Chapter

# Massive Open Online Courses (MOOCs) in Sub-Saharan African Higher Education Landscape: A Bibliometric Review

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## Abstract

In this study, we examined articles focused on Massive Open Online Courses (MOOCs) implemented in the sub-Saharan African (SSA) Higher Education context that describes the different models of MOOCs enacted as an initiative to provide access and opportunity to acquire quality higher education across different disciplines within the sub-region. In addition, the review aims to identify those factors that facilitate or inhibit the success and growth of MOOCs in the SSA context to understand how MOOCs has fared between the time 2012 to 2021. Based on this premise, 30 articles were included in the review in accordance with the authors' set criteria. Results revealed that there are very few collaborations, linkages, and relations between MOOCs researchers in SSA, similarly there is a slow growth of MOOCs production, Narrative, Conceptual and Discourse analysis are the dominant analytical methods, while the perennial challenges of poor internet connectivity, lack of policy framework, poor bandwidth and electricity and lack of personnel with the requisite competences were the major hinderances to MOOCs growth in SSA. The inferences, implications and future directions were discussed.

**Keywords:** MOOCS, production, relations, Challenges, sub-Saharan Africa, Higher Education, Bibliometric Review

## 1. Introduction

Massive Open Online Courses (MOOCs) have emerged as a disruptive technological innovation in the educational sphere and has stoked conversations among critical stakeholders in education [1, 2]. MOOCs are educational offerings that have broken the barriers of distance, time and space and provided opportunity for diverse population of learners to access quality and affordable education. However, there is an indication that the number of paid MOOCs users are on the increase with a corresponding decrease in the number of MOOCs enrollees in the broader global context. According to Shah [3], over the period of seven years, the number of new MOOC users are shrinking while more and more people are paying for MOOCs with corresponding rise in the number of MOOCs degrees. Nevertheless, over 100

million people have enrolled in MOOCs in about 900 universities that offer more than 11,000 MOOC courses since its inception in 2008 [3].

Over the years, MOOCs has evoked different interests among researchers, institutional managers and media organizations such as The New York Times, blog posts and other information dissemination platforms [4] and this is viewed as a reflection of its acceptance and recognition of its vast potentials for promoting equity, individualized learning, flexibility, and the massification of the learning process [1, 5]. ... MOOC was coined by David Cormier [6] to describe a course with a very large enrolment and open to diverse range of students. Openness in terms of content, design, accessibility and diverse criteria for completion or success following the successful launch of Connectivism and Connective Knowledge (CCK08) course in 2008. MOOCs may vary based on pedagogical interactions, participants experience and learning outcome [7].

In recent times, MOOCs have evolved into different formats: the connectivist MOOCs also known as cMOOCs, is a form of MOOCs in which users engage in learning through social engagement and interaction, wherein they create, co-create and share knowledge and learning experiences. Bates [8] described the key features of cMOOCs as based on networked learning, because learning develops through connections and discussions among participants in social media space without standard technology platform. In contrast, the xMOOC is designed in the form of the traditional model of teaching (also refered to as transmission model) Zhao, Wu, and Huang, [9] referred to xMOOCs as the 'teacher-centric' MOOC model. A recent addition is the Hybrid MOOC which is an agglomeration of the cMOOCs and xMOOCs. The range of MOOCs affordances for opening up to a large number of willing learners of diverse background, eliminating geographical, and resource constraints, flexibility, scalability, and affordability in terms of cost when compared to traditional education systems and the ability to be enrolled in both formal and informal offerings [10] makes it a good fit for sub-Saharan Africa and for learners in resource constrained regions [11, 12]. Nevertheless, MOOCs are bedeviled by issues of contextual relevance, attrition, poor completion rates, issues around credentialling and credit values [1, 13, 14]. Also, despite its popularity MOOCs are still nascent in sub-Saharan Africa as it is more popular in developed countries [14, 15]. A quick search on the Scopus database show that none of the prolific authors of MOOCs literature are in the sub-Saharan African context and the authors in SSA are seemingly not connecting. (see **Figure 1**) This scenario makes it plausible to investigate the growth and research trends in order to understand the MOOCs phenomenon in the SSA [16].

Given that, there are conflicting positions regarding the low patronage of MOOCs in SSA. Some authors argued that "MOOCs offered on Cousera platforms were more successful among the young, male, well-educated and employed

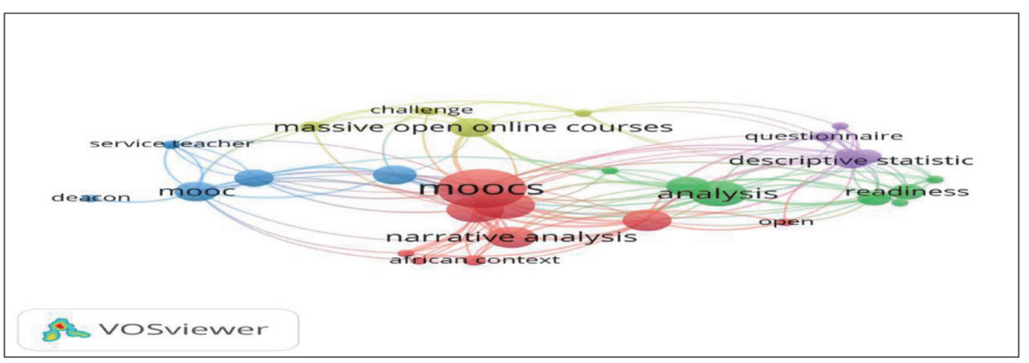


**Figure 1.**
*Network visualization of most occurring keyword terms in MOOCs articles in SSA.*

students in developed contexts [17, 18].Whereas, Ngimwa and Wilson, [11] reported that low technological level in Africa do not impede the adoption of educational technology, contrary to previous research studies [19–21]. Therefore, it is important to dig further to shed more light on the evolution of a disruptive technology such as MOOCs.

This chapter adopts a systematic bibliometric review approach to identify, collect, analyze, and synthesize articles focused on MOOCs applications in sub-Saharan Africa higher education in order to highlight the MOOCs growth landscape within the scope of authors occurrence and links strength, contexts of publication, adoption trends, research design strategies and the factors inhibiting the growth of MOOCs in the region across different disciplinary contexts. Bibliometric review is a technique that is used to highlight the activities of recorded knowledge and identifies the patterns, forms, and shape of the phenomenon of interest [22] Accordingly, bibliometric analysis is relevant in identifying, mapping, and visualizing the pattern of MOOCs authorship, adoption, implementation, and opportunities in the SSA higher education context based on publication trends. The review of literature shows a resurgence of Bibliometric studies across different scientific field. However, we align with the recommendation by Veletsianos & Shepherdson, [23] to the extent that more research is needed to clearly understand whether MOOCs literature are biased towards countries, or regions [24] as well as the growth of the technology within the SSA context. **Figure 1** illustrates the most recurring keyword terms within the corpus on MOOCs in SSA.

There are several studies that have focused on MOOCs across time periods, research objectives, outcomes, using diverse theories and methodological approaches. For instance, Liyanagunawardena et al., [4] conducted a systematic review article on MOOCs between 2008 and 2012; Albelbisi, Yusop, Kalsum, and Salleh [25] Mapped the factors promoting MOOCs, while, Yunusa and Umar [26] reviewed articles on MOOCs adoption, awareness, and barriers in sub-saharan Africa. In that work, forty articles were identified and analyzed to shed light on MOOCs trajectory in sub-Saharan Africa. Since then, more MOOCs platforms have emerged without clarity on the MOOCs trends in SSA. Moreover, the need for MOOCs in underserved communities has been made more stronger with the outbreak of the Corona virus disease (COVID-19) which had upset the norms, stunted and negatively impacted on academic activities in most parts of SSA [27] Hence, this study is Plausible. Moreover, identifying these factors will provide further empirical evidence for reference, guide and inform decisions on policy, curriculum design as well as learning design for MOOCs in the sub-Saharan African region. Moreover, de Waard et al., [28] noted that "more research needed to be undertaken into the realities, benefits, and challenges of MOOCs in order to properly map their dynamics" (P.112). Against this backdrop, this study seeks to achieve the following objectives:

i. To identify and collate articles on MOOCs in sub-Saharan African (SSA) higher education published in peer reviewed Journals, Conference proceedings and prominent academic databases.

ii. To identify the publication trends, different contexts, samples, and subject areas /disciplinary contexts of the studies as well as the research designs within the literature.

iii. To identify the different MOOC models enacted and the main challenges highlighted in the literature. And

iv. To draw on the information gathered to make inferences on the implications of the findings to higher education in sub-Saharan Afric1a.

Consequently, the paper responded to the following research questions:

1. What are the MOOCs articles published in peer reviewed journals, conference proceedings, academic databases focused on sub-Saharan Africa (SSA)?

2. What are the different contexts in the subregion, subjects, samples, disciplines, and research designs adopted in the identified articles?

3. What are the different models of implementation and the inhibiting factors highlighted in the studies on MOOCs in SSA?

4. What are the recommendations that could be advanced for policy and practice based on the information gathered from the Bibliometric review?

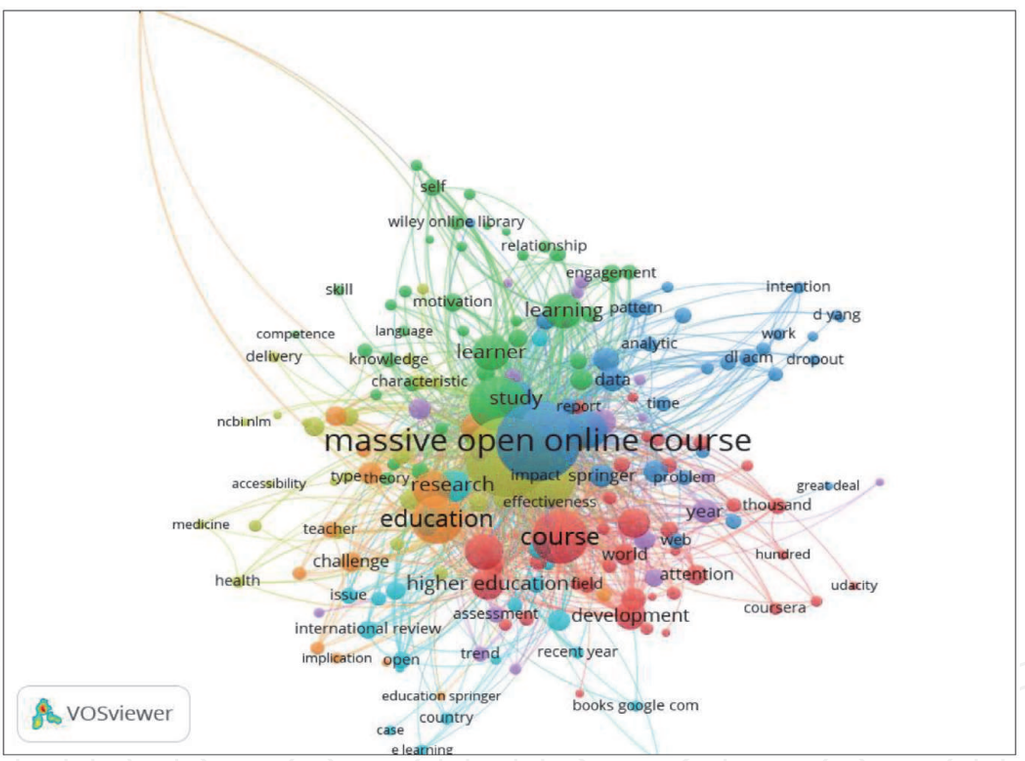


**Figure 2.**
*Network visualization of the co-occurrence of keyword terms on Scopus database.*

From **Figure 2**, the most recurring terms within the search strings on Scopus database was massive open online courses, followed by course, education, research, higher education, learning, learner, and development. The size of the circle represents the weight of the term relative to other terms while the lines represent the relationships between the terms.

**Figure 3** depicts the authors in the articles on MOOCs in SSA, indicating their relations and occurrences. The size of the circle around an author represents the weight and the co-occurrence of the author within the literature in the review. The absence of line strings as connections/links suggests that not much of collaboration and references to the different MOOCs projects has been made by the authors. The authors with the most occurrences are Czerniewicz, Deacon Small, Walji, [29] with

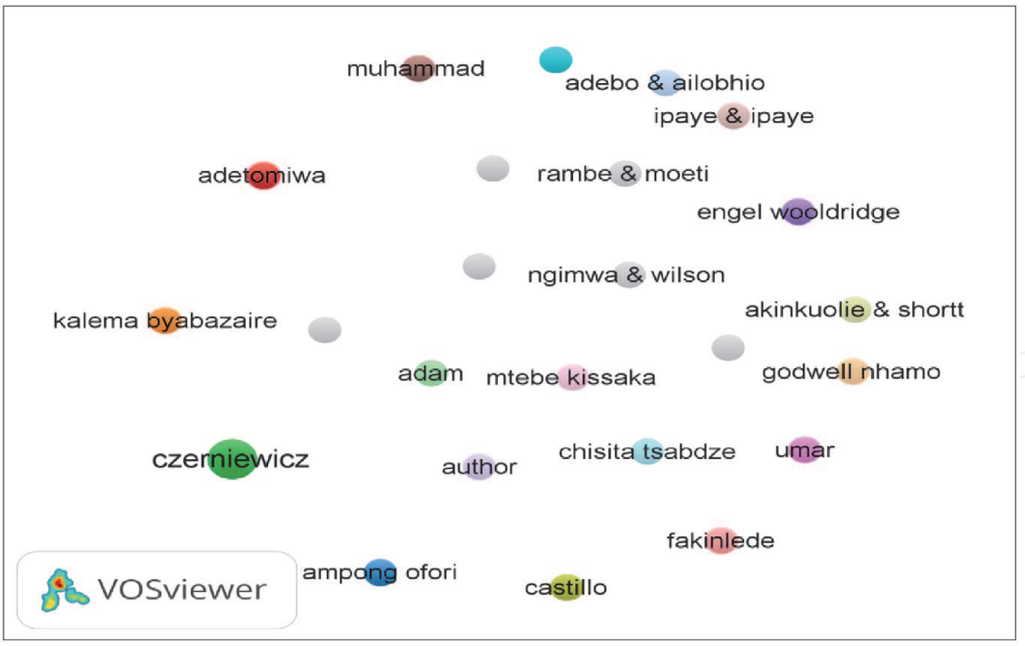


**Figure 3.**
*Network visualization of authors occurrence in MOOCs articles landscape in SSA.*

a total of 30 link strengths and 29 links. Two occurrences within the 42 items, while authors such as Kalema and Bybazaire, Adetomiwa, Ampong and Ofori, Mtebe and Kissaka, Umar and Muhammad all have only one occurrence, one link strength and in most cases no links and total links strengths.

## 2. Methodology

### 2.1 Method and design

This study adopted the bibliometric review approach by mining data from databases Scopus, and the Harzing, Publish or Perish software [30] for literature management. We developed a set of article inclusion and exclusion criteria and followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol by Moher, Liberati, Tetzlaff and Altman [31]. The PRISMA protocol is a sequential process to search, identify, collect, analyze, synthesize and report findings from the published articles. We searched databases for articles focused on "MOOCs" in sub-Saharan Africa, we used search terms such as (TITLE-ABS-KEY ('massive AND open AND online AND courses' OR 'mooc') AND TITLE-ABS KEY ('higher AND education' OR 'higher AND education AND institutions') AND TITLE-ABS-KEY KEY ('moocs') AND TITLE-ABS ('sub-saharan AND africa')) AND PUBYEAR >2011-2021.We also used Boolean functions to search the databases.The reference pages of retrieved articles were also chain searched (snowballing technique) for relevant articles. The articles were then sorted and organized based on the predetermined criteria, **Table 1** showcases the criteria for inclusion and exclusion of the articles, whereas **Figure 4** depicts the review process. Next we used the VOSviewer clustering and visualization software [32, 33] to cluster and map the authors identified within the review based on co-occurrence and the citation network. **Figures 1** and **2** shows the Network Visualization of authors of the articles on MOOCs in SSA and the Keyword strings within the bibliometric review.

| Inclusion Criteria |
| --- |
| • Articles published in the English Language.<br>• Articles focused on MOOCs in sub-Saharan African context.<br>• Articles published between 2012 and 2019<br>• Articles that are focused on MOOCs in Higher Educational Institutions and Universities in sub-Saharan Africa. |
| **Exclusion criteria** |
| • Articles published in language other than English.<br>• Articles that focused on e-Learning as broad concept<br>• Articles on MOOCs published earlier than 2012.<br>• Articles that focused on MOOCs in second circle institutions (secondary schools) |

**Table 1.**
*Article selection criteria for the systematic review of MOOCs awareness, adoption and barriers in SSA.*

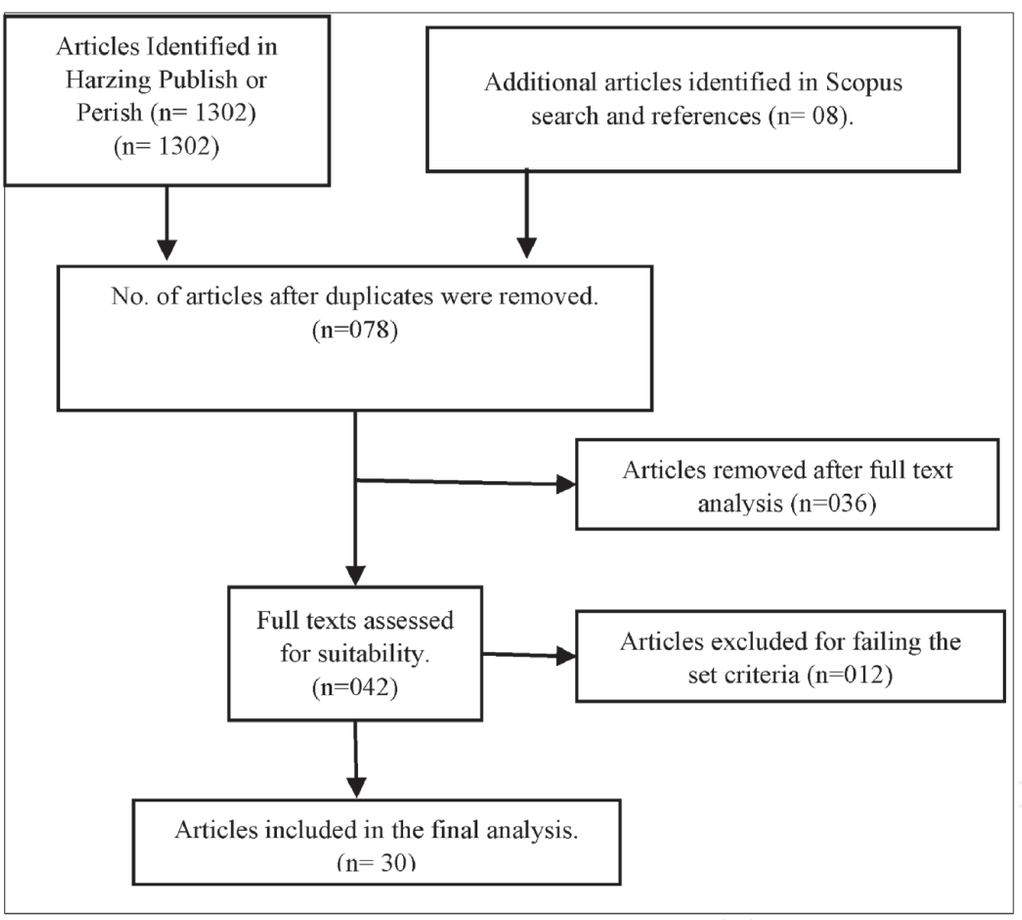


**Figure 4.**
*Literature inclusion and exclusion process adapted from PRISMA Moher, Liberati, Tetzlaff and Altman [31].*

## 3. Results and analysis

To properly sort the articles, they were coded based on contexts, research design, subjects and sample size, disciplinary contexts, MOOCs model of implementation, and the inhibitions to the success of the MOOCs projects.

i. Contexts: refer to the location where the study was conducted and geographical region

ii. Research Design: The bibliometric review was based on the classification of research methodology by Creswell [34] which included Qualitative, Quantitative and /or Mixed method research, Narrative analysis/ Conceptual analysis papers published in reputable journals were also included.

iii. Subjects and Sample: Refer to the respondents, their affiliations and the number involved in the studies. Consequently, the sample size of subjects are grouped into; small, medium, & large and coded as ( $\leq 150$ = small sample); ($> 150 \leq 250$ = medium sample) and (>250 = Large sample).

iv. Subject/Disciplinary Context: refers to the discipline under which the MOOC was implemented.

v. Implementation Models: The review identified the different framework adopted / used in the MOOCs implementation in sub-Saharan Africa.

vi. Milestones / Achievements refers to the milestones attained within the identified studies for reference as well as.

vii. Barriers towards the adoption and implementation of the MOOCs models highlighted in the reviewed articles.

In line with the above-mentioned measures, 30 articles were found relevant to the focus of the systematic bibliometric review. However, three articles: *Applying MOOCocracy learning culture themes to improve digital course design and online learner engagement* by Akinkulie & Shortt (2020) *Digital neo-colonialism and massive open online courses (MOOCs): colonial pasts and neoliberal futures,* by Adam Taskeen [35] and *A Kenyan Cloud School: Massive Open Online & Ongoing courses for blended and lifelong learning* by Jobe [36] despite its focus on Secondary school education level because it appears to be one of the first of its kind in SSA and offers interesting insights in to the development and testing of MOOCs at that level. They were also included despite their broad focus on MOOCs and its fundamental goals and contributes to the understanding of MOOCs from historical, philosophical, and pragmatic principles of implementation, and make the case for MOOCs based on the unique context of underserved communities rather than on neoliberal philosophical world view of openness and accessibility.

### 3.1 Contexts and yearly article production trends

The distribution of articles based on the context or location of MOOCs adoption and implementation studies is illustrated in **Figure 5**.

**Figure 5** illustrates the scientific production trends of MOOCs articles based on contexts. Nigeria tops the chart with nine articles followed by South Africa with five, Articles focused on the broader African context have four articles Kenya three, Uganda two while Ghana, Tanzania, Zimbabwe, and Eswatini (Swaziland) produced one article each. The publication trends show a significant growth between 2012 and 2014 from one article to four in 2013 and five in 2014, and three each for 2015 and 2016, another rising wave was observed in 2017 with five articles which appeared to be the "plateau of production" then began the downward slide from 2018 with four and two each in 2019, 2020 and one in 2021. There are prospects for additional literature in 2021 going forward given the increase in E-learning research spurred by the impacts of the COVID-19 pandemic (Yunusa, Ismaila, Dada,

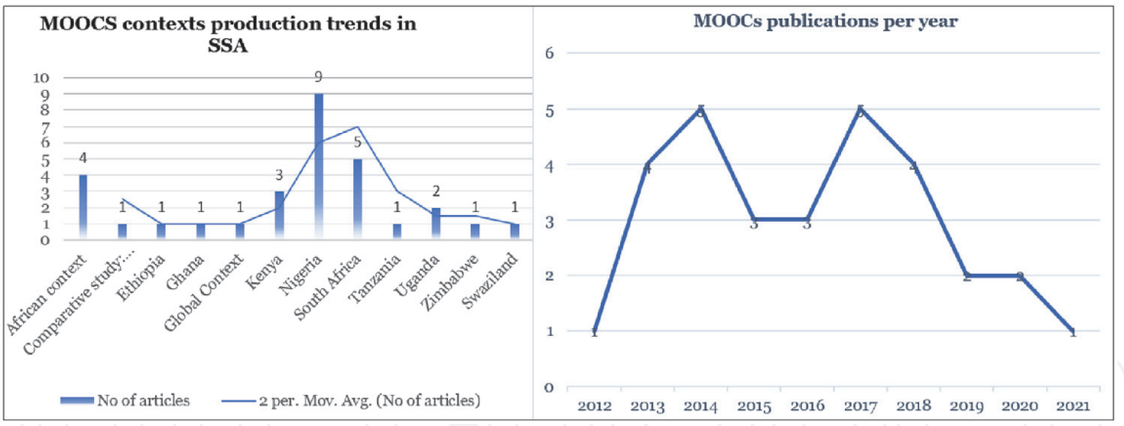


**Figure 5.**
*Spread of MOOCs articles in SSA context.*

Solomon & Agbo, [27] which provided varied options for technology mediated engagements in the form of MOOCs, emergency remote teaching, and online learning models.

### 3.2 Subjects and sample size

The subjects and samples sizes featured in the reviewed articles are presented in **Figure 6**.

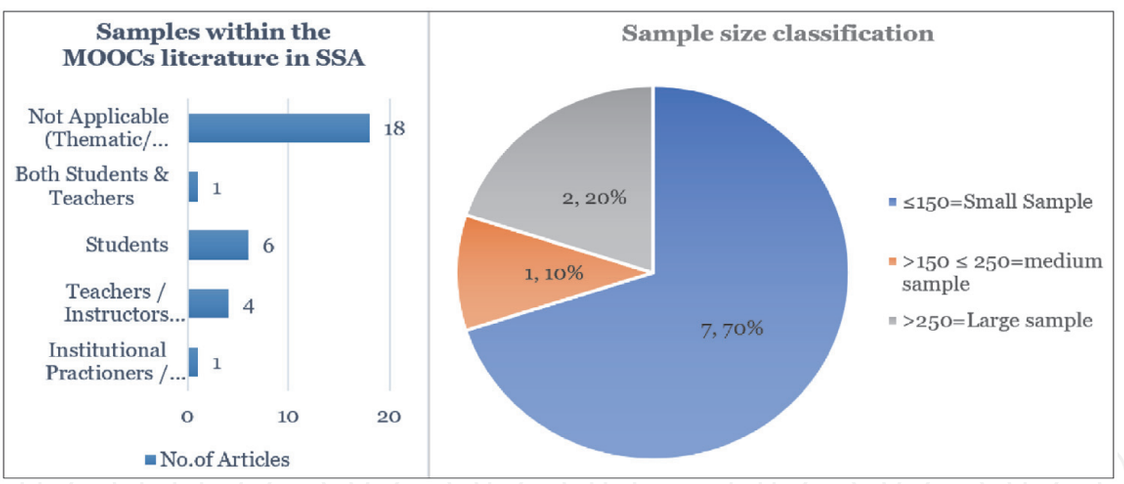


**Figure 6.**
*Research sample characteristics and sample size classification within the review.*

From **Figure 6**, the distribution of the articles by types of sample characteristics shows that Thematic, discuss, narrative analysis is the most dominant research techniques within the SSA literature 56% (n = 18 articles), followed by articles with students as respondents 25% (n = 6), articles with teacher, instructors or facilitators as respondents 16% (n = 4) while the least form of samples are institutional leaders and both teachers and students each with one article (4%).

### 3.3 Disciplinary contexts of the MOOCs literature in SSA

What are the different subjects/course or disciplines within which MOOCs were adopted/ implemented in SSA?

**Table 2** shows that the MOOCs articles within SSA were focused on only seven disciplinary/ subject contexts, spread across the period under the review. The

| Subjects/Discipline/MOOC's Context | Author(s) |
|---|---|
| Archives and Records Management<br>Computer Science | Chisita & Tsabedze [37]<br>Mtebe & Kissaka [38] |
| Digital Skills / Green Economy | Godwell & Nhamo [39]; Oyo et al., [17] |
| Capacity building/ Continous Professional Development (CPD) | Jobe, [36]; Boga & McGreal, [21];Wambugu [40]; Czerniewicz et al., [41]; Mapitsa [42] |
| Mathematics | Reju & Jita [43] |
| MOOCs Readiness, Adoption and differentiated MOOCs contexts and Evaluation | Fakinlede et al. [44]; Oyo & Kalema [45]; Rambe & Moeti [46]; Van Stam [47]; Odebero [48]; Mapitsa [42]; Waldegiyorgis [49] Czerniewicz et al. [29] Muhammad et al. [50]; Fiannu Blewett et al. [51, 52]; Kpolovie et al., [53]; Ngimwa et al. [11]; Yunusa & Umar [26]; Adam, T. [35]; Akinkuolie & Shortt [54]. |
| Systematic Review of MOOCs Literature | Safana & Nat [55] |

**Table 2.**
*Disciplinary contexts of MOOCs literature within the study.*

subject areas covered are presented in a chronological order for ease of reference. They include, Archives and records management, Computer science, Digital skills and Economy, continued professional development (CPD) MOOCs, Mathematics, Readiness factors, differentiated as well as Systematic review. Despite the low production the spread depicted MOOCs as a multidisciplinary avenue (**Table 3**).

### 3.4 Research design and methods utilized in MOOCs studies in SSA

The different research approaches used within the reviewed articles are illustrated in the **Figure 7**.

From **Figure 7**, the statistics on the research design and instruments are presented. The design groupings were classified based on the recommendation by Creswell [34]. Conceptual narrative discourse was the most prominent in the literature (n = 14) followed by quantitative research design (n = 8), Mixed methods (n = 4), and qualitative research design (n = 3),The least recurring of the designs was the experimental design (n = 1).while the most used instrument/ analytical technique was narrative and discourse analysis, followed by survey questionnaire, combinations of survey questionnaire, interview and observations, systematic reviews, and the least was experimental testing approach.

### 3.5 Disparate forms of MOOCs implementation models in SSA

The review of the MOOCs articles revealed that the MOOCs implementation models in SSA are based on two fundamental models. The connectivist MOOCs (cMOOCs) and teacher centric MOOCs (xMOOCs) (Bates [8]; Gaebels [60] as cited in [39]), particularly the teacher guided models that mimic the traditional teaching method where the learning experiences are guided by the teacher as the second predominant model/approach. On the other hand, 50% of the articles were based on narrative/thematic/discourse analysis and anecdotes wherein the authors draw on their experiences and evolution of MOOCs in other contexts to propose indigenous / contextualized formats for the African continent. For instance, Rambe & Moeti [46] enunciated the potentials of MOOCs to disrupt the educational landscape in Africa.

However, the authors argued that for that to happen, the MOOCs curriculum must be designed within the context of the needs of the African environment not as an extension of the elitist models from established institutions (such as MIT,

| SN/Paper title | Author(s)/ date | SSA context (s) | Disciplinary context | Research design | Subjects/samples | Statistical tools | Journal |
|---|---|---|---|---|---|---|---|
| 1. Enhancing the Quality of Computer Science Education with MOOCS in Sub-Saharan Africa | Mtebe, & Kissaka, [38] | Tanzania (But focused on Africa) | Computer Science | Not Applicable Narrative/Conceptual discuss | NA | NA | *Handbook on research on Active Learning* IGI Global Book Chapter |
| 2. Massive Open Online Courses (MOOCs) and Green Economy Transition: Feasibility Assessment for African Higher Education | Godwell Nhamo [39] | South Africa | Green Economy Transition Courses (Sustainability) Focused on Africa | Narrative/Exploratory Analysis (Feasibility assessment for Higher Education) | Not Applicable | Not Applicable | Journal of Higher Education in Africa (JSTOR) |
| 3. MOOCs for in-service Teachers: The case of Uganda and lessons for Africa | [17] | Uganda | Digital literacy & Lifelong Learning within Uganda's Teachers E-learning Portal (TEP) | Quantitative Research design (Evaluation of Teachers Completion of digital literacy course on MOOCs (using end of course examination report) | In-service teachers in Uganda = **120** in-service-teachers | Simple descriptive statistics | Revista Espanola de Pedagogia |
| 4. An empirical investigation of the emergent issues around OER adoption in Sub-Saharan Africa | Ngimwa & Wilson, [11] | Comparative study of Kenya, Uganda & South Africa | Adoption of OERs | Qualitative Research design | Institutional practioners in Higher Education Institutions in SSA (Teacher Education in sub-Saharan Africa (10 TESSA participants and 9 non-TESSA participants) 19 were interviewed | Descriptive Stats analysis using Nvivo version 8 for Thematic analysis | Learning, Media and Technology |
| 5. Massive Open Online Courses (MOOCs) for Professional Teacher and Teacher Educator Development: A Case of TESSA MOOC in Kenya | Wambugu, [40] | Kenya | TESSA MOOC E-Learning portal for teacher professional development in SSA | Mixed method research combining Questionnaire with Focused group discussion | Teachers, Teacher Educators and Other stakeholders/interested parties -participants were drawn from University 16, Secondary school 12 | Descriptive Statistics, Frequency & Percentages and Narrative analysis | Universal Journal of Educational Research |

| SN/Paper title | Author(s)/ date | SSA context (s) | Disciplinary context | Research design | Subjects/samples | Statistical tools | Journal |
|---|---|---|---|---|---|---|---|
| | | | | | and Primary School 5 and educators 23 = **56** registered (47completed) | | |
| 6. Readiness for MOOCs: Learners' inequity in Nigeria | Kpolovie & Iderima, [53] | Nigeria | Readiness for MOOCs Evaluation | Quantitative Research Design (Comparative ex-post facto Research design) Using questionnaire | University Undergraduate & Postgraduate student from 4 different universities **1200** | Descriptive analysis, Frequency, mean, and Standard Deviation | EPRA International Journal of Economic and Business Review |
| 7. Readiness for Online Learning in Higher Education: A Mixed Methods Assessment of Students at a Nigerian University | Fakinlede, Yusuf, & Mejabi, [44] | Nigeria | Students Readiness for MOOCs in Nigeria | Concurrent Mixed Method Study(Survey & Pen and Paper Interview | University Undergraduate student **119** | Descriptive Statistics using frequencies and percentages | Malaysian Journal of Distance Education |
| 8. Systematic Review on Massive Open Online Courses Based on Primary/Meta-Analysis | Safana & Nat, [55] | Nigeria | Systematic Review of MOOCs across different contexts | Quantitative Research method | Peer reviewed articles on MOOCs in Africa **40** | Descriptive Stats | International Journal of Scientific & Technology Research |
| 9. Opportunities and Challenges for Open Educational Resources and Massive Open Online Courses: The Case of Nigeria. | Ipaye & Ipaye, [56] | Nigeria | Higher Educational Institution and readiness to adopt OERs | Quantitative Narrative/ Conceptual Analysis (Anecdotal) | Not Applicable | Descriptive Analysis (textual) | Commonwealth of Learning Educo-Health Project Ilorin Nigeria |
| 10. Students' experiences with distance and online learning of university-level undergraduate mathematics in Nigeria | Reju & Jita, [43] | Nigeria | Mathematics | Mixed-Method Research Design with Narrative Content Analysis | Undergraduate students **60,** while 10 students were interviewed for the qualitative data | Descriptive Statistics and Non-parametric Binomial Analysis | International Review of Research in Open and Distributed Learning |

| SN/Paper title | Author(s)/ date | SSA context (s) | Disciplinary context | Research design | Subjects/samples | Statistical tools | Journal |
|---|---|---|---|---|---|---|---|
| 11. A Kenyan Cloud School. Massive Open Online & Ongoing courses for blended and lifelong learning | Jobe, [36] | Kenya | English Language and Kiswahili (Secondary School Subjects taught in Kenya) | Iterative Design Research approach (Design, Development, and Implementation) | Exploratory research NOT Applicable | Narrative and Situational Analysis | Open-Praxis |
| 12. Introducing MOOCs to Africa New Economy Skills for Africa Program-ICT | Boga & McGreal, [21] | African Context | Capacity Building on ICT skills (NESAP-ICT) Using the Coursera Platform | Narrative/ Thematic / Discuss analysis based on author's world view | Not Applicable | Narrative analysis and presentation | Commonwealth of Learning auspace.athabascau.ca |
| 13. Boosting Higher Education in Africa through Shared Massive Open Online Courses (MOOCs) | Escher, Noukakis, & Aebischer, [57] | African Context | Assessment of MOOCs program in Africa and Identifying the potential for its growth | Narrative/ Conceptual presentation | Not Applicable | Narrative analysis | *Education, learning, training: Critical issues for development. https://library.oapen.org/* |
| 14. MOOCs for Development: Trends, Challenges, and Opportunities | Castillo, Lee, Zahra, & Wagner, [52] | African Context | MOOCs4development Conference in African Context (Focused on underserved regions of the world) | Descriptive content analysis | Not Applicable | Descriptive & Narrative analysis | Conference Report (Informational Technologies & International Development) www.moocs4d.org |
| 15. Factors Affecting MOOC usage by students in selected Ghanaian universities | Fianu, Blewett, Ampong, & Ofori, [51] | Ghana | Generic evaluation of MOOCs as learning medium/ Not disciplinary specific | Quantitative Research design? Questionnaire | Undergraduate students **207** | PLS-SEM | Education Sciences |
| 16. Can Massive Open Online Courses Fill African Evaluation Capacity Gaps? | Mapitsa, Khumalo, Engel, & Wooldridge, [42] | South Africa | Evaluation Capacity development (Theory of Change for development) | Narrative Content Analysis drawn from course data | Not Applicable | Descriptive Narrative analysis | African Evaluation Journal (http://www.aejonline.org) |

| SN/Paper title | Author(s)/ date | SSA context (s) | Disciplinary context | Research design | Subjects/samples | Statistical tools | Journal |
|---|---|---|---|---|---|---|---|
| 17. Massive Open Online Courses (MOOCs) and the 'revolution' in higher education: Implications for Africa | Woldegiyorgis & Carvalho, [49] | Ethiopia | MOOCs potential in Higher Education Context | Narrative Analysis (Conceptual Paper) | Not Applicable | Descriptive Narrative analysis | Proceedings of the 13th international conference on African private higher education |
| 18. The Place of MOOCs in Africa's Higher Education | Odebero [48] | Kenya | MOOCs in African Higher Education (Multi-access learning theory) | Descriptive Survey Research of Published articles on MOOCs | Not Applicable (Online artifices, Newspapers, Magazines & blogs) | Thematic Narrative Analysis | Chapter in A book-IGI Global |
| 19. Developing world MOOCs: A curriculum view of the MOOC landscape | Czerniewicz, Deacon, Small, & Walji, [58] | South Africa (African Context) | MOOCs in African Higher Education, prospects for contextualized offerings | Thematic Narrative Analysis | Not Applicable | Thematic Narrative analysis | Journal of Global Literacies, Technologies, and Emerging Pedagogies |
| 20. Massive Open Online Courses: awareness, adoption, benefits and challenges in Sub-Saharan Africa | Muhammad, Mustapha, & Haruna, [50] | Nigeria | MOOCs in University Contexts | Quantitative Research Design (Questionnaire) | Undergraduate students in two universities in Nigeria **(300)** | Descriptive Statistics, Multiple linear regression analysis | International Journal of ICT and Management |
| 21. Massive Open Online Courses awareness and adoption by Nigeria university students: A Case Study | Adebo & Ailobhio, [59] | Nigeria | MOOCs in the university context | Quantitative Research design (Questionnaire) | Undergraduate students **(126)** | Descriptive statistics using frequency counts and Analysis of variance | International Journal of Computer Engineering and Information Technology |
| 22. eLearning in Africa and the Opportunity for Innovative Credentialing | van Stam, [47] | Zimbabwe | Credentialing | Thematic Narrative Analysis | Not Applicable | Thematic/ Narrative Analysis | Conference paper |
| 23. MOOC - Making and Open Educational Practices | Czerniewicz, Deacon, | South Africa | MOOC Educators Open Practices | Mixed-Method Research design using Semi-structured Interviews, | University Educators using MOOCs **(22)** | Thematic/ Narrative analysis | Journal of Computing in Higher Education |

| SN/Paper title | Author(s)/ date | SSA context (s) | Disciplinary context | Research design | Subjects/samples | Statistical tools | Journal |
|---|---|---|---|---|---|---|---|
| | Glover, & Walji, [41] | | | Focus Group and artifacts | | | |
| 24. Disrupting and democratizing higher education provision or entrenching academic elitism: towards a model of MOOCs adoption at African universities | Rambe & Moeti, [46] | South Africa | MOOCs in higher Education context: A comparative narrative between Africa and America | Thematic Narrative analysis underpinned by Disruptive Innovation Theory | Not Applicable (Mainstream literature review) | Thematic Analysis | Educational Technology Research and Development |
| 25. Massive pen online courses for Africa by Africa | Oyo & Kalema, [45] | South Africa | MOOCs implementation strategies | Thematic, Narrative Analysis | Not Applicable literature review | Thematic/ Narrative Analysis | The International Review of Research in Open and Distributed Learning. |
| 26. Adoption of massive open online courses (MOOC) for librarians' professional development in Africa | Fagbohun et al., (2018) | Nigeria | Advancing the course for the adoption of MOOCs for librarians' continuing professional development | Conceptual/Narrative Analysis | Not Applicable | Not Applicable | Library and Information Science in the Age of MOOCs (pp. 37-65). IGI Global. |
| 27. Applying MOOCocracy learning culture themes to improve digital course design and online learner engagement | Akinkuolie & Shortt [54] | International/ Global context | Culture / Adaptive / Bespoke MOOC | Thematic/ Content Analysis & Synthesis | Not Applicable | Thematic analysis | Education Technology Research and Development |
| 28. Leveraging Massive Open Online Courses (MOOCs) for Increased Access and Quality Education in Nigeria. | Yunusa, Umar, & Ussher [12]. | Nigeria | The paper advocated for the adoption of MOOCs as a panacea to the challenges of limited opportunities for | Conceptual / Narrative analysis | Not Applicable | Exploratory narrative analysis | Proceedings of the Asian Conference on Education and International Development (ACEID 2020). Tokyo, Japan. |

| SN/Paper title | Author(s)/ date | SSA context (s) | Disciplinary context | Research design | Subjects/samples | Statistical tools | Journal |
|---|---|---|---|---|---|---|---|
| | | | acquiring university education in Nigeria | | | | |
| 29. Digital neocolonialism and massive open online courses (MOOCs): colonial pasts and neoliberal futures, | Adam,T. [35] | South Africa | The paper was a holistic evaluation of the MOOCs platforms to understand their epistemologies and relevance to different socio-cultural contexts particularly sub-Saharan Africa. | Conceptual/ Narrative discourse analysis | Not Applicable | Narrative discourse analysis | Learning, Media, and Technology |
| 30. Massive open online courses (MOOCs): a tool for intercontinental collaboration in archives and records management education in Eswatini | Chisita & Tsabedze [37] | Eswatini (Swaziland) | The article explored the views of archives and records management (ARMS) professionals about MOOCS as an open platform to advance the growth of the discipline/ profession | Qualitative research design using interpretative technique drawn from interview texts | Students and Lecturers **(n = 60)** | Interpretative analysis | Archives and records management education |

**Table 3.**
*Summary of the reviewed MOOCS articles in SSA context.*

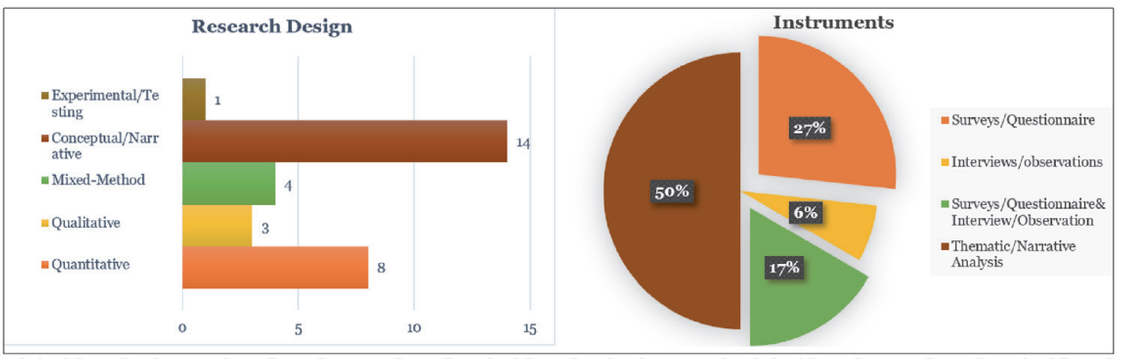


**Figure 7.**
*Research designs and relevant instruments within MOOCs articles on SSA.*

Harvard, Stanford etc.,). Similarly, Mtebe and Kissaka [38] dwelled on the potentials of MOOCs to enhance the quality of Computer Science Education in Tanzania, Similarly, Nhamo, [39] examined the feasibility of MOOCs for driving the transition to the development of green economy in Africa. furthermore, Boga & McGreal [21] reported their experience with how Cousera platform was used to provide opportunity for the enhancement and development of ICT skills in Sub-Saharan Africa to prepare them for the evolving knowledge economy. MOOCs as capacity building vehicles include the Teachers E-learning Portal (TEP) for enhancing the teacher's digital literacy and life-long learning capabilities in Uganda [17], The Teacher Education for Sub-Saharan Africa (TESSA), also known as TESSA MOOCs [40] which focused on Kenyan Teachers and Teacher Educators. The predominant themes for the narrative analyses also include opportunity for innovative credentialing [47]; MOOCs revolution implications for African Higher Education (Carvalho & Woldegiyorgis [49]; MOOCs for addressing African evaluation capacity [42]; Boosting African Higher Education through shared MOOCs [57] and the advocacy for a wholly African MOOCs (MOOCs for Africa by Africa [45]). Though an emerging phenomenon in the African context a few MOOCs adoption focused on the lower rung of the educational stream (Primary and Secondary education); The Kenyan Cloud School MOOCs for teaching foundational subjects [36].

### 3.6 The inhibiting factors within the MOOCs literature on SSA

A cluster of the inhibiting factors based on the reviewed literature was also created using the VOS viewer application. **Figure 8** presents the visualization of the

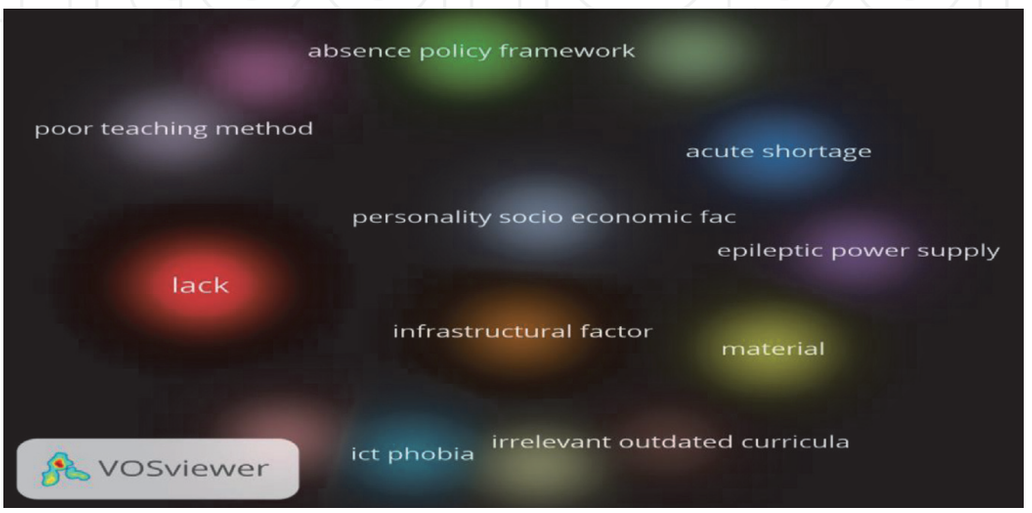


**Figure 8.**
*Cluster density visualization of inhibitions to MOOCs growth in SSA.*

text density visualization of the inhibiting factors of MOOCs in SSA. The most prominent are absence of policy framework to guide the adoption and implementation of the MOOCs platforms, poor teaching methods, acute shortage of expertise and personnel, Infrastructural factors, and irrelevant and outmoded curriculum across the SSA context.

## 4. Discussion

This paper aims to provide insights on the evolution of MOOCs in sub-Saharan Africa by searching, locating, and identifying articles on different *aspects of MOOCs* focused on sub-Saharan African contexts. Published between 2012 and 2021 *The Harzing publish or persish* literature search and management software along with the Scopus data base were used to identify 30 articles based on the authors' set criteria. The choice of the time period of the review was premised on the global evolution of the MOOCs phenomenon, given that MOOCs began to rise in 2013 [61] and was a Buzzword in 2012, [62]. The findings show a slow but steady production of articles on MOOCs in SSA domain, though with a bit of in consistencies. For instance, there was significant growth observed between 2012 to 2014, with a slight decline in 2015 and 2016, However, an increase was recorded in 2017 which appeared to be the highest since then. Though, from global perspectives MOOCs literature have been on the ascendancy, the probable reason for the slow pace of the scientific production of MOOCs in SSA may not be far from the myriads of challenges hindering its adoption in the sub-region. Nonetheless, significant publications have been recorded by the frontline countries in E-learning adoption and uptake such as Nigeria, South Africa, Kenya, and Tanzania.

These countries have recorded significant growth in internet penetration and usage including web based technologies such as the popular learning management systems, Moodle [19, 63]. According to a report by the international telecommunication union (ITU [64]) Kenya and Tanzania ranked 3rd and 4th behind Nigeria and South Africa as countries in Africa with the fastest growing mobile technology subscribers and internet users [63] given these statistics it can be concluded that the growth of MOOCs as reflected in the bibliometric review followed this trajectory even though these are not necessarily used for education purposes. Also, the low production may not be unconnected with the socio-economic status of the SSA countries as well as the doubts on its ability to impact positively given the disparity in the learning conditions between the environment where MOOCs was founded and the developing environment such as the SSA. Moreso that empirical evidence have shown that individuals who are already educated and have higher socio-economic status are more disposed to the MOOCS particularly in the developed contexts [65, 66] Notwithstanding, MOOCs has the potential to reduce inequities in education when contextualized and structured on the needs of the underserved communities [35, 67].

In terms of research design, the systematic bibliometric review revealed that the conceptual, narrative and discuss analysis was the most dominant within the reviewed literature. This is also not surprising given the scenario mentioned earlier. The contradictions around the conception of MOOCs as a technology that can facilitate the inclusion of underserved individuals is still raging within the SSA contexts. As [35, 46, 67] argued, until the issues around the contextualization and relevance of MOOCs to Africa is fully resolved, most discussions around the phenomenon would continue to be anecdotal and based on the experiences of the privilege few who are only opportune to experience MOOCs either through shear individual self-directedness and determination to achieve certain learning goals as in the case of the Rwandan citizens ([68] or through interventions and partnerships

as is the case with the TESSA MOOCs [40] which emphasized MOOCs based on partnership with global organizations and prominent MOOCs providers such as Cousera (www.cousera.org), edX(edx.org), Udemy (www.udemy.com), FutureLearn (futurelearn.com), Openlearning (www.openlearning.com) etc.

Regarding subject area, disciplinary contexts, and samples that were more pronounced in the MOOCs articles, the novelty of the MOOCs and it's slow pace stuck out. This is because the most prominent subject areas and the themes revolved around, readiness, willingness to adopt, and the researchers narration the relevance of MOOCs to some of the disciplinary contexts such as Evaluation management and Archives and records management practitioners [37, 42]. Thus, underscoring the explorative inclination of MOOCs research. It is however, encouraging to observe the widening of the scope of research based on discipline as it cut across the STEM, STEAM and Continued personal and professional development of individuals and collectives across the different fields within the review (covering, Archives and Records Management, Computer science, Green Economy, and Mathematics). The presence of computer science, mathematics and the arts and humanities resonate with the courses that recorded completions in prominent platforms [69], thus, reflecting the multidisciplinarity of the phenomenon. Similar reasons may be advanced for the sampling techniques and sample sizes expressed within the MOOCs literature in SSA.

The dominant model among the MOOCs within the empirical literature are the traditional MOOCs format (xMOOCs), which is a replication of the teacher dominated model, followed by the connectivist MOOCs (cMOOCs). This outcome may also be ascribed to the predominance of the conceptual or theoretical views of the MOOCS phenomenon aligning with the findings of [16] they found that conceptual model constituted the most employed in their review as more than half of the articles in the corpus used this approach. However, these researchers argued against viewing MOOCs from theoretical or conceptual perspectives as according to them there is no evidence of how this benefits the growth or otherwise of MOOCs [70].

In that sense, it may therefore be inferred that the predominance of conceptual approach to the MOOCs phenomenon signifies a limitation in the actual practice or adequate utilization of the MOOCs affordances or technology within the context of the study. In terms of research methodology, and instruments, the findings also corroborated previous literature but add to the body of evidence from SSA perspectives. Additionally, conceptual narratives and thematic discourse analysis outnumbered the use of survey, observation, or a combination of both. The survey instrument approach was the next most used, followed by qualitative method while the least was the experimental and/ or testing-based article. More investment in MOOCs through partnership and innovative conception of the technology in SSA will benefit from the exploration MOOCs vast potentials through empirical research. Regarding the milestones, the successes and the enthusiasm demonstrated in the few MOOCs within the SSA literature (e.g TESSA MOOCs in Kenya, E-learning Portal, Uganda) underscores the relevance of MOOCs in providing and facilitating accessibility and learning at scale. While the inhibitions are peculiar issues with developing countries, which needed to be solved through concerted efforts, conscious quality policy and legal framework for the implementation of MOOCs and more investment through partnerships with established institutions and MOOCs providers.

## 5. Conclusion

This paper sought to identify articles published on MOOCs focused on the technology in SSA between 2012 and 2021 to understand the growth and production

trends of the phenomenon. 30 articles were found relevant and included in the bibliometric review. The review identified the most recurring keywords, the prolific authors, and their relations depicting a lack of collaborations among the experts within SSA. The low production of MOOCs articles signifies that despite the much-taunted disruptive potential of MOOCs to address the needs of underserved communities, the expectations are yet to be met. Perhaps due to the underlying challenges inherent in developing environments and the philosophy of being a neocolonial product and not fit for the SSA context. The predominant literature was based on anecdotes and expert opinions with a few empirical articles. Based on the findings we can conclude that more collaboration, networking, and partnership is required to develop a nuanced indigenous MOOC for SSA.

## 6. Limitations, future studies, and recommendation

This study's limitations may be drawn from the broader aspects of bibliometric studies and the method. Though, the paper sought to highlight the growth of MOOCs production, and drew a matrix that included the journals, the paper did not cover the metrics on the sources and document types, albeit due to space constraints therefore, future studies might want to consider the journals, journal citation metrics and their ranking based on MOOCs article publication to offer more interesting insights. In addition, the review did not capture the authors citation metrics. But rather presented only the link strengths and occurrences of the authors. Furthermore, the review was based on literature from Harzing publish or perish and Scopus, even though Harzing is an integrative platform, there may be literature in other databases that were not captured. The review was primarily focused on SSA therefore limiting extrapolation to Africa in general despite common characteristics across the continent. Future studies might want to consider comparative reviews between SSA and the rest of the region (North Africa).

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## Conflict of interest

The authors hereby declare that they have no conflict of interests regarding this paper.

## Availability of data

All the data related to this article are contained in the article matrix which can be found from this link https://drive.google.com/file/d/1NLY1yXDTN-DOPr0wPpZAJ0cXN2IaHtGys/view?usp=sharing.

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