



Research Article

Harnessing Global Partnerships to Elevate Actuarial Science in Developing Nations: Fostering Innovation, Educational Growth, and Inclusive Development

Daniel Sanusi¹ , James Uhomoibhi^{2,*}

¹Department of Computer and Information Technology, Veritas University, Abuja, Nigeria

²Faculty of Computing, Engineering & Built Environment, Ulster University, Belfast, United Kingdom

Abstract

Actuarial science is critical for assessing financial risk, supporting insurance systems, and promoting long-term economic stability; however, many developing countries face structural barriers to advancing the profession, such as limited educational infrastructure, insufficient technological capacity, and a shortage of skilled professionals. This study investigates how global partnerships might increase actuarial ability in different circumstances by conducting an exploratory qualitative synthesis of academic literature, recorded case studies, and institutional reports from key professional organisations. International collaboration fosters curriculum development, faculty training, technology adoption, knowledge transfer, the creation of inclusive financial solutions like microinsurance, and the modernisation of actuarial approaches, according to the findings. In addition, the study highlights possible hazards such as institutional dependence and an excessive reliance on outside knowledge that, if not adequately addressed, may hinder long-term local capacity building. Consequently, the study highlights the significance of partnership models founded on long-term institutional ownership, organised capacity growth, and mutual benefit. This study provides a structured framework for understanding how international cooperation can advance actuarial education, innovation, and inclusive financial-sector development in emerging economies by integrating perspectives from actuarial science, development studies, and educational collaboration.

Keywords

Actuarial Science, Developing Nations, Capacity Building, International Collaboration, Knowledge Sharing, Actuarial Education

1. Introduction

Actuarial science is crucial in influencing decisions about finance-related risks as it concerns the sustainability of insurance, pensions, and investment businesses [1]. However, the field is still in its infancy in many third-world countries because of inadequate access to education, infrastructure, and

professional practitioners. Today, actuarial skills are required in growing fields such as healthcare, climate risk, and social security, to name a few; there is a need to foster capacity within countries [18]. Global partnerships constitute a hopeful solution because they help share experiences and knowledge,

*Correspondence: James Uhomoibhi (d.sanusi@ulster.ac.uk)

Received: 19 February 2026; **Accepted:** 28 February 2026; **Published:** 10 August 2026



Copyright: © The Author(s), 2026. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

stimulate innovation, and respond to regional-level patterns. Collaborations between universities, professional bodies, and private organisations can help develop the actuarial science structure in developing countries. Actuarial education, system and product innovation, and inclusive development are areas where partnerships/internationalisation have a positive impact. It also considers observed challenges, including the possible long-term dependence on imported skilled personnel and other factors, and ways to achieve effective and long-term homegrown advancement in the actuarial profession.

While prior studies address actuarial education, international collaboration, and financial inclusion separately, few research comprehensively integrates these components within the context of developing countries. Much of the literature focuses on technical actuarial improvements in rich economies or broad development cooperation frameworks, but does not directly link them to actuarial capacity building. This study adds to the literature by presenting an integrated conceptual synthesis of global collaborations, educational progress, technology innovation, and inclusive finance systems in new actuarial ecosystems. By framing these factors within a capacity-building and sustainability perspective, the research advances a structured understanding of how international collaboration can develop actuarial institutions while avoiding long-term dependency.

2. Methodology

A qualitative research method has been adopted to determine how global partnerships impact the advancement of actuarial science in developing nations. This approach was appropriate because the research involved a multifaceted and case-oriented problem of education, personal and professional development, and economic activities. The conclusions in this research were drawn based on the literature review, secondary data collection, and case analysis.

2.1. Literature Review

In the study's first phase, a literature search was conducted involving international partnerships in actuarial science research, emphasising peer-reviewed journals, business and industry reports, and white papers. Other sources included printed and electronic journals, journals from the Society of Actuaries (SOA), and the International Actuarial Association (IAA). This review offered a theoretical framework within which such international collaborations might alter the patterns of educational opportunity, foster technological improvements, and boost local parties' capabilities.

Despite growing recognition of international collaboration in higher education and financial development, limited scholarship directly examines how these partnerships specifically shape actuarial institutional capacity in developing economies. This study addresses that gap by synthesising interdisciplinary insights into a focused actuarial-development framework.

Inclusion and Exclusion Criteria

The literature selection process was guided by specific inclusion and exclusion criteria to improve methodological transparency. Peer-reviewed journal articles, institutional reports from recognised actuarial organisations (such as international actuarial association), and recorded case studies released between 2009 and 2024 were among the sources. One or more of the following dimensions, actuarial education, international academic collaboration, technology innovation in actuarial practice, or actuarial contributions to inclusive financial systems in developing or underdeveloped countries, were addressed by the sources that were selected.

Opinion articles lacking a philosophical or empirical foundation, unpublished comments, and papers lacking a clear methodological explanation were among the materials excluded. This selection process assured academic reliability while being thematically relevant.

2.2. Data Sources

Information was obtained from various databases, Google Scholar and JSTOR. Therefore, the results of this study were investigated by analysing the published articles, conference proceedings, and official reports related to this issue. Part of the documents also highlighted successful country partnerships, for example, in Kenya, South Africa, and India, where partnerships have been central to the development of actuarial education and practice.

2.3. Case Study Analysis

Examples were adapted to dissect various partnership models to offer a specialised association of several models. These case studies also presented diverse collaborations, including faculty exchange, online learning and teaching, and research collaboration. For example, (The Actuarial Society of Kenya) TASK's collaborations with other international organisations, such as the SOA, demonstrated how the training and curriculum enhancement programs could enhance existing local talent in actuarial knowledge.

2.4. Key Themes Identification

To achieve the purposes of the study, the collected data were coded qualitatively to recognise patterns and themes. Three primary themes emerged:

- 1) Educational Growth: Maintaining and building region-specific curricula, offering scholarships, and increasing the quality of teachers were named priorities that should not be omitted by parties eager to achieve the aims of cooperation.
- 2) Innovation in Actuarial Practice: This allowed the establishment of relevant connections to implement new technologies, such as data analysis and machine learning, to

respond to specific geographic issues using local people's knowledge.

- 3) Inclusive Development: In many collaborative efforts, improving financial tools for excluded groups, including microinsurance and social protection, was emphasised.

Coding and Thematic Development

Thematic analysis followed an inductive-deductive coding strategy. Initially, open coding was used to find recurring topics throughout the examined materials. These preliminary codes were then classified into wider categories that represent trends in educational progress, innovative dissemination, and inclusive financial application. A deductive step followed, which matched the emergent themes with capacity-building and sustainability frameworks found in development literature.

Themes were kept if they emerged regularly across numerous independent sources and showed conceptual consistency with the study's goals. This rigorous coding approach improved analytical validity while reducing subjective interpretation bias.

2.5. Data Synthesis and Analysis

This paper adopted thematic synthesis as the primary approach to analysing the data collected to make conclusions regarding the effects of global partnerships on actuarial science in developing countries. This comprised using codes to sort information under the revealed themes, examining findings, and assessing the level of impact of partnerships on local capacity, sustainability, and development.

2.6. Limitations

Some of the limitations noted in the method were as follows:

First, there is a problem with secondary data use, which may result in the availability and quality of the published materials. However, this research was concerned with documented case studies and omitted informal and undocumented partnerships. Data was cross-referenced from different sources to overcome limitations such as sample sizes and lack of control over participant scheduling. Hence, reliability and validity were assured. Thus, utilising the qualitative approach gave detailed insights into global partnerships' benefits to developing actuarial science in developing nations. In synthesising literature review and research from case studies and reports, the study focused on the areas of difference, such as educational development, innovation, and inclusion. Because of this cross-sectional approach, it was possible to identify the potential benefits of international collaborations in actuarial education and practice and threats.

Although qualitative synthesis provides conceptual depth, the absence of primary empirical data limits causal inference. Future research may benefit from mixed-method approaches incorporating interviews with actuarial educators, policymakers, and practitioners in developing regions to empirically validate the proposed partnership framework.

3. Results

3.1. Argument and Evidence

Global Partnerships and Knowledge Transfer

Knowledge transfer is one of the most valuable aspects of global partnerships in actuarial science [3]. Such collaborations are a game-changer in developing nations where opportunities to gain in actuarial sciences education and knowledge are often scarce or unavailable. Knowledge transfer is the process of sharing information, skills, research, and good practices from well-developed universities and institutions to those universities and institutions in developing regions [6]. This transfer helps develop the essential framework needed to support the fledgling profession and take a more complex look at local problems. Through this sharing, developing nations can obtain the resources required in the international market.

The partnership between the SOA and African universities is an excellent example of how international cooperation can result in local curricula. These efforts are planned and directed toward the needs of the particular region. The curricula are adjusted to correspond to the economic and social structure in South Africa. Therefore, actuarial programs in Africa may have more inclination toward risks in areas such as agriculture, health, or climate because of the needs of people in that region. The assistance in the development of actuarial programs and the development of the capacity of the academic staff provides SOA support, as well as core items such as study packs and scholarships. This partnership not only strengthens the technical proficiency of future actuaries but also ensures that training meets the demands of developing countries, where roles in traditional pure actuarial fields such as life insurance or pensions can differ in size and scope.

Moreover, partnerships foster research that supplements the advancement of actuarial science in developing countries. Collaboration between developed and developing countries' institutions enables the investigation of region-specific risks and opportunities [4]. For example, universities in developed countries offer state-of-the-art modelling methods and technological support, while local universities offer essential information about local risks. The generated research advances international scholarship and solves immediate concerns like access to critical financial services, healthcare affordability, and dangers posed by calamities. Such synergies create a solid local research base and advance the scholarly area of actuarial science by integrating different approaches.

In conclusion, knowledge transfer also helps to overcome the significant barriers to actuarial education in developing nations. Developing countries have access to less qualified faculty, limited access to study materials, and insufficient technological infrastructure. Global partnerships can address these challenges by providing faculty exchange programs, access to digital libraries, and online courses. By leveraging modern technology, such as virtual classrooms and e-learning platforms, students in developing nations can access high-quality

actuarial education without needing significant physical resources. This democratisation of knowledge ensures that aspiring actuaries in developing countries have the same opportunities to learn and grow as their counterparts in more developed regions.

Educational Growth through Collaborative Programs

Knowledge transfer also assists in the elimination of the colossal impediments to actuarial education in developing countries. Developing countries need help with problems like a shortage of qualified teachers, scarcity of books and other informative materials, and inadequate provision of technologies [16]. These characteristics can be solved by cooperating with universities from different countries by creating a faculty exchange, providing access to online libraries, and offering online courses. With the current advanced technology, there is a need for extensive infrastructure to conduct virtual classes and e-learning, which means that students in developing nations can embrace actuarial education within the available technology [20]. That democratisation of knowledge implies that those who wish to become an actuary in a developing country also have equal chances of achieving the same goals as their counterparts in developed countries.

Moreover, international actuarial societies and institutions also actively increase access to education in actuarial science within developing countries. Incubating people through scholarships, exchange programs, and research collaborations is part of international relationships that enable the growth of a new generation of actuaries in less-represented areas [9]. This growth is crucial given that there is a need for more qualified professionals in the actuarial profession in many developing countries with limited access to education and training institutions.

Some of the most extensive international efforts in developing standards include the International Actuarial Association. The IAA has developed several projects to enhance the quality of actuarial education in the developing world by offering mentoring programs, skill enhancement seminars, and online learning resources [7]. These programs are meant to address the gap between the emerging actuaries in developing countries and the resources and professional companies in developed markets. For example, mentorship programs pair students with actuaries, offering general advice on exam-taking and the actuarial profession and practical teaching on actuarial concepts. Unlike typical classroom training environments, these mentorship positions provide technical expertise and professional development for the students while learning about issues and their resolutions in situations related to the actuary career path.

Fostering Innovation and Problem-Solving

Technology is essential for societies to deal with socio-economic and ecological issues in the third world. Areas like climate risks, health financing, social security, and disaster management are complex problems that need innovative solutions that can respond to local contexts [19]. As these solutions involve prediction, risk evaluation, and financial management,

actuarial science proves inevitable when developing these solutions. Global partnerships can improve the capability of actuaries based in developing countries through the transfer of sophisticated technologies, methodologies, and expertise from comparative global partners to provide solutions that address local challenges.

Global partnerships' key benefits include sharing state-of-the-art technologies such as artificial intelligence (AI), big data and analytics, and machine learning (ML) [2]. Such tools are becoming valuable in the actuarial profession as they provide actuaries with enhanced and refined means of creating better speculative models, improving risk assessment, and providing enlightenment to financial control and insurance systems. Utilisation of these technologies remains high and elusive to most developing regions; these partnerships present the window to the world of emerging technologies. When AI and ML are integrated into the actuarial practice, actuaries in developing countries can optimise big data, pinpoint and analyse risks, and likely create solution-finding approaches to existing issues, including climate change, healthcare financing, and pension systems stability.

Moreover, global collaboration will allow developing nations to mitigate the constantly increasing threats associated with climate change. Developing nations experience climatic conditions like drought, floods, and storms since climate change has caused much havoc to agriculture, infrastructure, and human health [15]. AI can help actuaries make future predictions and evaluate events that might happen so that governments and businesses can create insurance plans, social protections, insurance products, and financial tools [5]. Developing countries can approach other international actuarial bodies or firms to acquire the most advanced climate modelling tools and data analysis methodologies relevant to risk and policy analysis to achieve this.

Inclusive Development through Actuarial Science

Actuarial science is a critical enabler for the progressive improvement of the social protection necessary for inclusive development worldwide by delivering sound analytical methods to support the required financing of healthcare and insurance products that positively impact a range of needy and disadvantaged citizens [11]. While many developing countries continue to struggle with poverty, inequality, and a lack of adequate social protection systems, the job of actuaries becomes even more critical in developing efficient financial solutions to those problems. Developing countries must have the necessary quantitative support to implement the inclusive financial solutions required to foster sustainable growth.

Moreover, actuarial science supports inclusive development through risk management techniques in designing social protection programs that support vulnerable groups. Insurance analysts and actuarial scientists provide policy advisors with projections to control expenditures regarding legislation such as unemployment benefits, pensions, and health insurance [14]. This predictive ability guarantees that social protection

systems are financially sustainable and output-oriented in protecting socially vulnerable groups such as the elderly, unemployed, and low-income earners. Inshoring can enable actuaries to forecast future costs and advise governments on policy solutions that will allow them to pursue equity with prudential fiscal solvency [17], help governments allocate resources efficiently, and prevent social programs from reaching their breaking point.

Partnerships extend this inclusion to strengthen the flow of developed nations and disseminate knowledge, skills, and practices from developed to developing countries. These collaborations assist local actuaries in transmitting local knowledge on effectively managing complicated financial systems and creating sound financial products for everyone. For example, partnerships with other international actuarial organisations and local institutions allow the development of specific training programs necessary to produce qualified national actuaries who understand the nature of regional issues [17]. Raising this capacity is crucial for those developing countries to design and implement effective social protection systems for people with low incomes that will not be inefficient.

3.2. Counterarguments

Global partnerships in actuarial science and development in developing countries have numerous benefits but also come with criticism.

Over-reliance on Foreign Expertise

A common argument against international collaborations is "brain drain," where developing countries rely on the skills and knowledge of foreign professionals [13]. Critics state that this reliance is dangerous since it discourages the development of institutions within the state and reduces its potential for unique product development. They fear this often leads to local professionals being blinded by the possibilities contained within existing global norms and standards in their various speciality fields. Consequently, this self-organising profession in actuarial science might not be able to sustain itself.

However, it is necessary to note that proper partnership development that focuses on enhancing all capacities with local people can help build local institutions' capacity and improve their knowledge base. For example, partnerships may focus on training and development with local experts, providing practice development skills, such as developing local mentorship schemes where international actuarial practitioners work alongside local professionals. It centralises control and, at the same time, maximises the dissemination of valuable recommendations from foreign professionals.

Stifling Local Innovation

Critics also argue that foreign methodologies and practices may slow the local research and development of actuarial methods [10]. They claim that while global players define the relations, local realities, and traditional knowledge,

the resulting solutions may need to be revised for developing countries. This issue considers the areas where cultural, economic, and environmental circumstances dampen actuarial considerations tremendously. However, this argument can be mitigated by guaranteeing that international collaboration is framed to encourage mutual exchange. With such a model, cooperation could lead to a mutual exchange of knowledge rather than an imposition of foreign expertise in the local countries. This reciprocity makes it possible to incorporate community needs in actualising actuarial services. For example, successful partnerships and collaborations may help develop localised actuarial models that may be useful in understanding current developmental issues prevalent in the developing world [12].

Addressing the Risk of Dependency

Another emerging criticism of globalisation for partnerships is developing countries' reliance on international donors and expert advice. Social critics have argued that too much dependence on outside aid and support from developing nations means that actuarial programs will fail when foreign support is withdrawn. This could deter the growth of the actuarial profession in those regions in the long run.

However, this argument can be mitigated by promoting partnership models for sustainable development through local capacity development. The global partnerships should be "designed with an eye towards exits"; the objective should be to achieve minimal foreign presence over time as domestic actors gain experience and skills. This kind of staggered approach facilitates a move from dependence to collaboration, making it possible for the local actuarial bodies to drive their manner of development.

In conclusion, contrary to the criticism of cross-border partnerships in actuarial science, these dilemmas can easily be managed provided adequate planning and execution. Establishing capacity and knowledge transfer encourages a successful symbiosis of the vitality of foreign markets while enabling developing nations to exploit potential innovations. By celebrating and debunking the counterarguments that exist for global alliances, the pressure for actuarial science partnerships to provide economic development for developing countries is eased while, at the same time, highlighting how these collaborations can advance the profession and enhance the quality of life of citizens of developing nations.

4. Discussion

The results highlight the three-way contribution of global partnerships in the use of actuarial science to aid developing nations. Such partnerships enhance knowledge exchange and sharing, contribute to educational development, enhance innovation and encourage inclusive growth to counter arguments like overreliance on foreign expertise, lack of suppression of local individuality and dependency risks.

4.1. Knowledge Transfer Through Global Partnerships

The study also appreciates the knowledge cascade, where institutions in developed nations pass their resources, skills and practices to those in developing continents. This coincides with Embrechts and Wüthrich, who note that cooperation at the international level can go a long way to reverse the problem of limited access to actuarial learning and material in developing countries [3]. As found by Iqbal, the adoption of programmes to serve regional needs, such as agriculture and health risks in African actuarial programmes through curricula, also supports Iqbal's findings regarding the applicability of regional variations in knowledge transmission [6]. These developments ensure the relevance of the profession to local socio-economic issues, thus contributing to arguments that partnerships enhance technical appreciation and application. For instance, the Organisation for Economic Co-operation and Development opined that much emphasis is placed on foreign expertise, which means that indigenous capacity would be constrained [11]. However, the research findings debunk this criticism by asserting that strategic partnerships entail strategies for building local capacity, including developing faculty through learning and development, training of mentors and development of region-specific actuarial models.

4.2. Educational Growth via Collaborative Programs

The outcomes indicate that global partnerships help to reduce educational disadvantages in developing countries by offering access to faculty mobility, digital libraries and online universities. Rodriguez-Segura agrees with this postulation, arguing that e-learning brings quality education to the students [16]; hence, the students in resource-constrained environments can acquire a similar level of expertise as those in the developed nations. This viewpoint is supported by the fact that the wave of initiatives and proposals coming from institutions such as the International Actuarial Association includes the provision of scholarships, mentors, and skill enhancement seminars [7]. However, there is a certain danger in the orientation to external support. In this respect, the findings suggest the development of sustainable partnership models at every stage of which withdrawal strategies would be considered to avoid such dependence; Bruce et al. have a similar opinion, recommending strengthening a local base for the independent development of actuarial programs [21].

4.3. Innovation and Problem-Solving Through Technology

Personalised recommendations for improvement of the findings: Despite endorsing the use of new technologies such as artificial intelligence, big data, and machine learning in

contemporary actuarial practices across developing nations, nowhere did the research express any possible effects or implications. Similar to the findings presented here, Dai and Bo-roomand stress that these technologies revolutionise the approaches to risk assessment and financial modelling [2]. When these tools are implemented in actuarial science, emerging nations address regional issues, for instance, climate change, financing of healthcare, and social security [5]. However, critics are quick to point out that using the AI embrace of technological methods may reduce local innovation. However, the results imply that partnerships can facilitate the sharing of ideas back and forth to establish localised constructs. Mugisha echoes this opinion for the reason that the amalgamation of cooperation can encourage the development of unique solutions respecting cultural and environmental differences, which had been the criticism for the global ones [12].

4.4. Actuarial Science and Inclusive Development

This work also finds actuarial science useful for the development of inclusive systems relating to sustainable social issues, such as poverty and inequality. Ngwenduna and Mbuva also support the idea that actuaries are the main actors in designing financially viable programmes for vulnerable groups, shifting in the unemployment benefits, pensions, and healthcare findings of actuarial science [22]. In addition, the partnership model enhances the acquisition of special skills and practice for local professionals, as well as fairly distributing resources. Sheedy and Jepsen have similar opinions, calling for the enhancement of the role of actuarial skills, which can enhance the stability of the effectiveness of social exports by the economically disadvantaged areas [17].

4.5. Addressing Criticisms of Global Partnerships

The findings are useful in responding to the following criticisms: relying on consultants, limiting domestic creativity, and dependency on risks. The results indicate that these challenges can be neutralised by focusing on capacity-building activities and sustainable partnership approaches. The fact of the gradual replacement of foreign actors by local ones identified in the findings corresponds with Kousky et al. [8]; it guarantees that partnership exposes people to independence rather than making them dynamically dependent. Nonetheless, partnership sustainability depends on governance design. Without clearly defined transition mechanisms, power asymmetries may persist, particularly where funding structures are externally controlled. Therefore, accountability frameworks, measurable capacity indicators, and structured leadership transfer mechanisms are essential components of responsible actuarial internationalisation.

The implications of this study suggest how international collaborations may enhance actuarial science in emerging

countries. Toward that goal, the primary advantages that are derived from the present study are as follows: Knowledge transfer, educational growth, technological innovation and inclusive development outcomes find support in the literature. Despite such criticisms as over-dependence, innovation suppression, and dependency risks, these can be effectively countered by the views of strong partnership models that are based on reciprocity, capacity building and sustainability. These outcomes support the notion not only that collaborations with universities from all over the world contribute to the development of the actuarial profession but also that they help solve socio-economic problems in the developing states.

5. Conclusion

Global partnerships, in particular, are of tremendous importance in developing countries by filling known educational gaps, promoting the technological development of actuarial science, and encouraging the development of inclusive, sound financial systems. Such partnerships offer connections to international learning and empower professionals to rise to region-specific issues. Some of these are new practices and approaches that support local actuaries in developing new and effective solutions for increasing financial stability in disadvantaged areas. However, threats, including over-dependency on outside professionals and possible constraints to home-grown innovation, must be controlled for. Organisational capacity should be considered, and capacity development and local professional capacity should be encouraged. These collaborations can support permanent economic development and sustainable growth for members and the actuarial profession in developing areas by stressing mutual knowledge exchange and local ownership.

Abbreviations

AI	Artificial Intelligence
IAA	International Acturial Association
ML	Machine Learning
OECD	Organisation for Economic Co-operation and Development
SOA	Society of Actuaries
TASK	The Actuarial Society of Kenya

Author Contributions

Daniel Sanusi: Data curation, Formal Analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing, Conceptualisation, Visualisation

James Uhomoibhi: Project administration, Resources, Supervision, Validation, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Chan, K. C., & Liano, K. (2009). Influential articles, journals, and institutions in risk management and insurance. *Risk Management and Insurance Review*, 12(1), 125–139. <https://doi.org/10.1111/j.1540-6296.2009.01156.x>
- [2] Dai, D., & Boroomand, S. (2021). A review of artificial intelligence to enhance the security of big data systems: State-of-art, methodologies, applications, and challenges. *Archives of Computational Methods in Engineering*, 29(2), 1291–1309. <https://doi.org/10.1007/s11831-021-09628-0>
- [3] Embrechts, P., & Wüthrich, M. V. (2022). Recent challenges in actuarial science. *Annual Review of Statistics and Its Application*, 9(1), 119–140. <https://doi.org/10.1146/annurev-statistics-040120-030244>
- [4] Espey, J. (2019). Sustainable development will falter without data. *Nature*, 571(7765), 299. <https://doi.org/10.1038/d41586-019-02139-w>
- [5] Hassani, H., Unger, S., & Beneki, C. (2020). Big data and actuarial science. *Big Data and Cognitive Computing*, 4(4), 40. <https://doi.org/10.3390/bdcc4040040>
- [6] Iqbal, A. (2021). Innovation speed and quality in higher education institutions: The role of knowledge management enablers and knowledge sharing process. *Journal of Knowledge Management*, 25(9), 2334–2360. <https://doi.org/10.1108/jkm-07-2020-0546>
- [7] Kayhan, F. (2022). An overview of the actuarial profession in the insurance industry: The case of Turkey. *International Journal of Entrepreneurship and Management Inquiries*, 6(10), 71–79. <https://doi.org/10.55775/ijemi.1105859>
- [8] Kousky, C., Wiley, H., & Shabman, L. (2021). Can parametric microinsurance improve the financial resilience of low-income households in the United States? *Economics of Disasters and Climate Change*, 5(3), 301–327. <https://doi.org/10.1007/s41885-021-00088-1>
- [9] Macaranas, F. (2023). Management Science for Pagtanaw 2050 talent development and retention. *Transactions of the National Academy of Science and Technology*, 45, 1–30. <https://doi.org/10.57043/transnastphl.2023.3459>
- [10] Maillart, A., & Robert, C. (2024). Distill knowledge of additive tree models into generalised linear models: A new learning approach for non-smooth generalised additive models. *Annals of Actuarial Science*, 18(3), 692–711. <https://doi.org/10.1017/s1748499524000241>
- [11] Managing the United States' development cooperation. (2016). OECD Development Co-operation Peer Reviews, 57–66. <https://doi.org/10.1787/9789264266971-9-en>
- [12] Mugisha, B. (2023). Predictive modelling of insurance claims in Rwanda. *International Journal of Modern Risk Management*, 1(2), 22–32. <https://doi.org/10.47604/ijmrm.2219>

- [13] Radwan, A., & Sakr, M. (2020). Exploring ‘brain circulation’ as a concept to mitigate brain drain in Africa and improve EU–Africa cooperation in the field of science and technology. *Broadening the Debate on EU–Africa Relations*, 72–84. <https://doi.org/10.1201/9781003009689-5>
- [14] Raghavendra, K. S., & Bheemanagouda, N. A. (2020). Actuarial and risk management in the insurance business. *International Journal of Financial Services Management*, 10(4), 368. <https://doi.org/10.1504/ijfsm.2020.113164>
- [15] Raimi, M. O., Odubo, T. V., & Omidiji, A. O. (2021). Creating the healthiest nation: Climate change and environmental health impacts in Nigeria: A narrative review. *Sustainability in Environment*, 6(1). <https://doi.org/10.22158/se.v6n1p61>
- [16] Rodriguez-Segura, D. (2021). EdTech in developing countries: A review of the evidence. *The World Bank Research Observer*, 37(2), 171–203. <https://doi.org/10.1093/wbro/lkab011>
- [17] Sheedy, E. A., & Jepsen, D. (2018). Interim report: Risk management maturity in large Australian superannuation funds. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3171833>
- [18] Tan, K. S., Weng, C., & Wirjanto, T. (2020). Advances in predictive analytics. *North American Actuarial Journal*, 24(2), 165–167. <https://doi.org/10.1080/10920277.2020.1737495>
- [19] Zuccaro, G., Leone, M. F., & Martucci, C. (2020). Future research and innovation priorities in the field of natural hazards, disaster risk reduction, disaster risk management and climate change adaptation: A shared vision from the Espresso Project. *International Journal of Disaster Risk Reduction*, 51, 101783. <https://doi.org/10.1016/j.ijdrr.2020.101783>
- [20] Nthenya, A. J., Muchiri, D. K., Kagori, P. N., & Mawira, P. Z. (2021). Challenges and Issues of Online Education in Sub-Saharan Africa amid the COVID-19 Pandemic. *Int. J. Multidiscip. Res. Publ.(IJMRAP)*, 3, 40–48.
- [21] Bruce, D., Avis, C., Byrne, M., Gosrani, V., Lim, Z., Manning, J., Popovic, D., Purcell, R. & Qin, W. (2018). Improving the success of InsurTech opportunities. *British Actuarial Journal*, 23, e31. <https://doi.org/10.1017/S1357321718000296>
- [22] Ngwenduna, K. S., & Mbuva, R. (2021). Alleviating class imbalance in actuarial applications using generative adversarial networks. *Risks*, 9(3), 49. <https://doi.org/10.3390/risks9030049>