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Constraints in the Integration of Gamification in Learning Management Systems in Higher Education

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Abstract

Rationale of Study – Integrating gamification in Learning Management Systems (LMSs) in higher education is a complex undertaking often flawed by several constraints. This study focused on determining the constraints in integrating gamification technologies in LMSs.

Methodology – Descriptive survey research design and inferential and descriptive statistics were employed in data analysis. The census sampling technique was adopted because of the small population size of 81 respondents. Questionnaires integrated into a modular object-oriented dynamic learning environment were administered to 81 respondents for data collection. The secondary data was accessed and downloaded from the Dimensions research database, whose articles spanned from 2015 to 2024. VOSviewer and Bibliometrix packages in R, JASP, and SPSS software were used to analyse data, and the results were presented in tables, charts, and statistical narratives.

Findings – The study's findings confirmed constraints when integrating gamification elements in LMSs. For students' motivational learning experience, constraints are inexorable in integrating these innovative technologies that any higher education institution may not avoid. The study recommends that the university management support learners' technical team and lecturers with the appropriate eLearning infrastructures, among other necessary resources, to proactively help the LMS stakeholders overcome any constraints that may arise in the integration of gamification in education.

Implications – This study is significant to institutional policymakers and eLearning instructional designers in meeting the fourth sustainable development goal that ensures inclusive and equitable quality education and promotes lifelong learning opportunities for everybody.

Originality - This paper contributes to the understanding of the various constraints facing the integration of gamification in the higher education through bibliometric analysis and experimental research design and consequently making its implementation successful.

Keywords

Learning Management System, Constraints, Gamification, Higher Education, eLearning

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1 Background to the Study

Rapid technological development and innovations constantly produce innovative and captivating methods to suit the expanding demands of education and interest students in the learning process. However, at the very least, consistently, conventional instructional techniques or even applications still in use today are inadequate. Modern lecture halls are under growing pressure to be redesigned to better integrate Technology-Enhanced Learning (TEL) techniques and raise educational standards (Bist et al., 2022). Gamification in higher education refers to using game mechanics and design ideas in the educational process to improve student motivation, engagement, and retention (Gironella, 2023). The concept of gamification has existed for over a decade since its initiation in the education sector. Gamification includes game aspects in non-game environments to fascinate attention and modify students' behaviour during learning (Luis et al., 2022). The application of gamification tools such as awards, badges, feedback, and level-ups in an educational setting is known as gamification. It can foster cooperation and teamwork among pupils and develop critical thinking and problem-solving abilities.

If the game components are not in line with the learning objectives, gamification, which can be a potent tool to boost motivation and engagement in the classroom, can also be shallow (Fuchs, 2022b). According to the findings of the studies, students' motivation increases by 25%, and the dropout rate decreases by 26%. Research on gamification in online learning environments is especially pertinent now because of the move towards remote and blended learning (Kucher et al., 2023), which hastened events like the COVID-19 epidemic and the Russian invasion of Ukraine.

Casanova et al. (2018) confirmed that the foremost cause of students' low usage of LMSs and dropping out of university learning is demotivation, which is attributed to inadequate use of game mechanics to foster students' engagement and make learning enjoyable and interesting. Moreover, when students are demotivated, they can drop out of the learning process at any phase of their study programme (Caruth, 2018), causing them future problems in their jobs and occupations due to inadequate or low-quality skills when they graduate. This technology has been extensively applied and researched. However, limited knowledge is available on the constraints encountered in integrating game tools in LMSs in higher education; this could be attributed to the small number of studies on this topic. A constraint limits or controls what you can do and can be generated by an organisation, technology or system users. However, gamification in higher education has its detractors despite its widespread use. According to others, adding game-like features to the learning process without completely incorporating them into the underlying curriculum can result in superficial gamification (Landers & Sanchez, 2022). According to Alzahrani and Alhalafawy (2023), gamification may foster a competitive atmosphere that hinders collaborative learning and deters some students from participating. According to Sailer and Homner (2020), including gaming components in an educational setting alone might not be enough to produce a successful learning environment. Gamification may also be less successful for students with specific cognitive impairments or learning difficulties (Lämsä et al., 2018). Hence, this study is geared towards filling this lacuna by determining the constraints facing integrating gamification elements in learning management systems in higher education.

To find out how gamification affects students' learning, numerous literature evaluations on the subject have been carried out (Zainuddin et al., 2020). However, there are gaps in the literature due to conflicting findings, adoption at different educational levels, the absence of specialised assessment methods, the haphazard application of gaming aspects, and overall suggestions from academics that more research is needed in this area (Rapp et al., 2019). Do certain target groups respond differently to certain gamification elements, and if so, how much? Future studies should address constraints related to integrating gamification mechanics, including features, game mechanics, and instructional methodologies (Kalogiannakis et al., 2021).

Students might not participate in deep learning if the quiz questions are not complicated or pertinent; instead, they might remember the answers to get points. Kruse et al. (2022) provide evidence for this claim, stating that "students mistakenly equate learning with memorisation." Students might not value the badges and be less inclined to obtain them if they are not significant or pertinent (Qiao et al., 2022). This may result in low involvement and engagement in the gamified learning process (Xiao & Hew, 2024). It has been noted that the implementation of gamification in technical higher education presents particular difficulties. These sparked worries about the possible drawbacks of gamification and ensuring it was properly aligned with learning objectives (Toda et al., 2018).

The problem with using LMSs is that they have inadequate engagement and other interactivity mechanisms, which was linked to the integration of gamification constraints, which consequently caused students' learning demotivation. This study was done within a public university setup, and the respondents were 81 second-year students taking a standard unit with theoretical and practical requirements to meet Bloom's taxonomy framework. The questionnaire, which generated quantitative data, was used for data collection, and its reliability was established. Data was analysed through descriptive and inferential statistics because these techniques could provide enough insights to confirm the study's hypothesis. The findings of this study will be impactful to the institutions of higher learning, policymakers as well as the body of knowledge in gamification.

Despite the efforts in research and industry to improve students' motivation and engagement, limited studies have focused on integrating gamification techniques and their constraints. Consequently, this paper aimed to determine the constraints encountered in integrating gamification mechanics in LMSs for students' motivational learning experience in higher education institutions. The structure of the paper entails the theoretical framework underpinning the study and the review of related literature based on three themes, methods, and materials that established the strategies used for carrying out this study. Further, it provides the results, discussion, conclusion, recommendations for future studies, and investigation implications.

2 Theoretical Framework of the Study

Theories are fundamental in guiding studies, so researchers must link their studies to legacy knowledge in models, frameworks, architectures, or algorithms, among other things. This study was anchored on the Theory of Constraints (TOC). Eliyahu Goldratt first proposed the Theory of Constraints TOC as a management approach 1984. Nevertheless, it has been domesticated in the information technology framework as a theory that aims to thoroughly evaluate the several limitations that restrict the incorporation of gamification components in LMSs. A system constraint

limits a system or an organisation from achieving better performance relative to its goal (Goldratt & Cox, 1992).

"There are different types of restrictions in institutions of higher learning that can limit the progress in the integration of gamification in LMSs; the most common are technological, institutional and technical user support issues" (Goldratt, 1990). In alleviating these, create plans to maximise the limits that have been recognised, making sure that the most pressing problems are addressed first. After important constraints have been resolved, assess and realign non-constraints to facilitate the successful incorporation of gamification in the LMS learning management systems. Keep an eye on the performance of the constraints that have already been recognised, and when needed, bring them to the forefront of improvement initiatives. When integrating gamification mechanics into LMSs, cultivate a culture of continuous development to avert the formation of new limitations and proactively handle possible problems.

According to this theory, any system always has at least one "constraint" that restricts its overall performance; significant gains can be made by locating and resolving this constraint. However, its drawbacks include the possibility of oversimplifying complex systems, the failure to consider numerous possible restrictions, and the need for in-depth knowledge to execute it successfully. A system constraint limits a system from achieving better performance relative to its goal (Goldratt & Cox, 1992). "There are different types of restrictions in institutions of higher learning that can limit the progress in the integration of gamification in LMSs; the most common are technological, institutional and technical user support issues" (Goldratt, 1990).

The typical incorporation of gamification in LMS learning management systems is hindered by obstacles that educational institutions encounter, including technical, institutional, and technological user support concerns. To ensure learning continuity and competitiveness while using LMSs, the Theory of Constraints TOC provides eLearning content designers and technical user support assistants with an alternative for improving the integration of gamification in LMSs, often without the need for expensive investments. The TOC has recently expanded and become more widely accepted academically (Davies et al., 2005).

To facilitate successful communication between the instructor, who imparts knowledge and content, and the students or participants who absorb it, traditional education and learning methods have evolved into new teaching methods, tools, and approaches for re-engagement purposes. In this sense, "Games are turning into a new way of interacting with content, worth exploring for learning." Games are instruments to present or reinforce a topic or content to participants. Since they enable the concerned individual to learn alongside other participants and under the direction of the teacher, they are helpful throughout the learning process for developing personal skills like communication, leadership, teamwork, and problem-solving, among others (Gómez, 2010). Students can develop technical skills and a problem-management mindset using gamified learning techniques. Therefore, this theory, which focuses on identifying, exploiting, subordinating, and elevating the constraints that may have adverse effects on the integration of gamification in LMSs for students' motivational learning experience in higher education, was deemed pertinent to this study. Consequently, it is relevant in explaining gamification constraints.

3 Literature Review

The literature for this study was thematically organised based on technological, institutional, and technical user support.

3.1 Technological Constraints

Significant technological barriers to eLearning applications hinder effective gamification in Indonesia. In consonance with a previous study, poor content design, technological proficiency, administrative assistance, and internet accessibility are all associated with eLearning (Anggraeni & Sole, 2018). Furthermore, it has been noted that students' motivation, namely their desire to take responsibility for their learning, is the root cause of the current eLearning issues (Pratama & Arief, 2019). Students are believed to lack sufficient eLearning knowledge (Kaunang & Usagawa, 2017). The application of eLearning was anticipated to provide the same advantages and motivation, but poor student utilisation of the LMSs was observed and was linked to demotivation (Lynch, 2020).

Even though educators have played an important role at HEIs in Africa, which has expanded to embrace innovative technologies in teaching and learning, there has been little success in this arena. Nigerian HEIs are ranked better than most African countries; however, due to quality concerns, they have been unable to compete on the international academic scene, which calls for attention (Bakare & Olaniyi, 2017). Table 1 shows countries, the number of research documents, and their citations from the Dimensions research database.

Table 1: Countries and the Number of Research Documents (2015-2024)

Country	Number of Documents	Number of Citations
Australia	4	4
Denmark	4	10
German	4	110
Greece	5	23
Indonesia	4	6
Italy	4	27
Malaysia	5	63
Spain	4	32
United Kingdom	9	110
United States	14	177

Table 1 demonstrates the number of documents generated from each country and their citations based on the "Constraints" and "Gamification" and other criteria defined in the search strategy. The bibliometric analysis results indicated that the United States produced the highest number (24.6%), followed by the United Kingdom (15.8%), with 177 and 110 citations, respectively. As can be observed from Table 1, all these are Western countries. This implied that there are geographical, knowledge, and empirical gaps worth bridging in the current study.

Mekler et al. (2017) found that the gamification procedure did not significantly improve students' marks since most students were unfamiliar with it. Previous studies have shown that students' inability to finish their learning assignments is primarily due to their lack of familiarity with the technique (Butler & Bodnar, 2017). Moreover, Ding et al. (2018) found that certain students in the gamified learning exercise need longer to understand the gamification process. Although its implementation tools in education have demonstrated advantages for students' behavioural and learning outcomes, such as focus, motivation, engagement, and performance, specific concerns still need to be addressed (Bovermann & Bastiaens, 2018).

Aldemir et al. (2018) acknowledge that measuring the effect of a single gamification

element on raising students' feelings of attentiveness makes it challenging to establish that students who performed below expectations showed discontent with the gamification process. Pereira et al. (2017) provided more support for this worry, stating that students experienced uneasiness when their names were absent from the leaderboards. Moreover, individual variances among students in a classroom may not excite every student similarly. Figure 1 shows a network visualisation diagram that illustrates authors' names in the field of gamification in education.

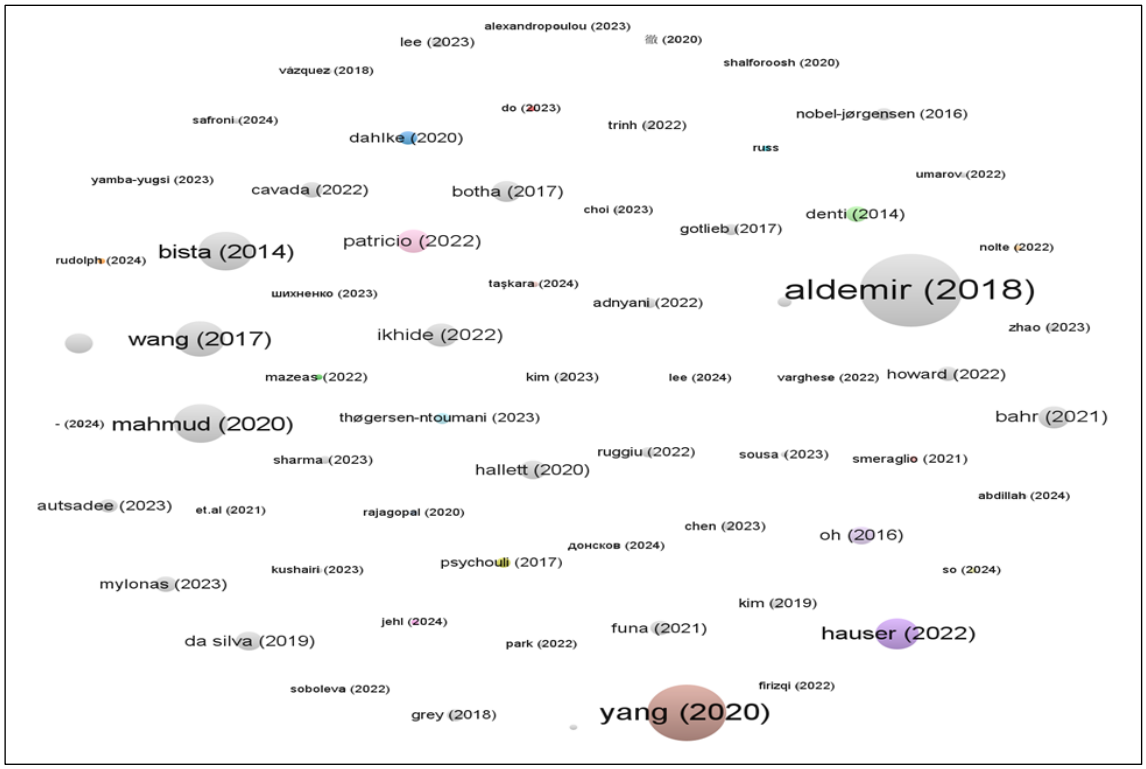

Figure 1: Publication Authors in Gamification (2015-2024)

Figure 1 reveals the various authors who have published their work using a dataset accessed from the Dimensions research database. The results are visualised using the Bibliometrix package in the R programming language, suggesting that this topic has sparked interest among scholars globally.

Unlike serious games, gamification involves integrating a gamified system into an already-existing learning management system. Nicholson (2012b) affirmed that meaningful gamification will only be successful if it prioritises user requirements over organisational needs. It also aims to "influence motivations as opposed to demeanour and/or behaviour specifically, as is the situation in convincing innovations" rather than providing "immediate hedonic experiences by method, for example, through audiovisual content or economic incentives as seen in loyalty marketing." Users will benefit from this, leading to deeper and longer-lasting engagement with organisations, non-gaming tasks, and participants. To achieve a goal, concentrating solely on the game mechanics will lead to a false situation. The enjoyment of playing a game, not winning points, is what makes gaming experiences beneficial. The "gamified" learning system was intended to create incentives for learning, allow for self-paced learning, and introduce students to the professional body of knowledge they will need as professional engineers.

Glover (2020) contends that to determine if gamification may benefit a particular set of students, it is critical to ascertain their motivation levels and implement a reward system in an optimal environment. This is because the reward components risk interfering with their regular operation, making them dependent on them and possibly demotivating them if the system is removed. Gamification should be simultaneously included in the planning process as the learning activity, as it cannot impact subpar or poorly thought-out materials and activities.

Instead of focusing just on quantitative components like points and awards, it can make greater use of quality-based examples, such as students evaluating and commenting on each other. Dominguez et al. (2013) confirmed that while gamification has a limited impact on the cognitive components of educational content, it may nonetheless greatly motivate students to learn by altering the structure and design of the information to make it more enjoyable. In the light of the researchers, creating a user-centred, relevant, gamified learning environment is far more challenging than integrating gaming with an informal learning environment. The site may be successfully gamified by changing how the badges and points system is implemented, allowing for more clearly defined goals, and enhancing the social components of the game features.

Similarly, not every student may be motivated by gamification in the same manner (Hew et al., 2016). This might be because students in the same classroom are different. Finally, it may not produce a collection of feedback that is dispersed equally in a broad evaluation program. This is because students given gamified tasks require more time to organise their ideas and thoughts (Schreuders & Butterfield, 2016). A successful gamified learning task must be established to guarantee that students have the experiences and practice necessary to share and advance in the eLearning task effectively.

3.2 Institutional Constraints

Of the ten African universities assessed, "only the University of Dar Es Salaam (UDSM)" possessed established online infrastructures. Sokoine University of Agriculture (SUA), the Open University of Tanzania (OUT), and Mzumbe University have a small amount of eLearning implemented in their basic ICT infrastructure. Among the barriers to eLearning's adoption at Tanzanian institutions were frequent power outages, a lack of ICT setup for the eLearning platform, and a negative perception of the technology due to a gap in capacity assessments before deployment.

Students may become frustrated and lose confidence due to changes in their skill levels, among other unfavourable outcomes (Butler & Bodnar, 2017). Some students in the gamified learning activity may need more time to acquire the knowledge needed to go through the learning process efficiently. Because of this, teachers must continue to help and encourage their students to comprehend better what is expected of them (Sailer et al., 2017). Another drawback of using gamification in a Wiki setting (Özdener, 2018). She discovered that the course instructors were not sufficiently aware of the importance of the student's talents in completing the assignment. To complete the gamified task, learners ought to work well with others. To ensure that gamification is successfully incorporated into learning activities, it is also essential to assist the instructors in honing their technology proficiencies.

Research conducted in Zimbabwe revealed that 97.5% of the instructors leading Open,

remote, and eLearning (ODeL) had no experience with remote learning (Mpofu et al., 2012). In line with this study, the main obstacles to eLearning's widespread acceptance in these schools are severe technological and infrastructural difficulties and staff and student attitudes against it. Lack of energy and Internet access were two infrastructure problems (Kasse & Balunywa, 2013). Despite these obstacles, "new virtual universities are opening up throughout Africa. The success of the University of South Africa (UNISA), one of the continent's top providers of distance education, has amply demonstrated the potential impact of eLearning on African educational delivery."

In tandem with evaluating eLearning initiatives in Kenya, HEIs have many obstacles when adopting eLearning (Nyagorme, 2014). Kenyatta University and the University of Nairobi face several obstacles in providing ODeL, including insufficient funding, delayed study material production, and subpar program facility utilisation. The lack of national policies guiding some ODeL providers in Kenya created resource mobilisation and program quality difficulties. Approximately 32% of instructors and 35% of students took advantage of the eLearning platforms installed at institutions. The survey also revealed that Kenyan institutions lacked the ICT infrastructure and expertise to deploy eLearning successfully (Makokha & Mutisya, 2016).

Institutional considerations impede lecturers' effective and efficient implementation of gamification integration in eLearning. These include a shortage of computer labs on campus and insufficient bandwidth. This makes it challenging for professors to provide online courses without access to a computer or laptop. The amount paid for gamifying online courses did not match the part-time teaching rates authorised for in-person programs. The professors' reduced motivation may explain the poor log-in numbers in the online courses as a result of this. Some instructors felt the financial allotment for gamifying eLearning courses was insufficient, preventing regular online student interaction (Ogange et al., 2018). As demonstrated by some research, university eLearning system adoption is poor because of inadequate assistance for working areas, technical support, and Internet connectivity. Gamifying courses may be challenging in departments where eLearning procedures are not owned. A few lecturers also mentioned that they had trouble juggling their workloads between in-person instruction, online learning, and other responsibilities. It is evident how much the total infrastructure required to start the process would cost in capital. The high ongoing expenditures connected to the efficient use of ICT are less evident.

Even if gamification approaches in higher education improve students' performance, motivation, and engagement, specific problems still need to be fixed (Bovermann & Bastiaens, 2018; Huang et al., 2018). Previous studies on gamification in higher education have observed that certain students may not participate in the gamified learning activity because they are unfamiliar with gamification and its techniques (Ding et al., 2018; Van Roy & Zaman, 2019). This could be a lack of university management and the Directorate of eLearning not building the capacity of lecturers among other stakeholders to deploy such an innovative teaching and learning technique.

Because they are terrified of failure, some students could find engaging in the learning activity difficult, which lowers their motivation to participate. Moreover, competency can change based on the circumstances. Changes

in their ability levels might negatively affect students, such as frustration and confidence loss (Butler & Bodnar, 2017). The cost of implementing gamification in LMS in higher education: Instructors are experts at making significant advancements for little or no money. Since adjuncts attend colleges and obtain certification training, they should see a return on their investment. The success of gamification adoption depends on administrators, boards, and principals taking costs into account. Technology infrastructure, such as software fees, training expenditures, and chances for professional growth, such as teaching instructors how to incorporate gamification into their lesson plans properly. Items such as research articles and case studies. Integration should the learning institution's learning management system be unable to facilitate it. Continuous assistance, such as instructional and technical support. Assessment and evaluation: The effects of gamification techniques on students' learning objectives.

Nonetheless, gamification offers potential returns on investment in enhanced learning, higher learner engagement, efficiency, and effectiveness compared to conventional approaches. It also increases perceptions of the training's value and level of enjoyment. Gamification proponents contend that in addition to drawing attention, it improves retention.

3.3 Technical User Support Constraints

Technical user assistance is one of the main components in the actual gamification of an eLearning system that convinces end users to adopt a positive mindset and accept the usage of technology (Sanchez et al., 2013). Users of the system and IT professionals will see a superior technical assistance system favourably. This will increase the likelihood that new technology used in institutions will succeed. On the other hand, a technology like the incorporation of gamification in learning management systems would not work if it has a poor technical user support system. For example, it is thought that in Saudi Arabia, one of the organisational hurdles preventing learners from embracing and using LMSs is the lack of technical assistance (Asiri et al., 2012).

The expertise and calibre of technical assistance offered to users determine the effectiveness of eLearning systems (Gray et al., 2011). Most developing nations lack technical professionals and provide inadequate technical assistance and services (Sife et al., 2011). The utilisation of technology by educators and students is hampered without adequate support and maintenance, even for the most advanced gear and applications.

Nawaz and Qureshi (2010) conducted a study involving four universities and found that providing sufficient pedagogical supervision and technological assistance was crucial for the effective development of online programs. The presence and upkeep of the institute's technical unit are connected to the frequently mentioned technological issues at the institutional level. The technical department's assistance is allegedly infrequently available, and users require consistent and prompt support.

Technical user support is essential for educators as well as learners. Technical user assistance is required for lecturers to guarantee that educators have the tools and knowledge required to incorporate technology into their teaching methods. Technical support aids students in gaining the information and abilities required to complete their program requirements. ICT assistance includes performing software installs, fixing hardware issues, and assisting users with typical ICT applications in eTeaching, eLearning, and

eEducation. When equipment is dependable, technical support personnel may devote more time teaching instructors and students how to utilise software instead of spending as much time on maintenance.

It was reported that following an analysis of many institutions with successful eLearning initiatives, the conclusion was reached that "the success of the project was often dependent on the skills and quality of technical support provided to end users." On the authority of Zhao and LeAnna (2011), researchers propose that university components require ongoing technical and human resource assistance for continual technology integration following training. Technical malfunctions may cost much money and time without on-site technical user assistance. The deployment and integration of ICT in education require crucial technical help. Nevertheless, this support is frequently unavailable. Thus, instructors and students must be proficient in specific fundamental troubleshooting techniques.

Technical personnel such as network managers, e-commerce developers, site administrators, and security professionals are needed in university eLearning environments. Technical user staff maintain and enhance the system, help lecturers prepare materials, and manage the environment's high-level architecture. Technology integration experts who can assist classroom technology integration through team teaching and/or mentorship should be made available to help the present teaching force more effectively (Nawaz & Kundi, 2010).

Elearning is an information system incorporating various educational elements, such as discussion, quizzes, assignments, audio, video, text, gamification, and learning materials (Basak et al., 2018). Because the eLearning system is intimately linked to digital media and communication, its problems might impact users' pleasure. Gamification in education often aims to increase students' focus, engagement, and performance and minimise their dissatisfaction and demotivation in learning environments (Lopes et al., 2019; Metwally et al., 2020).

4 Methods and Materials

This study was anchored on descriptive survey research design because it allows a researcher to systematically observe, analyse, and describe phenomena, capture real-world context, and collect quantitative or qualitative data. This study utilised both secondary and primary datasets. The secondary data was obtained from the Dimensions research database, an open source without a subscription. This helped develop and enrich some parts of the literature by bringing state-of-the-art knowledge trends to this study. This was meant to enrich the literature review, establish the various state-of-the-art trends and gaps in gamification in higher education, and inform and meet the objective of this study. Publication types included are research articles, book chapters, and proceedings from 2015 to 2024, written in English. In the search strategy "Constraints" and "Gamification", two main keywords were used, and publication years "2015" OR "2016" OR "2017" OR "2018" OR "2019" OR "2020" OR "2021" OR "2022" OR "2023" OR "2024". The publication type search query was "Article" OR "Book Chapter" OR "Proceedings". Documents that met these criteria were downloaded in the form of a CSV (Comma Separated Value) file, and bibliometric analyses were used in their scrutiny through the use of the VOSviewer and Bibliometrix package in the R programming language. Therefore, both secondary and primary data were utilised to create this paper.

The primary data for the study was collected at Kisii University in Kenya through questionnaires integrated into Modular Object-Oriented Dynamic Learning Environment (MOODLE) LMS. A 12-item questionnaire was designed with consideration for the study's particular goal. The responses to the questions were measured using a five-point Likert scale. Besides being a public university, it was chosen because it had many more Elearning courses than its counterparts, such as Maseno University and Rongo University. A descriptive survey research design was employed in driving this study because it could provide a holistic understanding of a phenomenon, which can help researchers infer it as a whole. The study used a university computer laboratory so that students could access the data collection tool, which was a questionnaire integrated into the MOODLE LMS for their responses. The unit of analysis for this study was eLearning students, whose population was 81 in total and achieved a response rate of 100% due to the activation of the conditional activity tracking feature on the LMS. Census sampling was applied here because of the small size of the population for better results. This unit of analysis was appropriate because the group was taking a common unit designed according to Bloom's taxonomy framework that encourages lower-order and higher-order thinking skills.

Primary data for this study was gathered through questionnaires carefully designed by the researcher according to the study's objective. The questionnaire, which was incorporated into the MOODLE LMS, was appropriate for in-depth analysis, objective, and exhaustive research, and it allowed respondents enough time to complete it.

The researcher conducted a pilot study at the same university to establish the internal consistency of the questionnaire. This aimed to determine whether the designed questionnaire had any restrictions, defects, or other problems requiring amendments before being administered to the respondents. The results of the pilot study confirmed that the questionnaires had a reliable (ω = .787) five-point Likert scale measurement tool and were administered to the actual study for data collection. JASP and SPSS (version 28) software tools were utilised to analyse the primary data. Inferential statistics techniques of regression and correlation, and descriptive statistics methods of percentages, mean, and standard deviation were used to analyse primary data. These methods were appropriate because they could determine the behavioural characteristics of various variables and reveal patterns and relationships in the data. Finally, tables, charts, and statistical narratives were employed to present the findings and results of the study for both primary and secondary data.

5 Findings of the Study

Descriptive and inferential statistics were used to analyse the primary data collected through questionnaires from the MOODLE LMS. The respondents were required to provide their opinion on a five-point Likert scale of 5 = Strongly Agree (SA), 4 = Agree (A), 3 = Not Sure (NS), 2 = Disagree (D), and 1 = Strongly Disagree (SD). All 81 participants responded to the questionnaires with 12 sub-constructs integrated into the MOODLE LMS. The findings of the study are summarised in Table 2.

Table 2: Constraints in Integrating Gamification in LMS (Researcher, 2024)

Gamification Constraints	N	Mean	Std. Dev
Lecturers' adequacy of time for developing interactive contents	81	3.72	1.132
Sufficient skills, training, role models, and time	81	2.73	.925
Timely real-world and educational uses of gamification	81	2.60	1.291
There is faith in using technology, willingness to work with technology, and concern about students' access	81	2.60	1.339
Students do not fear failing in using gamification	81	2.57	1.367
Sufficient policies supporting gamification in education	81	2.47	.866
Positive perceptions towards using gamification	81	2.46	1.304
Familiarity with gamification and integration strategies	81	2.43	1.254
Adequacy of LMS skills in technical instructional design	81	2.37	1.123
Adequate funding to support eLearning infrastructure	81	2.30	1.259
Adequate ICT infrastructures facilitating gamification	81	2.28	1.325
Adequate access to new technologies in gamification	81	2.04	1.188
Overall Results	81	2.55	1.281

Scale Range: 1.0-1.80=Strongly Disagree, 1.81-2.60=Disagree, 2.61-3.40=Neutral, 3.41-4.20=Agree, 4.21-5.0=Strongly Agree

The results in Table 2 confirmed that the majority of the respondents disagreed that there were timely real-world and educational uses of gamification (M=2.60, SD=1.291), there is faith in using technology, willingness to work with technology and concern about students' access (M=2.60, SD=1.339), students do not fear failing in using gamification (M=2.57, SD=1.367), sufficient policies supporting gamification in education (M=2.47, SD=.866), positive perceptions towards using gamification (M=2.46, SD=1.304), familiarity with gamification and integration strategies (M=2.43, SD=1.254), adequacy of LMSs skills in technical instructional design (M=2.37, SD=1.123), adequate funding to support eLearning infrastructure (M=2.30, SD=1.259), adequate ICT infrastructures facilitating gamification (M=2.28, SD=1.325) and adequate access to new technologies in gamification (M=2.04, SD=1.188).

Also, the minority of the respondents remained neutral (M=2.73, SD=1.525) that there were sufficient skills, training, role models, and time, and a few agreed (M=3.72, SD=.932) that lecturers had adequate time for developing interactive content. The overall results established that the majority (M=2.55, SD=1.281) of the respondents confirmed that there were constraints encountered in the integration of gamification in LMSs. The standard deviation of 1.281 indicates that the individual responses, on average, were a little over one point away from the overall mean.

Further, the study also conducted a correlation analysis to determine whether there was a relationship between the constraints encountered in integrating gamification in LMS and students' motivational learning experiences. Table 3 shows the study's findings.

Table 3: Gamification Constraints and Students' Motivational Learning (Researcher, 2024)

		Constraints	Learning Motivation
Constraints	Pearson Correlation	1	-.656**
	Sig. (2-tailed)		.000
	N	81	81
Learning Motivation	Pearson Correlation	-.656**	1
	Sig. (2-tailed)	.000	
	N	81	81

**. Correlation is significant at the 0.01 level (2-tailed).

The results in Table 3 confirmed a strong negative relationship (r = -.656) between gamification constraints and students' motivational learning experience. Further, the results demonstrated a statistically significant ($p < .05$) relationship between the two variables investigated. The study also carried out a simple regression analysis to confirm the degree of the effect of gamification constraints on students' motivational learning experience. The results are shown in Table 4.

Table 4: Gamification Constraints and Students' Motivational Learning (Researcher, 2024)

				Std. Error of the	Change Statistics				
Model	R	R Square	Adjusted R Square	Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.656a	.430	.423	.05715	.430	59.688	1	79	.000

a. Predictors: (Constant), Constraints

In Table 4, r connotes the correlation coefficient. It provides a strong negative correlation (r = -.656) between gamification constraints and students' motivational learning experience. R-square of .430 measures part of students' motivational learning experience, which was explained by gamification constraints. It suggested that approximately 43% of the variation in students' motivational learning experience was attributed to variation in gamification constraints. The adjusted R-square provides an idea of how the model may be generalised. It should be as close to R-square as possible, if not the same. In this regard, the difference for the final model is slight, at .7%. This implies that if the model were derived from the population rather than a sample, it would have accounted for approximately .7% less variance in students' motivational learning experience. The overall model was statistically significant ($F=59.688$, $p < .05$). Thus, gamification constraints negatively influenced students' motivational learning experience. Unstandardised coefficient values were used to construct the regression equation. The Beta coefficient for the gamification constraints was -.10 and was statistically significant ($p < .05$). Table 4 and the simple model show the optimum regression equation showing the relationship between gamification constraints and students' motivational learning

experience. This optimum regression equation followed a general form of $Y=\beta_0+ \beta_1\chi_1+ \beta_2\chi_2+\dots \beta_n\chi_n+\varepsilon_0$, where:
Y = Dependent variable,
β_0 = Intercept term,
$\beta_1\dots \beta_n$ = Coefficients of independent variables,
$\chi_1\dots \chi_n$ = Independent variables,
ε_0 = Model's unique term,
n = number of observations.
$Y= 0.845 - 0.10\chi_1$

Where,
Y = Motivational learning experience,
χ_1 = Gamification constraints,
Coefficient of gamification constraints = -.10,
Intercept term = .845
The simple regression model has a strong negative correlation (r = -.656) between gamification constraints and students' motivational learning experience. The regression analysis model was 43% by the variation in gamification constraints and was statistically significant ($p < .05$).

6 Discussion of Findings

The study's objective was to analyse the constraints encountered in integrating gamification in learning management systems in higher education. The overall results established that most respondents agreed that various constraints faced the integration of gamification in LMSs and consequently had adverse effects on students' motivation. Further, the correlation analysis confirmed a strong negative relationship (r = -.656) between gamification constraints and students' motivational learning experience. Additionally, the results show a statistically significant ($p < .05$) relationship between these two variables. These findings confirmed the hypothesis that gamification constraints hurt students' motivational learning experience. Thus, this hypothesis validated the theory of constraints. This implies that the relationship between these variables negatively impacts students' motivational learning experience. This effect cannot be ignored, and it is the responsibility of the relevant eLearning stakeholders to take the necessary measures so that gamification can be of value to both lecturers and eLearning students.

The simple regression analysis demonstrates that the R-square of .430 measures part of students' motivational learning experience, which was explained by gamification constraints. It established that approximately 43% of the variation in students' motivational learning experience was attributed to variation in gamification constraints. This means that gamification constraints explained 43% of the variation in motivational learning experience. Simply put, gamification constraints are inevitable in higher education that any institution might not evade. The management and the Directorate of eLearning ought to be aware of this and devise appropriate mechanisms to counter them to improve students' motivational learning experience.

Another study corroborated this study's findings, discovering that because the COVID-19 pandemic spread so quickly, academia has unavoidably had to deal with a variety of erratic hindrances, including insufficient experiences with online instructions, the creation of gamified content to make up for skill gaps, and inadequate support for educational technology from the eLearning technical team (Bao, 2020). This suggests that the limitations imposed by the integration of gamification on eLearning pose a global threat to institutions of higher learning.

This is also consistent with another research, which discovered that students exhibited discontent with the effectiveness of the

gamification process when they failed to fulfil performance targets (Çakıroğlu et al., 2017). This demonstrates that eLearning students developed a negative attitude towards using gamification elements in LMSs because they were demoralised when they failed to meet their academic goals.

Moreover, the results of the current study are in tandem with the work of Orange (2018), who reported that it is clear how much capital the entire integration of gamification mechanics infrastructure would cost to begin the process. Besides, several instructors also acknowledged that they struggled to balance their workloads between face-to-face education, distance learning, and other obligations. According to this study, staff and student antagonism and significant technological and infrastructural challenges are the key barriers preventing gamification from being widely adopted in eLearning.

Further, the findings of this research are consistent with the study of Gupta and Goyal (2022), who confirmed that academics' attitudes towards the use of technology, their varied knowledge of creating gamification-infused courses, skills in developing creative instructions, inventiveness in creating visually appealing and captivating learning materials for students, and the amount of active and innovative technology at their disposal are additional limitations that affect their use of gamification in the classrooms. Gamification planning and preparation do not require much time; they are necessary to guarantee a successful and well-managed deployment.

Additionally, the current study's results resonate well with the findings of Ding et al. (2017), who averred that certain students may need additional time to fully comprehend the materials to progress in the gamified learning sessions. Because of this, teachers must continue to help and encourage their students to comprehend better what is expected of them (Sailer et al., 2017). Also, another difficulty with using gamification techniques in a Wiki setting was prominent that the course instructors were not sufficiently aware of the importance of the student's talents in completing the assignment (Özdener, 2018). The findings of this study further confirm the theory of constraints that postulates that system performance can be affected by at least one constraint that limits its objective from being met.

7 Conclusion and Directions for Future Studies

The purpose of the study was to determine the constraints encountered in the integration of gamification in learning management systems in higher education. The findings unveiled that there were technological, institutional, and technical user support constraints in the integration of gamification in LMSs, meaning that constraints are inevitable in integrating this innovative technology that any higher education institution cannot avoid absolutely. This suggests that the university management should consider mitigating these constraints to create an enabling environment for the integration of gamification for eLearning students and lecturers, among other stakeholders.

As demonstrated by this study, by offering training on the potential applications of these active educational innovations and the values they may provide, the university's administration can raise instructors' knowledge of the incorporation of gamification in LMSs and consequently know how to handle some constraints proactively. Further, the cross-sectional strategy was employed to obtain the data used in this investigation. Future studies should collect respondents' data through longitudinal studies

to better comprehend how various constraints can impact the integration of gamification tools in LMSs and affect students' motivational learning experiences in higher education.

8 Implications of the Study

In practice, the study findings could be applied by higher education lecturers and eLearning facilitators in tailoring and developing gamification content to the exact needs of their students. Further, it recommends that the university management provide the lecturers and learner support assistants with the appropriate infrastructures and develop their skill capacity in gamification. This study is significant to institutional policymakers and eLearning instructional content designers in enhancing the fourth sustainable development goal that ensures inclusive and equitable quality education and promotes lifelong learning opportunities for everybody in higher education institutions. This study can also be used to confirm and extend this theory because the primary constructs of the study have relevant, elaborate, and rich literature supporting them. The theory of constraints is limited to just one postulate, which is a "constraint", hence the need to extend it to cover a broader perspective for future studies, thus developing growth in empirical and body of knowledge in educational gamification.

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