E-LEARNING PRACTISED INNOVATION TOWARDS KNOWLEDGE MANAGEMENT AND MASSIVE OPEN ONLINE COURSES (MOOCS) IN OPEN UNIVERSITY, INDONESIA

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ABSTRACT

Developing students' competences for postgraduate has been attractive to explore in the field of social sciences. However, there is little study to analyze the effect of an e-learning practiced innovation on knowledge management and massive open online courses (MOOCs) for postgraduate student academic performance in Open University. We applied a quantative analysis through structural equation modelling with data sampled from 155 postgraduate students spread across the whole of Open University in Indonesia. Data gained through questionnaires was entered and the 6 point Likert scale was applied for strongly agreeing to strongly not agreeing. The results show that e-learning practice models have a positive and significant effect on knowledge management and Massive Open Online Courses (MOOCs). Meanwhile, knowledge management also has a positive and significant effect on Massive Open Online Courses (MOOCs) of postgraduate student achievement in Open University. Based on the research findings, we argue that developing of postgraduate student academic performance in knowledge management and MOOCs programs availability, then, it must be creating a better e-learning practiced innovation at Open University in Indonesia for creating a greater policy programs of independent Learning-Independent Campus era.

Keywords: E-Learning practiced model, knowledge management, massive open online courses (MOOCs), postgraduate student, open university, Indonesia.

INTRODUCTION

Accordingly, the e-learning model has been viewed as a successful model in education. For example, research has investigated the success model of e-learning in undergraduate students' academic performance and asserted that an e-learning initiative's overall success is contingent on achieving success at each of the three stages of e-learning system development: system design, system delivery, and system outcome (Holsapple & Lee-Post, 2006). Moreover, the e-learning strategy has greater effectiveness for study compared with face-to-face teaching and learning programs in universities (Soffer & Nachmias, 2018). Other studies have proved that there were some elements of e-learning success factors. The critical elements involved course design quality, instructor, motivation, student-student dialog, student-instructor dialog, self-regulated learning, and

perceived learning results were all elements in e-learning systems being viewed as success factors in Higher Education (Eom & Ashill, 2018)the proliferation of measures of dependent and independent variables has been overelaborated. We argue that a significant reduction in dependent and independent variables and their measures is necessary for building an e-learning success model, and such a model should incorporate the interdependent (not independent.

E-learning may improve students' knowledge management and learning management system innovation. The relationship between e-learning and knowledge management (Dahou et al., 2019; Eom & Ashill, 2018; Holsapple & Lee-Post, 2006; Soffer & Nachmias, 2018)the proliferation of measures of dependent and independent variables has been overelaborated. We argue that a significant reduction in dependent and independent variables and their measures is necessary for building an e-learning success model, and such a model should incorporate the interdependent (not independent has been considered to be explored in order to develop the learning management system. Besides, the knowledge management theory perceived as the main factor and/or as crucial dimensions in the learning governance development and businesses of all types and sectors (Calcado et al., 2022; Dahou et al., 2019; Fernandez-Gimenez et al., 2019; D. Maier et al., 2015; Ronald, 2007)yet few longitudinal studies examine how learning occurs in CAM or apply the science of learning to interpret this process. We present an analysis of decision-making processes within the collaborative adaptive rangeland management (CARM. Open University in Indonesia is the one kind of university delivering a distance learning postgraduate programs. There are many programs innovations have been conducted, such as e-learning programs, the Massive Open Online Courses (MOOCs), and the Learning Management System in the Open University in Indonesia. However, Open University has faced challenges to how to improve the academic learning outcomes for postgraduate students and make the students more attractive to learn, satisfaction, and ease to improve their chance for success. This research proposes a model of e-learning practiced in the postgraduate students' academic achievement at Open University in Indonesia.

This research focus on to measure the effect of e-learning perspective on the postgraduate students' academic performance and learning management system in Open University in Indonesia. Based on the previous description, this study purposes to analyze the impact of e-learning perspective on knowledge management and learning management system effectiveness for improving the postgraduate students' academic performance in Open University in Indonesia. The need for such innovations is highlighted by prior studies, which emphasize the importance of aligning e-learning strategies with knowledge management practices to support student learning and improve organizational effectiveness (Rulinawaty et al., 2024). Furthermore, this research seeks to measure the impact of e-learning on knowledge management and its role in improving postgraduate academic outcomes.

E-Learning Practiced

E-learning systems have undergone considerable evolution, particularly due to the global shift towards online education in recent years. These systems comprise multiple dimensions, such as instructional design, learner engagement, technological readiness, and the adoption of innovative teaching methodologies. Instructional design, as noted by Bilgic & Tüzün, (2020), plays a foundational role in ensuring the success of e-learning, particularly in environments that differ from traditional face-to-face education. Effective instructional design, aligned with established learning theories, enhances both the course structure and the educational experience (Afifi & Alamri, 2014). Additionally, (Ucar & Ugurhan, 2023) suggests that learners' readiness for e-learning significantly affects their self-regulation, an essential skill for thriving in digital education.

Moreover, learner engagement is critical for fostering deeper interaction with course content. Mirmoghtadaie & Ahmady (2019) assert that active learner participation is key to developing higher-order thinking skills, while Demir et al., (2023)catalysis, drug storage and delivery. The number of MOFs and their potential applications are growing so quickly that, when novel MOFs are synthesized, testing them for all possible applications is not practical. High-throughput computational screening approaches based on molecular simulations of materials have been widely used to investigate MOFs and identify the optimal MOFs for a specific application. Despite the growing computational resources, given the enormous MOF material space, computational identification of promising MOFs requires more efficient approaches in terms of time and effort. Leveraging data-driven science techniques can offer key benefits such as accelerated MOF design and

discovery pathways via the establishment of machine learning (ML emphasize the role of learner autonomy in improving satisfaction and performance. Social connectedness, fostered through interactive elements like discussion forums, further contributes to this engagement (Slagter van Tryon & Bishop, 2012).

Technological readiness also profoundly impacts e-learning success. According to Madi Odeh et al., (2023), the availability of technological resources and continuous support are critical for sustaining effective online learning, particularly during crises like the COVID-19 pandemic. The Technology Acceptance Model (TAM) demonstrates that ease of use and perceived usefulness are significant factors influencing learners' engagement with e-learning platforms (Demirer & Baki, 2018). Alshammari, (2020) further highlights that instructional design and self-efficacy play important roles in facilitating students' use of Learning Management Systems (LMS).

The COVID-19 pandemic spurred innovative approaches to e-learning, including the increased adoption of blended learning models, which have been shown to improve student satisfaction and outcomes (Cakir & Solak, 2014). However, studies like that of Kisacik et al., (2023)p= 0.001 also recognize the limitations of fully online education, particularly in fields like nursing, where hands-on training remains indispensable.

Finally, the evaluation of e-learning practices is vital for continual improvement. Frameworks proposed by Barbera et al., (2016); Gomez-Rey et al., (2016) for assessing the quality of online education through both teacher and student perceptions, align with the findings of Cigdem & Ozturk, (2016) on the importance of evaluating e-learning readiness in relation to learner achievement. By continually refining these practices, institutions can better meet the diverse needs of their learners and enhance the efficacy of e-learning systems.

Knowledge Management

The integration of knowledge management (KM) into e-learning systems is critical, particularly in the context of distance education, such as at the Open University of Indonesia (OUI). KM involves processes for creating, sharing, and managing knowledge within an organization, and its application in e-learning can significantly improve educational outcomes, encourage collaboration, and drive continuous enhancements in pedagogical approaches.

A key dimension of KM in e-learning is the facilitation of knowledge sharing and collaboration through technology. Cakir & Solak. (2014) demonstrate that blended learning models, which combine face-to-face interaction with online components, can lead to enhanced student satisfaction and better learning outcomes. Tan (2016)universities face issues that may hinder active sharing among its faculty members such as the absence of trust among its members or insufficient incentives rewarded to those who deserved it. The aim of this research is to focus on the impact of knowledge management (KM expands on this by emphasizing the role of student interactions in open distance learning, where effective KM practices foster meaningful exchanges of knowledge among learners and educators. These findings highlight that technological integration is essential not only for the dissemination of knowledge but also for cultivating a collaborative learning environment, crucial for the success of KM.

Additionally, the experiences of both educators and learners in online settings play a pivotal role in determining the effectiveness of KM practices. Radiansyah et al. (2023) reveals that educators' proficiency with technology and pedagogical strategies in online learning environments directly influences the success of KM. This is particularly relevant for open universities, where faculty often face unique challenges in adapting to digital teaching methods. Strengthening educators' KM competencies can enhance overall teaching effectiveness and student outcomes.

Another vital component is self-regulated learning, which is closely linked to KM. Ucar & Ugurhan, (2023) highlights that learners with strong e-learning readiness are better at self-regulating their learning processes. This ability to manage one's own learning is integral to KM, as it empowers students to actively seek knowledge, engage with peers, and collaborate in the creation of new learning experiences. The interplay between self-regulation and KM emphasizes the need for educational environments that promote learner autonomy.

Institutional support is also essential for the successful integration of KM into e-learning. Kisacik et al. (2023) argue that innovative teaching methods are critical for incorporating e-learning into various disciplines, such as nursing education, which can serve as a model for other fields. This underscores the importance

of institutions providing frameworks that encourage KM practices, such as collaborative platforms and resources that facilitate knowledge exchange among both faculty and students.

Finally, ongoing evaluation of e-learning practices is crucial for the continuous improvement of KM. (Afify Et Al., 2023) highlights the necessity of establishing clear criteria for assessing the quality of virtual learning environments. This approach allows institutions to identify best practices in KM and refine their strategies to ensure the continuous development of effective e-learning environments. The challenges posed by the COVID-19 pandemic have further demonstrated the need for adaptive KM frameworks to support evolving educational demands, as noted by Henderikx et al. (2019), who observed that barriers to participation in MOOCs can significantly impact learner satisfaction and outcomes.

In conclusion, effective knowledge management within e-learning is fundamental to improving educational outcomes and fostering collaboration in open universities. The integration of technology, learner engagement, institutional support, and continuous evaluation are all vital components that contribute to the success of KM in these contexts. As educational institutions adapt to the increasing demands of online learning, a robust focus on KM will be essential to achieving sustainable success.

Massive Open Online Courses (MOOCs)

Massive Open Online Courses (MOOCs) have significantly transformed the educational landscape by making learning opportunities more accessible and flexible to a global audience. This innovation in e-learning spans various dimensions, including learner engagement, course design, retention challenges, and the influence of technological advancements. These aspects, when examined through the lens of existing scholarly literature, reveal both the potential and challenges associated with MOOCs in promoting effective online education.

A crucial factor influencing the effectiveness of MOOCs is learner engagement. Henderikx et al. (2019) discuss how participant interaction is critical in enhancing satisfaction within online learning environments, particularly in MOOCs where traditional interaction is often limited. Peer assessment is highlighted as a valuable strategy for fostering community and providing feedback among learners. This aligns with Lan & Hew. (2020)and helping learners and instructors understand how learning engagement is constructed in a MOOC context is of increasing importance. Although previous research has undoubtedly enriched our knowledge of MOOCs, our understanding of student engagement in the MOOC context is still limited. This study adopts a sequential explanatory mixed-methods approach to examine student engagement in MOOCs from the self-determination theory (SDT findings that positive student experiences in MOOCs are often tied to meaningful interactions with peers and instructors. These studies emphasize that designing MOOCs with interactive components is essential for enhancing learner engagement and overall satisfaction.

However, retention rates remain a significant challenge in MOOCs. Gomez-Rey et al. (2016) report dropout rates as high as 86%, consistent with findings that online courses typically face higher abandonment rates compared to traditional settings. Henderikx et al. (2019) further explore factors influencing persistence in MOOCs, noting the importance of course relevance and the role of the instructor. Addressing these factors is critical for developing strategies that improve completion rates, a key barrier to the effectiveness of MOOCs.

The design of MOOCs plays a central role in shaping the learning experience. Tlili et al. (2022) reflect on the challenges posed by the transition to online learning during the COVID-19 pandemic, underscoring the importance of robust pedagogical strategies and technological infrastructure to support learners.Zhu et al., (2021) argue that MOOC design must cater to diverse learner needs, incorporating strategies to address cultural diversity in both design and delivery. Inclusive design principles are essential for making MOOCs accessible and effective for a global audience.

Technological advancements have also had a profound impact on MOOCs. Innovations like artificial intelligence and gamification are being integrated to improve learner engagement. Medina-Labrador et al., (2023) explore the use of biometric recognition technology in MOOCs, suggesting that such advancements could enhance personalized learning experiences. As technology continues to evolve, it is imperative that MOOCs adapt to leverage these innovations for better engagement and learning outcomes.

Self-regulated learning is another key factor in MOOC success. Albelbisi & Yusop. (2019) emphasize

that learners with strong self-regulation skills are more likely to actively engage with course materials and complete MOOCs. Therefore, MOOC designers should incorporate elements that promote self-regulation, such as goal-setting and reflection activities, to help learners manage their learning processes more effectively.

The impact of MOOCs on traditional educational models raises important considerations for the future of higher education. Albelbisi & Yusop, (2019) highlights the need for a shift towards more learner-centered approaches, where educators facilitate rather than dictate the learning experience. This transition challenges conventional pedagogical models, necessitating a reevaluation of the role of educators in the context of MOOCs and online education.

MOOCs represent a significant innovation in the field of e-learning, offering the potential to democratize education and provide flexible learning opportunities. However, the complexity of MOOCs requires careful consideration of various factors, such as learner engagement, course design, retention rates, and technological integration. By addressing these challenges and maximizing the strengths of MOOCs, educational institutions can enhance the effectiveness of online learning and better meet the needs of a diverse and evolving learner population.

Research Frameworks

E-learning practices play a significant role in promoting knowledge management (KM) and facilitating knowledge transfer within organizations and educational institutions. KM, in conjunction with e-learning, supports the development of organizational learning and enhances both teaching and learning processes (Abass et al., 2021; Al-Emran & Teo, 2020; Razzaque, 2020; Soltani et al., 2020)this requires online participation through quality knowledge sharing (KS. In higher education, e-learning has been linked to improvements in student performance and satisfaction, particularly as digital technologies reshape educational models.

A widely recognized model in the context of e-learning and information systems (IS) is the DeLone and McLean IS Success Model, originally proposed by DeLone & McLean, (2002, 2003, 2004). This model assesses the success of information systems through six key dimensions: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. When applied to e-learning, these dimensions provide a framework for evaluating the effectiveness of e-learning platforms, particularly regarding their ability to enhance student satisfaction, learning experiences, and academic achievements (DeLone & McLean, 2003).

Extended this model within the context of higher education, emphasizing its application in the development of students' skills, learning styles, and overall academic achievements. This extension highlights the significance of adapting the D&M IS Success Model to suit the evolving digital and technological landscape of education, particularly in fostering self-regulated learning and improved performance in e-learning environments.

Based on this theoretical foundation, the following hypotheses are proposed to examine the impact of e-learning innovations and KM on postgraduate students' (El-Sabagh, 2021) academic achievement at the Open University of Indonesia:

Hypothesis 1: *E-learning practices innovation effects on knowledge management in* Open University in Indonesia.

Hypothesis 2: E-learning practised innovation effects on Massive Open Online Courses (MOOCs) in Open University in Indonesia.

Hypothesis 3: Knowledge management effects on Massive Open Online Courses (MOOCs) in Open University.

Hypothesis 4: Knowledge management effects on the postgraduate student's academic achievement in Open University.

Hypothesis 5: Massive Open Online Courses (MOOCs) effects on postgraduate student academic achievement in Open University in Indonesia.

Figure 1 this research framework seeks to analyze how e-learning innovations and KM practices contribute to students' academic success in open universities, where online platforms such as MOOCs have become an important tool in delivering educational content and encouraging student engagement.

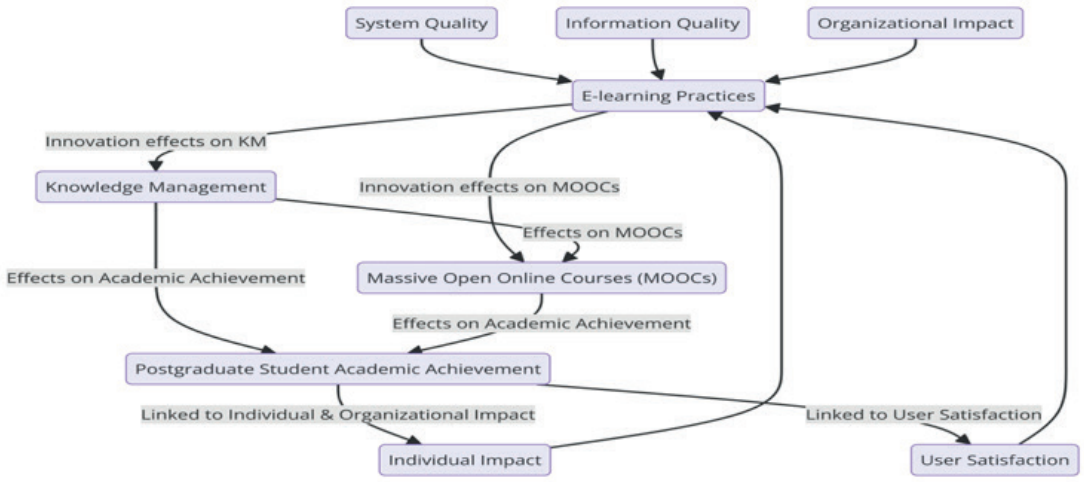

Figure 1. Research framework of e-learning and knowledge management

RESEARCH MODEL

In developing MOOCs model, we combine two perspective of MOOCs such as efficacy based on Ghazali et al. frameworks such as information searching, making queries, MOOC Learning, MOOC usability (El-Sabagh, 2021) also involved media unit for production, platform digitalization, social media team, academic content, and academic development (Kerr et al., 2019). Meanwhile, regarding postgraduate students' achievement, in this study, we use five dimensions such as cooperative learning, active learning, authentic learning, constructive learning, and intentional learning. According to the relevant literature description previously, we then provide the research frameworks as seen in the following figure:

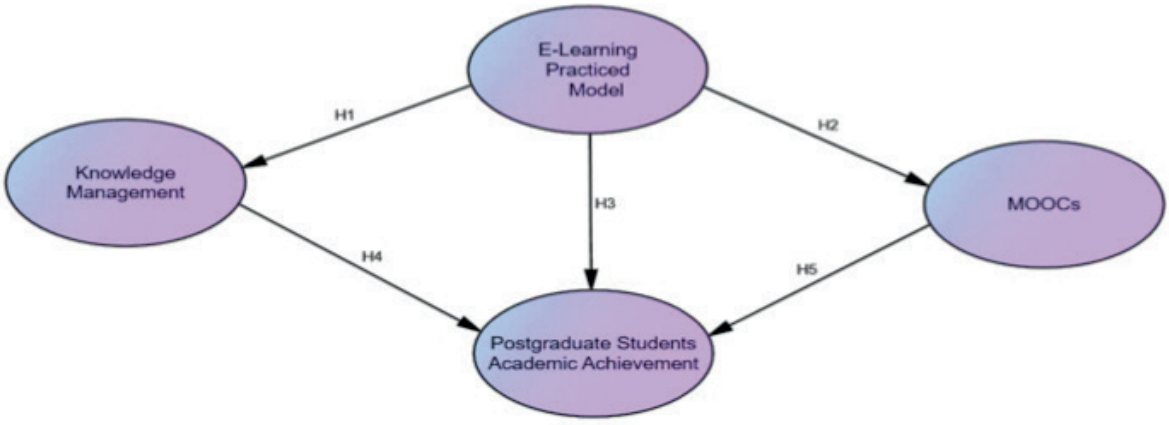

Figure 2. Theoretical Model

METHOD

The structural equation modelling (SEM) was applied using AMOS windows version 24 has had which was beneficial in analyzing data and measuring the five hypotheses proposed in the study. AMOS was chosen as is is a popular software with a distinctive Graphical User Interface (GUI) for resolving structural equation modeling issues. AMOS offers a user-friendly graphical or programmatic interface for assessing the intricate connections between the components (Arbuckle, 2013; Hair Jr Joseph et al., 2009; Thakkar, 2020). The sample was selected using a stratified random sampling technique, targeting 155 postgraduate students across Open University, Indonesia, ensuring representative coverage. Data was collected through structured questionnaires using a 6-point Likert scale. The structural model employed in this study included relationships between continuous or discrete independent variables (IVs) and dependent variables (DVs), analyzed through SEM(Ullman, 2015).

Variable Measurement

This study investigates four core variables: e-learning practices, knowledge management systems (KMS), Massive Open Online Courses (MOOCs), and postgraduate student academic achievement. Each variable was measured using a set of indicators grounded in existing literature to ensure comprehensive analysis.

1. *E-Learning Practices:*

   The measurement of e-learning practices includes a variety of elements that reflect the diverse nature of online education. These include proactive searching, repetition, interactive learning, presentation style, computer operation skills, e-learning content, media-based learning, technology and equipment availability, and video-based learning (Bonk et al., 2006; Ghazali et al., 2020; Ullman, 2015).These factors collectively capture the technological and instructional aspects necessary for effective e-learning environments.

2. *Knowledge Management Systems (KMS):*

   KMS in this study encompass dimensions such as the ability to capture knowledge, socialization, externalization, skill development, collaboration in learning, pedagogical techniques, cognitive structuring, and internalization (Al-Sharafi et al., 2021; Alavi & Denford, 2012; Garcia-Penalvo et al., 2017; Nonaka & Toyama, 2005). These dimensions highlight the processes by which knowledge is created, shared, and utilized, with a focus on enhancing collaborative learning and pedagogical effectiveness.

3. *Massive Open Online Courses (MOOCs):*

   MOOCs were measured based on accessibility, user interaction, learning content quality, and technical usability. These factors align with the increasing reliance on MOOCs in higher education and their impact on educational inclusivity and learner engagement (Albelbisi & Yusop, 2019a, 2019b; Tlili et al., 2022). MOOCs offer flexible learning opportunities and address diverse learner needs through adaptive course designs.

4. *Postgraduate Student Academic Achievement:*

   The academic achievement of postgraduate students is the final dependent variable, measured through indicators such as student engagement, satisfaction, learning outcomes, and skill development. These indicators reflect the broader goal of improving educational quality and student success in distance learning contexts (Solak & Cakir, 2014; Williams, 2015).

Then, the research instruments based on those literature review for measuring the validity and reliability items previously. Before measuring the research hypotheses, we need to conduct the piloting research for measuring the validity and reliability data. We have tested the instruments by using 45% of respondents of this research. According to the piloting research, we found each dimension of this study as presented in the following table:

Table 1. The central tendency values, reliability, and validity instrument test results.

Variabel	Indicators	Codes	Min.	Max.	Mean	Mean	SD	Validity	Reliability
E-Learning Practoiced (ELP)	Interactive learning	ELP3	1	6	3.71	3.71	1.49	0.631	0.933
	Presentation style	ELP4	1	6	3.929	3.929	1.3	0.709	0.932
	Computer operation	ELP5	1	6	3.923	3.923	1.307	0.7	0.932
	Media based learning	ELP7	1	6	3.916	3.916	1.297	0.696	0.934
	Technology & equipment availability	ELP8	1	6	3.916	3.916	1.297	0.696	0.934
Knowladge Management (KM)	Individual ability	KM5	1	6	3.845	3.845	1.538	0.646	0.933
	Skillful learning	KM6	1	6	4.381	4.381	1.397	0.55	0.935
	Learning collaboration	KM7	1	6	3.961	3.961	1.111	0.551	0.935
	Pedagogical techniques	KM9	1	6	4.194	4.194	1.542	0.624	0.934
	Cognitive structure	KM10	1	6	4.813	4.813	1.566	0.659	0.934
Massive Open Online Courses (MOOCs)	MOOC learning	MOOC3	1	6	3.639	3.639	1.456	0.633	0.933
	MOOC usability	MOOC5	1	6	3.761	3.761	1.464	0.735	0.934
	Media units for production	MOOC6	1	6	5.826	5.826	1.512	0.728	0.932
	Platform adaptation	MOOC7	1	6	5.995	5.995	1.512	0.728	0.932
	Academic content	MOOC9	1	6	5.955	5.955	1.34	0.65	0.933
Postgraduates Student Academic Achievement (IPSA)	Cooperative learning	PSAA4	1	6	4.187	4.187	1.393	0.418	0.934
	Constructive learning	PSAA6	1	6	4.391	4.391	1.191	0.566	0.937
	Self-regulated learning	PSAA7	1	6	4.329	4.329	2.11	0.585	0.956
	Learning outcome refocusing	PSAA9	1	6	4.477	4.477	1.107	0.531	0.935

Source: Author 2022

The results of items measured based on SPSS analysis shows that the validity and reliability of the measurement instruments were evaluated through piloting with 45% of the total respondents. Each dimension was rigorously tested for internal consistency using SPSS, yielding a reliability coefficient above 0.91, indicating high instrument reliability. In terms of validity, the analysis produced values above 0.55 for each variable, confirming the construct validity of the instruments, we find the factor loading, AVE, and CR which describe in the Table 2.

Table 2. Standardized Loading Factor, Average of Variance Exracted, and Composite Reliability

Variable	Indicators	Codes	Standardized Factor Loading	AVE	CR
E-Learning Practiced (ELP)	Interactive learning	ELP3	0.796	0.781	0.889
	Presentation style	ELP4	0.794		
	Computer operation skill	ELP5	0.99		
	Media based learning	ELP7	0.991		
	Technology digitalization equipment availability	ELP8	0.978		
Knowledge Management (KM)	Individual ability	KM5	0.809	0.723	0.836
	Skillful learning	KM6	0.788		
	Learning collaboration	KM7	0.901		
	Pedagogical techniques	KM9	0.893		
	Cognitive structure	KM10	0.856		

Massive Open Online Courses (MOOCs)	MOOC learning	MOOC3	0.678	0.721	0.838
	MOOC usability	MOOC5	0.861		
	Media units for production	MOOC6	0.898		
	Platform digitalization	MOOC7	0.922		
	Academic content	MOOC9	0.834		
Postgraduates Student Academic Achievement (PSAA)	Cooperative learning	PSAA2	0.737	0.748	0.858
	Active learning	PSAA4	0.804		
	Constructive learning	PSAA7	0.914		
	Self-regulated learning	PSAA9	0.873		
	Learning outcome refocusing	PSAA10	0.976		

Source: Author 2022

Table 2 shows that Using AMOS, the study analyzed convergent validity and factor loading for each item, along with the **average variance extracted (AVE)** and **composite reliability (CR)**. The analysis revealed that all items met the required thresholds, ensuring no violations of statistical assumptions. The results showed:

- *E-learning practices:* AVE = 0.781, CR = 0.889
- *Knowledge management:* AVE = 0.723, CR = 0.838
- *MOOCs:* AVE = 0.721, CR = 0.838
- *Postgraduate student academic achievement:* AVE = 0.748, CR = 0.858

These values confirm that each construct's variance exceeds 70%, establishing the robustness of the measurement model.

To ensure the validity of the structural equation modeling (SEM), various fit indices were calculated, including Chi-Square, CMIN/DF, RMSEA, GFI, AGFI, TLI, and CFI. All indices met the acceptable thresholds (Hair et al., 2014), confirming that the proposed model adequately fits the data and can be used to test the hypotheses.

Table 3. The Statistical Measurements of Goodness of Fit of Structural Modelling Results.

Fit Model Criteria	Cut-Of Values Model	The Obtained Results	Labelling
X^2-CHI-SQUARE	Intended small value	235.664	Fitted
Probability	≥ 0.05	0	Fitted
CMIN/DF	< 2.00	1.473	Fitted
GFI	≥ 0.90	0.987	Fitted
AGFI	≥ 0.90	0.938	Fitted
TLI	≥ 0.95	0.976	Fitted
CFI	≥ 0.95	0.979	Fitted
RMSEA	≤ 0.08	0.55	Fitted

Source: Adapted from Hair et.al. (2014)

Hypotheses Measurement

The results of the structural equation modeling (SEM) indicate that the proposed model fits well with the data, as confirmed by Table 3. This model was used to test the five hypotheses set forth in this study, all of which were found to be significant. Each hypothesis showed a positive and significant relationship, supporting the study's framework for understanding how e-learning innovations, knowledge management (KM), and MOOCs impact postgraduate student academic achievement at the Open University of Indonesia.

The findings are as follows:

1. *Hypothesis 1:* E-learning practice innovations have a positive and significant impact on knowledge management at the Open University of Indonesia. This supports existing theories that highlight the role of e-learning in enhancing knowledge creation, sharing, and management within educational institutions (R. Maier & Schmidt, 2007; Yordanova, 2007). The findings suggest that when designed effectively, e-learning can foster better knowledge management processes, which, in turn, improve learning outcomes.
2. *Hypothesis 2:* E-learning practice innovations positively and significantly affect the implementation of MOOCs at the Open University of Indonesia. This confirms prior research indicating that well-structured e-learning systems can facilitate the growth and effectiveness of MOOCs (Solak & Cakir, 2014). The success of MOOCs, in this context, is enhanced by technological readiness and instructional design, which align with theories on digital learning frameworks (Ghazali et al., 2020) making queries, MOOC learning, and MOOC usability.
3. *Hypothesis 3:* Knowledge management has a positive and significant impact on MOOCs. This supports the idea that successful knowledge management systems are crucial for the development and scalability of MOOCs (Al-Sharafi et al., 2021). Effective KM systems ensure the quality of content, support collaborative learning, and help students navigate vast digital resources more efficiently, which enhances the MOOC experience.
4. *Hypothesis 4:* Knowledge management significantly influences postgraduate student academic achievement at the Open University of Indonesia. This aligns with existing literature, which suggests that knowledge management is essential for improving academic performance by providing a structured approach to knowledge dissemination and student engagement (Alavi & Denford, 2012). The results suggest that institutions focusing on robust KM practices can better support student learning and innovation.
5. *Hypothesis 5:* MOOCs have a positive and significant effect on postgraduate student academic achievement at the Open University of Indonesia. The findings support the theory that MOOCs offer flexible, accessible learning opportunities that can positively impact student success (Williams, 2015). The success of MOOCs in enhancing academic performance is tied to their ability to provide engaging, high-quality content that aligns with student needs and learning styles (Medina-Labrador et al., 2023).

These findings have significant implications for educational policy and practice, particularly in open universities and distance learning settings:

- *For Educational Settings:* The study demonstrates that e-learning innovations, combined with effective knowledge management systems, are critical for improving both MOOCs and overall academic achievement. Institutions should invest in the development of e-learning infrastructures that promote interaction, accessibility, and collaboration to maximize student outcomes.
- *For Policy-Making:* Policymakers should consider these results when designing educational programs, especially in the context of distance learning and MOOCs. A focus on integrating knowledge management into e-learning systems can enhance the effectiveness of MOOCs, making education more accessible to diverse populations

The positive and significant relationships between the variables confirm that e-learning practices, knowledge management, and MOOCs are critical components for improving academic achievement in open university settings. These findings reinforce existing educational theories and provide a foundation for future research and policy-making focused on the intersection of technology, knowledge management, and student success.

Here, we describe the structural model analysis in the next table:

Table 4. The standardized regression weights result analysis.

Variable	Relation	Estimate	S.E.	C.R.	P	Label
KSM	<--- ELP	0.313	0.078	4.002	***	Accepted
MOOC	<--- KSM	0.25	0.059	4.258	***	Accepted
MOOC	<--- ELP	0.423	0.061	6.895	***	Accepted
PSAA	<--- KSM	0.194	0.084	2.319	0.02	Accepted
PSAA	<--- MOOC	0.288	0.108	2.654	0.008	Accepted

Source: Primary Data Anaysis, 2022; S.E=Standard Error; C.R=Critical Ratio; P= Probability.

***=significant for ----=0.01,0r …=0.05

DISCUSSIONS AND CONCLUSION

The results of this study confirm that e-learning practice innovation has a significant impact on knowledge management at the Open University of Indonesia. This aligns with previous research, showing that that e-learning innovations enhance students' abilities, motivation, satisfaction with learning, and overall educational outcomes (Afify et al., 2023; Fung Choy & Quek, 2016)design, and goal setting to create an effective learning environment. Virtual distance education involves more than just uploading educational content; it is rather an educational process that provides choice for learners, as well as flexibility and responsibility for learning and academic support. In this context, the aim of this research is to determine the quality criteria for designing virtual classrooms with their different styles (synchronous, asynchronous, and blended. Improved e-learning systems foster better engagement, making education more accessible and interactive (Bilgic & Tuzun, 2020; Venugopal & Jain, 2016). These results support the hypothesis that e-learning innovations positively affect knowledge management, enhancing student experiences and optimizing knowledge-sharing systems within educational institutions.

Similarly, the second hypothesis was confirmed: e-learning practices positively influenced the effectiveness of MOOCs at the Open University of Indonesia. This finding supports prior studies that emphasize the importance of well-designed e-learning platforms in increasing the accessibility and success of MOOCs (Albelbisi & Yusop, 2019a; Solak & Cakir, 2014). The positive relationship between e-learning innovations and MOOCs suggested that technological enhancements and improved instructional design could make MOOCs more effective learning tools.

The third hypothesis, which suggests that knowledge management positively affects MOOCs, was also supported. Knowledge management systems provide essential frameworks for the success of MOOCs by ensuring content quality and facilitating collaborative learning (Al-Sharafi et al., 2021; Mirmoghtadaie et al., 2019). These findings confirm that effective knowledge management enhances adaptive learning and the scalability of MOOCs, especially in higher education. This is consistent with theories that integrate knowledge management with e-learning to enhance adaptive learning and MOOC development (Sein-Echaluce et al., 2017). The study highlights five key elements of knowledge management—individual ability, collaboration, pedagogical techniques, cognitive engagement, and student involvement—which were crucial for the growth and effectiveness of MOOCs in higher education.

The fourth hypothesis—that knowledge management has a positive effect on postgraduate academic achievement—was validated by the findings. Knowledge management served as the foundation for developing student performance by fostering innovation and ensuring that learners had access to updated, relevant information (Barbaroux, Pierre, Amel Attour, 2016). The integration of knowledge management into e-learning systems also supported the infrastructure needed for data security, student confidence, and technological adaptability (Alavi & Denford, 2012; Cakir & Solak, 2014) . Thus, knowledge management was critical for optimizing learning environments in universities

The fifth hypothesis was confirmed that MOOCs positively affected postgraduate academic achievement. This aligns with existing research, which shows that MOOCs offer participatory and interactive learning opportunities that contribute to student satisfaction and knowledge development (Alhazzani et al., 2020; Lan & Hew, 2020). MOOCs provide flexibility, enabling students to access high-quality educational materials at

their own pace. These platforms also offered students access to pre-recorded lectures and other educational resources from experts, which enhanced their learning experiences (Waldrop, 2013) . As such, MOOCs were an effective tool for improving academic achievement in open universities, especially in remote and digital learning contexts.

The findings of this study had significant implications for educational policy and practice. First, universities needed to prioritize the development of e-learning systems that integrate knowledge management to enhance student engagement and learning outcomes. E-learning platforms needed to be designed with interactive features that foster collaboration and enable seamless access to educational resources. For policymakers, these findings suggested that investment in technological infrastructure and teacher training was crucial for improving the quality of MOOCs and e-learning in higher education. Furthermore, knowledge management systems needed to be incorporated into the broader educational framework to ensure that both students and faculty could access, share, and manage knowledge effectively (Luisa Sein-Echaluce et al., 2016).

In conclusion, e-learning innovations, when combined with effective knowledge management practices, significantly enhanced the academic achievement of postgraduate students at the Open University of Indonesia. The findings confirm that e-learning practices and MOOCs were critical for improving educational outcomes in open and distance learning environments. By integrating technological advancements and fostering collaboration through knowledge management, universities can created flexible, engaging learning environments that meet students' diverse needs. This highlighted the importance of prioritizing e-learning systems and knowledge management to maximize educational success.

Limitations and Future Research

This study is limited to the context of the Open University of Indonesia, which may affect the generalizability of the results to other institutions or countries. Additionally, the study focuses on postgraduate students, and further research could examine how e-learning practices and MOOCs impact undergraduate or professional learners. Future research should also explore the long-term effects of knowledge management on academic achievement and investigate how MOOCs can be further improved to increase retention rates, given the high dropout rates typically associated with these courses.

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