

Rhizomatic Learning and Use of Mobile Instant Messaging Platforms: Case of University of Technology in South Africa

Frank Makoza, Cape Peninsula University of Technology, South Africa*

 <https://orcid.org/0000-0002-5818-3810>

Laban Bagui, Cape Peninsula University of Technology, South Africa

ABSTRACT

Rapid development and adoption of mobile technologies including mobile instant messaging (MIM) platforms have transformed teaching and learning practices over the past decade. This paper presents an analysis of how students used WhatsApp as an example of a MIM platform to organise their learning activities. Drawing on rhizomatic learning theory (RLT), the study showed that WhatsApp supported students to navigate through a complex network of learning where knowledge was generated beyond the confines of the formal learning context. WhatsApp supported learners during the transition to remote learning that was introduced during the lockdown due to the COVID-19 pandemic. Further, WhatsApp use supported learners to cope well with new learning experiences and practices. The study offers insights into the perspective of learners on the use of technology during challenging and uncertain times. The insights can be useful for lecturers when developing technology strategies and teaching best practices during uncertain times.

KEYWORDS

ICT, Mobile Instant Messaging, Mobile Technologies, Rhizomatic Learning, South Africa, WhatsApp

1. INTRODUCTION

The past decade has seen rapid development and adoption of mobile technologies that are transforming organisations and society. Mobile technologies are being integrated in universities in the context of South African higher education to make them more competitive and achieve effectiveness and efficiency in the delivery of academic programs (Mpungose, 2020; Zongozzi, 2020). Mobile instant messaging (MIM) platforms (e.g. WhatsApp, WeChat, Facebook instant messenger etc.) are examples of mobile applications that have the potential to transform practices of lecturers and students in universities. However, integrating MIM platforms in teaching and learning practices remains problematic and not well understood (Barfi, Bervell & Arkorful, 2021; Hordovik, MacPhil & Ronglan, 2020; Njenga & Fourie, 2010).

DOI: 10.4018/IJVPLE.295304

*Corresponding Author

The current study joins the debates on the role of information and communications technologies (ICT) in supporting students to acquire new knowledge, skills and experiences beyond the confines of the classroom (Bouhnik & Dshen, 2014; Zulkanain, Miskon & Abdullah, 2020). The study focused on mobile instant messaging (MIM) platforms that have become popular and affordable to many users including students in the context of developing countries (e.g. South Africa has 25 million users of social media) (DP, 2021). Studies show that MIM platforms are supporting teaching and learning in the context of South African Universities in supporting collaboration between lecturers and students, delivery of course in remote areas and supporting use other teaching and learning systems (see Gachago, Strydom, Hanekom, Simons & Watters, 2015; Mpungose, 2020; Rambe & Chipunza, 2013; Thaba-Nkadimene, 2020). While these studies are significant in understanding the use of MIM, the use of MIM among students beyond the classroom is still not well understood. The current study responded to the call for further studies on how students use MIM to organise their learning activities (Bharuthram & Kies, 2013; Bouhnik & Dshen, 2014; So, 2016).

Bidarra and Rusman (2017) argue for a holistic understanding of learning beyond the classroom and that MIM platforms can support acquiring knowledge in diverse environments including school, work, family, private and leisure contexts. From this point, the study aim to analyse how students use MIM to organise their learning activities. We draw concepts of Rhizomatic thinking (Deleuze & Guattari, 1987) that offers alternative way of thinking from fixed, predetermined and recognised identities in a social system. Instead, rhizomatic thinking supports the understanding of generative interconnectedness of individuals with diverse goals, histories and practices in collective activity systems. The study used a case of a University of Technology (UoT) in the context of South Africa. Universities in South Africa are transforming to redress the apartheid legacy and become more inclusive. There is a commitment from the government to support universities in creating equal education opportunities for all students regardless of their backgrounds (Bidarra & Rusman, 2017; Bharuthram & Kies, 2013; Govinder, Zondo & Makgoba, 2013). The universities are also integrating technologies to transform teaching and learning to support their activities and improve practices. Understanding the use of technologies is significant for lectures, university managers and policymakers to develop effective strategies for integrating technologies in teaching and learning and achieve academic inclusion.

The rest of the paper is presented as follows. Section 2 presents the background to the study. Section 3 summarises the theory guiding the study. Section 4 outlines research methodology of the study. Section 5 summarises the findings of data analysis. Section 6 discusses the findings. Section 7 is the conclusion.

2. BACKGROUND TO THE STUDY

2.1. Mobile Instant Messing Platforms as Technologies for Learning

Mobile Instant Messaging (MIM) platforms are ubiquitous Internet applications that operate on electronic devices (e.g. computers and mobile devices) and support instant communication and sharing of content (e.g. voice, text and video) among users (Pimmer, Mateescu & Grohbiel, 2016). Examples of MIM platforms are WhatsApp, Tweeter, WeChat, Facebook, Telegraph etc. MIM platforms support creation and maintaining of individual's identities in a social context through practices e.g. in communication, sharing interests or affinities, obtaining support and building social capital (Mackness, Bell & Funes, 2016). Hence, there is growing adoption and integration of MIM in everyday activities in many settings including work, education, leisure, social and political activities (Barhouni, 2015; Zulkanain, Miskon & Abdullah, 2020).

In the education setting, MIM platforms are becoming part of mainstream technologies for teaching and learning (Bouhnik & Dshen, 2014; Thaba-Nkadimene, 2020). MIM platforms are being integrated into teaching and learning to support the delivery of programs and managing learning

activities (Barhoumi, 2015; Gachago, Strydom, Hanekom, Simons & Watters, 2015). MIM platforms are changing traditional teaching and learning that is often delivered face to face and take place in classrooms at specific times. Lecturers are using MIM platforms to enhance their interactions with students through MIM to collaborate, share information, experiences with students and improve ways of creating knowledge. MIM are supporting teaching and learning to happen any time at different locations (Coleman & O'Connor, 2019; Mpungose, 2020; Zongozzi, 2020). Students are using MIM platforms to navigate around personal and education-related activities (Bouhnik & Deshen, 2014).

2.2. Advantages and Challenges of Using MIM Platforms in Education Context

There are advantages of using MIM platforms for teaching and learning (Barfi, Bervell, & Arkorful, 2021; Udenze & Oshionebo, 2020). MIM platforms offer cheaper means of communication compared to other means of communication e.g. mobile phone or landline calls. MIM are relatively easy to learn and use in teaching and learning activities. The MIMs support learning activities from location and anytime. User can access, upload content and share information in different formats e.g. voice recording, documents, images and video clips. Further, MIM motivates both students and lecturers to participate in learning activities because they facilitate innovative means of learning e.g. game-based learning. MIM platforms support the creation of identities of users and can facilitate creation of social capital in the academic setting. They can support students in a multicultural learning context where participants from diverse backgrounds can learn from each other. MIM platforms have the potential to support the creation of learning communities and improve knowledge of specialised topics or disciplines among participants (Anderson, 2019; Bouhnik & Deshen, 2014; Pimmer, Mateescu & Grohbiel, 2016).

There are also challenges when using MIM platforms in the context of teaching and learning (Nagle, 2018). The challenges include intrusiveness where students are flooded with information without invitation. There can be information overload where a large amount of information is sent to students and can impede the learning process. In some cases, using MIM platforms may require a high investment of applications for re-packaging and designing learning content that is suitable for portable devices. Educators may require more time to develop interesting content and keep students engaged. Students can be disengagement over time when using the MIM platforms (Barhoumi, 2015; Coleman & O'Connor, 2019; Thaba-Nkadimene, 2020).

Anderson (2019) highlighted that there are potential commercial biases in the designs of MIM platforms where they are developed to promote advertising and consumption of goods and services which can be distractive in a learning context. In some cases, MIM platforms have been used as spaces for cyberbullying which can affect the mental well-being of students (Nagle, 2018). It is, therefore, important to understand the advantages and disadvantages so that appropriate strategies can be implemented when using MIM in teaching and learning.

While there are studies that have noted the advantages and disadvantages of MIM platforms as highlighted above, integration of MIM platforms in teaching and learning should not be viewed as a simple and straightforward activity. The process is complex because of diverse issues e.g. rigid organisation practices, politics among parties (e.g. technology companies and universities), vested interests within and outside higher education institutions, too much focus on technologies and potential loss of control in learning activities (Anderson, 2019; Bidarra & Rusman, 2017; Shelton, 2017; So, 2016). The current study focuses on students. Taylor and Harris-Evans (2018) argue that students learning experiences are often downplayed concerning effective learning and institutional practices when adopting technologies in higher education institutions. Jones and Bennett (2017) highlighted that integrating technology in the education setting is complex because of diverse interests e.g. market-driven ideals of technology and best practices in teaching and learning. As higher education institutions are moving towards electronic enabled learning and incorporate new technologies e.g. MIM platforms, it is important to understand how the students use technologies to develop appropriate teaching and learning strategies and practices (Coleman & O'Connor, 2019; Bidarra & Rusman, 2017).

2.3. Context of the Study: Universities in South Africa

The higher education sector in South Africa comprises public traditional universities, universities of technologies (UoT), training and vocational colleges and other private organisations offering training programs (Langa, 2016). The current study focuses on public universities because of their social and economic role in South African society. Universities are crucial in knowledge development, skills development that meets the human capacity of economic sectors, and research that informs government policies and industry solutions that addresses the needs of communities. In South Africa, universities are also playing a crucial role to redress the legacy of apartheid in promoting education and economic inclusion (Bidarra & Rusman, 2017; Govinder, Zondo & Makgoba, 2013).

Traditional universities concentrate on developing skills required for white-collar employment and attract affluent students who can afford high tuition fees and students who do better (e.g. students coming from well-resourced primary schools categorised as quantile 5 schools and high performing high schools) (Langa, 2016). University of Technologies (UoT) focuses on developing hard skills of students that meet practical skills required in industries with less emphasis on engaging with the critique of ideas as part of intellectual development. UoTs attracts students from low-income households and previously disadvantaged communities. Students from these communities do not learn subjects that are offered high resourced schools due to limited infrastructure and capacity (e.g. electricity, ICT facilities and IT skilled personnel). Thus, despite the presence of transformation policies in the higher education sector after 1994 (post-apartheid era), problems persist that are directly or indirectly affecting UoTs to achieve equal access to higher education, retention, throughput and quality of graduates with skills that are required in South African industries (Mpungose, 2020; Tankou epe Nukunah, Bezeuidenhout & Furtak, 2017).

The government established the National Students Financial Aid Scheme (NSFAS) to provide financial support to students who come from households with less than R350,000 per year. The support includes loans for tuition fees, living honorarium, books and transport allowance (Langa, 2016). NSFAS funding from the government has been increasing while state funding to higher education has reduced over the years. For instance, in 2013 funding from the government was R8.5 billion (Bhorat, Kimani & Pillay, 2018). However, issues persist related to students funding scheme e.g. late disbursement of monthly funding to students and the large volume of queries from students that take a long time to resolve. These challenges are affecting students to meet their expenses e.g. data bundles to access e-learning platforms of universities. Those residing in remote areas are most affected where telecommunication coverage is still challenging (Mpungose, 2020; Zongozzi, 2020).

3. THEORETICAL PERSPECTIVE OF THE STUDY

Deleuze and Guattari (1987) suggest the concept of rhizome drawing from botanical studies and represents the idea about a root system that is interconnected, non-hierarchical, multiple roots and continuous. The ideas are rooted in post-structuralism and postmodernism and the authors propose a way of thinking about reality to consider the interconnection of humans and entities in knowledge construction, culture, attitudes or values in society. This approach moves away from traditional and hierarchical frames of thinking and promotes multi-perspective of being and becoming of individuals in a social system. Thus, rhizomatic thinking can be used to capture the complexity of interconnected, co-constructed of reality and the interplay between human and non-human objects including technology in a social system (Mackness, Bell & Funes, 2016; Tillman, Holland, Lorenzi & McDonagh, 2014). The concept of human and non-human is considered holistically as a source of action or causing objects to act in a network can be an object or narrative or social bond (de Freitas, 2012).

The key concepts of rhizomatic thinking are assemblages, nomadism, war machines and line of flight (Deleuze and Guattari, 1987). Assemblages is an aggregate of human and non-human that function collectively in a context to produce something unique. Nomadism relates to an actor or non-

human object existence of not being permanent or willingness to move from one territory to another. It further asserts that current situations are not maintained but open to new ideas and concepts. War machines relate to the assemblage that makes nomadic and opposes any form of power or domination of the state or capital. The aim is to trigger transformation and change. Lines of flight represents breaks from the present situation and the emergence of something new. For instance, breaking away from traditional roles and norms and taking up new roles (Tillmanns, Holland, Lorenzi & McDonagh, 2014). Six principles of rhizomatic thinking are proposed to understand the processes and activities of people in a social context. The six principles are based on the concepts of assemblages, nomadism, war machines and lines of flights (Clarke & Parsons, 2013; Deleuze & Guattari, 1987). The six principles of rhizomatic thinking are summarised as follows:

- **Connection:** Human and non-human parts are connected at any part of the rhizome or network.
- **Heterogeneity:** All parts of the rhizome or network are connected but not in hierarchical order.
- **Multiplicity:** There are no beginning and end in the structure of the rhizome or network and only lines.
- **Asignifying rupture:** The network or rhizome may be shuttered at one point but start again on old or new lines that are structured, territorialized, organised and signified.
- **Cartography:** Act as a map with many entry points ways which are open and connectable (detachable, reversible and constant changing)
- **Decalomania:** The rhizome or network can be torn, reversed or adapted to any mounting.

Rhizomatic thinking can be applied in the context of teaching and learning and commonly known as Rhizomatic learning Theory (RLT). The argument for RLT is that knowledge is created through a collaborative and challenging environment. Both lecturers and students contribute towards knowledge creation and development. This approach to teaching and learning challenges the traditional way of thinking about education that views lecturers as sole creators of knowledge; and students as receivers of knowledge. Further, RLT supports the creation and development of knowledge beyond the confines of classrooms (Cronje, 2018; Mackness, Bell & Funes, 2016). Students can generate knowledge from their experiences and share that knowledge with their peers and lecturers. This process happens in their social contents and mobile technologies facilitate this process because they are ubiquitous, collaborative, interactive and instant (Jones & Bennett, 2017; Tillmans, Holland, Lorenzi & McDonagh, 2014). Thus, the application and use of MIM platforms for learning can support understanding of how students organise their learning activities because MIM platforms support activities in school, work, family, private and leisure contexts (Bidarra & Rusman, 2017).

There are growing studies that have used RLT as a theoretical underpinning to analyse the use of ICTs in teaching and learning setting (e.g. Bozkurt, Honeychurch, Bali, Koutropoulos & Cormier, 2016; Mackness, Bell & Funes, 2016). Bozkurt et al. (2016) analysed the use of MOOCs drawing on RLT. Similarly, Mackness, Bell and Funes (2016) used RLT to understand curriculum development where MOOC was used for collaboration among participants. Similarly, Jones and Bennet (2017) analysed the use of MOOCs for collaborative learning. Mackness, Bell and Funes (2016) examined experiences of students in virtual environments using RLT. Cronje (2018) looked at how RLT principles can improve blended learning in the context of higher education. Bagui and Mwepele (2019) assessed the students use of mobile phones outside classroom using the principles of RLT. Table 1 summarises studies that have used Rhizomatic Learning Theory in the context of learning.

As can be seen in Table 1 (we acknowledge that the list is not exhaustive), RLT has been applied differently using different concepts that fit with the aims of the study. For consistency with studies that have used RLT in technology-enabled teaching and learning (e.g. Cronje, 2018; Bagui & Mwepele, 2019), the study will use concepts from the six principles of (e.g. connection, heterogeneity, multiplicity, asignifying rupture, cartography and decalomania) to understand how a MIM platform

Table 1. Examples of studies that used Rhizomatic Learning Theory

Authors	Context of study	Concepts used
Bozkurt, Honeychurch, Bali, Koutropoulos & Cormier, 2016	MOOCs for collaborative learning	Connections at macro, meso and micro levels
Mackness, Bell & Funes, 2016	Learning in a virtual environment	Rhizome, rhizome as a metaphor and arboreal thinking
Jones & Bennett, 2017	MOOCs for collaborative learning	Rhizome space, habitat, biotic and abiotic features
Cronje, 2018	Blended learning context	Connection, multiplicity, heterogeneity, rapture, cartography, asignifying and decalcomania
Bagui & Mwepele, 2019	Mobile phones beyond classrooms	Connection, multiplicity, heterogeneity, rapture, cartography, asignifying and decalcomania

is used to organise learning activities of students at a University of Technology (UoT) in the context of South Africa.

4. RESEARCH METHODOLOGY

The objective of the study was to understand how students used WhatsApp to organise their learning activities. Constructionist learning informed our research methodology where students construct understanding through experience, observation and reflecting on their experiences (Taylor, & Harris-Evans, 2018). Students construct knowledge to understand the world around them. Hence, learning is perceived to take place beyond the confines of the classroom and that educators and students are involved in a complex network to create knowledge and transform themselves (Hordovik, MacPhil & Ronglan, 2020). Qualitative research approach was used to gather subjective insights, experiences and opinions of students using WhatsApp (Polit & Beck, 2010). The qualitative search approach was consistent with similar studies that have analysed the use of WhatsApp for teaching and learning (e.g. Mpungose, 2020; Rambe & Nel, 2014; Thaba-Nkadimene, 2020).

Purposeful sampling was used in the study to select a university that was convenient for the researchers and a course that students were using WhatsApp for their learning activities (Bidarra & Rusman, 2017; Farrugia, 2019). The study was conducted at a University of Technology in South Africa. The researchers obtained ethics approval from the University Ethics Committee and permission the Head of Department, the lecturer of the course and the students. The data for the study was collected from a WhatsApp group of 152 users who were first-year undergraduate students. The group comprise 90 female students and 62 male students. The group had local students (South African born) and international students (from Southern African countries including Angola, Democratic Republic of Congo, Zimbabwe and Zambia). In most cases, the students interacted in English and shared information related to their academic work, accommodation, travel, leisure, events happening on campus, national news, grants and funding opportunities, course content (notes, lecture slides, links to websites, clips and videos), discussions and support on topics covered in formal classes. Lecturers participated in WhatsApp group on few occasions when they explored delivering classes using the platform but were removed from the group to maintain privacy of the students. Communications with the students was done through the class representatives who shared the information on the WhatsApp group.

The students were not awarded any marks for using WhatsApp group and use of the platform was voluntary. The students were motivated to use WhatsApp because they had limited information

about other systems e.g. Learning management information system and E-mail system. Some students were not yet registered and did not yet have access to the systems because only registered students could access university systems. The students were new to their learning environment and came from diverse backgrounds. Hence, the students used WhatsApp group extensively to navigate around their new learning environment in organising and managing their learning and personal life activities.

The collected data covered posts between February and July 2020 and was analysed using content analysis (Erlingsson & Brysiewicz, 2017). Qualitative data analysis software (Atlas.ti) was used to store the data and support the process of coding the data. The iterative process began with reading and re-reading the data to be familiar with the data and get a general understating of what the students were discussing. Key ideas in the data were noted. Data was grouped in smaller parts and each part assigned a meaning unit. The smaller parts of the data were condensed into smaller text while maintaining the initial meaning. Codes were developed from condensed meaning and later grouped into categories. The categorised were related to theoretical concepts of Rhizomatic Learning Theory (RLT) six principles. A report was developed at the end to answer the research question. The identities of the students have not been revealed in our findings to maintain confidentiality.

5. SUMMARY OF FINDINGS

5.1. Connection

Connection was analysed looking at interactions between human and non-human part of the network that emerged when using WhatsApp and other systems for learning. The human networks include interactions of the students with educators and other organisations. The learner interacted with their peers as part of their first-time experience to be at an institution for higher learning. One learner commented that *“Let us be friends”*. This meant that WhatsApp supported establishing both personal and academic relationships. The participants felt that they were facing similar situations in a new environment where they had to deal with several issues including accommodation, safety, academic processes and procedures. Table 2 summarises examples of statements about the situations of students.

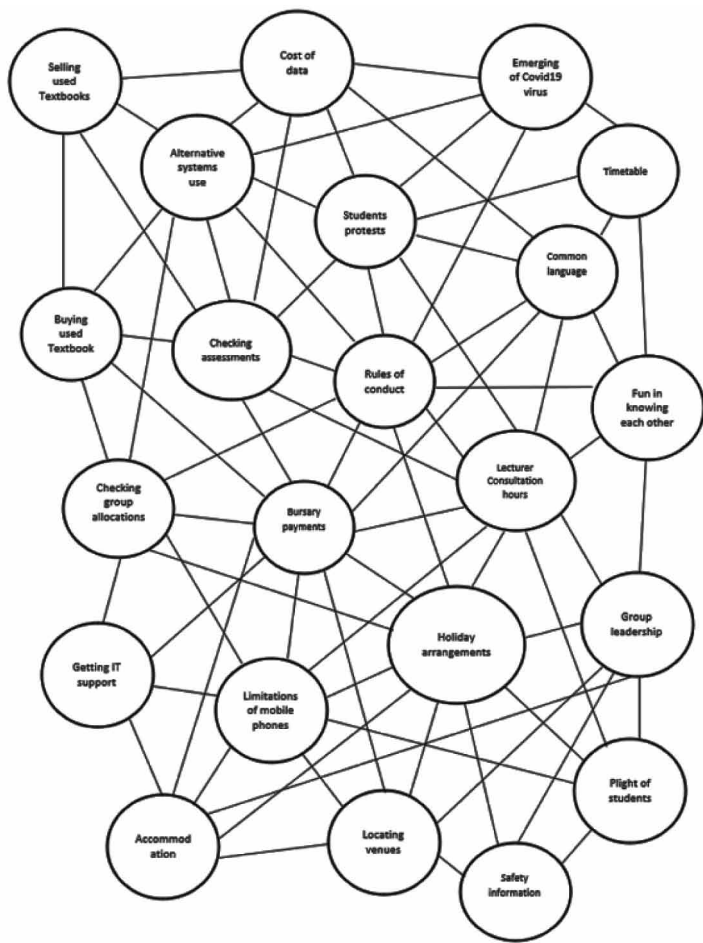
Table 2. Examples of statements about students' situations

Code	Example of statements
Accommodation	<i>“There are students who are sleeping at student's centre. Two weeks ago, an armed person was found at 02:00 a.m. trying to enter 5th floor where there are also female students who are sleeping there”</i>
	<i>“Residence registration process closed in February. You must go to your residence and sign that check in form...”</i>
Safety on campus during students protests	<i>“Guys, please be careful. If you are driving and park your car in the parking lot, take caution”</i>
	<i>“Please be careful. Protesting students do get reckless and selfish. Take great precaution”</i>
Delays in receiving students grants	<i>“... worse I did not get a message that I will receive my money [from NSFAS] and I didn't get the one that says I won't, am now truly stressed”</i>
	<i>“Guys is anyone facing the same problem as me? I uploaded my banking details long ago, but the financial aid office says I have no banking details, am confused. What must I do?”</i>
Limited knowledge about university procedures	<i>“Guys, can I please ask, where do you go when you are accepted for student's residence?”</i>
Access to IT systems	<i>“Where do we go to get your login details [username and password]?”</i>

The sharing of the concerns and challenges led to the students to relay on one another “*We all in this together*”. There also positive things beyond the challenges that students experienced when using WhatsApp. For example, encouraging each other to stay focus on their studies: “*Guys am not against anything but please do not forget that you came to university to further your studies ...*”. In a way the situations created cohesion in developing the rhizome.

Students used WhatsApp to find and share information about contact details of organisations that were supporting students. For example, one learner inquired on information related to the financial grants: “*If I applied the student grant in January this year and registered in February but applied NSFAS bursary last year ... will I be paid? Where is the NSFAS office?*”. The students also wanted to know if their grants were transferred in their personal bank accounts. This was important for the students to meet their financial expenses on time for private rented accommodation, transport to campus and textbooks required for the course. It was interesting to note that WhatsApp was also used to sell used textbooks and computer devices: “*I am selling an Entrepreneurship 1 and Finance 1 textbook for R300 each*”. The prices of the textbooks and computer devices were usually lower than the normal prices from Bookshops and Retail outlets. Figure 1 summarises rhizome that emerged from the analysis.

Figure 1. Example of the rhizome that emerged from the analysis



The analysis also showed the importance of material and non-material in the connections that emerged in their context. For instance, access to Internet was challenging because of high cost of data. The students inquired about access data that the university was providing for students: *“How do we access the free data...?”*. Students preferred to use WhatsApp to share content for their courses despite the presence of content being available on a Learning Management System of the University because accessing the system required more data. Some of the students preferred to use WhatsApp more because they had no adequate skills yet to use the systems for the University. Further, the learners also used WhatsApp because they had not yet completed the registration process: *“I just sent the files [lecture slides] here because some of you only have WhatsApp access and does not have access to Blackboard [LMS] and Outlook [Email system] ...”*. Only students who completed registration could access the university systems. Other students used WhatsApp to obtain information for IT technical support. For example, issues related to obtain technical support, systems used for learning and support on technical issues for using WhatsApp. Thus, the network was useful as a first point of contact for any IT support issues. The issues that could not be resolved were referred to other parts of the network e.g. IT Helpdesk for the university. On overall, WhatsApp supported flow of information that facilitated interactions of students with different parties and organisations within and outside the university and formation of a rhizome.

5.2. Heterogeneity

Heterogeneity was assessed looking the way the human and non-human parts of the network interacted. As can be seen in Figure 1 for the summary of the Rhizome, there was no hierarchical approach to learning where lecturers did not act as the main source of knowledge for the courses. The network or rhizome supported the students in many aspects of learning including sharing of content: *“Whoever sent those slides thank you so much because I do not have access to Blackboard [Learning Management System] here at home, so thanks”*. The lecturers formally shared content of the systems and students used WhatsApp to share content to their peers. WhatsApp was used in peer-learning of where students discussed topics and exercises that were covered in face to face classes: *“If there is anyone who needs assistance with exercise 1 to 4, feel free to text me I will explain to you”*. The students also shared information that was used for making personal travel arrangements and financial issues. Further, the network was crucial in sharing information regarding the emergence of Covid19 pandemic and the lockdown for the country. Instance, announcements from government: *“President Cyril Ramaphosa announced that the country will be placed on lockdown from midnight on Thursday 26 March until midnight on Thursday 16 April 2020”*. Thus, network supported generating information and knowledge that was supporting different issues that were related to learning activities or affecting the learning activities.

Despite the students coming from different backgrounds, cultures and languages, there was consensus to use one language which all can understand: *“the only medium to be used in this group is English for a number of reasons. The most important being that it is the language we all understand and can interact and engage in.”*. The students agreed amongst themselves on the rules of conduct when using the WhatsApp group including to be tolerant: *“Please refrain from name calling. It is rude and unnecessary”*. There was a consensus for being polite to each other as noted in the following statement: *“Could we just please have a level of respect for one another and be sensitive to the people in the group”*. Thus, members of the group cooperated in dealing with issues that were affecting interactions. Use of emojis, graphical pictures and short form of text were important in facilitating communication and the expression and emotions of the students.

5.3. Multiplicity

Multiplicity was analysed to understand multiple lives, devices, roles, truths that were ubiquitously connected. Students performed multiple roles of being students and tutors in some of the aspects of the courses and their experiences at university. Students shared their knowledge to their peers in

the group. For instance, knowledge on using WhatsApp: *“Clearly you do not know WhatsApp. You can open the group and send the link here ... It is not rocket science”*. This illustrates an example of learning that was not part of the formal learning in the course. The students used WhatsApp to share content that was covered in the face to face classes. On participant requested content using the WhatsApp group: *“Can anyone please send me slides for Communication? Thank you”*. Some students used WhatsApp group to seek clarifying instructions that were given to them during the formal classes: *“Yes, I asked the lecturer on Monday and it does make sense because that is the theory we have covered thus far”*. Thus, learning was not confined to course content and from lecturers but also from the other students who attended the face to face classes.

The devices including laptop, computers and smartphones where also used for multiple functions. For instance, sharing information about courses, timetables, lecture venues, transport schedules and remote learning. Further, the devices were also used for selling used books to generate personal income: *“Selling Entrepreneurship 1 and Financial Management 1 textbook for R300 both”*, seeking travel information for planning holidays: *“Please tell me when are we going on holiday!?! For how long?”* and sharing information about safety protocols for Covid-19 pandemic: *“we urge the institution to provide face masks and gloves for students and there should be health checks at campuses and residences for students”*. Thus, development of knowledge for learning had multiple directions and happened not in a linear manner.

5.4. Asignifying Rapture

Asignifying rapture was assessed focusing on noting any breakoff and new growth from the network. The idea about new knowledge growing into new insights was evident in the use of WhatsApp. For instance, sharing of course content was challenging for some students due to the limited space on smartphones: *“As for the thing of sending slides and pages I think opening another group will be much better because not all of use them. Some of us you are using space on our phone cautiously”*. The size of the files that were shared sometimes were large and required more data bundles. Students discussed the possibilities of creating a separate chatgroup for sharing content. However, there was no evidence that the new group was created. Students maintained the same WhatsApp group but shared knowledge on managing data e.g. setting WhatsApp automatic download off and sharing files to specific individuals that requested information rather than sharing the files to the whole group.

It appeared that cost of data bundles and usage of data for learning were some of the areas that the students applied knowledge and used WhatsApp effectively. Multi-model learning and remote learning was introduced as a result Covid-19 pandemic. The students participated in online classes via WhatsApp for the theory based courses. Other students used WhatsApp and smartphones to do their practical tasks as one learner commented: *“Not to sound insensitive but these laptops are a luxury. If your cellphone is smart enough. I am sure you can get your work done there. In your whole entire community, [assuming] that could let you use their smart phone or laptop for at least an hour or two a day”*. However, there were challenges when using smartphone including the small size of the screen and limited storage space. On overall, there was demonstration of new ways of learning developed over time when the students switched from face to face learning to remote learning. Students used WhatsApp to cope with some of the changes.

5.5. Cartography

Cartography was related to the emerging rhizome representing a map rather than a tracing. This meant that the students generated their own maps linking the knowledge that was developed over time in a connected environment. WhatsApp facilitated the students to create webs of knowledge representing their own maps.

Cartography was demonstrated in the way topics kept reimagining and often in different perspectives when being discussed on the WhatsApp group. For instance, use of common language that all participants understood. Often when there were unpleasant situations or exiting situation or just

forgetting some participants used their mother language. The incidents created problems as one learner reported being not able to understand and participate in the discussions. However, the participants were apologised and encourage each to communicate in English and resolve their differences amicably. Another example was sharing content that emerged in diverse stand points including access to formal learning systems, use of WhatsApp as an alternative system. Students also reported the high cost of data to access content. At the begging of the course, students used WhatsApp to access the content. At times some of the content required more data which some student could not afford. Another challenge was information overload as a learner commented that: This meant that getting large amount of content on the chatgroup was considered problematic. Table 3 below summarises the examples of statements about re-imaging issues that were part of the discussion among the students.

Students joined the WhatsApp group at different points and participation in discussions at different times. Each encounter was often unique experience because each student brought their personal perspective to the discussion. For instance, issue regarding the plight of students, one participant noted that some of the students in the group were not coming from affluent households and financial support for them was crucial to attain higher education: *“We do not get allowances back home, we need NSFAS [student funding] as much as we understand what we here for education”*. This meant that student funding was crucial for the students to meet their financial needs and concentrate on their studies. The students refer to previous students protest e.g. #feesmustfall that led to changes of student funding for higher education in the country. This meant that students perceived that student’s protests may lead university management to address issues that were affecting their learning activities and conditions.

5.6. Decalcomania

Extending the cartography was the endless and repetition of topics on WhatsApp and represented learning of the participants. The topics were directly related to the courses they were learning e.g. about content, timetables, learning venues, feedback from lecturers and assessments. Other topics were not directly related to the content of the courses but were crucial for the learning process. Thus, WhatsApp was used to support activities that indirectly affected the learning process. For instance,

Table 3. Examples of statements about reimagining topics

Code	Example of statements
Use of common language in the WhatsApp group	<i>“This group has people from other countries and some group members to use their maternal language and causes conflicts. Please let us use the universal language”</i>
	<i>“We have already managed to speak and understand English, so now you guys are going to speak again in another language. It is not kind”</i>
Mutual understanding	<i>“We have just to understand each other, we are a family, and it is not a bad thing to help each other. It is not war!”</i>
	<i>“We do not have to argue about this for the sake of peace”</i>
Alternative system for supporting learning	<i>“I just sent the stuff here because some of you only have WhatsApp data and do not have excess to Blackboard [Learning Management Systems] and Outlook [an Email system]”</i>
	<i>“Like me, I do not have excess to Blackboard. Thanks”</i>
	<i>“I think I have a problem accessing Blackboard. I cannot view the Marketing Chapters”</i>
Cost of accessing learning content using WhatsApp	<i>“... but guys really please don’t send it [course notes] here. Some of us are not using Wi-Fi.”</i>
	<i>“I just sent the files here because some of you only have WhatsApp data and do not have excess to Blackboard and Outlook...”</i>
Information overload	<i>“Even if I have Wi-Fi access! Getting millions of messages here is not fun!”</i>

WhatsApp was used to remind the students about staying focused on their studies despite the challenges they were facing: *“Rough my mates but we need to be strong for the sake of our education”*. Other challenges were related to learning approach because of Covid-19 pandemic and limited resources to participate in remote learning: *“How do we go and attend our classes and do assignments when some of us do not even have laptops and personal computers?”*. One student highlighted delay in receiving financial support for upkeep and transport allowance: *“There are some of our classmates who are missing classes because they cannot afford to travel to campus and the same university that is keeping their money cannot give them accommodation”*. The students discussed issues that were affecting their studies, well-being at the university and showed solidarity with other students who were experiencing challenges.

6. DISCUSSION OF FINDINGS

The aim of this study was to understand how students used MIM platforms to organise their learning. The findings showed that WhatsApp as an example of MIM was used for personal organisation to support learning experience and transformation of the students. The students used WhatsApp for accessing and sharing learning context, seeking clarification on learning issues related to timetable, learning venues and contact with lecturers. These findings were consistent with similar studies that have reported on the use of WhatsApp for academic purposes (e.g. Gachago, Strydom, Hanekom, Simons & Watters, 2015; Mpungose, 2020; Rambe & Chipunza, 2013). However, we discuss the findings to demonstrate contextual contributions of our study in the subsequent paragraphs.

The findings of the study offer insights on perspective of students in use of technology during challenging and uncertain times. WhatsApp was used to communicate information between the lecturers and students. Further, the students relied more on using WhatsApp group rather than the formal systems of the university e.g. email system and Learning management system. This can be attributed to limited IT skills (for students that were not exposed to technologies in high school especially those coming from rural areas of the country) and lack of knowledge about the university systems at the beginning of their course. Udenze and Oshionebo (2020) elaborates that WhatsApp is easy to use and may be ideal for undergraduates that have limited IT skills. The findings in our study contribute to this debate to show that MIM can support students with limited IT skills in the transition to formal university systems e.g. use of email-systems, learning management systems and students' records systems. Here, we draw on connection learning to explain that learning on use of IT systems can happen drawing knowledge from diverse sources including personal learning through try and error, peers, lectures and other internet platforms.

Another interesting finding was use of WhatsApp to organise activities of multimodal learning that was introduced during the lockdown due to Covid-19 pandemic. Remote learning was introduced during the academic year (without pre-formal plans) and both lecturers and students had to adjust to new ways of learning. The lecturers and students used both formal and informal means of communication. WhatsApp was used for informal communication to complement formal communication where students shared information that was communicated to them from their lecturers and management. Previous studies have often highlighted use of WhatsApp mainly for informal communication (Gachago, Strydom, Hanekom, Simons & Watters, 2015). The study demonstrated use of WhatsApp as an additional means of communication among the students because of its features for instant communication and easy to access with limited IT skills. The insights can be useful for lecturers when developing technology strategies and teaching best-practices to cope with uncertainties in their environments. As Gachago, Strydom, Hanekom, Simons and Watters (2015) pointed out that lecturers struggle to integrate MIM platforms in teaching and learning, the current study has demonstrated from the perspective of students that MIM platforms can be useful for learning beyond the classroom to support activities that impact learning. For example, students used WhatsApp to navigate in a new learning environment and obtaining peer support to deal with uncertainties because

of student protests on campus and Covid-19 pandemic. This finding adds our understanding of the actual use of MIM platforms from the perspective of students as most studies in this area have focused more on lecturers (Rambe & Nel, 2014; Udenze & Oshionebo, 2020).

The finding highlighted the use of WhatsApp in a multicultural environment where there both local and international students collaborate using WhatsApp group for learning. Some of the international students was their first time to be in South Africa and the group offered support and information that was useful for their experience and integration in the context of the country. Pather, Norodien-Fataar, Cupido and Mkonto (2017) looked at first year experience of university students in context of South Africa. The study looked insights on first year experience based on capital, habitus and field. The current study extends the understanding of using WhatsApp and shed light on the perspective of international students who formed part of the student's population in the higher education of South Africa. It was important also important to understand their perspective on how they used WhatsApp so that e-learning strategies can also consider their needs.

Use of common language to communicate and share information was important among students in the WhatsApp group. The students came from different backgrounds and spoke different languages e.g. Afrikaans, isiXhosa and Zulu for local students; and French and English for students coming from other African countries. While the students spoke different languages, there was consensus among the students to use English in the group to ensure that there was common understanding of the messages and information. Further, use of common language made the students to be aware of the diversity in their learning context and the need to be sensitive to inclusivity. Here we see the concept of nomadism for students who have left their normal environment and were adapting to the new learning environment e.g. university of technology. The transformation was beyond classroom experience to appreciate the cultures, political and social context of South Africa in facilitating their learning activities. This process was crucial for their persistency and resilience to progress with their studies and achieve their goals (Pather, Norodien-Fataar, Cupido & Mkonto, 2017).

Another interesting finding was the use of WhatsApp among the students to share information on funding opportunities and the processes of applying NSFAS funding. For some of local students (South African born), student funding was one of the major issues affecting access to higher education in South Africa. This can be attributed to the legacy of apartheid where families from previously disadvantage communities are not able to pay fees for their children (Bhorat, Kimani & Pillay, 2018; Bidarra & Rusman, 2017). NSFAS funding scheme was supporting such students to pursue their studies. The findings highlighted issues that students face when accessing NSFAS funding especially first year students who had limited knowledge on administration processes. The students who benefited from NSFAS used WhatsApp to share and obtain information related to the administration processes. The study contribute to the understanding of issues affecting students in the funding processes and how WhatsApp can be used to support sharing information.

The study was without limitations, the authors were not able to translate competently content that was not in English. In some cases, students expressed themselves in their mother languages e.g. French, isiXhosa, Zulu and Afrikaans. We engaged a professional language translator to translate the data and some contextual meaning might have been lost. We are cautious of generalising our findings to a large population but rather view the findings as analytical generalisations (Polit & Beck, 2010) where studies can be conducted in similar contexts and compare the findings. The study offer basis for further research in the following areas (a) how educators or lecturers are integrating MIM for education purposes to complement use of Learning Management Systems (b) analysing standards and practices for use of MIM platforms in Higher education policies for E-Learning to identify limitations and opportunities (c) Strategies for integrating MIM in Higher education to address issues on copyright and acceptable use of MIM platforms (f) integrating MIM platforms in first-year students experience programs at higher education institutions. The study offers the following recommendations for practice especially for higher education managers and IT Managers to lead and consider developing strategies that can assist educators to integrate MIM platforms for academic uses

e.g. skills development on different MIM platforms, effective management of content, awareness of copyright issues and acceptable use of MIM platforms to avoid abuse and bullying among students.

7. CONCLUSION

This study was set out to understand how students use MIM platforms to organise their learning. Using Rhizomatic Learning Theory we have showed that learning happens beyond the confines of the classroom. WhatsApp was useful to organise the learning activities of students including getting support from peers and sharing learning content. The students also used WhatsApp to organise their personal activities that were affecting their learning activities including obtaining information for accommodation, location of venues, safety information and travel information to campuses. The information was also useful to deal with uncertainties that emerged because of students protests on campuses and the Covid-19 pandemic. The study offers insights on use of MIM platform for learning from the perspective of students that can be useful for developing technology enabled learning strategies. Further research is recommended to include views of lecturers on the use of MIM for teaching and learning; and compare the findings.

REFERENCES

- Anderson, T. (2019). Challenges and opportunities for use of social media in Higher education. *Journal of Learning for Development*, 6(1), 6–19.
- Barfi, K., Bervell, B., & Arkorful, V. (2021). Integration of social media for smart pedagogy: Initial perceptions of senior high school students in Ghana. *Education and Information Technologies*, 26(3), 3033–3055. doi:10.1007/s10639-020-10405-y
- Barhoumi, C. (2015). The effectiveness of WhatsApp mobile learning activities guided by activity theory on students' knowledge management. *Contemporary Educational Technology*, 6(3), 221–238. doi:10.30935/cedtech/6151
- Bharuthram, S., & Kies, C. (2013). Introducing e-learning in a South African Higher Education Institution: Challenges arising from an intervention and possible responses. *British Journal of Educational Technology*, 44(3), 410–420. doi:10.1111/j.1467-8535.2012.01307.x
- Bhorat, H., Kimani, M., & Pillay, N. (2018). The evolution of National Student Financial Aid Scheme (NSFAS) funding. *Labour Market Intelligence Partnership. Policy Brief*, 22, 1–8.
- Bidarra, J., & Rusman, E. (2017). Towards a pedagogical model for science education: Bridging educational contexts through a blended learning approach. *Open Learning*, 32(1), 6–20. doi:10.1080/02680513.2016.1265442
- Bouhnik, D., & Dshen, M. (2014). WhatsApp goes to school: Mobile instant messaging between teachers and students. *Journal of Information Technology Education*, 3, 217–231. doi:10.28945/2051
- Bozkurt, A., Honeychurch, S., Bali, M., Koutropoulos, A., & Cormier, D. (2016). Community tracking in a MOOC and normadic learning behavior identification on a connectivist rhizomatic learning network. *Turkish Online Journal of Distance Education*, 17(1), 4–30.
- Clarke, B., & Parsons, J. (2013). Becoming Rhizome researchers. *Reconceptualizing Educational Research Methodology*, 4(1), 35–43. doi:10.7577/term.685
- Coleman, E., & O'Connor, E. (2019). The role of WhatsApp in medical education: Scoping review and instrumental design model. *BCM Medical Education*, 19(279), 1–13. doi:10.1186/s12909-019-1706-8
- Cronje, J. (2018). Learning 3.0: Rhizomatic implications for blended learning. *Educational Technology to improve quality and access on a global scale*, 9-20.
- de Freitas, E. (2012). The classroom as a Rhizome: New strategies for diagramming knotted interactions. *Qualitative Inquiry*, 18(7), 557–571. doi:10.1177/1077800412450155
- Deleuze, G., & Guattari, F. (1987). *A thousand plateaus: Capitalism and Schizophrenia*. Athlone Press.
- DP. (2021). *Digital 2021: South Africa*. Accessed on 26 May 2021 from: <https://datareportal.com/reports/digital-2021-south-africa>
- Erlingsson, C., & Brysiewicz, P. (2017). A hands-on guide to doing content analysis. *African Journal of Emergency Medicine*, 7(3), 93–99. doi:10.1016/j.afjem.2017.08.001 PMID:30456117
- Farrugia, B. (2019). WASP (write a scientific paper): Sampling in qualitative research. *Early Human Development*, 133, 69–71. doi:10.1016/j.earlhumdev.2019.03.016 PMID:30948245
- Gachago, D., Strydom, S., Hanekom, P., Simons, S., & Watters, S. (2015). Crossing boundaries: Lecture's perspective on the use of WhatsApp to support teaching and learning in Higher Education. *Progressio*, 37(1), 172–187. doi:10.25159/0256-8853/579
- Govinder, K., Zondo, N., & Makgoba, M. (2013). A new look at demographic transformation for universities in South Africa. *South African Journal of Science*, 109(11/12), 1–11. doi:10.1590/sajs.2013/20130163
- Hordovik, M., MacPhil, A., & Ronglan, L. (2020). Developing a pedagogy of teacher education using self-study: A rhizomatic examination of negotiating learning and practice. *Teaching and Teacher Education*, 88(102969), 1–11. doi:10.1016/j.tate.2019.102969

- Jones, A., & Bennett, R. (2017). Reaching beyond an online/offline divide: Invoking the rhizome in higher education course design. *Technology, Pedagogy and Education*, 26(2), 193–210. doi:10.1080/1475939X.2016.1201527
- Langa, M. (2016). Researching #FeesMustFall movement. In #Hashtag: An Analysis of the #FeesMustFall Movement at South African Universities. Centre for the Study of Violence and Reconciliation.
- Mackness, J., Bell, F., & Funes, M. (2016). The rhizome: A problematic metaphor for teaching and learning in a MOOC. *Australian Journal of Educational Technology*, 32(1), 78–91. doi:10.14742/ajet.2486
- Mpungose, C. (2020). Is Moodle or WhatsApp the preferred e-learning platform at a South African university? First-year students' experiences. *Education and Information Technologies*, 25(2), 927–941. doi:10.1007/s10639-019-10005-5
- Nagle, J. (2018). Twitter, cyber-violence, and the need for a critical social media literacy in teacher education: A review of the literature. *Teaching and Teacher Education*, 76, 86–94. doi:10.1016/j.tate.2018.08.014
- Njenga, J., & Fourie, L. (2010). The myths about e-learning in higher education. *British Journal of Educational Technology*, 41(2), 199–212. doi:10.1111/j.1467-8535.2008.00910.x
- Pather, S., Norodien-Fataar, N., Cupido, X., & Mkonto, N. (2017). A conceptual framework for understanding pre-entry factors influencing first-year University Experience. *South African Journal of Higher Education*, 30(1), 1–21.
- Pimmer, C., Mateescu, M., & Grohbiel, U. (2016). Mobile and ubiquitous learning in higher education settings. A systematic review of empirical studies. *Computers in Human Behavior*, 63, 490–501. doi:10.1016/j.chb.2016.05.057
- Polit, D., & Beck, C. (2010). Generalisation in quantitative and qualitative research: Myths and strategies. *International Journal of Nursing Studies*, 47(11), 1451–1458. doi:10.1016/j.ijnurstu.2010.06.004 PMID:20598692
- Rambe, P., & Chipunza, C. (2013). Using mobile devices to leverage student access to collaboratively-generated resources: A case of WhatsApp instant messaging at a South African University. *International Conference on Advanced Information and Communication Technology for Education (ICAICTE 2013)*, 331–337. doi:10.2991/icaicte.2013.66
- Rambe, P., & Nel, L. (2014). Technological utopia, dystopia and ambivalence: Teaching with social media at a South African University. *British Journal of Educational Technology*, 46(3), 629–648. doi:10.1111/bjet.12159
- Shelton, C. (2017). “Virtually mandatory”: A survey of how discipline and institutional commitment shape university lecturers' perceptions of technology. *British Journal of Educational Technology*, 45(4), 748–759. doi:10.1111/bjet.12051
- So, S. (2016). Mobile instant messaging support for teaching and learning in higher education. *Internet and Higher Education*, 31, 32–42. doi:10.1016/j.iheduc.2016.06.001
- Tankou epse Nukunah, C., Bezeuidenhout, A., & Furtak, A. (2017). The contribution of a private higher education institution to the South African Higher Education. *South African Journal of Higher Education*, 33(1), 283–300.
- Taylor, C., & Harris-Evans, J. (2018). Reconceptualising transition to higher education with Deleuze and Guattari. *Studies in Higher Education*, 4(3), 1254–1267. doi:10.1080/03075079.2016.1242567
- Thaba-Nkadimene, K. (2020). The influence of WhatsApp usage on collaborative pedagogy and social networking during teaching practice at a rural university in South Africa. *Journal of African Education*, 1(1), 5–23. doi:10.31920/2633-2930/2020/S1n1a1
- Tillmans, T., Holland, C., Lorenzi, F., & McDonagh, P. (2014). Interplay of Rhizome and education for sustainable development. *Journal of Teacher Education for Sustainability*, 16(2), 5–17. doi:10.2478/jtes-2014-0008
- Udenze, S., & Oshionebo, B. (2020). Investigating WhatsApp for collaborative learning among undergraduates. *Etkilesim*, 5(5), 25–50. doi:10.32739/etkilesim.2020.5.92
- Zongozzi, J. (2020). A concept analysis of theory in South African Open Distance and E-Learning research. *Open Learning*, 1–15. doi:10.1080/02680513.2020.1743172
- Zulkanain, N., Miskon, S., & Abdullah, N. (2020). An adapted pedagogical framework in utilizing WhatsApp for learning purpose. *Education and Information Technologies*, 25(4), 2811–2822. doi:10.1007/s10639-019-10096-0

Frank Makoza is a Lecturer in the Department of Entrepreneurship and Business Management at Cape Peninsula University of Technology, Cape Town, South Africa. He holds a PhD in Information Systems and Master's degree in Information Systems from University of Cape Town. His research interests are assessing societal impact of ICT in context of developing countries and ICT use in small businesses.

Laban Bagui is a social entrepreneur, a development and civic technology researcher, and a learning facilitator. Laban has worked for various industries including Higher Education, Internet Service Providers, Television broadcasting, and mobile software engineering. He holds a PhD in Information systems from UCT. Laban research interests include eParticipation, Cybersecurity in Africa, African e-Commerce entrepreneurship, and networked learning.