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An empirical analysis of the impact of mobile instant messaging for collaborative learning during the Covid-19 lockdown in a rural-based university

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Abstract

The world-wide outbreak of Covid-19 effected radical change in most institutions of higher learning. These institutions were forced to adopt any technologies at their disposal to continue with teaching and learning and, during that time, many students and lecturers at rural-based universities adopted mobile instant messaging (MIM) for collaborative learning. This study investigates the impact of MIM for collaborative learning during a Covid-19 lockdown in one rural-based university. Data were collected from both students and lecturers using a closed-ended questionnaire, and analysed using IBM SPSS Statistics. The study found that MIM had a positive impact on collaborative learning in the rural-based university during the Covid-19 lockdown.

Keywords: mobile instant messaging, collaborative learning, rural-based university, Covid-19

Introduction

A decade ago, several scholars predicted that mobile instant messaging (MIM) tools would be one of the enablers for teaching and learning in universities (El-Hussein & Cronje, 2010; Ryu & Parsons, 2012). MIM tools enable unified communication between students by providing cutting-edge functionality for instant connectivity (Kim et al., 2014). More recently, the literature has noted an increase in the adoption of MIM tools globally by higher institutions of learning (Bere, 2019; Bere & Rambe, 2016; Yadegaridehkordi et al., 2019). This rise in the adoption of MIM was due to the Covid-19 pandemic (Zaidi et al., 2021).

During the Covid-19 lockdown, South African universities were closed for contact lectures and were expected to continue teaching and learning using other methods of teaching (Netshakhuma, 2021). These universities adopted MIM to realise its optimum benefits for communicating, collaborating, and sharing learning material with students (Bere & Rambe,

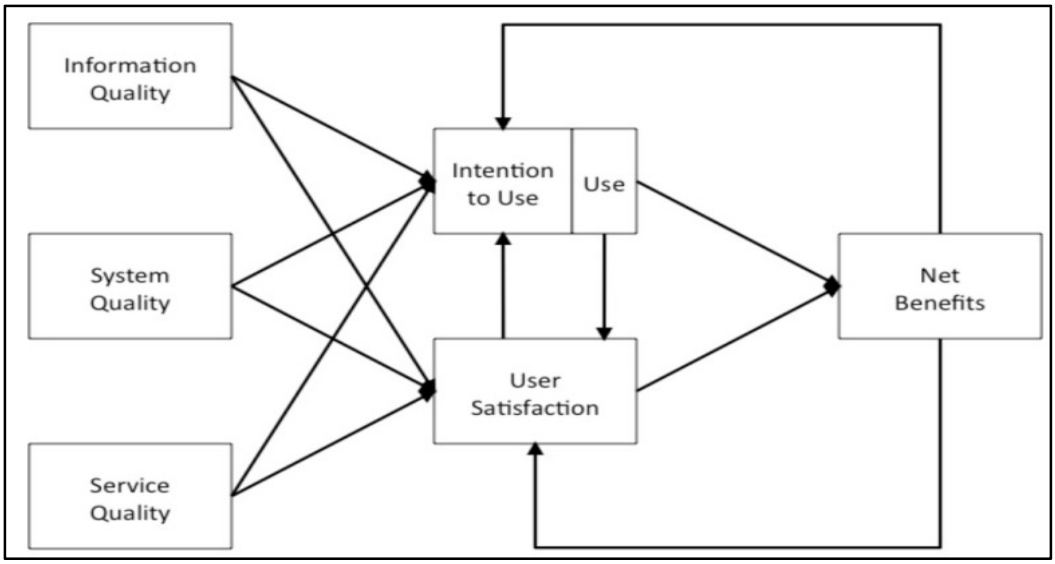
2016; Netshakhuma, 2021; Zaidi et al., 2021). The literature shows that students in universities use MIM tools for collaborative learning, especially for assignments and group discussions (Sarwar et al., 2019; Tang & Bradshaw, 2020). Collaborative learning through MIM tools is defined as a state in which two or more students study, or try to study something together, using these tools (Kim et al., 2014). Collaborative learning using MIM improves students' critical thinking and information sharing through interaction (Bere & Rambe, 2016).

Studies have been conducted on the use of MIM for collaborative learning, focusing on students and lecturers (Jeong & Hmelo-Silver, 2016), and some have focused on the process of collaborative learning and its outcomes in other countries (Kim et al., 2014). These studies do not reveal the impact of instant messaging on collaborative learning in rural-based universities. The available literature focuses on semi-urban and urban universities (Bere & McKay, 2017). However, there is a lack of literature exploring the impact of MIM on collaborative learning in rural-based universities during the Covid-19 lockdown, which indicates a need to investigate this. Therefore, this study seeks to investigate the impact of MIM on collaborative learning in a rural-based university during the Covid-19 pandemic.

Theoretical foundation

To explore the impact of MIM on collaborative learning in rural-based universities, a theoretical foundation was needed. To establish the theoretical foundation of this study, DeLone and McLean's (2002, 2003) IS success model (D&M IS) and the diffusion of innovation (DOI) theory were employed. The D&M IS success model is one of the most significant theories used to measure information system effectiveness and success. This theory is critical for understanding the value that information systems have for individuals (DeLone & McLean, 2003). The D&M IS success model was created by DeLone and McLean in 1992, and Figure 1 shows the adapted model with its six constructs.

Figure 1
D&M IS model (DeLone & McLean, 2002, p. 9)



According to DeLone and McLean (2002), these constructs are described as follows:

- Information quality. Measures the impact of relevant, complete, accurate, timely, and consistent information generated by information systems for individuals.
- System quality. Measures the perception of the system on how it can be used to support and address user needs.
- Service quality. Measures what the information system can do.
- Intention to use. Measures the purpose of the system.
- User satisfaction. This is an important construct used to measure individual opinion about the information system.
- Net benefits. Used to measure the positive and negative impacts of the information system.

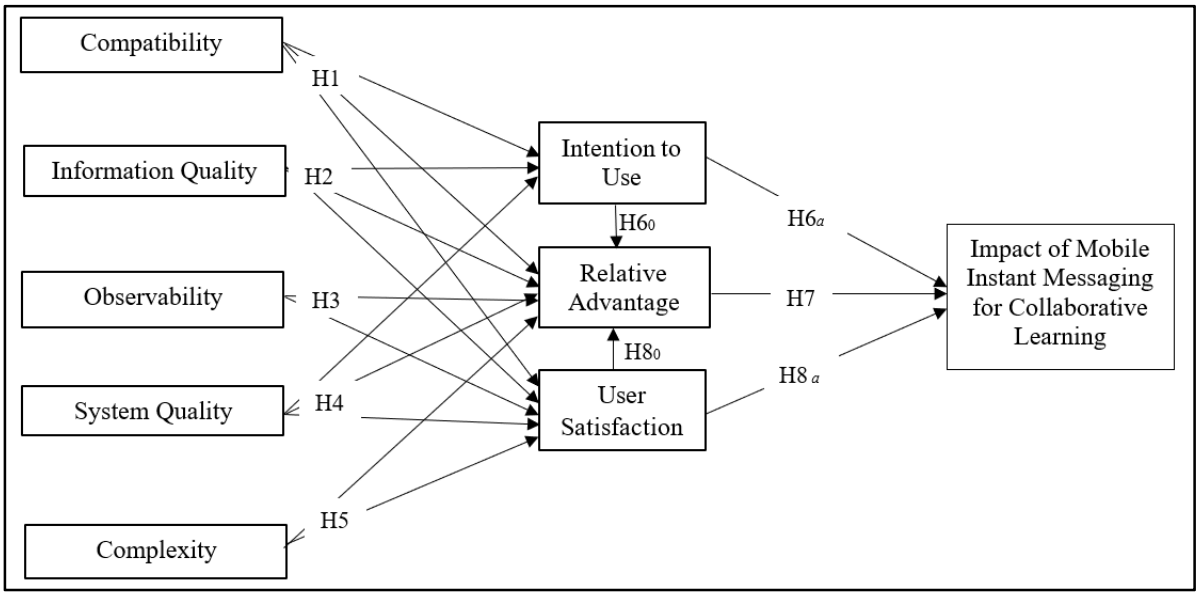
The diffusion of innovation theory was developed by Rogers in 1962. This theory comprises five characteristics that influence the use of technology (Rogers, 1962, 1995, 2003). Those five characteristics are relative advantage, trialability, compatibility, observability, and complexity (Rogers, 2003). Relative advantage is a measure used to explore the benefits and advantages that promote the innovation (Rogers, 1995); trialability is seen as an experiment of the innovation to see if it addresses the user's requirements (Rogers, 1995, 2003). Compatibility refers to an innovation that is able to function together with other innovations without causing problems, observability refers to the benefits provided by the innovation and lastly, complexity refers to the difficulty of understanding technology (Rogers, 1995, 2003).

In this study, the D&M IS success model and the DOI theory are selected as an ideal foundation to explore the impact of instant messaging for collaborative learning during the Covid-19 lockdown in rural-based universities.

Proposed framework and hypotheses

The framework proposed for this study was derived from the D&M IS success model and the DOI theory using compatibility, information quality, observability, system quality, complexity, intention to use, relative advantage, and user satisfaction as constructs to predict the impact of instant messaging on collaborative learning in rural-based universities. The literature postulates that intention to use, relative advantage, and user satisfaction are critical for predicting the impact of using technology (DeLone & McLean, 2002; Rogers, 2003). As shown in Figure 2, learner intention to use, relative advantage, and user satisfaction of MIM influenced the impact of using MIM tools for collaborative learning.

Figure 2
Proposed conceptual framework



This study then hypothesised compatibility, information quality, observability, system quality, complexity, intention to use, relative advantage, and user satisfaction to explore the impact of MIM on collaborative learning. The following eight hypotheses were derived from the aim of the study.

- Hypothesis 1: Compatibility of the MIM tools for collaborative learning may affect the intention to use, relative advantage, and user satisfaction of the learners in rural-based universities.
- Hypothesis 2: Information quality will influence the intention to use MIM applications and realise their advantages, as well as user satisfaction with collaborative learning in rural-based universities.
- Hypothesis 3: Observable advantages of, and user satisfaction with, using MIM tools will affect students' perception of using these tools for collaborative learning in rural-based universities.
- Hypothesis 4: System quality will influence intention to use the MIM and leverage the advantages and user satisfaction of using MIM tools for collaborative learning in rural-based universities.
- Hypothesis 5: The complexity of MIM tools will influence the students towards realising the advantages and satisfaction of using MIM for collaborative learning in rural-based universities.
- Hypothesis 6_0: The intention to use MIM tools will affect the relative advantages of using MIM for collaborative learning.
- Hypothesis 6_a: The intention to use MIM tools will influence the impact of MIM for collaborative learning in rural-based universities.
- Hypothesis 7: The relative advantage of MIM tools will influence the impact of MIM on collaborative learning in rural-based universities.

- Hypothesis 8_0: User satisfaction with MIM tools will affect the relative advantage of using MIM for collaborative learning.
- Hypothesis 8_a: User satisfaction with MIM tools will influence the impact of MIM on collaborative learning in rural-based universities.

Research design

Data were collected from students and lecturers at a rural-based university. This study followed a quantitative rather than qualitative approach. Qualitative study relies more on human understanding, perception, and narrative (Cresswell & Clark, 2011; Myers, 2013); a quantitative approach relies more on calculations and statistical analyses that comprise aggregations, relationships, or associations between constructs to approve or disprove a hypothesis (Myers, 2013; Oates, 2006). A quantitative approach was selected for this study because it was aimed at generalising the results analysed from data collected through a survey at a rural-based university in South Africa.

Participants

The target population for the study was students and lecturers from a rural-based university in South Africa. This study was limited to all the lecturers and students from the Business Information Systems and Computer Science departments. The researcher used purposive sampling to select the lecturers and students from these two departments. Purposive sampling is a non-probability sampling technique that is used to select participants through the personal judgement of the researcher, examining the qualities and experiences of the participants associated with the research problem (Babbie, 2005).

Data collection procedure

Data were collected using an online survey. The researcher developed a closed-ended questionnaire on Google Forms. An email with a Google Forms link was sent to the lecturers and students in the Business Information Systems and Computer Science departments. In total, the email was sent to 532 participants, of whom 341 participants completed the survey. Of the 341 responses received, 93 were not usable. In total, the researcher analysed 248 responses to address the research problem.

Ethical clearance

This study was cleared for ethical considerations before data collection commenced. Before participating in the survey, all participants were requested to sign an informed consent form. Where the participant was a minor, consent was sought through their parents or guardians who signed the consent form on their behalf. It was stipulated in the consent form that participation was voluntary and that there would not be any benefit or financial reward.

Results and analysis

Descriptive statistics

As indicated in Table 1, the majority of the respondents were female (140; 56.5%)] and most of them were students (238; 96.0%). Most of these students were doing undergraduate programmes (178; 71.8%). The results show that 186 (75%) of the respondents were between 17 and 29 years old. Of all the respondents, 70 (28%) held postgraduate degrees and out of those respondents, 2 (0.8%) were doctoral students.

Table 1
Demographic information

Moderating factor	Moderating variable	Frequency	Percentage
Title	Dr	2	0.8
	Miss	120	48.4
	Ms	0	0
	Mr	106	42.7
	Mrs	20	8.1
Gender	Male	108	43.5
	Female	140	56.5
Age	17 to 19 years	90	36.3
	20 to 29 years	96	38.7
	30 to 39 years	52	21.0
	40 years and above	10	4.0
Status	Student	238	96.0
	Lecture	10	4.0
Level of study	Undergraduate	178	71.8
	Honours	46	18.5
	Master's	22	8.9
	Doctoral	2	0.8

From the total number of participants, 142 (57.3%) used Facebook, 90 (36.3%) used Twitter, 88 (35.5%) used Skype and 32 (12.9%) used other instant messaging applications. However, all 248 (100%) of the participants used WhatsApp. Most of them had six years or more experience using instant messaging applications and most of them used it daily.

Table 2
Instant messaging application usage

Moderating factor	Moderating variables	Frequency	Percentage
Instant messaging application	Facebook	142	57.3
	Twitter	90	36.3
	Skype	88	35.5
	WhatsApp	248	100.0
	Other	32	12.9
Experience using instant messaging application	0 to 1 year	28	11.3
	2 to 3 years	52	21.0
	4 to 5 years	42	16.9
	6 or more	126	50.8
Instant messaging application usage frequency	Frequently	126	50.8
	Daily	104	41.9
	Weekly	14	5.6
	Monthly	4	1.7

Normality testing

Table 3 below presents the results of normality testing on all measured constructs using the Kolmogorov-Smirnov[a] and Shapiro-Wilk tests. The results show that all measured constructs for both Kolmogorov-Smirnov[a] and Shapiro-Wilk are significant because the p-value is equal to 0.000.

Table 3
Results of normality testing

Measured constructs	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Compatibility	.298	248	.000	.753	248	.000
Information quality	.259	248	.000	.764	248	.000
Observability	.195	248	.000	.886	248	.000
System quality	.217	248	.000	.879	248	.000
Complexity	.252	248	.000	.781	248	.000
Intention to use	.175	248	.000	.916	248	.000
Relative advantage	.238	248	.000	.706	248	.000
User satisfaction	.255	248	.000	.811	248	.000

a. Lilliefors Significance Correction

Reliability analysis

A reliability test is a way to measure the reliability of the results using a combination of constructs (Ritter, 2010). This test uses a set of scores for each construct. To determine reliability, Cronbach's alpha scores were used. According to Gliem and Gliem (2003), Cronbach's alpha reliability score ranges between nil (0) and one (1). An acceptable score starts from 0.07 (Ritter, 2010; Schober & Schwarte, 2018). This study's instruments achieved acceptable and good reliability scores (cf. Table 4). Based on Table 4, all constructs were consistently acceptable because scores were between 0.703 and 0.843.

Table 4
Results for Cronbach's alpha reliability analysis

Constructs	Cronbach's alpha	Comment
Compatibility	.716	Acceptable
Information quality	.721	Acceptable
Observability	.802	Good
System quality	.784	Acceptable
Complexity	.727	Acceptable
Intention to use	.843	Good
Relative advantage	.703	Acceptable
User satisfaction	.796	Acceptable

Correlation analysis

In this study, correlation analysis is presented to show the relationship between various constructs: compatibility, information quality, observability, system quality, complexity, intention to use, relative advantage, and user satisfaction. A negative correlation between two constructs shows that the constructs are moving in opposite directions (Mukaka, 2012). Negative correlation happens when a score between two constructs is less than nil (0) (Asuero et al., 2007; Mukaka, 2012; Schober & Schwarte, 2018). The results displayed in Table 5 below show that the constructs between observability and system quality, intention to use and information quality, intention to use and observability, and user satisfaction and information quality relationships move in opposite directions because they have a negative correlation.

Table 5
Correlation analysis results

	CP	IQ	OB	SQ	CM	IU	RA	US
CP	1.00							
IQ	0.14	1.00						
OB	0.03	0.31	1.00					
SQ	0.179	0.07	-0.08	1.00				
CM	0.01	0.15*	0.187**	0.02	1.00			
IU	0.373**	-0.07	-0.07	0.230**	0.08	1.00		
RA	0.14	0.07	0.06	0.237**	0.179**	0.142*	1.00	0.339**
US	0.27*	-0.02	0.04	0.229**	0.01	0.179**	0.339**	1.00
** Correlation is significant at the 0.01 level (2-tailed).								
* Correlation is significant at the 0.05 level (2-tailed).								

Abbreviations on the construct for Table 5: Compatibility = CP, Information quality = IQ, Observability = OB, System quality = SQ, Complexity = CM, Intention to use = IU, Relative advantage = RA, User satisfaction = US

Hypothesis testing

In this research, eight hypotheses were created using p-value and beta from the regression analysis. Each independent construct was regressed against the dependent construct to test the hypothesis. The results depicted in Table 6 show that the impact of using MIM for collaborative learning during the Covid-19 lockdown can be associated with compatibility, information quality, observability, complexity, intention to use, relative advantage, and user satisfaction. In this study, Hypothesis 4 (system quality) was not supported.

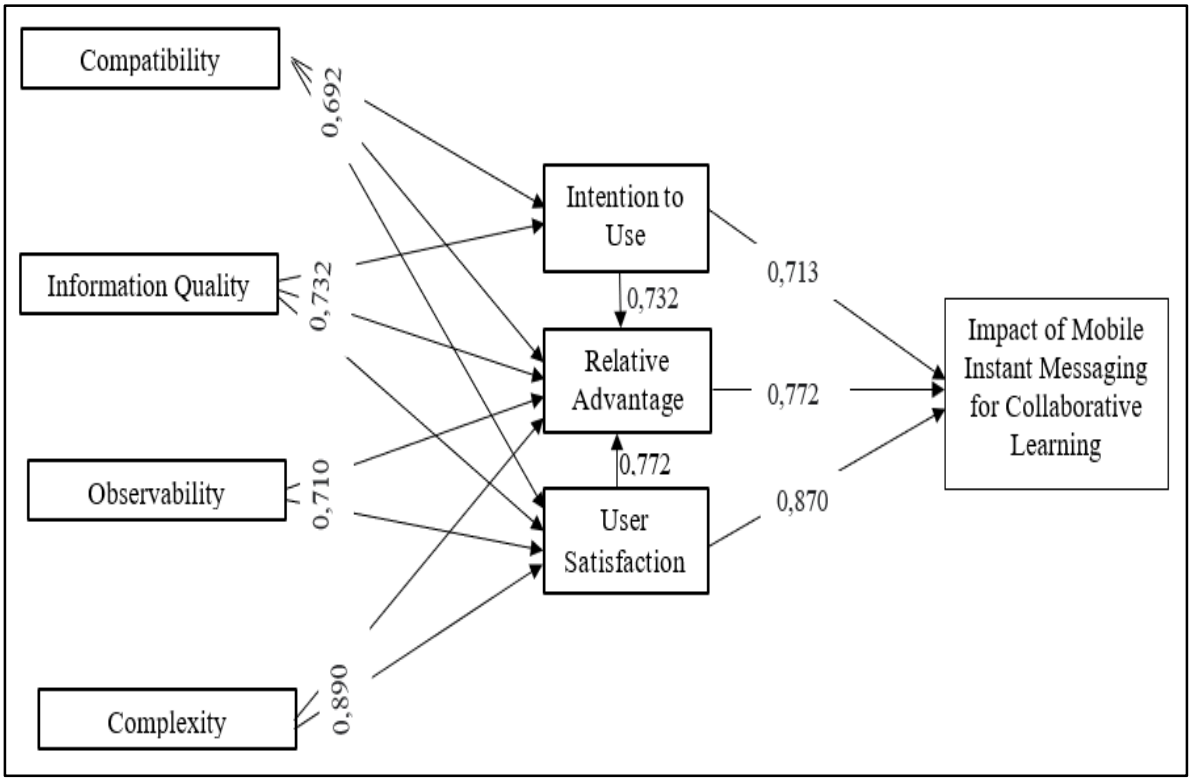
Table 6
Hypothesis test results

Hypothesis	Variables	Beta	P-Value	Comment
Hypothesis 1	Compatibility	0.692	0.000	Supported
Hypothesis 2	Information quality	0.732	0.000	Supported
Hypothesis 3	Observability	0.710	0.032	Supported
Hypothesis 4	System quality	0.038	0.423	Not supported
Hypothesis 5	Complexity	0.890	0.000	Supported

Hypothesis	Variables	Beta	P-Value	Comment
Hypothesis 6	Intention to use	0.713	0.000	Supported
Hypothesis 7	Relative advantage	0.772	0.013	Supported
Hypothesis 8	User satisfaction	0.870	0.000	Supported

This research used path co-efficient (β) to test the model. The hypothesis test rejected Hypothesis 4 (system quality). The study found that system quality did not have a positive influence on intention to use MIM in order to realise its advantages. When students realise the advantages, they will probably be satisfied with the use of MIM for collaborative learning in rural-based universities. The findings further show that compatibility, information quality, observation, and complexity are significant for students to experience the advantages, satisfaction, and intention to use MIM for collaborative learning. Thus the findings reveal that the impact of using MIM for collaborative learning is dependent on the intention to use and the advantages and satisfaction of MIM.

Figure 3
Research framework with co-efficient path



Discussion

This research aimed to investigate the impact of MIM on collaborative learning during the Covid-19 lockdown in a rural-based university. To achieve the aim of the study, eight

constructs (compatibility, information quality, observability, system quality, complexity, intention to use, relative advantage, and user satisfaction) were used to validate the proposed conceptual framework. The uniqueness of this study is that it was conducted at a previously disadvantaged university, also known as a rural-based university, to explore the impact of MIM on collaborative learning during the Covid-19 lockdown. Rural-based universities have limited social, economic, and digital infrastructures (Bere & Rambe, 2016). Therefore, the investigation into the impact of students using MIM for collaborative learning in a rural-based university was crucial.

Most participants indicated that they had been using MIM (WhatsApp, Facebook, Twitter, and Skype) for different purposes before the Covid-19 pandemic. All claimed that they resorted to MIM to communicate with their peers during the nationwide lockdown. Most of them were using WhatsApp. Consistent with previous studies, the students reported that they used WhatsApp for collaborative learning because it was compatible with their digital devices, and they used the platform to acquire the information that they needed (Bere, 2019; Fu & Hwang, 2018; So, 2016). Moreover, most of the students indicated that they used MIM to discuss various concepts and assignments with their peers because of the relative advantages that it offers (Habes et al., 2018; Yadegaridehkordi et al., 2019). They claimed that they could study wherever they were. Indeed, previous studies have suggested that mobile learning enables students to study at any time without being confined within four walls (Habes et al., 2018; Mashau, 2016; Sarwar et al., 2019).

In addition, students indicated that MIM is not complex to use, share, and receive learning material (Ansari & Khan, 2020; Alwreikat et al., 2022). This is consistent with findings by Mashau and Mokwena (2017) who indicated that if instant messaging is not complicated, students are likely to see the advantages of adopting it. Furthermore, instant messaging that is simple to use is likely to have a positive impact on the students (Ansari & Khan, 2020; Mashau, 2016).

This study also found that system quality did not have any impact on using MIM for collaborative learning in the rural-based universities during the Covid-19 lockdown. Therefore, compatibility, information quality, observability, complexity, intention to use, relative advantage, and user satisfaction positively impacted the use of mobile instant messaging for collaborative learning during the Covid-19 lockdown.

Limitation and recommendation

This study has a limitation that could be addressed in future studies. Data were collected from only one rural-based university due to Covid-19 restrictions preventing travel to other provinces in South Africa. Future studies could sample more than one university, compare the results, and possibly reveal critical factors that had an impact on the use of MIM for collaborative learning in South African rural-based universities during the Covid-19 lockdown. Furthermore, future studies could use mixed methods and incorporate interviews and questionnaires to collect data.

Conclusion

This paper investigated the impact of MIM on collaborative learning in a rural-based university during the Covid-19 lockdown. The data were collected using a closed-ended questionnaire on Google Forms. The data were later analysed with the IBM SPSS statistical tool. The constructs derived from the D&M IS success model and the DOI theory were used to validate the proposed conceptual framework.

After conducting hypothesis testing using beta and p-value, Hypothesis 4 (system quality) was rejected as a predictor of the impact of the use of MIM for collaborative learning. All the other hypotheses were supported as predictors for measuring the impact. The findings show that most participants used MIM to communicate and collaborate with their peers. Most of them used it to access and share learning materials while others used it to discuss the subject matter and assignments.

The study shows that MIM had a significant impact on the rural-based university because students were able to work together even though they were "locked down" in their homes. In addition, lecturers were able to continue teaching and learning using MIM. However, going forward, more constructs could be explored by examining the issue of the availability of devices and internet connectivity for rural-based universities students.

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