaging promoted an informal learning community that enabled geographically dispersed students to engage on academic matters off-campus. Conceiving instant messaging innovation from the social embeddedness perspective, it is clear that attention is given to relevance and situatedness (embeddedness) of this innovation in its social context (Avgerou, 2010) of geographically remote students striving to deepen their understanding through peer-based knowledge sharing. Students used WhatsApp instant messaging as a platform for extending their learning beyond formal spaces as indicated in these interactions which unfolded after hours:

> *Send me a snapshot of your chapt 4 initiating projects and the issues involved* (female student, cluster 6)
>
> *The definition says: its (it) includes recognising and starting a new project or project phase. Chpt 3 slide 6* (male student, cluster 6)
>
> *Can I please hv(have) types of cost estimation (3.9 in the scope)* (male student, cluster 1)
>
> *Do u (you) have e(the) soft copy of INL textbook? If u(you) do, it will b(be) easier to search key words and it will take u(you) straight 2(to) e answer* (female student, cluster 1)

This aforementioned extension of the informal learning community by students further supports the opinion that a social embeddedness approach views the aim of ICT innovation as developing from local problematisations, and its progression as being driven by the manner in which users obtain meaning and accommodate this technology innovation in their lives (Avgerou, 2010). The use of instant messaging was a consequence of the educator's difficulty with supporting students and extending consultations after hours due to the cost of Internet connectivity via personal computers. The student-peer consultations on WhatsApp instant messaging are also indicative of their domestication and accommodation of instant messaging as an alternative, productive academic consultation space in organisational contexts where peer-consultations after hours were difficult to sustain. The progression and extension of the informal learning community through deeper psychological student interactions institutes a practical application of mLearning using instant messaging in environments where educator support after hours was hard to access. Evidence of informal academic community is displayed by student consultations such as:

> *Guys can you pls (please) assist me with question 3 on what ERM of lecturer and student is-the question our lecturer posted on e-thutho* (male student, cluster 6).
>
> *I think the answer to question 3 is that we need to create a composite entity to bridge relationships […]* (female student, cluster 6).

Such a request for assistance suggests that students conceived WhatsApp as an ambient space for academic consultation with peers. Such interpretation potentially resonates with Avgerou's (2010) view that social embeddedness emphasises the cognitive abilities that humans in social establishments offer to bear on the unfolding of innovation efforts. In the aforementioned resource-constrained environments, student innovative use of WhatsApp informal networks provide evidence for the essence of social embeddedness approach in understanding such innovation.

The aforementioned interactive opportunities potentially created mobile networking opportunities for exchanging content, commenting on peers' views and updating one's knowledge (Bere, 2012).These social practices enhanced the collaborative creation of learning content amongst information-seeking populations. The interaction above reveals that informal peer networks were valuable resources for academically challenged students.

Emotional capacity: Pleas for assistance

Emotional capacity constituted student expression of their feelings, characters and personality involving their academic and social lives at university. These ranged from student pleas for academic assistance, social appreciation to discontentment with peers' conduct. An example of a plea for assistance is highlighted below:

> *Den (then) whr (where) a (are) u (you)? We r (are) failing without yu (you)…wd (would) u (you) have mercy on us pls (please)* (female student, cluster 4)
>
> *You won't fail* (lecturer)
>
> *Its already happening* (female student, cluster 4)
>
> *Exam scope attached on e-thutho* (lecturer)

The statements "have mercy on us please" and "its (that is, failing) already happening" are indicative of frustrations among students due to lecturer's unavailability during critical moments such as exam preparation, where academic assistance was deemed essential. Student use of WhatsApp instant messaging to articulate their concerns and dissatisfaction with limited support from the educator in a university context resonate with social embeddedness of this technology. Social embeddedness highlights emotional capacities, which demonstrates that individuals raised in local social establishments bring to bear on the unfolding of innovation efforts (Avgerou, 2010). One student expressed her feelings to her peers this way:

> *To my friends, I appreciate you all…to those who show me + I am grateful. To those who hurt me= I forgive you. To those I hurt+ I am so sorry*.(female student, cluster 8)

Another student also expressed her discontentment with peers who discussed past examination papers on WhatsApp:

> *Formula for calculating* $NPV = \sum_{t=0\ldots n} At/(1+r)t$
> *…of the cash flow, n is the last year of the cash flow* (male student, cluster 4)
>
> *Can I have a full image of that question?* (female student, cluster 4)
>
> *… (You) what is the excitement? If you want to discuss previous question papers why don't you do it outside instead of bothering with annoying texts. Go away* (male student, cluster 4)

WhatsApp enhanced the democratic expression of student discontentment with peers' behaviour, their grievances and discontentment with their lecturer's occasional unavailability for consultations before impending examinations. A social embeddedness approach thus reveals how social actors use the ICT innovation to negotiate their diverse interests and disagreements in situated contexts.

Political Capacity: Disruptive behaviour

Political capacity involved discourses constructed by actors implicated in relations of power in interactional contexts. Such discourses demonstrate the ability of the lecturer to exert control and regulate student behaviour, the right of students to respond including their capacity for generating self -generated discussions:

> *Does your timetable reflect that we hv (have) class today?* (lecturer)
>
> *No it says class cancelled* (female student, cluster 5)
>
> *Check yours* (male student, cluster 5)
>
> *Just ansa (answer) the que (question), I hv (have) a reason for asking. Don't be disrespectful young man* (lecturer)

The educator's authoritative power is portrayed in the narratives "Just answer the question […]. Don't be disrespectful" which is symptomatic of the expression of academic authority. These academic interactions between these academic interactants demonstrate the perpetual contestation for power in the complex platforms. O'Brien and Freund (2018) propose that lecturers are in constant controversy with students as they attempt to impose hierarchical modes of teaching which are inconsistent with student expectations for self-control in fluid online spaces. These interactions are not only symptomatic of how actors socially negotiate power and authority but the mutual re-constitution of information systems (IS) innovation and shifting social dynamics. Avgerou (2010:5) argues that a social embeddedness approach provides a theoretical lens for understanding the mutual constitutiveness of technology and social action and their double effects on each other.

Students also wrestled power from educators through their contestations of educators' decisions which attempted to territorialise control over interactional processes:

> *That would be of great help Mr…What time tomorrow afternoon?* (female student, cluster 3)
>
> *Just be available tomorrow afternoon* (male student, cluster 2)
>
> *Those with que (questions) can cum (come) and c (see) me in office frm (from) nw (now) till 2* (lecturer)

While the lectures did not always have off hand solutions to student's demands, these interactions are a clear indication of the potential of the WhatsApp platform to democratize communication between individuals with different levels of authority

Social Interpretation of Technology

Evidence of social embeddedness also manifested in students' interpretation of technology (smartphones and instant messaging). Students conceived WhatsApp as a platform for fostering an academic community, as a technology for promoting instant communication (immediacy) and a platform for socialisation. These sub-categories that emerged from student WhatsApp postings were conceived to align with social embeddedness categories: local interpretation, the context of use and social immersion.

Local Interpretations: Fostering an academic community

Local interpretations of technology describe the perceptions of interactants on their interpretation involving the value of communicating and interacting through technology. Students interpreted WhatsApp as a technology for fostering an academic community as it enhanced their academic engagement and communication with peers:

> *I believe dis (this) grp (group) was created for us to interact with one anoda (another). Are you still active guys. Simple tests will do* (male student, cluster 3)

> *Yep I am* (male student, cluster 3)

> *Lol (laugh out loud) of coz (cause)[…]* female student, cluster 3)

For the educator, WhatsApp served as a platform for instant communication of announcements to students:

> *My apologies for the wrong marks you have seen on the notice board. Correct marks include six tests and they will be displayed tomorrow* (lecturer)

The educator's provision of instant communication to students consummates Rajasingham's (2011) view that using mobile phones has created possibilities for providing education on-the-go which offers just-in-time learning. Students who resided outside the university with limited access to the university learner management system conceived WhatsApp as an alternative powerful platform for academic engagement.

Context of Use: Immediacy

The context of use of technology revolved around spatio-temporal dimensions of the learning encounters, contextual circumstances in which MIM was deployed for learning. Spatio-temporal aspects relate to the time and location aspect of the learning process (Ng'ambi and Bozalek, 2013). Students desired immediate communication with the educator and tended to be frustrated with educators delayed responses or silence on WhatsApp:

> *Mr Mokgosi (lecturer's pseudonym) wt (what) u (you are) doing aint (is not) fair on us.. u (you) created ds (this) groups nd (and) nxthin (then nothing) u js kip (you just keep) quite (quiet) I gt u a sick bt cant u at least typ nd tel us u gtn beta (I got that you are sick but you can at least type and tell us you are getting better)…(*female student, cluster 1)

Social conditions of WhatsApp adoption ranged from geographical dispersion of off-campus students and their limited English language proficiency. As some students discussed the career fairs, some complained about distance:

> *Art gallery –library, third floor it's the venue for career fairs* (female student, cluster 2)

> *Thank u (you) but I can't as I need a taxi and its expensive* (male student, cluster 2)

> *How did … (tutor) give people who did not write an average of 78% mark?* (female student, cluster 7)

> *U mean test 3?* (male student, cluster 3)

> *This is unfair. I was not even ready as I was tired after travelling 15km but I wrote anyway* (female student, cluster 7)

Lack of student physical interaction describes the geographical dispersion of individual students. The use of WhatsApp exposed student geographical constraints that could otherwise be taken for granted by educators in their provision of academic support to students. IS innovation like WhatsApp should not be conceived exclusively from desirable consequences but rather than the limitations that inhibit (Avgerou, 2008) physical engagement as well. On the contrary, the engagement opportunities presented by WhatsApp reinforce Rambe and Bere's (2013) view that there is a double articulation of offline and online spaces where there is a reproduction of offline relations in online environments.

Social Immersion: Socialisation

Social immersion was related to relaxed socialisation processes which formed the base for academic engagements. Such socialisation included student complaints about being overwhelmed by complex projects and their ridiculing of peers who failed tests:

> *After completing this project, my head is burning* (male student, cluster 7)

> *I need some weed (a drug)* (male student, cluster 7)

> *I think I got addicted to bio plus*. (male student, cluster 7)

> *Some guys failed and I think that they deserve this*. (male student, cluster 4)

> *What about those with low marks –it doesn't make sense to go write and get low marks and the other person gets 79perc (per cent)* (female student, cluster 4)

> *So you get 12 marks mahala (for free) and fail again. Lol* (laugh out loud) (male student, cluster 4)

Social conversations in mobile environments are conceived as icebreakers and precursors to making deeper conversations, opening possibilities for mutual academic engagements (Bere, 2018). According to Salmon's (2000) five-step model of online engagement, online socialization provides the impetus for building trust and providing bridges between social-cultural practices of offline and online learning environments. In the excerpts above, however, socialisation provided the platform for ridiculing underperforming peers in ways that potentially undermined peer-based trust and one's self-confidence.

Social immersion is associated with humorous social interactions, motivational talks, and informal assessments. A typical lecturer-student humorous exchange is articulated:

> *Sir u gna go 2 skul 2mrw (Sir are you going to school tomorrow?)* (female student, cluster 4)

> *No, am in Cape Town wat (what) do u (you) want?* (lecturer)

> *Hope you are not auditioning for idols (South African Idols) there in da (the) Cape* (female student, cluster 4)

> *How do you kow tht (know that) I am here 4 (for) idols. I am gonna (going to) be the next SA (South African) idol* (lecturer)

> *You are so ryt sir u a (right sir you are) the next SA wooden mic (microphone) model* (female student, cluster 4)

Although these socialisation processes lacked strong intellectual qualities, they often paved the way for productive academic engagement.

Technological contexts

The technological contexts are related to the WhatsApp-mediated constraints that complicated educator-student interactions such as geographical barriers, connectivity costs and knowledge gaps between academics and students. These sub-categories that emerged from WhatsApp data resonated with the social embeddedness categories-physical divide, lack of networked connectivity and skewed academic networks respectively.

Physical divide: Geographical barriers

One of the expressions of the physical divide was the physical distance between the educator and students. The evidence of a geographical boundary between these interactants is shown in the following:

> *I am happy that u (you) guys are working out critical path examples. Please compare your examples. I can't verify right or wrong answers as I am away* (female tutor).

In such scenarios where the educators had travelled, students are unable to get support from their lecturer, in particular through face-to-face academic consultations. However, most often WhatsApp bridged the physical divide between students and their lectures:

> *I will be n (in) office frm (from) 11:20 to 13:30* (lecturer)

> *Sir m awr dt u at da (I am aware that you are at the) campus bt I cnt cum cos I liv (but I cannot come because I live) a bit far. Will it be specified to draw a cross foot ERD, or shud (should) we always draw it in dt (that) form or a UML form?* (female student, Cluster 1)

The student addresses the lecturer's assumption about student homogeneity (that is as on-campus learners) by stressing her remote location. The geographical barrier of the student including the capacity of the technology to breach such barriers resonates with the social embeddedness approach, which emphasises the significance of the social context in the implementation of IT innovation (Avgerou, 2010) among interactants to ensure effective use of technologies.

Networked Connectivity: Connectivity costs

Technological contexts could also be understood from the perspective of networked connectivity issues. The cost of connectivity lay in the need for educators and students to purchase airtime or data plans to maintain sustainable interactions. Educators often physically drew IT network diagrams, took pictures of them and posted these pictures online together with corresponding questions either as text or audio for student discussions. Although such engagements tended to be more bandwidth intensive they are still a cheaper option than uploading the same learning resources on a web-based learning management system:

> *See attached diagram and listen to the audio below involving a computer networking project* (lecturer).

> *Apologise to your colleagues on my behalf who are not on WhatsApp since I could not post this task on ethutho (learner management system) tonight because I do not have enough data to connect my laptop to the Internet; however, I will upload it tomorrow on campus* (lecturer).
>
> *Thank u sir, I doubt if they hv (have) data either to access ethutho* (female student, cluster 5).
>
> *Lol, to what extent do you expect students to be broke if their lecturer is broke too, no offence sir* (female student, Cluster 5).

It is common knowledge that live streaming videos and uploading documents consumes data and bandwidth. Sanga et al. (2016) advised that to ensure sustainability of mLearning systems, these teaching and learning technologies should be developed based on software that reduces costs on teaching and learning. However, in this study lecturers and students access these large files on WhatsApp without experiencing exorbitant costs while utilisation of traditional learner management system for uploading or accessing audios and pictures was too expensive for the lecturer and students. This suggests the impact of cost on teaching and learning using ICT.

Skewed academic networks: Knowledge gaps

Skewed academic networks manifested in the knowledge gaps between educators and students. These gaps manifested in some students' expression of their confusion online and their request for assistance from peers:

> *Can anyone check the correctness of my critical path diagrams? I tried it but activity j and k are confusing* (male student, cluster 5)
>
> *You are not alone. I am lost also* (female student, cluster 5)
>
> *I am not sure but the tutor might know* (male student, cluster 5)
>
> *Sir may u plz cum to skul (you please come to school). We hv sum (have some) questions n we nid u (and we need you).* (male student, cluster 7)
>
> *Am sick* (lecturer)
>
> *Wen u (you) get beta plz cum (better please come)* (male student, cluster 7)

Less confident and struggling students' undoubtedly perceived tutors and lecturers as the more dependable source of information than students (see statement 3 above). These findings are consistent with previous literature that indicate that although educators may desire to use mLearning and social networking platforms to generate conversations among students and peers, in addition to consulting the lecturer, most students often consider their educators as the main sources of authentic information (Hodgkinson-Williams and Dick Ng'ambi, 2009).

Organisational behaviour

Organisational behaviour comprised the situated, departmental contexts which influenced the delivery of content to students. Organisational behaviour related to course load, which comprised two categories existed, namely, multiple classes and cohort heterogeneity.

Multiple classes

Since the lecturer taught multiple classes, his challenge was apportioning his limited time across the different classes.

> *Does your timetable reflect tht (that) we hv (have) a class today?* (lecturer)
>
> *Yes sir* (male student, cluster 7)
>
> *Meet u (you) in class then. Mine is clashing with my new class 4 (for) comp sys (computer systems)* (lecturer)

Time constraints in light of multiple classes taught by a single lecturer were depicted through clashing teaching timetables. With reference to South African higher education, Ng'ambi and Bozalek (2013) observed that multiple teaching challenges: Heavy teaching loads for faculty, administrative assignments and lack of systematic schedules for lectures and meetings. While administrative assignments were not evident in the educator-student conversations, the clashing teaching timetables could be indicative of the heavy faculty responsibilities of educators at this university.

Heterogeneous cohorts

Classes comprised students with different levels of understanding of course content:

> *Sir critical path analysis especially network diagrams are giving me a runaround* (male student, cluster 2)
>
> *Can you post in this platform questions that you need assistance on so that your peers and I could help* (lecturer)
>
> *Sir I have answered all the critical path analysis exercises in our text book and I have attempted all the critical path analysis questions from the past five exam papers. I am confident that I am now a critical path analysis pro* (female student, cluster 7)
>
> *That's good then you should help others* (lecturer)
>
> *Lazy pple are taking us backwards, we should move on instead of discussing critical path analysis. Pple should study and not bring their lazynes tendences here and expect to be spoon fed* (female student, cluster 7)
>
> *Watch your tone; I will not tolerate such behaviour on this platform* (lecturer)

With reference to South African higher education delivery, Ng'ambi and Bozalek (2013) report poor quality of students admitted into programmes as one of the challenges that impede effective instruction at the university. Mindful of the fact that universities of technologies often admit students with lower grades into their programmes compared to traditional universities, it is undeniable that poor mastery of English Language (the language of instruction) contributes to the low-quality of students. Hodgkinson-Williams and Dick Ng'ambi (2009) argue that opening the learning space in an unthreatening way is difficult for South African educators as they are often confronted with the challenge of teaching the course content and managing discipline.

IMPLICATIONS FOR PEDAGOGY AND DEVELOPMENT

Some students complained about the emotional stress caused by the occasional unavailability of the lecturer on WhatsApp, particularly during exam preparation. Since genuine reasons like sickness and busy schedules explained his absence, tutors might need to be recruited as group leaders who sustain academic activity during the lecturer's absence.

The foregoing discussion has several implications for information technology for development discourses. The social embeddedness (that is, potential to promote knowledge sharing, fostering academic communities) of mobile instant messaging should be reconciled with the appropriate mediating role of educators (scaffolding students) that improves pedagogical delivery. In circumstances where students engage with complex concepts that increase their cognitive load and constrain their capacity to process information, the mediating role of technology in supporting student understanding and improving the quality of their learning experience cannot be assumed to be automatic. Educators would need to provide adequate and appropriately pitched scaffolding to students in these technology-mediated environments to ensure quality pedagogical delivery and increase meaningful participation in higher education of academically challenged students.

The increased hype about the educational benefits of using mobile devices should be considered in context by not underestimating the potential of mobile instant messaging to support disruptive and disrespectful behaviour by students. The political capacity of mobiles can be harnessed by students to support unproductive academic behaviour like unjustifiable critiques of educators, which undermines quality learning. Mobile instant messaging also creates unintended consequences like students' unrealistic expectations to be continually supported by educators in the ways that compromise student independent learning and self-regulation.

Students' expectations for immediate feedback from lecturers after hours can be addressed through the establishment of academic engagement guidelines on frequency of educator responses including setting up possible minimum response times for lecturers.

Lastly, in African nations where unsubstantiated claims about the potential of mobile phones persist (Bere and Rambe, 2016; Murire and Cilliers, 2017) these claims need to be considered against the background of erratic connectivity, slow connectivity, full-time students' limited access to the Internet due to lack of airtime and other hidden costs of communication. As such, discourses considering the relationships between ICT (particularly the potential of mobiles to support effective engagement) and the advancement of quality education should avoid generalisations about the power of ICT to transform education and conduct a reality check of ICT's performance based on individual countries and institutions' circumstances.

LIMITATIONS OF THE STUDY

The limitation of this study is that it did not draw on the artifacts of those students who had standard phones with no Internet connectivity. These students' postings were made on the discussion forum of the institutional learning management system. While these could have rendered some insights into the context-informed learning experiences of student use of technology (that is, discussion forums), we could not use this data as we were concerned about mobile mediated interactions. Our focus on WhatsApp was due to its low cost and ubiquitous nature among all students with smartphones.

CONCLUSION

The research examined the evidence of context-driven use and social embeddedness in student adoption of mobile technologies in educational environments. To explore such evidence, social embeddedness theory and WhatsApp-mediated lecturer-student and peer-based interactions were drawn upon as theoretical and analytical lens respectively. Evidence of context-driven use of WhatsApp manifested in academic conditions such as geographical barriers of remotely-located students, connectivity constraints, and knowledge gaps between students and educators, which regulated and constrained student use of this technology. The geographical dispersion of predominantly off-campus students, their peers and the educators made the use of WhatsApp necessary, to overcome challenges of differential knowledge among students, peers and their educator. The intensified use of WhatsApp after-hours bore testimony to student need to overcome their off-campus status, which constrained access to educator and peer-generated knowledge after hours.

Evidence of social embeddedness manifested in the different human capacities activated in student use of WhatsApp, including the various interpretation of technology which students brought to bear upon their use of this platform. The cognitive, emotional and political capacities that emerged in student use of WhatsApp included its appropriation for peer-based knowledge sharing, in student pleas for academic support and its use for promoting disruptive behaviour by students. There are sharp contrasts between these MIM uses and those reported in developed contexts. Perhaps our context marked by educators' expectations for academic interactions among students explain the higher levels of academic engagement, suggesting the role of educator regulation in the quality of academic conversations.

Students interpreted technology (smartphones and instant messaging) as a platform for fostering an academic community, promoting immediate conversations (immediacy) and for socialisation. Such uses are not necessarily unique to developing contexts as these have resonance with developed contexts as well. Timmis' (2012) study on third year E-Business undergraduate uses of IM reported intimate peer communications for affirming peers' responses and providing practical support in the course, which helped them foster an academic community. However, some subtle differences in the use of WhatsApp across different contexts also prevail. For instance, while our students intensified the use of WhatsApp after hours due to their geographical dispersion as off-campus students, Castrillo et al.'s (2014) study reported WhatsApp groups' concentration of WhatsApp messages during working hours. Perhaps the stipulated purpose of interactions and residence of students shape and inform the distribution of WhatsApp interactions.

Future research needs to reconcile potential contradictions between student demands for immediate responses and educator delays in giving feedback, and those between student socialisation and educator demands for more academic discussions.

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