Top Cited Articles on Structural Engineering Reliability by the Nigerian Authors

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Abstract

This study analyses the characteristics of top-cited articles on structural reliability with at least one author affiliated to Nigeria. A search in the Google Scholar database for articles published between 2010 and 2020 was carried out. From the top-cited articles, variables related to the journal, article, and authors, such as journal ranking from SCImago Journals & Country Rank (SJR), H-index, author affiliations, international research collaboration, and source of funding were collected and descriptively analysed. A sample of 25 original reports was identified from the search. The average citations per year ranged between 0.10 and 6.1. The articles were published in 20 different journals (36% found in only four journals) with five of them based in Nigeria. It was observed, that international collaboration on reliability-based researches was present in 4% of the articles, and funding was reported in just 1 article. Articles having Nigerians as first authors were reported in 100% of the articles. Articles with authors affiliated to ABU, Zaria were more frequent in the sample. A list of top-cited articles is thus, presented to provide an overview of the top-cited articles. This study could aid in supporting further analyses regarding publication, citation behaviours, research funding and international collaboration of structural reliability based researches in Nigeria.

Keywords

Bibliometric analysis, citation counts, Nigeria, structuraes,reliability

1. Introduction

Statistical methods have been used in Bibliometric analysis to provide a quantitative evaluation of scientific literature. Bibliometric analysis is a

method that uses citation counts to evaluate research performance. It is used to identify publishing trends, for instance, to evaluate the impact of journals, articles, and researchers and often not, it is used to evaluate institution or country's research output (Thomson Reuters, n.d). Many bibliometric tools have been developed in the last few years, in most cases, considering citation counts of articles over some time. Government, research & Academic institutions also use citation rates and other publication metrics for resource allocation and budgetary spending (Ale *et al*, 2013). However, it has been contested whether or not, the number of citations received by an article could, in a way, reflect its actual influence in the literature (Garfield 1979; Abbot *et al*., 2010). Nevertheless, citation rates have remained widely used and acceptable indicators for the influence of articles and journals in science. Scientific fields have different citation rates and authorship behaviours (Bornmann & Daniel, 2008). This is because the possibility of an article to be cited depends on many variables such as the number of publications, the number of researchers and journals in that particular field. These may, in turn, influence the number of articles published annually.

A number of studies have reported top-cited articles in different fields of study. Goncalves *et al*., (2019) identified top-100 most cited articles published in international dental journals between 1996 and 2017 within the scope of dentistry in Brazil available in the Scopus database. In a similar study, Eshraghi et al., (2013) analysed top-100 most cite articles related to the field of limb prosthetics and published in the Web of Knowledge database of the Institute for Scientific Information (ISI) from the period of 1980 to 2012. The studies showed that original research articles were predominant in the list with most articles published in journals with high bibliometric indicators in their respective fields. However, there are no similar reports in the literature on structural reliability. Thus, this study aims to analyse the top-cited articles in structural reliability with authors affiliated to Nigerian institutions. Such analysis could aid the country in portraying its prospect concerning the top-cited articles on structural reliability as well as attract government and international attention for possible collaboration and funding.

3. Methodology

3.1 Search Plan

A search for articles relevant to structural reliability with authors affiliated to Nigerian institutions was conducted through the google scholar citation database. The following keywords and its synonyms were used to search for articles: structural reliability, Nigeria, structures, FORM, reliability index, probability of failure. The search results were filtered to exclude articles related to book chapters, proceedings, editorials, letters and unknown sources. Articles published from 1990 to 2020 were thus, retrieved. The final filtered papers were ranked from most to least cited using citation index. SCImago Journal and Country ranking was consulted for the identified journal rankings and h-index. However, several articles were cited more often than others because of the difference in time since publication and relevance to literature. A citation index was thus, determined for each article to control this error. The citation index is defined as the mean number of citations per year.

3.1 Data Collection and Analysis

The following variables were collected and divided into variables related to the journal that published the article and variables related to the article and authors. Variables Related to the Journal: Journal Impact Factor (JIF) 2019 obtained from the SCImago journal and country rank (SJR); publisher; access type (closed, open, or mixed mix access); and journal subject. Variables Related to the Article and Authors: affiliation of the first author (country); number of authors; presence of international collaboration (yes/no); year of publication; number of citations received up to 2020; article type (original research/review); funding type (sponsorship, research grant).

A total of 990 articles were found following a time interval of 10 years (2010-2020). All of these publications were exported to EndNote to facilitate data analysis and manipulation. As an initial criterion, duplicate publications, chapters, parts of books and articles from unknown sources were deleted from the sample. Further reading of titles of all items was done, and through this criterion, only articles that had a consistent title according to the goals of this research were selected. Following the screening process, Google Scholar was consulted to obtain the number of times cited that each of the remaining articles had. Hence, only articles with at least one citation were selected. Thus, a sample of 25 articles was chosen for use in the research.

4. Results and Discussion

Table 1 lists the top-cited articles along with their H-index and Scimago Journal & Country Rankings. The oldest article in the sample was published in 2010 and the newest was published in 2020. The mean H-index and average citations/year received by the articles were 6 and 11.40 respectively. Table 1 also indicates the presence of international collaboration in the articles and whether the first author was from Nigeria. The result shows that there is no international collaboration between authors from Nigeria and their counterparts from other countries in the area of structural reliability.

This is an indication that these articles derived from studies carried out majorly in other countries and may reflect collaborations between Nigeria and foreign research groups or even were generated by Nigerian researchers working as visiting scholars abroad. One may argue if those articles may reflect the work of the Nigerian authors on structural reliability. It is believed that because of collaborations with international groups in the past were extremely important to place the Nigerian research on reliability in the position it is currently occupying in reliability literature. The foreign country most present in the sample was the UK, which is one of the leading countries in many scientific fields. Studies suggest that international collaborations might result in authored publications with higher citation rates and increased visibility than purely local articles. A possible "country-of-origin" effect for article citations rates also may be in place, although this is yet to be validated. These findings have not been explored in the Nigerian SR so far and maybe investigated in a future study. Consequently, the lack of international collaboration could be seen as responsible for the low citation counts and ranking.

Table 2 presents the number of top-cited articles published in various journals. 25 articles were published in 20 different journals, 5 of them based in Nigeria. Only four (4) out of the journals, published more than one article in the list.

Table 1: Top cited structural reliability articles with authors from Nigeria

Title of Article	Ave. Citations per year	Nigeria Alone	Nigerian as First Author
Yohanna, P, Oluremi JR, Adrian OE, Osinubi KJ & Sani JE (2019). Reliability assessment of bearing capacity of cement–iron ore tailing blend black cotton soil for strip foundations. *Geotechnical and Geological Engineering*, Springer	6.00	yes	yes
Johnson R., Oluremi JR, Stephen TI, Adrian OE & Osinubi KJ (2019). Reliability evaluation of hydraulic conductivity characteristics of waste wood ash treated lateritic soil. *Geotechnical and Gelogical Engineering*, Springer	4.00	yes	yes
Aguwa, JI, & Sadiku, S (2011). Reliability Studies on the Nigerian Ekki timber as bridge beam in bending under the ultimate limit state of loading. *Journal of Civil Engineering and Construction Technology*, academicjournals.org	2.44	yes	yes
Aguwa, JI (2012). Reliability assessment of the Nigerian Apa (afzelia bipindensis) timber bridge beam subjected to bending and deflection under the ultimate limit state of loading. *International Journal of Engineering and Technology*, Citeseer	2.38	yes	yes
Jimoh, AA, Rahmon, R, & Ajide, SO (2018). Reliability-Based Investigation on Compressive Strength Characteristics of Structural-Sized Iroko (Meliceae Excelsa) and Mahogany (Khaya Ivorensis) Timber Column Found in Nigeria. *Computational Engineering and Physical Modelling*, jcepm.com	2.00	yes	yes
Abejide, OS (2014). Reliability analysis of bending, shear and deflection criteria of reinforced concrete slabs. *Nigerian Journal of Technology*, ajol.info	1.50	yes	yes
Aguwa, JI (2013). Structural Reliability of the Nigerian Grown Abura Timber Bridge Beam Subjected to Bending and Deflection Forces. *Nigerian Journal of Technology*, ajol.info			

Salahudeen, AB, & Kaura, JM (2017). Reliability-based analysis of foundation settlement. *Leonardo Electronic Journal of Practices and Technology*, academia.edu	1.14	yes	yes
Samuel, S, & Benu, MJ (2019). Reliability Analysis of a Solid Timber Column Subjected to Axial and Lateral Loading. *FUOYE Journal of Engineering and Technology*, engineering.fuoye.edu.ng	1.00	yes	yes
Wilson, UN, Adedeji, AA, Oriola, FOP, Alomaja, JA, & Sani, JE. (2019). Reliability-Based Design of Solid and Nail-jointed I-Section of Nigerian-Grown African Birch (Anogeissus leiocarpus) Timber Column. *Journal of Applied Sciences and Environmental Management*, ajol.info	1.00	yes	yes
Aguwa, JI, & Sadiku, S (2012). Reliability studies on timber data from Nigerian grown iroko tree (chlorophora excelsa) as bridge beam material. *International Journal of Engineering Research in Africa*, Trans Tech Publ	1.00	yes	yes
Salau, MA, Esezobor, DE, & Omotoso, MF (2011). Reliability assessment of offshore jacket structures in Niger Delta., ir.unilag.edu.ng	0.88	yes	yes
Ibekwe, AU, Pu, YC, Ham, WL, & Dow, RS (2014). Progressive collapse analysis and reliability of a damaged hull girder. *International conference on offshore mechanics and arctic engineering*, asmedigitalcollection.asme.org	0.78	yes	yes
Idris, A, Olasehinde, AJ, & Osinubi KJ (2014). Reliability-based design of reinforced concrete raft footings using finite element method. *Jordan Journal of Civil Engineering*, platform.almanhal.com	0.67	yes	yes
Benu, MJ, Sule, S, & Nwofor, TC (2012). Reliability analysis of a square solid timber column. *Journal of Advances in Applied Science Research*, researchgate.net	0.67	yes	yes
Jimoh, AA, Rahmon, R, & Ibrahim, K (2018).	0.63	yes	yes

Modelling the Strength Characteristics of Structural-sized Afara (Terminalia superba) and Babo (Isoberlinia doka) Timber Columns Using Constant Failure Rate (CFR) Model of Reliability. *Journal of Soft Computing in Civil Engineering*, jsoftcivil.com	0.50	yes	yes
John, W, & Adedeji, AA (2018). Reliability Assessment of Reinforced Concrete Beam with Embedded PVC Pipes Below the Neutral Axis. *International Journal of Multidisciplinary Sciences and Engineering*, eprints.abuad.edu.ng	0.50	yes	yes
Sani, JE, Akanbi, DO, Yisa, GL, & Hamidu, HI (2017). Reliability estimate of unconfined compressive strength of black cotton soil stabilized with cement and quarry dust. *Leonardo Electronic Journal of Sciences and Practice*, academia.edu	0.33	yes	yes
Adewumi, OJ, Afolayan, OJ, & Oluwatuyi PE (2017). Reliability assessment of BS 8110 (1997) ultimate limit state design requirements for reinforced concrete columns. *Jordan Journal of Civil Engineering*, eprints.lmu.edu.ng	0.33	yes	yes
Aderinlewo, O, & Alade, GA (2014). Reliability-based analysis and design of steel frames with different supports. *Journal of Engineering, Design and Technology*, emerald.com	0.33	yes	yes
Abubakar, I, & Ma'aruf, A (2014). Reliability-Based Design of Reinforced Concrete Two-Way Solid Slabs using Eurocode 2. *Nigerian Journal of Technology*, ajol.info	0.33	yes	yes
Owoeye, AP, Otuoze, HS, & Abejide SO (2012). Incorporation of Advanced Second Moment Reliability Assessment Method into Assessment and Design. *World Journal of Engineering, Pure and Applied Sciences*, academia.edu	0.25	yes	yes
Afolayan, JO, & Opeyemi, DA (2010). Reliability Analysis of Static Pile Capacity for Concrete and Steel in Cohesionless Soils. *Electronic Journal of*			

Geotechnical Engineering, researchgate.net	0.20	yes	yes
Kaura, JM, & Afolayan, JO (2011). Reliability-based capacity rating of wood shear walls under seismic loading. *International Journal of Engineering and Mathematical Intelligence*, icidr.org	0.11	yes	yes
Ogork, EN, & Wasiu, J (2010). Reliability-Based assessment of simply supported hollow-pot slabs. *Journal of Engineering Technology*, bayerojet.com	0.10	yes	yes

These four journals contained just 2% of the articles in the sample. Among the 25 top-cited articles, 36% were published in only four journals: Nigerian Journal of Technology (3 articles), Journal of Geotechnical and Geological Engineering (2 articles), Leonardo Electronic Journal of Sciences and Practice (2 articles) and Jordan Journal of Civil Engineering (2 articles). All the journals in the sample publish either closed or open-access articles. The publishers from the journals are mostly based in Nigeria, USA and UK. The journals were categorized according to their subjects, which was defined based on the main topics of the articles published in the journals. Few journals containing articles from the sample had a specific subject: Geotechnical and Geological Engineering and Energy. Nine (9) journals in the sample were categorized as Engineering and Six (6) others as Multidisciplinary since they publish articles from many different topics. However, must of the journals, especially the Nigerian-based journals, were not available on the Scimago journal and country ranking list. This could also be further investigated to ascertain whether or not it a factor for the low citation index associated with the articles.

Table 2: Journals that published three or more articles included in the sample

Journal	Articles	H-Index	SJR	Access Type	Journal Subject	Publisher (Country)
Geotechnical and Geological Engineering	2	51	0.541	Close	Geotechnical and Geological	Springer (Netherlands)

International Journal of Engineering Research in Africa	1	21	0.331	Close	Engineering	Trans Tech Publications (Switzerland)
Journal of Engineering, Design and Technology	1	19	0.324	Open	Engineering	Emerald Group Publishing Ltd. (UK)
International conference on offshore mechanics and arctic engineering	1	40	0.282	Open	Energy and Engineering	ASME (USA)
Jordan Journal of Civil Engineering	2	13	0.202	Open	Engineering	Jordan University of Science and Technology (Jordan)
Journal of Engineering Technology	1	8	0.179	Open	Engineering	American Society for Engineering Education (USA)
Petroleum and Coal	1	10	0.175	Open	Energy	Slovnaft VÚRUP (Slovakia)
Leonardo Electronic Journal of Practices and Technology	2	14	0.136	Open	Multidisciplinary	Academic Direct (Romania)
Electronic Journal of Geotechnical Engineering	1	25	0.123	Open	Geotechnical engrg And engrg goelogy	Oklahoma State University (USA)
International Journal of Engineering and Technology	1	24	0.103	Open	Engineering	Engg J. Publications (India)

Journal of Civil Engineering and Construction Technology	1	NA	NA	Open	Civil engineering and Construction	Academic Journals (Nigeria)
Computational Engineering and Physical Modelling	1	NA	NA	Open	Engineering	Pouyan Press (Iran)
Nigerian Journal of Technology	3	NA	NA	Open	Engineering	African J. Online (Nigeria)
FUOYE Journal of Engineering and Technology	1	NA	NA	Open	Engineering	FUOYE (Nigeria)
Journal of Applied Sciences and Environmental Management	1	NA	NA	Open	Multidisciplinary	Department of Pure & Industrial Chemistry, UniPort (Nigeria)
Journal of Advances in Applied Science Research	1	NA	NA	Close	Multidisciplinary	Pelagia Research Library (Egypt)
Journal of Soft Computing in Civil Engineering	1	NA	NA	Open	Civil Engineering	Pouyan Press (Iran)
International Journal of Multidisciplinary Sciences and Engineering	1	NA	NA	Open	Multidisciplinary	BOAI
World Journal of Engineering, Pure and Applied Sciences	1	NA	NA	Open	Multidisciplinary	European Publishing Ltd (Turkey)

International Journal of Engineering and Mathematical Intelligence	1	NA	NA	Open	Multidisciplinary	International Centre for Integrated Development Research (Nigeria)

Table 3 presents the findings for variables related to the article and authors. Literature reviews are known for usually gathering more citations than regular research articles. However, all the 25 articles were original research reports, the first authors are affiliated to a Nigerian institution in all the articles, whereas the corresponding author was affiliated to Nigeria in 96% of the articles. Thus, the low citation counts is expected and might be considered positive because original reports are necessary for the incremental process of science and to promote further knowledge development. Most studies were written by a maximum of 4 authors (76%). International collaboration was present in just 4% of the articles. The main collaborating countries are UK and Singapore (1 article). The authors reported that the study was supported by funding in just 1 article while the remaining 24 did not report their sources of funding. Government funding is of utmost importance to stimulate independent research and development. Science and Technology should be properly funded because it is good for the economy of the country and may benefit its society, and reduce inequalities. However, it was observed that funding statement was reported in only 4 % of the sample, which suggests that the presence of funding may not be associated with higher article citations counts. This is another finding worth being explored in a future investigation. Literature reviews are known for usually gathering more citations than regular research articles. However, all the articles in the sample were original research reports.

Table 3: Variables related to the articles and authors

Variables	Outcomes	n
Type of Article	Review	0
	Research	25
First author affiliation	Nigeria	25
	Others	0
Corresponding author affiliation	Nigeria	24
	Others	1

Number of authors	1	3
	>= 2 -<=4	19
	>4	3
Collaboration with other countries	0	24
	1	0
	>=2	1
Main Collaborating countries	UK	1
	Singapore	1
Funding	Sponsorship	0
	Grant	1
	No reported	24

Table 4 presents a list of Nigerian universities and other institutions that authored the top-cited articles. The five universities most often present were Ahmadu Bello University, Zaria, Federal University of Technology Akure, University of Ilorin and the Federal University of Technology Minna. From the 20 institutions authoring the articles, 75% are public and 25% private institutions.

Table 4: Nigerian institutions authoring the Top Cited Articles

Name of substitution (acronym)	n
Ahmadu Bello University, Zaria (ABU Zaria)	7
Federal University of Technology Akure (FUTA)	5
University of Ilorin (Unilorin)	4
Federal University of Technology Minna (FUT Minna)	3
University of Port Harcourt (Uni Port)	2
Federal Capital Development Authority (FCDA)	2
Nigeria Defence Academy (NDA)	2
Akintola University of Technology, Ogbomoso (LAUTECH)	1
University of Jos (Uni Jos)	1
Adeleke University, Ede	1

University of Lagos (Unilag)	1
Afe Babalola University, Ado-Ekiti (ABUAD)	1
Nigerian Building and Road Research Institute (NBRRI)	1
Kaduna State Polytechnic (KAD POLY)	1
Land Mark University, Omu-Aran	1
University of Ibadan (UI)	1
Kano State University of Science and Technology, Wudil	1
Rufus Giwa Polytechnic, Ondo	1
Bayero University Kano (BUK)	1
Musa Iliasu College, Kano	1

5. Conclusion

The top-cited list presented is to provide an overview of the top-cited structural reliability articles with authors affiliated to Nigerian institutions. It is concluded from the study that, deliberate efforts should be made by editors, publishers, the government, its agencies and institutions to speed up the internationalization of researches on structural reliability and related topics and attract attention from the international community for possible collaboration and funding. One way this could be achieved is by increasing the international coverages of the local journals and encouraging local authors to target such journals to submit their main studies. This would go a long way in stimulating independent research and development in the country.

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