

Push and pull factors influencing LMS use post-COVID in Nigerian open distance learning: a qualitative study

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Abstract. The emergence of the COVID-19 pandemic precipitated an unprecedented transformation in educational delivery, particularly in higher education globally. As a result, LMS emerged as a critical tool, ensuring educational continuity when physical campuses became inaccessible. However, as higher education institutions transition into the post-pandemic period, emerging evidence indicates that LMS adoption patterns among ODL students reflect a complex interplay of factors that drive or attract engagement with these digital learning platforms. While there are studies that examined initial LMS adoption during the pandemic period, few studies investigated the post-COVID sustainability of LMS usage. However, no study has examined LMS use through the dual lens of push and pull dynamics in Africa, especially in the Nigerian context. Hence, this study examined the push and pull factors influencing LMS use post-COVID in an ODL context in Nigeria through the lens of the Unified Theory of Acceptance and Use of Technology (UTUAT). The study employed a qualitative research design grounded in the interpretive paradigm. Twelve academic and support staff members from the National Open University of Nigeria (NOUN) participated in the study, which employed a multi-stage sampling technique. Semi-structured interviews, based on an interview guide designed explicitly for the study, served as the primary data collection instrument. Data collected from the interviews were thematically analysed. Findings from the study revealed that COVID-19-related factors, digital readiness and literacy, as well as flexibility and autonomy offered by the LMS, were identified as push factors influencing LMS use post-COVID. System features, regular updates, effective support mechanisms, and institutional policies provided by the ODL-based university served as pull factors influencing students' use of the LMS after the COVID-19 pandemic. However, infrastructural and access issues, the digital literacy skills of students, low participation or engagement with the LMS by students, as well as technical and content-related issues, limit the effective use of the LMS for learning post-COVID. These findings underscore the importance of holistic strategies that simultaneously enhance digital literacy, improve infrastructure, and ensure ongoing institutional support. Future research should investigate the longitudinal effects of these factors and assess the efficacy of targeted interventions.

Keywords: push and pull factors, learning management system, post-COVID-19, open distance learning, Nigeria, qualitative study

1. Introduction

The emergence of the COVID-19 pandemic precipitated an unprecedented transformation in educational delivery, particularly in higher education globally [59]. The pandemic compelled higher education institutions to adopt digital learning platforms for the continuity of learning rapidly [2]. In Nigeria, the shift in learning mode occa-

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sioned by the COVID-19 pandemic significantly affected the higher education system, especially open and distance learning (ODL) institutions [1]. ODL plays a significant role in expanding access to higher education in countries like Nigeria, which face enormous infrastructural and socio-economic barriers to traditional campus-based education [4]. During the pandemic, learning management systems (LMS) emerged as a critical tool, ensuring educational continuity when physical campuses became inaccessible [65]. However, as higher education institutions in the country transition into the post-pandemic period, emerging evidence indicates that LMS adoption patterns among ODL students reflect a complex interplay of factors that drive or attract engagement with these digital learning platforms [58, 61, 79].

The Nigerian ODL context presents unique challenges and considerations for LMS adoption. ODL-based universities, such as the National Open University of Nigeria (NOUN), which serves approximately 150,000 students nationwide [57], rely heavily on LMS (iLearn) to deliver instruction to geographically dispersed populations. Although LMS integration was a core feature of NOUN's pedagogy before the pandemic, reliance on LMS as the sole medium of instruction increased due to COVID-19 [55]. While studies before the emergence of COVID-19 showed gradual LMS adoption in Nigerian higher education, the pandemic crisis accelerated LMS implementation [21, 53]. This led to 'forced digital migration' across the country's educational spectrum, resulting in challenges such as digital disparity and varying digital competency levels among students and lecturers [41]. This raises a critical question, especially in the post-pandemic period, about the sustainability of LMS usage patterns, particularly as institutions transition from emergency adoption to long-term integration [20].

There exist ample studies [11, 17, 24, 28, 53, 56] that examined initial LMS adoption during the pandemic period. Few studies [26, 27] investigated the post-COVID sustainability of LMS usage. However, no study has examined LMS use through the dual lens of push and pull dynamics in Africa, especially in the Nigerian context. Push factors within the context of this study refer to external factors or systemic conditions that influence LMS use. Pull factors, on the other hand, refer to the inherent attractions of the LMS system that motivate voluntary and continued use after COVID. Studies conducted in diverse educational settings have revealed that institutional policy direction [1], technology readiness [36], pandemic-induced behavioural shift [42], and infrastructural and socio-economic constraints [48, 78] are the push factors influencing LMS adoption. Conversely, the functionality and user-friendliness of the LMS interface [80], responsiveness to user feedback [43], technical and pedagogical support [9], institutional support [67], and accessibility and resource availability [16] are pull factors associated with LMS use.

Many studies have also identified challenges affecting the effective use of LMS pre-, during, and post-COVID across various contexts. One of the significant barriers identified is technical issues. While Nannim et al. [54] identified poor internet connectivity, limited internet access, and poor electricity supply, Cao [19] emphasised lack of digital devices, system quality issues such as usability, availability, and accessibility, as well as inadequate technical support as recurring technical barriers that impede the effective use of LMS among students and lecturers. Beyond the technical aspects, pedagogical and user-related factors play a critical role in inhibiting the effective use of LMS [51, 60, 63]. Likewise, organisational and policy-related challenges impede effective LMS use. The absence of a clear policy framework regarding LMS implementation or a lack of coordination in managing technical resources was found to hinder the successful adoption of LMS [50, 74]. Lastly, economic factors contribute to the challenges affecting effective LMS use. The high cost of internet subscription and implementation of robust LMS in higher education has been identified to be a deterrent [6, 12, 75]. However, despite the numerous challenges highlighted, there is

a gap regarding a qualitative exploration of challenges affecting LMS use in the ODL context post-COVID in Nigeria.

This study, therefore, seeks to address these gaps by investigating push and pull factors and the challenges affecting the effective use of LMS post-COVID in an ODL context in Nigeria through a qualitative approach. This is done to illuminate the complex factors driving LMS engagement and factors impeding its effective use post-COVID. The study's findings are expected to contribute to a theoretical understanding of LMS adoption in resource-constrained settings and provide practical strategies for enhancing digital learning in Nigerian ODL institutions. This will equip policymakers, ODL administrators, and the broader academic community with evidence-based recommendations. In other words, these recommendations will be essential for sustaining pandemic-era digital learning gains while addressing its challenges in Nigeria's ODL context.

2. Theoretical framework

This study adopted the Unified Theory of Acceptance and Use of Technology (UTUAT) developed by Venkatesh et al. [77]. UTUAT offers a comprehensive framework that integrates and consolidates various existing theories to explain user intention, acceptance, and usage behaviour of information technology [46]. The theory synthesises multiple theories, including the theory of reasoned action, the technology acceptance model, the theory of planned behaviour, the diffusion of innovation theory, the social cognitive theory, the motivational model, the model of personal computer utilisation, and combined elements of the technology acceptance model and the theory of planned behaviour. The goal of the synthesis is to provide a unified perspective on user acceptance of information technology [25]. The UTUAT model identifies four key determinants influencing an individual's behavioural intention and technology usage.

The four key determinants are [77]:

1. *Performance expectancy* is the degree to which an individual believes that using the technology will improve their task performance, making them more effective and efficient.
2. *Effort expectancy* pertains to how easy the technology is to use. The simpler and more convenient the technology appears, the more likely individuals are to adopt it.
3. *Social influence* involves the extent to which individuals perceive that important people in their lives, such as friends, peers, and family, think they should use the new technology.
4. *Facilitating conditions* includes the resources, support, and infrastructure available to individuals that aid in the adoption and use of the new technology.

Additionally, the UTUAT includes moderating factors such as gender, age, experience, and voluntariness of use that influence technology adoption. UTUAT has become prominent among scholars due to its robust understanding of technology adoption in both individual and organisational contexts, surpassing other technology acceptance and use theories [33].

The rationale for adopting the UTUAT as the theoretical framework for this study is multifaceted. Firstly, the UTUAT provides a robust framework that could help to gain a comprehensive insight into the determinants of LMS adoption and sustained use among students in a post-COVID-19 ODL environment. Secondly, the theory offers a strong contextual fit that can explain why certain factors differentially impact LMS use among students. It is very important to address the unique challenges and dynamics faced by students, particularly in how they adapt and engage with the LMS in this

new context. Thirdly, the UTUAT model has been empirically validated across various studies and contexts, demonstrating its reliability and effectiveness in predicting technology acceptance behaviour. Adopting it for this study ensures that the findings will be grounded in a well-established theoretical framework, enhancing the credibility and generalizability of the results. Lastly, using this theory will help to explore the complexities influencing students' use of LMS as emphasised by Venkatesh et al. [77].

3. Methodology

3.1. Research design

This study employed a qualitative research approach, utilising a thematic framework to investigate the push and pull factors influencing LMS use and the challenges that affect effective LMS use following the COVID-19 pandemic. The researchers believe that using this approach would help gain a deeper understanding of the subject matter based on the lived experiences of the academic and support staff of the ODL-based university in Nigeria. According to Awasthy [13], the qualitative research method offers researchers the opportunity to collect detailed and nuanced data from participants, based on their lived experiences and viewpoints. Upadhyay and KC [76] pointed out that qualitative research is inherently contextual, shaping and interpreting the world, generating new understandings of the social world. It is typically exploratory, devoid of fixed or predetermined responses [5].

3.2. Research paradigm

The interpretive paradigm was adopted to understand participants' perspectives, which were grounded in their diverse constructivist experiences within the ODL landscape. Thus, the study collected qualitative data to capture a comprehensive understanding of the participants' diverse experiences and viewpoints. According to Malterud [45], qualitative research is situated in an interpretive paradigm, where notions about particular human experiences in context are recognised from different subject positions.

3.3. Participants

Academic and support staff play a significant role in students' use of LMS; thus, they serve as the participants of this study. Academic staff are directly involved in course delivery, content creation, and student engagement on the LMS, while administrative staff are responsible for technical support, policy implementation, and LMS maintenance. Their perspectives might offer insights into push and pull factors as well as systemic barriers affecting LMS use post-COVID. The ODL institution chosen for this research is the National Open University of Nigeria (NOUN). It is the foremost ODL institution established and funded by the Federal Government of Nigeria. It is purely ODL-based and offers academic programmes leading to the award of bachelor's degrees. A sample of 6 academics and 6 support staff from different study centres and demographics was included in the interview. This is based on the ideal sample size recommendation for qualitative research that uses interviews as a research method [39].

Additionally, due to data saturation, the interviews with the 12 academic and support staff provided valuable insights. Conducting more interviews would just be repetition. The participants were selected based on having a minimum of five years of experience in teaching or administration within the university setting. The academic and support staff were recruited for the study based on their willingness to participate in the study. Additionally, they share similar characteristics in offering in-depth knowledge of the research objectives. Table 1 shows the demographic information of the participants.

Table 1

Characteristics of participants.

| Category | Group | Number of participants |
|-------------------------|---------------|------------------------|
| Gender | Male | 8 |
| | Female | 4 |
| Years of service | 5–10 years | 2 |
| | Over 10 years | 9 |
| | Over 15 years | 1 |

The gender distribution of the participants shows a predominance of males, with males comprising approximately 67% of the sample and females accounting for about 33%. The participants are composed of experienced individuals, as the majority (75%) have over 10 years of service in the university. Only a small percentage have between 5 and 10 years of service.

3.4. Sampling method

The study employed a multistage sampling technique to select participants from NOUN study centres across Nigeria's six geopolitical zones. Multistage sampling involves executing the sampling process in multiple stages, progressively using smaller and smaller sampling units at each stage [37]. Utilising this sampling technique allowed the researchers to obtain samples that are geographically representative of the study population while ensuring a manageable sample size. This makes the study more comprehensive and generalisable for the entire population. Initially, NOUN study centres were divided into six strata based on Nigeria's six geopolitical zones (North-West, North-East, North-Central, South-West, South-South, and South-East). Within each geopolitical zone, one study centre was purposively selected. Two (2) academic and support staff were then purposively selected from each of the study centres.

3.5. Data collection

This study utilised semi-structured interviews, which, according to Scanlan [69], allow participants to respond to predetermined questions. Leavy [40] opined that semi-structured interviews could be conducted either physically through face-to-face interactions or virtually via remote means (such as phone or Internet). According to Creswell and Poth [23], semi-structured interviews are a process of collecting detailed information from respondents in a somewhat conversational manner. Academic and support staff at the selected ODL institution in Nigeria participated in the interview sessions. The pertinent information gathered enabled the researchers to explore various issues that serve as both push and pull factors affecting students' use of LMS in the ODL-based university in Nigeria. The semi-structured interviews focused on the study's objectives, as outlined in the interview guide prepared in accordance with the research objectives (appendix A). To ensure all interview details are captured, the conversations were audio-recorded, and each session with participants lasted between 40 and 60 minutes.

3.6. Ethical considerations

Complying with ethical research guidelines, the researchers sought and obtained ethical permission from the UNISA College of Education Ethics Review Committee (RF: 2024/07/12/0000077/02/RB). Also, the researchers obtained permission to conduct the study at NOUN. The study participants were provided with information regarding

the research, its purpose, and how the information collected during the study would be used. Participants were assured that the information provided would be treated with the utmost confidentiality. For the anonymity clause, the participants were not required to provide their names, addresses, or any other personal information. Before participation in the study, informed consent was obtained from all the study participants. Furthermore, participants were allowed to review the interview guide (interview questions) and provided their consent for their interviews to be recorded electronically.

3.7. Data analysis

The audio recordings of the interviews were transcribed and analysed using NVivo. A discussion of each result followed this. To ensure the credibility, dependability, and confirmability of the research findings, the researchers maintained an audit trail and shared draft summaries of key interview findings with the participants to ensure that their intended meanings were accurately captured. Also, two independent coders analysed a subset of the interview transcripts to identify themes using NVivo, and there was peer debriefing. Thematic analysis was the primary method for the qualitative data analysis. Thematic analysis is a type of qualitative analysis that involves identifying, analysing, and interpreting themes within a qualitative dataset [22]. Thus, the researchers identified common themes from the interview transcripts and organised relevant themes based on the study's research objectives into sentences, discussing them using the thematic framework. Specifically, the qualitative data analysis followed a thematic analysis approach outlined by Persson et al. [64]. This method involved a systematic process of identifying and refining themes within the interview transcripts:

1. *Transcription*: Interviews were transcribed to create a textual record of the data.
2. *Familiarisation*: The researcher engaged in repeated readings of the transcripts to gain a comprehensive understanding of the data.
3. *Initial coding*: Interesting features and recurring concepts were identified and assigned preliminary codes.
4. *Theme development*: Codes were grouped into potential themes based on their relationships. Relevant data were gathered to support each theme.
5. *Theme refinement*: The researcher revisited the themes, ensuring they accurately reflect the coded extracts and the entire data set.
6. *Theme definition and naming*: Each theme was clearly defined and named after thorough analysis.
7. *Final analysis*: Selected data extracts were re-examined to ensure they connect to the research questions and existing literature. This analysis informed the final report.

The study's findings were reported in a manner that made the participants' identities untraceable.

4. Findings

Based on the broad themes and subthemes identified from the analysis of the interviews, the study's findings are presented below.

4.1. RQ 1: Push factors influencing students' use of LMS post-COVID

To understand factors driving students' LMS use post-COVID-19, findings from the interview analysis revealed three major factors. These factors include COVID-19-related considerations, digital readiness and literacy, as well as flexibility and autonomy. Thus, these three identified factors emerged as subthemes and are presented subsequently.

4.1.1. Subtheme 1: COVID-19-related factors

The COVID-19 pandemic was identified as one of the major push factors influencing students' adoption of LMS. Many of the interview participants cited the necessity for online learning and the rapid changes in education delivery due to lockdowns and social distancing as factors influencing students' use of the platform post-COVID. Some of the participants observed that:

The COVID-19 shift to remote learning resulted in increased LMS usage across multiple dimensions – frequency, tools, and times (P1). (P1)

The shift in the mode of learning caused by the emergence of COVID-19 had lasting positive effects on LMS use. (P2)

The policies and practices adopted during the COVID-19 shift to remote learning had a profound impact on students' continued engagement. (P10)

However, some participants noted that using LMS was not new, as the university had been leveraging it for instructional delivery prior to the pandemic. The pandemic pushed the ODL-based institution to limit its educational delivery to the use of LMS to bridge the learning gap caused by the pandemic. Thus, it creates a long-term shift towards a remote learning model. Some of the participants opined that:

The university has been using LMS before the pandemic as a mode of instruction, and our students have been partially using it before the pandemic. However, the pandemic made the students realise that LMS is the only option for continuity of learning during the period, and that influenced continuous use post-pandemic. (P8)

... This shift is significant, especially when considering facilitation. Before the pandemic, we had physical facilitation sessions, but since then, all facilitation has moved online through the LMS. The post-pandemic period has truly brought about a complete paradigm shift in how instruction is delivered and received. (P12)

These views emphasise how COVID-19 catalysed systemic change, influencing the institution to adopt LMS for learning fully and the consequent impact on students' use of LMS during the post-pandemic period.

4.1.2. Subtheme 2: Digital readiness and literacy

The analysis revealed that digital readiness and literacy also emerged as factors influencing students' use of LMS after the COVID-19 pandemic. The majority of participants indicated that digital literacy and familiarity with digital tools and resources played a significant role in students' engagement with the LMS platform after the COVID-19 pandemic. Some of the participants noted as follows:

A factor that contributes to students' increased use of LMS is the emphasis placed on digital literacy skills as a necessity for success in the ODL environment by the university. Students have been improving their digital literacy skills, and this has influenced their ability to navigate the LMS platform effectively. (P5)

... Students' enhancement of their digital skills and familiarity with online tools has significantly influenced them to use the LMS platform. Many became more proactive in utilising features like discussion boards and assignment submissions, leading to improved overall engagement and efficiency in their studies post-COVID-19. (P7)

... students' knowledge of available digital learning resources and their ability to access and leverage these resources influenced their LMS adoption post-COVID. (P6)

Generally, the responses suggest that, given the university's emphasis on and influence over students' acquisition of digital literacy skills, students have demonstrated significant improvement in their digital skills. Digital literacy, along with knowledge and the ability to utilise digital tools and resources, has significantly influenced the increased use of LMSs post-COVID.

4.1.3. Subtheme 3: Flexibility and autonomy

The study participants depict the flexibility and autonomy that LMS platforms offer as one of the push factors influencing students' use of LMS post-COVID. They argued that LMS makes learning more personal and provides students with the ability to learn at their own pace, regardless of their location. LMS also provides centralised resources that make studying easier for students, thus influencing their use in the post-pandemic era. Some of the participants opined that:

Flexibility in learning options and many modes of assessment serve as an impetus for LMS use post-COVID. (P1)

The ability of the student to access learning materials from anywhere at any time allowed them to manage their education more autonomously. This serves as motivation for continuous use of the platform for learning. (P6)

By using the LMS, students can take ownership of their learning, engaging with the material in a way that allows them to discover knowledge on their own ... the mere fact that students can revisit lessons at any time, at their own pace, and as often as needed, they are always motivated to use the platform. (P12)

Generally, these views suggest that flexibility and the sense of autonomy afforded by LMS, especially in a post-COVID world, allowed students to take more control over their learning. This self-directed learning model aligns with the greater flexibility that students sought in their educational experiences, driving the sustained use of LMS post-COVID.

4.2. RQ 2: Pull factors influencing students' LMS use post-COVID-19

To understand the pull factors influencing students' LMS use after COVID-19, the academic and support staff identified three major pull factors during the course of the interview that contributed to the increased use of LMS among NOUN students after COVID-19. These factors include system features, regular platform updates, effective support mechanisms, and robust institutional policies. These identified factors, therefore, emerged as subthemes.

4.2.1. Subtheme 1: System features and regular updates of the platform

The analysis revealed that participants believed the LMS platform was built with features that made navigation and interactivity easy for students. This is in addition to the frequent updates of the platform and the incorporation of new features that enhance their learning experiences following the COVID-19 pandemic. Some of the participants expressed the view that:

...new features such as improved communication tools, enhanced collaboration spaces, and user-friendly interfaces were implemented in the LMS.

These upgrades made it easier for students to access resources, participate in discussions, and submit assignments, contributing to a more engaging and efficient learning experience post-pandemic. (P7)

There were newly introduced features and regular upgrades of the LMS platform to meet the expected needs of the students. This made it more user-friendly and beneficial for students post-pandemic. (P1)

The LMS has undergone significant evolution, especially in recent times. Just within the past two weeks, there has been another system upgrade, and it's something we continuously adapt to. Each semester, students encounter new features and changes, keeping them engaged with the system. (P10)

The opinions expressed indicate that effective LMS features and regular system updates make the platform user-friendly, which positively influences students' use of the LMS post-COVID.

4.2.2. Subtheme 2: Effective support mechanisms

The availability of effective support mechanisms for both the students and facilitators was a crucial pull factor that influenced LMS use post-COVID. Several participants noted that the technical and instructional support encouraged students to continue using the LMS. Support such as providing navigational guidelines, training, and counselling services to enhance students' use of the LMS. According to some of the participants:

A step-by-step guide was given to students on how to use the LMS. So, through this step-by-step guide given to them, they were able to know where to place the icon and what to do with that icon. This policy influenced student engagement even after COVID. (P4)

Support services are provided in the form of guidance and counselling, and through technical support services. These services assist students in navigating the various challenges associated with the use of the LMS. As a result, there is a robust support system that influences them to use effectively post-COVID. (P12)

These views suggest that the provision of adequate support systems has a significant impact on students' use of LMS post-COVID.

4.2.3. Subtheme 3: Institutional policies

Findings from this study also revealed that the university had policies in place that encouraged the use of LMS platforms. This has been part of the pull factors influencing students' use of the LMS platform since the COVID-19 pandemic. The university introduced policies that encourage LMS use and digital engagement, continuous improvement of the platform for user-friendliness, expansion of course offerings and facilities, the introduction of virtual examination options, and E-ticketing for student support. All these have greatly influenced students' use of LMS post-COVID. Some of the participants expressed the following views:

Supportive policies and training introduced by the institution helped sustain students' engagement with the LMS platform post-COVID. (P5)

New initiatives are employed day by day by the university to make the system more student-friendly. These enhance students' sustained use of the platform for learning. (P8)

The university implemented an E-ticketing policy. E-ticketing is a platform from the National Open University of Nigeria that allows students to ask questions about any challenges they have. So, it has been established to respond to students' challenges... This has greatly helped obtain increased use of the platform post-COVID. (P4)

Therefore, institutional policies have facilitated greater student use of the LMS platform post-COVID by enhancing accessibility, expanding services, and providing critical support and resources necessary for sustained use of the platform in learning.

4.3. RQ 3: Challenges affecting LMS use post-COVID-19

Despite the benefits inherent in LMS use for learning, especially in the ODL landscape following the COVID-19 pandemic, interview participants reported several challenges hindering effective LMS usage among students. The participants expressed opinions that challenges affecting students revolve around infrastructure and access, user literacy and engagement, as well as technical and content-related issues. Therefore, infrastructure and access, user literacy and engagement, as well as technical and content-related issues, become the subthemes and are presented below.

4.3.1. Subtheme 1: Infrastructure and access issues

Some of the major challenges identified by the interview participants hindering the effective use of LMS post-COVID are associated with access disparities and poor internet connectivity. The majority of the participants opined that these challenges are especially common in remote areas that lack basic infrastructure, such as electricity and internet connectivity. Additionally, frequent power outages exacerbated these access issues. The following claims support this view:

Though LMS is interactive, user-friendly, attractive, captivating and fashion-compliant, it is still heavily reliant on electricity, which is often a problem in most communities. (P9)

We sometimes face connectivity issues. This is a significant hurdle for online facilitation. If students encounter network problems, they risk missing important information. Additionally, many students in remote areas struggle with access to reliable internet. (P5)

There are many challenges. There is the issue of the internet, as students and staff often grapple with the financial implications of data subscription. Secondly, devices. Most students don't have a good device to use the platform effectively. (P10)

These responses from the participants indicate that a lack of good internet connectivity and digital devices, as well as poor electricity supply, affect students' effective use of the LMS platform post-COVID.

4.3.2. Subtheme 2: Digital literacy

It was observed in the responses of the participants that students struggled with low digital literacy, and this affected their ability to utilise the LMS features fully. According to some of the participants:

... some students lack digital literacy. Many did not attend conventional secondary schools and are now facing a steep learning curve at the university level. This lack of foundational education impacts their ability to navigate LMS effectively post-COVID. (P5)

... and unfortunately, some students are unable to keep up with their studies due to low digital skills... (P12)

These responses suggest that inadequate digital literacy creates significant barriers to the effective use of LMS by students after the COVID-19 pandemic. This highlights a major issue in ensuring equitable access to digital learning.

4.3.3. Subtheme 3: Low participation/engagement

Some participants identified low participation or engagement with the platform and other academic activities. They believed that low participation from peers and instructors using the LMS platform made the learning experience difficult for students. Some participants believed that remote learning through the LMS platform poses a challenge, leading many students to feel isolated due to the lack of in-person interaction. Some of the participants expressed the following views:

One of the major challenges we face is low participation, especially when it comes to interaction and engagement. It's surprising at times. For instance, as a lecturer, you may plan a virtual class or facilitation session expecting around a thousand students to join live, but when the session starts, it's difficult to get even 500 logged in at that time. (P12)

Recurring challenges in maintaining student engagement through the LMS post-pandemic include inconsistent participation. (P7)

It can be observed from the participants' views that students' participation in real-time lectures has been abysmally low. This affects students' engagement with the platform post-COVID.

4.3.4. Subtheme 4: Technical and content-related issues

Some participants also point to issues related to technical and content-related factors as another challenge inhibiting students' effective use of the LMS platform post-COVID. They identified system downtime and glitches, as well as limited availability of technical assistance when issues arise. Many felt that the platforms were too resource-intensive or that instructors did not keep learning content updated. Some of the participants expressed the following views:

Some students struggle with technical issues or find it hard to stay motivated in a digital learning environment, which has affected students' overall engagement with the LMS platform post-COVID. (P7)

We usually face some technical challenges, and it might take a long period to get assistance from the technical team ... most especially during examination. (P1)

Accessing course materials online can also be prohibitively expensive, especially given the current economic climate in Nigeria. (P5)

Some of the courses lack up-to-date content. This often discourages students from engaging with or benefiting from the learning experience using the platform post-COVID. (P6)

The above views suggest that technical and content-related issues pose a great challenge to the effective use of LMS for learning among students. These challenges affect the overall effectiveness of the LMS platform post-COVID.

5. Discussion

This study aims to investigate the push and pull factors influencing LMS use post-COVID in ODL-based institutions in Nigeria. The study also aimed to understand the challenges that limit the effective use of the LMS for learning among ODL students. Analysis of the qualitative data revealed three major push factors influencing students' use of LMS after the COVID-19 pandemic. Firstly, it was revealed that COVID-19-related factors served as a catalyst for the adoption and sustained use of the LMS following the COVID-19 pandemic. This finding aligns with many studies [24, 31, 56] that reported how the emergence of COVID-19 influenced the rise of online learning, including the use of LMS for learning. In Nigeria, the shift to online learning, occasioned by lockdowns and social distancing measures taken to curb the rapid spread of the COVID-19 pandemic, forced many higher institutions, including ODL-based universities and students, to rely heavily on LMS for educational continuity [34]. Thus, the pandemic served as a compelling external push factor, mandating the use of LMS for continuity of learning, and students utilised it due to compliance requirements. This aligns with the UTUAT's emphasis on the role of environmental and contextual factors in enabling technology adoption [46]. Secondly, it was revealed that digital readiness and literacy are crucial factors influencing LMS use following the COVID-19 pandemic. This result is consistent with previous research findings [3, 8, 71]. According to Mabila, Gelderblom and Ssemugabi [44], the efficiency and effectiveness of ODL students in using LMS depend on their digital readiness and literacy. Digital literacy, therefore, becomes a facilitating condition that enhances ODL students' effective use of LMS. This highlights the importance of students' skills and resources in the adoption of technology [68]. Thirdly, the result indicated that the flexibility and autonomy offered by the LMS served as another push factor for its sustained use post-COVID. This finding is consistent with the study by Kaur and Saraswat [35], who found that ubiquity and autonomy are critical factors contributing to students' use of LMS. Participants of the study noted that *LMS provides an opportunity for students to learn and access learning materials at their convenience, thus allowing them to take ownership of their learning*. This refers to the perceived benefits of LMS in enhancing the learning of ODL students. This aligns with the key construct of the UTUAT model (performance expectancy), which demonstrates that students are more likely to use LMS when they perceive it as useful for achieving their learning goals [62].

Additionally, the analysis of the interview data revealed three major pull factors influencing students' use of the LMS after the COVID-19 pandemic. The first factor is related to the system's features and regular updates, which make the LMS platform user-friendly, thereby enhancing ODL students' engagement with the platform and, consequently, their learning experience post-COVID. This finding is consistent with the research findings of Zanjani [80]. According to Thangavel [73], students' engagement and usage efficiency of LMS is based on the system features and functionalities. The study participants highlighted that *continuous upgrades to the LMS platform enhance communication tools and provide collaboration spaces that motivate students to use the platform*. The user-friendly interface of the LMS platform and ease of navigation, based on continuous updates, align with effort expectancy, one of the key constructs of the UTUAT, which emphasises that the actual use of technology is based on how intuitive and user-friendly it is perceived to be [49]. Thus, as ODL students find the LMS platform easy to navigate, they use it effectively for learning post-COVID.

Additionally, the findings revealed effective support mechanisms as the second pull factor influencing ODL students' LMS use following the COVID-19 pandemic. This aligns with previous studies [9, 14, 32, 81] that have found effective support systems to influence students' LMS use. This finding suggests that the availability of technical

and instructional support plays a crucial role in motivating students to utilise the LMS after the COVID-19 pandemic. Support mechanisms serve as a facilitating condition that may reduce the perceived difficulty of using the LMS platform, thereby enhancing LMS adoption post-COVID [14]. The findings further revealed that institutional policies provided by the ODL-based university serve as another pull factor influencing students' LMS adoption following the COVID-19 pandemic. This finding is consistent with the findings of a similar study [70]. The ODL-based university introduced policies that encouraged the use of LMS and digital engagement, continuously improved the platform for usability, expanded course offerings and facilities, introduced virtual examination options, and implemented E-ticketing for student support during the pandemic period. This fostered a significant reliance on digital platforms for learning following the COVID-19 pandemic. These policies indicate institutional endorsement of the LMS for learning, thus aligning with one of the key constructs of the UTUAT model (social influence) that emphasises the impact of important others on technology adoption [30]. It is believed that institutional policies encouraging LMS use were made to create a social environment where students could perceive LMS as a necessary and valuable tool for learning during the pandemic period, and this influenced LMS use for learning post-COVID.

Moreover, the qualitative data analysis identified four challenges affecting students' LMS use post-COVID. Firstly, the findings revealed that students' use of LMS for learning is affected by infrastructural and access issues. These include erratic electricity supply, poor internet connectivity, and insufficient access to digital devices. This finding is consistent with previous research findings [15, 18, 32, 47, 66, 72]. Infrastructure and access issues may increase students' perceived effort required to use the LMS, as they struggle with connectivity and device limitations. It behoves the ODL-based institution to make a concerted effort to improve internet connectivity and address disparities in access to technological devices, thereby enhancing LMS use post-COVID. Secondly, the findings identified digital literacy skills as another challenge affecting students' use of the LMS post-COVID. This finding is consistent with the research findings of Adegboro, Tella and Jide [3]. According to Mabila, Gelderblom and Ssemugabi [44], the efficiency of using LMS platforms for learning is closely tied to students' digital proficiency levels, with certain usability challenges particularly pronounced for those with lower digital skills. This finding suggests that ODL students with low digital literacy skills may not perceive the LMS as a useful tool, as they struggle to effectively leverage its features. Thus, there should be adequate training for students, and the LMS platform should be designed with intuitive interfaces and clear instructions that can help reduce the learning curve for students with low digital literacy. Thirdly, it was revealed that low participation or engagement with the LMS by students and lecturers serves as another challenge to the effective use of LMS post-COVID. This finding is consistent with similar research findings [29, 52]. The finding indicated that facilitation sessions on the LMS often suffer from low attendance and inconsistent student participation. This may be due to a lack of knowledge or motivation requiring training, encouragement, or motivation to increase participation [29]. According to Klobas and McGill [38], students' active use of LMS for learning enhances the benefits they receive, while lecturers' active use of it guides appropriate use and improves the quality of information. Instructors should be encouraged to actively use the LMS for teaching activities to model engagement for students. Lastly, the findings revealed that technical and content-related issues affect students' use of the LMS post-COVID. This finding is consistent with previous research studies [7, 10, 72]. It is believed that technical challenges such as downtime, glitches, and limited technical support will hinder the facilitating conditions. Additionally, outdated or irrelevant learning content may reduce students' perceived usefulness of the LMS,

which can consequently affect the effective use of the LMS platform post-COVID. Establishing robust technical support systems and ensuring that course materials are regularly updated and relevant to students' needs will enhance the effective use of the LMS following the COVID-19 pandemic.

6. Theoretical implications

This study is one of the first efforts to explicitly extend the UTUAT model in the context of ODL in a post-pandemic developing country by exploring the interplay of push and pull factors with systemic challenges affecting LMS use. The findings reveal that factors influencing LMS use post-COVID are not isolated but interdependent. This creates a tension between potential and reality. For instance, digital literacy emerged as both a push factor and a challenge. This duality aligns with UTUAT's facilitating conditions construct, which posits that resources and skills serve as enablers of change. However, UTUAT overlooks the potential of enablers to exacerbate inequities in low-resource contexts. This study's findings, therefore, challenge the linear assumptions of UTUAT in this regard, suggesting a need for dynamic construct modelling in ODL research, especially in a developing country context. Similarly, institutional policies, a social influence in the UTUAT construct, were undermined by infrastructural gaps. This tension mirrors findings in other developing ODL contexts [15]. This suggests that UTUAT's facilitating conditions may require contextual adaptation to account for systemic barriers. Lastly, a performance expectancy driver (flexibility and autonomy) and effort expectancy driver (LMS's user-friendly design) were lauded by participants, yet infrastructural gaps (frequent power outages and poor connectivity) often hinder these benefits. This paradox highlights a critical gap in UTUAT's assumption that ease of use guarantees adoption. However, the findings extend UTUAT by demonstrating how environmental factors in Nigerian ODL settings can mediate the model's core constructs.

7. Conclusion and recommendations

This study examined the push and pull factors influencing LMS usage among ODL students in a Nigerian university in the post-COVID era. Findings revealed that COVID-19-related pressures, students' digital readiness and literacy, and the flexibility and autonomy provided by the LMS acted as significant push factors. Similarly, user-friendly system features and regular updates, effective support mechanisms, and institutional policies emerged as key pull factors promoting LMS engagement. However, LMS usage was constrained by infrastructural limitations, insufficient digital literacy, low user engagement, and technical/content-related issues. These findings underscore the importance of holistic strategies that simultaneously enhance digital literacy, improve infrastructure, and ensure ongoing institutional support. Future research should investigate the longitudinal effects of these factors and assess the efficacy of targeted interventions.

Based on these findings, the following recommendations are proposed:

1. *Invest in scalable LMS infrastructure* by developing robust LMS platforms that offer offline access and scalability to ensure learning continuity during future disruptions.
2. *Enhance digital literacy programs* by expanding digital readiness initiatives that empower students with the necessary skills to navigate LMS platforms effectively.
3. *Leverage LMS flexibility* by designing adaptable LMS environments that support diverse learning styles and schedules.

4. *Align content with LMS capabilities* by fostering collaboration between instructors and IT teams to ensure learning materials align with platform updates and features.
5. *Improve infrastructure and access* by partnering with government agencies, private stakeholders, and internet service providers to expand affordable and reliable internet and technological access.
6. *Establish resource centres* by setting up physical spaces equipped with electricity, internet access, and digital devices for students without stable home access.
7. *Strengthen technical support* by implementing 24/7 multi-channel support services (live chat, email, phone, self-help) for technical assistance.
8. *Ensure content relevance* by regularly updating course materials to maintain alignment with academic standards and evolving student needs.

8. Limitations of the study

This study was conducted at one ODL-based university in Nigeria. Therefore, the findings may not be generalised to other ODL-based institutions in the country. Additionally, the participants were conveniently selected, which may not accurately represent the overall views of other academic and support staff in the university, given the large number of academic and support staff spread across many study centres in the country. Lastly, in-depth interviews were conducted among the academic and support staff of the ODL-based institution without considering the students' opinions. This might limit the ability to fully understand the factors influencing LMS usage from the perspective of the students who are primary users of the LMS platforms for learning.

9. Suggestions for further studies

Future research should consider:

- Including multiple ODL institutions across Nigeria to enhance the representativeness and generalizability of findings.
- Exploring additional factors not covered in this study, such as the role of institutional policies and leadership in shaping LMS use and innovation.
- Incorporating the perspectives of students, whose firsthand experiences can provide deeper insights into user engagement, system usability, and the challenges of LMS adoption.

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A. Interview guide

1. Push factors (factors that drive increased LMS use)

- How did students' LMS usage patterns change during the shift to remote learning due to COVID-19?
- How did the necessity for online learning influence students' adaptation to using the LMS effectively post-COVID-19?
- Did your institution offer any specific support mechanisms (e.g., training, tutorials) to facilitate student use of the LMS during the pandemic and post-pandemic?
- Did your institution introduce policies that mandated or encouraged the use of the LMS during the pandemic? How did these policies influence student engagement post-pandemic?

2. Pull factors (factors that attract users to LMS)

- In your experience, how often did students utilise the LMS platform before the COVID-19 pandemic?
- Did you observe a rise in student engagement with the LMS during the pandemic and post-pandemic? If so, what factors might have contributed to this increase?
- Were there any new features or upgrades implemented to the LMS during the pandemic that made it more user-friendly or beneficial for students post-pandemic?
- From your experience, what are the most significant advantages and disadvantages associated with the LMS in an ODL environment?

3. Challenges

- How effective were these support mechanisms in assisting students with using the LMS post-pandemic era?
- What recurring challenges have you noticed in maintaining student engagement through the LMS platform post-pandemic?