





The Need for Nigerian Universities to Collaborate for Quality Research Output

Chukwuma C. Ogbaga^{1,2} , Terkuma Chia³, Oluwatosin Imoleayo Oyeniran⁴, Menizibeya Osain Welcome⁴, George Mangse², Habib-ur-Rehman Athar⁵, and Nugun P. Jellason⁶ 

¹ Department of Biological Sciences, Faculty of Natural and Applied Sciences, Nile University of Nigeria, Abuja, Nigeria

chukwuma.ogbaga@nileuniversity.edu.ng, chukwumaogbaga@gmail.com

² Department of Microbiology and Biotechnology, Faculty of Natural and Applied Sciences, Nile University of Nigeria, Abuja, Nigeria

³ Department of Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, Nile University of Nigeria, Abuja, Nigeria

⁴ Department of Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, Nile University of Nigeria, Abuja, Nigeria

⁵ Institute of Pure and Applied Biology, Bahauddin Zakariya University, Multan 60800, Pakistan

⁶ School of Agriculture, Policy and Development, University of Reading, Reading, UK

Abstract. The sustainable development of nations globally is highly influenced by the knowledge economy. Growth in the knowledge economy is driven by higher education with quality research being a major contributor to an excellent education. Over the years, universities in high-income countries have put research excellence at the core of their strategies with collaboration being a major tool utilised in improving the universities' global recognition and ranking. However, low-income countries lag behind in global recognition and ranking of universities. This is worsened by difficulties in securing collaboration. In this perspective, we examine, the situation in Nigeria- a low-income country. We compare public and private Nigerian universities in terms of research excellence and argue for collaboration between local private and public universities, and between the local and foreign universities to overcome the challenges associated with researchers working alone. We also highlight the barriers that could limit effective collaboration in Nigerian universities. These barriers include funding and finding collaborators, personal or family worries, lack of trust and respect for diversity of disciplines and poor internet infrastructure and the high cost of international calls. Finally, we conclude that collaboration is key to knowledge sharing, the attraction of research grants and meeting sustainability targets. Hence, Nigerian universities should reach out to researchers with mutual research interests at home and abroad for more successful and impactful research.

Keywords: Nigerian universities · Research collaborations · Quality research

1 Introduction

The sustainable development of nations globally is knowledge-driven. Central to the knowledge economy is education and specifically higher education [1]. Research is acclaimed to be one of the core mandates of universities alongside innovation and knowledge dissemination [2]. Research drives innovation, creates and improves already established knowledge that informs teaching and learning and is disseminated to the scientific community. Perhaps this informs the choice of research productivity as a common criterion for ranking universities globally [3, 4]. Owing to its vital place in universities, authorities often strive for research excellence, which is a tool for projecting a positive image of an institution. Research excellence enhances the attraction of institutional funding through research grants [5–7]. Arguably, citations garnered by a research publication reflect the quality of the research [8]. The contribution of research to economic growth is limited by factors such as lack of funding, ineffective higher education policies and recently technology deficiency [1]. High-income countries (HICs) have largely tackled these limitations over time with low-income countries (LICs) still struggling to overcome these challenges [9].

Nigeria is a LIC faced with multifaceted challenges hindering the growth of higher education. The Nigerian university system is plagued with numerous challenges principal among them is poor funding [10, 11]. Generally, public universities in Nigeria are funded by the government with little or no private participation [12]. The paucity of funds may be due to the dwindling government revenues, growing needs of universities as well as an increase in the number of universities. Consequently, university staff unions have often embarked on lengthy industrial actions to press home their demands for improved university funding and working conditions [13, 14]. These industrial actions have caused severe disruptions to academic activities at Nigerian universities. The situation has resulted in the gradual fall of standards and consistent low ranking of Nigerian universities globally and within the African continent [15]. According to Times Higher Education World Ranking of Universities for 2021 based on 1500 institutions cutting across 93 countries and territories, the best Nigerian university was ranked 401–500th position in the world and 27th position out of over 1225 universities in Africa [16].

Inter-university cooperation both locally and internationally holds much promise in enhancing research within the university system. Private and public research funding bodies increasingly require collaboration at disciplinary, institutional and international levels [17]. Through such collaborations, universities are able to interdepend on one another both for expertise and equipment to make up for areas they are lacking. Collaboration is the rule and not the exception and it ranges from an interpersonal, team and corporate partnership [18]. Hence, the notion of ‘collaborative capability’ which Blomqvist and Levy argue is a pre-requisite for knowledge creation based on communication, commitment, and mutual trust [19]. The existence of different layers of collaboration has led to a mixed understanding of the benefits of collaboration [18]. However, when properly defined, collaboration has been found to lead to several benefits such as better organisational performance with regards to knowledge creation, transfer and ingenuity [20]. Other benefits associated with well-defined collaborations are the ability to utilise resources optimally and the creation of positive competition amongst collaborators [20]. Within Nigeria, universities have differed from one another; whereby

the earlier established universities have relatively more experts well versed in research compared to the recently established universities. However, much attention has not been given to inter-university collaboration that may address some of the challenges faced by Nigerian universities.

In this perspective, we discuss the need for enhanced research collaboration in Nigerian universities for quality research output that will considerably raise the ranking and favourably position Nigerian universities among their peers globally. First, we briefly discuss the history of Nigerian universities to highlight potential aspects or peculiarities that may promote research collaboration. Second, we consider the common traits and differences between private and public Nigerian universities. Third, we discuss both local and international aspects of Nigerian university collaboration, focusing on knowledge sharing, collaborative research grant applications and meeting sustainable development targets. Finally, we consider the barriers to effective research collaboration.

2 Historical Perspectives on Nigerian Universities

Four generations of universities exist in Nigeria based on the year of creation. The oldest higher institution in Nigeria was established around the middle of the last century. The university college Ibadan was established in 1947 as an affiliate of the University of London following the recommendation of the Asquith commission of 1943 [21, 22]. This was followed by the establishment of the University of Nigeria, Nsukka (UNN) in 1960 which unlike the university college Ibadan was an autonomous university [23]. In anticipation of the manpower needs that may arise following Nigeria's independence in 1960, the Ashby commission of 1959 recommended the establishment of additional universities to train manpower in each of the regions and Lagos the then country's capital. This birthed the Ahmadu Bello University (ABU) Zaria in the north, the University of Ife (now Obafemi Awolowo University) and the University of Lagos in 1962 both in the west [22, 23].

Additionally, the University College Ibadan gained its autonomy and was now known as the University of Ibadan. With the creation of the mid-west region, another university was established at Benin, the University of Benin [22, 23]. These universities collectively formed what is regarded as first-generation universities in Nigeria. The first generation universities had strong ties with local and international research institutions especially in the UK and USA at the time – which promoted the training of research personnel, scholars, and enhanced research funding, and hence capacity building with great potential for becoming leading global frontiers of the knowledge economy [21–23].

The second-generation universities were established around 1975 in Ilorin, Calabar, Jos, Port Harcourt, Maiduguri, Sokoto, and Kano [22, 24]. They were a consequence of the military government's third national development plan of Nigeria. Third-generation universities were specialized universities focusing on technology and agriculture. These universities were established in the 1980s in Owerri, Akure, Makurdi, Bauchi, and Yola [22]. Also, about the same time, individual state governments began establishing their universities aside from those of the federal government. States such as Imo, Cross River, Lagos, Akwa-Ibom and Ondo state universities were established in the 80s [22, 25].

From the early 1990s, fourth-generation universities came into existence [26]. Several state government-owned universities fall into this category. Nigeria thereafter witnessed the boom of university expansion through private sector participation beginning from early 1999/2000s and upwards [27, 28]. Additional Federal and State universities have also been established during this period. A total of three private universities were established at the onset following the approval by the government in 1999, namely: Igbinedion University, Babcock University and Madonna University [29]. As of the first quarter of 2021, Nigeria had 195 licensed universities, comprising 44 Federal, 52 State, and 99 private universities [30]. Of these universities, only one, the National Open University of Nigeria (NOUN) is an exclusive open and distance learning institution. Recently, a few of the conventional universities now run some limited open and distance learning programmes [31]. The creation of more universities in the country gradually resulted in dwindling international research ties with renowned and leading global institutions due to a reduction in standards of teaching, quality staff and research facilities [32].

3 Common Traits and Differences Between the Universities: Private vs Public

In order to meet the rising demand for higher education by the growing populace, and to improve the quality of education in Nigeria, the Federal Government of Nigeria through the Ministry of Education and Nigerian Universities Commission (NUC) augmented the efforts of public universities and colleges of education by approving the establishment of private universities in 1999 [33]. The increase in the number of universities did not seem to have any significant effect on the number of students gaining admission into the universities. Documented reports reveal that out of over one million candidates seeking admission to Nigerian Universities through the Joint Admission and Matriculation Board (JAMB) exams, only about 450,000 representing approximately 30% were able to gain entrance into 112 universities in the country [34]. It is important to note that both public and private universities are established by acts of parliament and are both regulated by the same regulatory body – the NUC. Entry requirements for fresh students as well as the academic curricula used for teaching is the same for both institutions.

At the same time, both public and private Nigerian universities have their peculiarities. For instance, public universities have access to funding from the government. A certain percentage of the government's annual budget is allocated to the public universities in order to subsidize the running costs of the universities. Over N500billion (approx. \$1billion) has been released by the Federal Government of Nigeria to the federally funded universities between 2000 and 2008 [35]. In addition to the government subventions, the Education Tax Fund (ETF), established by law in 1993 was empowered to carry out major projects within the public universities using funds from the profit of private business organisations operating within the country [35]. The private universities on the other hand rely almost solely on the income realised from tuition fees from students running various degree programmes.

Another notable difference between public and private universities is access to research grants from the Nigerian government. While researchers from public universities are able to access research grants from the Tertiary Education Trust (TET) Fund, a

government agency, researchers from private universities mostly depend on their salaries or seek alternative sources of research grants e.g., from international sources. However, the quality of teaching facilities and manpower are believed to be much better in the private schools because the students pay relatively higher tuition fees than in the public schools [33], and can therefore place a demand on value for their money. This is not the case in most public universities, where tuition fees are quite low and affordable, consequently leading to a higher number of students depending on very few facilities and manpower to cater for them.

Cognisant of these peculiarities, there is a need for both public and private universities to work together to advance the Nigerian knowledge economy. Furthermore, multi-university collaborative research on economy-oriented innovations may substantially help to gradually close the gap between private and public universities, and address some of the critical threats facing the Nigerian university system.

4 Collaborative Research in Nigerian Universities May Drive the Knowledge Economy: Local and International Perspectives

4.1 Knowledge Sharing

Knowledge sharing entails learning, understanding and sharing information, ideas, views and resources [36]. The majority of the universities in Nigeria just like most of sub-Saharan Africa (SSA) are economically challenged and have had negative experiences with research [37] such as lack of research funds, minimal or no government support and limited research-oriented facilities. Oftentimes, researchers from these regions produce less rigorously researched papers that have little or no impact on society [38–41]. Thus, it is crucial to acknowledge the need for collaborative projects and the expertise that partners bring that are central to knowledge sharing.

Indeed, international collaboration, which promotes knowledge sharing, is not new as it has been ongoing in countries like the UK, USA, Germany, France, Japan, Canada, Brazil, South Africa, Pakistan, China [36, 42, 43]. A wide gap exists in knowledge sharing between the universities in SSA, particularly in Nigeria. In Nigeria, incentives exist for academics to work in silos. For example, universities offer higher rewards when research is done individually. Higher points are rewarded for single-authored research papers during the annual appraisal or promotion of academic staff.

Collaboration between universities results in sharing of ideas, resources and skills. Also, researchers are exposed to cutting-edge technologies which they may not likely have access to in their institutions [36]. More importantly, effective collaboration reduces the time required to complete a given research project, leading to faster research output for maximum societal impact and contribution to the knowledge economy.

4.2 Collaborative Research Grants

Research grants are essential means of funding research that promote quality research output and the knowledge economy. The massive research grants awarded by industrialized nations can be harnessed via cutting-edge collaborative research between local

and international institutions. Inter-nation agreements or research funding can also considerably promote research collaboration amongst different institutions.

In addition to helping the career path, productivity and growth of the researcher [44, 45], research grants, indeed, foster a multi-disciplinary collaboration amongst investigators and institutions that results in the acquisition of data or other products that inform decision making for societal benefit. For instance, the National Institutes of Health provides over \$32 billion in research grants per year to conquer diseases, promote a healthy life and reduce disability – which has resulted in life-changing discoveries that established new methods of disease treatments, advancing healthier lives and societal as well as economic growth [45, 46]. In contrast, research funding institutes in Africa, especially SSA countries are poorly developed with very little or no grant mechanisms to inform decision-making or drive monumental changes in the lives of the people [47]. As a result, research output from SSA tends to be weak.

4.3 Meeting Sustainability Targets

Universities are increasingly being challenged to respond to sustainability-oriented problems. These problems could be economically, socially or environmentally based. Economic problems include low GDP growth, low regional net profit and low production per employee [48]. Socially-based problems include diminishing demographic trends and a high unemployment rate whilst environmental problems on the other hand are linked to waste management strategies [48]. Universities are expected to develop curricula to address these problems in terms of quality teaching, research and outreach [48] and introduction of sustainability pedagogy in higher education to tackle sustainability issues at the university level [49].

Embedding sustainability in higher education curriculum is likely to lead to the development of future sustainability leaders [6, 7]. Furthermore, it is essential for universities in the country to adjust to recent developments in research collaboration that includes integrated knowledge translation, in which research partnership between the researcher and the knowledge user provides for productive research through co-generation and implementation of knowledge that ultimately lead to greater knowledge use and socially impactful opportunities in practice [50, 51]. Achieving these sustainability targets would pose substantial difficulties when universities do not align with international best practices.

5 Barriers to Effective Research Collaboration

5.1 Funding and Finding Collaborators

Funding is crucial for the successful take-off and execution of any collaboration. It is also an important aspect of fulfilling the internationalization mandate of universities [52]. However, securing funding is challenging for researchers in Nigeria due in part to the highly competitive nature of the grant application processes [53]. In addition, finding collaborators is also considered a major challenge as Nigerian researchers usually have limited knowledge on how to initiate or follow up the process [47, 53]. Hence, Nigerian researchers tend to work alone with minimal motivation.

5.2 Personal or Family Worries

Nigerian researchers find it challenging to travel especially when they have family commitments. This problem affects women more than men [52, 54]. For instance, women who have children or are nursing are less willing to travel for research purposes [54]. Also, Nigerians have a strong attachment to family members and relatives and have a culture of caring for elderly parents [54]. Thus, leaving family responsibilities for research is onerous.

5.3 Lack of Trust and Respect for Diversity of Disciplines

A major challenge to data sharing in science is the lack of trust in terms of data misuse, ethical or legal infringements [55]. There is a need for researchers and collaborators to establish close working relationships based on mutual trust [55]. Also, another daunting challenge is the diversity of disciplines. A situation whereby researchers collaborate on interdisciplinary research and need to work together including in common and rare languages [55]. For effective collaboration, the researchers will require a working guide to ensure that the views of all the collaborators are respected.

5.4 Poor Internet Infrastructure and the High Cost of International Calls

Poor access to good broadband or fluctuations in internet connection can limit engagement in research [56]. For instance, a recent study conducted in rural and small-town schools showed that a lack of home internet affected researchers' digital skills. This limitation could have a lifelong repercussion for affected researchers [56]. Similarly, the high cost of international phone calls limits global linkage preventing communication between researchers in different countries [57].

Both poor internet infrastructure or fluctuations in internet connectivity and the high cost of international calls are major limitations to research progress and output between collaborators in Nigeria and abroad [58]. Digital infrastructure is still grossly underdeveloped in Nigeria with the country ranking 105th out of a total of 137 for access to the internet [59]. Only about 0.05% of people residing in the country have access to fixed broadband subscriptions according to documented reports [59]. Although the Nigeria University's Commission (NUC) in collaboration with the World Bank established the Nigerian Research and Education Network (NgREN), which is meant to support digital communication, and sharing of resources across about 40 universities, there is still, no national repositories that hold research publications or data for the purposes of research and learning.

6 Conclusion

Collaborative research requires careful planning and is key to improving knowledge sharing, the attraction of research grants and the attainment of sustainability goals. However, this is not straightforward, as barriers such as inadequate funding and lack of trust and respect for diversity of disciplines could affect smooth collaboration.

A decrease in inter-university ties and research collaboration results in a considerable reduction in quality research output by the universities in the country [32]. Hence, activating sustainable research collaboration and inter-university ties once enjoyed by first-generation universities may serve as a panacea to some of the current challenges faced by Nigerian universities.

There is a need to create a collaborative space by bringing researchers from different backgrounds together to understand the language of each other, foster respect for each other's approaches to research and provide more training on interdisciplinarity in research. Also, there is a need to advise all university stakeholders on the advantage of collaboration and increased funding. The funding can also be extended to include the private universities to compete for the grants based on merit.

In addition, it is pertinent to call the attention of university stakeholders to encourage collaboration by discouraging single-authored publications (it should be given the least points during promotion exercises) and promoting collaborative work to be published in high-impact journals. Also, to solve contemporary and local problems, there is a need to encourage inter-governmental agencies and industry collaborations in SSA countries, as it used to be in developing countries. Finally, Nigerian universities should reach out to researchers with mutual research interests at home and abroad for more successful and impactful research.

References

1. Saint, W., Hartnett, T.A., Strassner, E.: Higher education in Nigeria: a status report. *High Educ. Pol.* **16**(3), 259–281 (2003)
2. Boulton, G., Lucas, C.: What are universities for? *Chin. Sci. Bull.* **56**(23), 2506–2517 (2011)
3. Liu, N.C., Cheng, Y.: The academic ranking of world universities. *High. Educ. Eur.* **30**(2), 127–136 (2005)
4. Piro, F.N., Sivertsen, G.: How can differences in international university rankings be explained? *Scientometrics* **109**(3), 2263–2278 (2016). <https://doi.org/10.1007/s11192-016-2056-5>
5. Hicks, D.: Performance-based university research funding systems. *Res. Policy* **41**(2), 251–261 (2012)
6. Lozano, R., Merrill, M.Y., Sammalisto, K., Ceulemans, K., Lozano, F.J.: Connecting competences and pedagogical approaches for sustainable development in higher education: a literature review and framework proposal. *Sustainability* **9**(10), 1889 (2017)
7. Taimur, S.: Pedagogical training for sustainability education. In: Leal Filho, W., Azul, A.M., Brandli, L., Özuyar, P.G., Wall, T. (eds.) *Quality Education. Encyclopedia of the UN Sustainable Development Goals*, pp. 611–621. Springer, Cham (2020). https://doi.org/10.1007/978-3-319-95870-5_51
8. Leydesdorff, L., Bornmann, L., Comins, J.A., Milojević, S.: Citations: indicators of quality? The impact fallacy. *Front. Res. Metrics Analyt.* **1**, 1 (2016)
9. Schendel, R., McCowan, T.: Expanding higher education systems in low-and middle-income countries: the challenges of equity and quality. *High. Educ.* **72**(4), 407–411 (2016)
10. Afolayan, F.O.: Funding higher education in Nigeria. *J. Res. Method Educ.* **1**, 63–68 (2015)
11. Gambo, O.O., Fasanmi, S.A.: Funding university education in Nigeria: the challenges and way forward. *Bulg. J. Sci. Educ. Policy* **13**(1), 80–91 (2019)
12. Onuka, A.: *Funding the Nigerian University Education: Role of Various Stakeholders* (2008)

13. Offem, O.O., Anashie, A.I., Aniah, S.A.: Effect of strikes on management and planning of educational activities in Nigerian universities. *Glob. J. Educ. Res.* **17**(1), 1–8 (2018)
14. Odiagbe, S.A.: Industrial Conflict in Nigerian Universities: A Case Study of the Disputes Between the Academic Staff Union of Universities University of Glasgow ASUU and the Federal Government of Nigeria (FGN). (2012)
15. Omonijo, D., Uche, C., Okunlola, O., Anyaegbunam, M., Adeleke, V.: Exploring factors responsible for the poor ranking of scholars and tertiary institutions in Nigeria In: Exploring Factors Responsible for the Poor Ranking of Scholars and Tertiary Institutions in Nigeria, p. 4250. Nigeria (2018)
16. https://www.timeshighereducation.com/world-university-rankings/2021/world-ranking#!/page/0/length/-1/sort_by/rank/sort_order/asc/cols/stats
17. Sonnenwald, D.H.: Scientific collaboration. *Ann. Rev. Inf. Sci. Technol.* **41**(1), 643–6819 (2007)
18. Smith, D.: Collaborative research: policy and the management of knowledge creation in UK universities. *High. Educ. Q.* **55**(2), 131–157 (2001)
19. Blomqvist, K., Levy, J.: Collaboration capability—a focal concept in knowledge creation and collaborative innovation in networks. *Int. J. Manag. Concepts Philos.* **2**(1), 31–48 (2006)
20. Sepuru, M., Musonda, I., Okoro, C.S.: An assessment of factors influencing collaboration impacts on organisational performance: a review. In: *Collaboration and Integration in Construction, Engineering, Management and Technology*, pp. 321–325 (2021)
21. Abrokwa, C.: Colonialism and the development of higher education. In: *Re-thinking Post-colonial Education in Sub-Saharan Africa in the 21st Century*, pp. 201–220. Sense Publishers, Rotterdam (2017). https://doi.org/10.1007/978-94-6300-962-1_12
22. Ejoigu, A., Sule, S.: Sixty-Five Years of University Education in Nigeria: Some Key Cross Cutting Issues. *Bulgarian Comparative Education Society* (2012)
23. Anyebe, A.A.: Nigerian University and its mandate in a changing world. *e-Bangi* **11**(2), 048–062 (2014)
24. Awe, B.A.: Quality and stress in Nigerian Public Universities. *Am. J. Educ. Res.* **8**(12), 914–925 (2020)
25. Nyewusira, B.: Politics and the establishment of public universities in Nigeria: Implications for University Education. *Politics* **5**(19) (2014)
26. Otonko, J.: University education in Nigeria: history, successes, failures and the way forward. *Int. J. Technol. Incl. Educ.* **1**(2), 44–48 (2012)
27. Obasi, I.N.: Analysis of the emergence and development of private universities in Nigeria (1999–2006). *J. Higher Educ. Afr./Revue de l'enseignement supérieur en Afrique* **5**(2–3), 39–66 (2007)
28. Okoro, N.P., Okoro, E.O.: Time and change: development of private universities in Nigeria. *Time Change: Dev. Private Univ. Nigeria* **5**(9), 1–7 (2014)
29. Ademola, E., Ogundipe, A., Babatunde, W.: Students' enrolment into tertiary institutions in Nigeria: the influence of the founder's reputation—a case study. *Stud. Enrol. Tertiary Inst. Nigeria* **5**(3), 1–28 (2014)
30. National Universities Commission homepage. <http://nuc.edu.ng>. Accessed 10 Jan 2022
31. Ofole, N.M.: Social loafing among learner support staff for open and distance education programmes in south-western Nigeria: the imperative for counselling intervention. *Open Learn. J. Open, Dist. e-Learn* **37**, 1–18 (2020)
32. Asiyai, R.I.: Challenges of quality in higher education in Nigeria in the 21st century. *Int. J. Educ. Plan. Admin.* **3**(2), 159–172 (2013)
33. Ajadi, T.O.: Private universities in Nigeria—the challenges ahead. *Am J. Sci. Res.* **1**(7), 1–10 (2010)
34. Iruonagbe, C., Imhonopi, D., Egharevba, M.E.: Higher education in Nigeria and the emergence of private universities. *Int. J. Educ. Res.* **3**(2), 49–64 (2015)

35. Ogbogu, C.: Modes of funding Nigerian universities and the implications on performance. *J. Int. Educ. Res.* **7**(4), 75–82 (2011)
36. Parekh, R.A.: Knowledge sharing: collaboration between universities and industrial organisations. In: *International Conference on Academic Libraries (ICAL-2009)*, pp. 146–151. University of Delhi, India (2009)
37. Bosma, L.M., Sieving, R.E., Ericson, A., Russ, P., Cavender, L., Bonine, M.: Elements for successful collaboration between K-8 school, community agency, and university partners: the lead peace partnership. *J. Sch. Health* **80**(10), 501–507 (2010)
38. Rohwer, A., Wager, E., Young, T., Garner, P.: Plagiarism in research: a survey of African medical journals. *BMJ Open* (11), e024777 (2018)
39. Thomas, A., De Bruin, G.P.: Plagiarism in South African management journals. *S. Afr. J. Sci.* **111**(1–2), 01–03 (2015)
40. Adeleye, O.A., Adebamowo, C.A.: Factors associated with research wrongdoing in Nigeria. *J. Emp. Res. Hum. Res. Ethics* **7**(5), 15–24 (2012)
41. Okonta, P., Rossouw, T.: Prevalence of scientific misconduct among a group of researchers in Nigeria. *Dev. World Bioeth.* **13**(3), 149–157 (2013)
42. Niu, F., Qiu, J.: Network structure, distribution and the growth of Chinese international research collaboration. *Scientometrics* **98**(2), 1221–1233 (2013). <https://doi.org/10.1007/s11192-013-1170-x>
43. Sabah, F., Hassan, S.-U., Muazzam, A., Iqbal, S., Soroya, S.H., Sarwar, R.: *Scientific Collaboration Networks in Pakistan and Their Impact on Institutional Research Performance: A Case Study Based on Scopus Publications*. Library Hi Tech (2019)
44. Bajaj, S.S., et al.: National institutes of health R01 grant funding is associated with enhanced research productivity and career advancement among academic cardiothoracic surgeons', In: *National Institutes of Health R01 Grant Funding Is Associated with Enhanced Research Productivity and Career Advancement Among Academic Cardiothoracic Surgeons*. Elsevier (2020)
45. Jacob, B.A., Lefgren, L.: The impact of research grant funding on scientific productivity. *J. Public Econ.* **95**(9–10), 1168–1177 (2011)
46. Schneider, W.H.: The origin of the medical research grant in the United States: the Rockefeller Foundation and the NIH extramural funding program. *J. Hist. Med. Allied Sci.* **70**(2), 279–311 (2015)
47. Osagie, R.O.: Federal Government Funding of Research in Universities in Nigeria, the University of Benin as a Case Study. *Int. Educ. Stud.* **5**(6), 73–79 (2012)
48. Lukman, R., Krajnc, D., Glavič, P.: Fostering collaboration between universities regarding regional sustainability initiatives—the University of Maribor'. *J. Clean. Prod.* **17**(12), 1143–1153 (2009)
49. Sandri, O.: What do we mean by 'pedagogy' in sustainability education?. *Teach. High. Educ.* **27**(1), 1–16 (2020)
50. Sibbald, S.L., Kang, H., Graham, I.D.: Collaborative health research partnerships: a survey of researcher and knowledge-user attitudes and perceptions. *Health Res. Policy Syst.* **17**(1), 1–10 (2019)
51. Zych, M.M., Berta, W.B., Gagliardi, A.R.: Conceptualising the initiation of researcher and research user partnerships: a meta-narrative review. *Health Res. Policy Syst.* **18**(1), 1–18 (2020)
52. Fox, M.F., Realff, M.L., Rueda, D.R., Morn, J.: International research collaboration among women engineers: frequency and perceived barriers, by regions. *J. Technol. Transf.* **42**(6), 1292–1306 (2016). <https://doi.org/10.1007/s10961-016-9512-5>
53. Yozwiak, N.L., et al.: Roots, not parachutes: research collaborations combat outbreaks. *Cell* **166**(1), 5–8 (2016)

54. Karatepe, O.M., Magaji, A.B.: Work-family conflict and facilitation in the hotel industry: a study in Nigeria. *Cornell Hosp. Q.* **49**(4), 395–412 (2008)
55. Parsons, M.A., et al.: A conceptual framework for managing very diverse data for complex, interdisciplinary science. *J. Inf. Sci.* **37**(6), 555–569 (2011)
56. Hampton, K., Fernandez, L., Robertson, C., Bauer, J.M.: Broadband and student performance gaps. SSRN 3614074 (2020)
57. Vertovec, S.: Cheap calls: the social glue of migrant transnationalism. *Global Netw.* **4**(2), 219–224 (2004)
58. Oyelaran-Oyeyinka, B., Adeya, C.N.: Internet access in Africa: empirical evidence from Kenya and Nigeria. *Telemat. Inform.* **21**(1), 67–81 (2004)
59. Fosci, M., Loffreda, L., Chamberlain, A., Naidoo, N.: Assessing the Needs of the Research System in Nigeria. Report for the SRIA Programme (2019)