
Promoting and Sustaining a Virile Statistical Laboratory in Nigeria's Premier University: Lesson from UI-LISA Experience

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8.1 Introduction

Education is one of the earliest social services embraced in Nigeria as an instrument of stability, change, and development. Since national independence in 1960, the education system has undergone several phases of transformation. Presently, it is divided into six years of primary, three years of junior secondary, three years of senior secondary, and four years of tertiary education. This system is popularly known as 6-3-3-4. Under this arrangement, statistics is not being taught as a subject at the primary school level. Before 1960, statistics was virtually unheard of even at the secondary school level. Thereafter, it was taught in secondary schools under the subject of mathematics up to 1973. It was introduced as one of the subjects to be taken in the West African School Certificate Examination (WASCE) in 1974 both at the Ordinary Level (O/L) and Advanced (A/L) (Olubusoye and Shittu, 1998). According to Adamu (1986), in 1979, the ratio of the number of candidates taking

statistics to that of mathematics, for example, was 1 to 94 and these candidates were from 138 of about 2,258 schools that registered for the examination. In 1982, the ratio was 1 to 170. With the introduction of the 6-3-3-4 education system in 1990, statistics was removed from the junior secondary school and senior secondary curricula, and subsequently from the WASCE syllabus.

The University of Ibadan (UI), fondly called the premier university in Nigeria, was founded in 1948 as University College, Ibadan (UCI) with 104 foundation students and three founding faculties (Arts, Science, and Medicine). Initially, statistics was taught in Departments of Mathematics and Economics and it was possible to graduate with B.Sc. statistics if the two other subsidiary subjects were in Science, say Chemistry, Physics, and Mathematics or B.A. statistics if the two other subsidiary subjects were in Arts, say English, Latin or History. The Department of Statistics was statutorily established in 1965 but operated in the Department of Economics. It became fully autonomous and started functioning as an independent department in 1973 (Olubusoye and Shittu, 1998) in the Faculty of Science. In addition to the B.Sc. degree programme in statistics, the department also ran the Professional Diploma in statistics (PDS) programme. Higher degree programmes were introduced in 1977. An unresolved debate that continues today is whether the department should remain a department within the Faculty of Science or be made into an autonomous institute.

Following the brief historical discourse enunciated above, statistical training in the department was confronted with several challenges. These problems underline the attraction of the LISA 2020 initiative in the Department of Statistics. For this chapter, three critical problems are identified. The first is the challenge of maintaining a judicious balance between theory and practice. At the inception of the department, much emphasis was placed on traditional statistics with overwhelming importance placed on theory as the driver of statistical concepts without the essential practical skills needed for using statistics to solve real-life problems. The excitement and pride of both staff and students were in glorifying statistics as a hard discipline and for belonging to a noble field of study. Much attention was given to abstract mathematical concepts such as real analysis, ordinary differential equations, etc., to the extent that students were fraught with being pessimistic about the possible future career and the application areas of the subject. The design of the curriculum failed to show where mathematics ends and where statistics begins.

The second problem is connected with the concept, setup, and operation of a statistical laboratory (stat lab). Even though statistical computing labs existed, it was never clear what role stat labs should play in statistical training. The need for a functional stat lab to support the teaching and learning of statistics has long been advocated. According to Kanji (1974), it is an emerging facility in statistical education. Kanji posits that the size of stat lab should depend on the amount and level of statistics being taught, and the utilisation should be widened to include facilities such as a "Statistical Library," a "Data Bank," the publication of a "Statistical Bulletin," etc. The existence of such a stat lab would provide proper statistical training and a better understanding of the subject, as well as facilitate the correct uses of statistics for users with varied interests. However, despite the existence of the Department of Statistics for almost five decades, the need for a statistical laboratory was not contemplated. Prior to the emergence of University of Ibadan Laboratory for Interdisciplinary Statistical Analysis (UI-LISA), it was a mirage to imagine statistics as a discipline that needs a laboratory in a fashion similar to chemical or biological disciplines. One area of friction was the manner of sharing bench fees

among the departments with specialist laboratory or fieldwork. Bench fees are payments made by the university to departments to maintain facilities in the laboratory and to cover consumables. While several departments in the Faculty of Science automatically benefit from these payments, the statistics department was painfully exempted due to lack of a functional stat lab.

The third but very notable problem was the poor motivation or rather lack of incentive for interdisciplinary or collaborative research in the university system. The issue of single, co-authorship and multiple-authorship have been debated variously in the literature (Vafeas, 2010, Woods, 1998, Woods et al., 2010, Lei et al., 2016, Awe and Vance, 2014). The university promotion guidelines clearly reward single authors compared with multiple authors. For instance, a journal article attracts a maximum of five points in the promotion guideline. A single-authored article could get 100% of the maximum points but only the first author can obtain about 50% of the points where there are more than five authors. Consequently, four single-authored journal articles can get a candidate seeking promotion to a cadre requiring a minimum of 20 points, while twice that number is required if each of the journal articles has two authors. Faculty members are mostly interested in solo rather than interdisciplinary research which is the strength of any research. Modern-day realities put collaborative research at the epicentre of societal problem-solving.

Following the above, this chapter plans to discuss the emergence of a LISA stat lab in Nigeria's Premier University, University of Ibadan, popularly called UI. The discourse is intended to cover the activities directed at addressing the critical challenges relating to teaching, research and collaboration in the Department of Statistics, UI. The rest of the chapter is organised as follows: Section 8.2 discusses the birth of the UI-LISA; Section 8.3 discusses the lessons drawn from two renowned and well-established stat labs in the United States which helped to build a solid foundation for UI-LISA; Section 8.4 elaborates on UI-LISA advocacy programmes, training activities and collaborations; and, finally, Section 8.5 presents concluding remarks for emerging labs.

8.2 The Birth of UI-LISA

The vision to create twenty stat labs in developing countries by 2020 has been vigorously pursued by Prof. Eric Vance since 2012. The concept and *modus operandi* of LISA 2020 is uniquely and carefully constructed to build the capacity of statisticians and non-statisticians on essential skills needed to enhance effective collaboration. The programmes of LISA 2020 are specially tailored to build statistics and data science capacity and research infrastructure in developing countries to help statisticians collaborate with scientists, government officials, businesses, and NGOs to use data to solve problems and make decisions for real-world impact. The programme was designed to pursue three missions which include (1) training statistics and/or mathematics students and staff to become effective, interdisciplinary collaborators who can move between theory and practice to solve problems for real-world impact; (2) serve as a research infrastructure for researchers and decision-makers at the university or in the surrounding community to collaborate with statisticians to enable and accelerate research and data-based decision-making that will have a positive impact on society; and (3) to teach short courses and workshops to improve statistical skills and literacy widely. All these were highlighted on January 16, 2015, in a

paper titled “LISA 2020: Creating a Network of Statistical Collaboration Laboratories” presented by Professor Eric Vance during his first visit to Nigeria to create a network of stat labs that will connect with LISA 2020.

The historic journey to the establishment of LISA in Nigeria started in May 2013 with the selection of Dr O. Olawale Awe, then a doctoral student in the Department of Statistics, University of Ibadan, as the first LISA Fellow to the Department of Statistics, Virginia Tech (VT). Visiting LISA Fellows are made to undergo intensive practical training under the supervision of the LISA 2020 Director and thereafter they return to their home countries to start a statistical collaboration laboratory.

Upon his return in 2014, the first LISA Fellow introduced the LISA 2020 concept to UI but opted to establish the Laboratory for Interdisciplinary Statistical Analysis and Collaboration (LISAC) in October 2014 at Obafemi Awolowo University, where he was employed as a lecturer. By December 2014, the second stat lab was created at Sekoine University of Agriculture (SUALISA), Morogoro, Tanzania (Vance and Magayane, 2014). The birth of UI-LISA followed suit in March 2015 and became officially recognised as a member of the LISA 2020 Network in June 2015.

Constant monitoring and follow-up by the founder of LISA 2020 have helped to sustain UI-LISA and position it to continuously serve as an engine for development through training and collaboration. There were two commissioned visits to UI-LISA to help strengthen its operations and to conduct an assessment of its activities. There was also the exchange visit extended to the lab coordinator to visit two prestigious universities in the United States, VT and Purdue University, to see first-hand how LISA 2020 trains students to communicate and collaborate with non-statisticians and how to manage labs to help clients apply statistics in their research projects. The unforgettable visit by Mr. Ian Crandell, a doctoral student from VT to UI-LISA took place between March 28 and April 17, 2015. Mr. Crandell helped UI-LISA develop a programme similar to LISA at VT and in line with the LISA 2020 programme. During his visit, he made a significant contribution to the setting up of UI-LISA as a fully functional statistical collaboration centre. He spent most of his time developing short courses for basic statistics and statistical software packages. He was instrumental in organising a series of collaboration meetings with graduate students and statisticians in UI. He actively participated in programme design & orientation and provided a series of lectures and meetings at the Faculty and Centre for Petroleum Energy Economics and Law (CPEEL). The memory of his visit and contributions still lingers in the minds of UI-LISA collaborators.

The second visit commissioned by the founder of LISA 2020 during January 2018 was by Ms. Monica Johnston; an expert in statistics education and assessment with expertise and experience working with women statisticians and small business owners in the United States. She is a prominent and active member of the ASA Section on Statistical Consulting. She had the mandate of the founder to conduct an assessment of UI-LISA and to identify some strengths of UI-LISA including potential opportunities to make UI-LISA even stronger and more sustainable. She also shared some ideas that may be useful in future grant proposals to be able to strengthen UI-LISA and the other LISA 2020 stat labs in the future. Finally, she documented some best practices that could be valuable to share with other stat labs in the LISA 2020 Network. Apart from her in-depth assessment and evaluation of UI-LISA activities since inception, she engaged in several other capacity-building and statistical education activities. She had exciting moments with the women in statistics and inaugurated the Women in Statistics Wing of the Department of Statistics, University of Ibadan. She made a public seminar presentation titled “Improving Student Learning; within a Small Business Setting”. The lecture was indeed an eye-opener to

young graduates of statistics that they could start their statistical practice upon graduation without having to take a government job. She encouraged the early career statisticians regarding the importance of joining a professional body and spreading tentacles across the globe. The hallmark of her visit was the facilitation of one of the flagships of the UI-LISA programme tagged “One hour with a statistician” with a topic *Statistical Method: Communication*, which attracted 87 attendees from three faculties across the university community.

An extract from the executive summary of the report is presented in the textbox below. The report underlines the importance of programme metrics and programme evaluation metrics which regrettably were found missing at UI-LISA. The UI-LISA programme evaluation is presented in Table 8.1. The report assesses UI-LISA programmes and how consistent they are with the stated mission and goals.

ACCORDING TO MS. MONICA JOHNSTON:

Overall, UI-LISA is doing the work of a statistical lab, but it has not demonstrated that it can sustain itself because it has not begun to develop the necessary infrastructure to quantify its success. The key to obtaining funding lies in its ability to quantify and reports its success.

However, the UI-LISA team was highly receptive to constructive feedback and began to make changes immediately in using software that would more readily allow them to quantify the success that they’re experiencing. There is a culture of eagerness to learn and systematise their processes in accordance with the LISA Network reporting standards.

Recommendations are that UI-LISA be provided with

1. Clear and direct guidance on building the infrastructure necessary to sustain a statistical laboratory, including advising on software selection, metric development and reporting. Furthermore, that advice should be consistent among the LISA Network members.
2. Financial assistance to motivate students to participate as student collaborators. Students and faculty are deprived of steady electricity, school-based Wi-Fi and basic materials and, given the sustained national economic inequality and deprivation, the spirit of volunteerism has not flourished.
3. A stronger incentive for lab coordinators, one that guarantees the role is independent of the faculty appointment, by re-examining the MOU process the LISA Network uses with universities.

The overall mission of UI-LISA is “Building statistics and Data Science Capacity in Nigeria.” The goals are to (1) complement statistical training in the department by developing the non-technical skills of our students to be able to relate with domain experts in other fields; (2) make statistics graduates to be employable in industry or be self-employed through practical experience; (3) promote statistical literacy within and outside the university community; and, (4) use statistics to transform our society by identifying and solving local problems. The UI-LISA programme evaluation is presented in Table 8.1. The Drop-In and Mobile Statistical Clinic (MSC) programmes are found not to be consistent with the goals in terms of metrics.

TABLE 8.1
Summary of Monica Johnston’s Assessment of UJ-LISA Programmes^a in January 2017

	Drop-In	Collaborative Training Workshops	Short Courses	Student Training	IT Training	One Hour w/a Statistician	Mobile Statistical Clinic
Consistent w/ mission	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Consistent with goals	No, only 2 of 450 participated	Yes	Yes	Yes	Yes	Yes	No
Programme metrics are in the analysis-ready form	No (paper)	No (Word)	No	No (Word)	No	No (Paper)	No
Evaluation metrics are available	No	Yes, Survey Monkey	No	No	No	No	No
Total # of attendees	84	I: 9 II: 22 III: 15	Unknown	Formal training: Not available Informal: 80+ students tutored (drop- in)	13 trained; upcoming training: 15	Unknown	Unknown

^a These programmes are discussed in Section 8.4.

The drop-in clients are coming from just 1 to 2 departments, thus creating the need to expand and reach out to other departments. The MSC is least successful probably because it requires more preparation and is of lower priority to the lab. Nearly all the programmes failed in programme metrics and evaluation metrics because the data about them were available mainly in “Word” or “Paper” formats rather than in format such as spreadsheet which could be readily analysed. No programmes, except for the Collaborative Training Workshops, have been formally evaluated using modern survey and analysis software. Emerging start labs must realise very early that programme evaluation is key to lab sustainability and quality service delivery. This has been a very hard lesson for UI-LISA.

The hallmark of the efforts to put UI-LISA on a foothold and strengthen its operations was the exchange visit by the UI-LISA Coordinator in February 2016, to the then headquarters of LISA 2020 at VT in the United States. The essence of the visit was to gain inspiration and ideas needed to continue to stir and manage the UI-LISA stat lab to fulfil its mission of training collaborative statisticians and helping the entire UI researchers (staff and students) apply statistics in their research. Also facilitated was a visit to Purdue University located in Lafayette, Indiana, United States. The abridged version of the report of the visit as presented to the Vice-Chancellor of the University of Ibadan is reproduced in the following section for the benefit of emerging laboratories.

The hallmark of the efforts to put UI-LISA on a foothold and strengthen its operations was the exchange visit by UI-LISA Coordinator to the then headquarters of LISA 2020 at VT in the United States between February 12 and March 16, 2016. The essence of the visit was to gain inspiration and ideas needed to continue to stir and manage UI-LISA stat lab to fulfil its mission of training collaborative statisticians and helping the entire UI researchers (staff and students) apply statistics in their research. Also facilitated was a visit to Purdue University located at Lafayette, Indiana, United States. The abridged version of the report of the visit as presented to the Vice-Chancellor of the University of Ibadan is reproduced in the following section for the benefit of emerging laboratories.

8.3 UI-LISA Setup and Programmes

The overriding objective of the LISA 2020 Programme is to build statistics and data science capacity in developing countries by creating a robust network of statistics and data science collaboration laboratories. It is expected that these stat labs will serve as engines for development by training the next generation of collaborative statisticians and data scientists; serving as infrastructure to support local researchers, businesses, governments, and NGOs; and teaching short courses and workshops to improve statistical skills and data literacy widely. The LISA 2020 Network encourages stat labs to improve their operations by adopting the best practices learned from one another. Each stat lab is allowed to operate based on the distinctive characters of its environment and the established culture of its institution. The freedom enjoyed by network members allows each stat lab to creatively formulate its vision and mission statements, including developing programmes suitable to its host institution.

Consistent with the LISA Network mission, UI-LISA puts UI students at the centre of its mission statement with the sole aim of building their capacity in data science and extending the same to statistics students in higher education institutions in Nigeria. Consequently, the lab programmes and activities are designed to support this mission

and goals enumerated. Thus, UI-LISA has seven (7) mission-driven programmes, namely LISA drop-in assistance, Collaborative Training, Short Courses, Student Training (formal and 1-1 tutoring), Industrial Training (IT) for students completing their academic degree, One Hour with a Statistician and the Mobile Statistical Clinic. Two programmes serve the students while the other five serve the entire university community, including statistics students and faculty, students and faculty in other departments, non-academic staff and neighbouring universities.

The UI-LISA lab has been operating since its inception in a standard office space provided by the Department of Statistics, which can accommodate about twenty people at a time. Laboratory equipment, such as a laptop, projector and printer, were provided by the department at take-off. The lab enjoys limited access to departmental facilities, such as computing labs, lecture rooms, and administrative assistance. Several other lab infrastructures are lacking or inadequate which include a camera, statistical kits, whiteboard, flip chart board, furniture, and internet access.

UI-LISA administrative structure is as follows:

- **Lab Coordinator** who oversees the lab and implements the LISA 2020 agenda. The Lab Coordinator decides who works on a project based on interest and areas of expertise.
- The **Deputy Coordinator** assists the Lab Coordinator in implementing UI-LISA Programmes.
- The **Senior Lab Collaborators** are in charge of training and design training modules. Usually, the Senior Collaborators are assigned to work with the expert faculty member to work on a project. All the Senior Collaborators are PhD students in the department. Due to lack of remuneration or compensation to lab collaborators, the level of commitment is very low.
- The **Lab Administrative Officer** keeps lab records, compiles programme metrics and conducts programme evaluation.
- The **Graduate Collaborators** assists the Senior Collaborators and carries out other duties assigned by the Lab Coordinator.
- The **Faculty Members** provide consulting services to clients in their areas of expertise.

In particular, the Administrative Officer and the Collaborators are motivated by funds that are generated by the lab.

UI-LISA has two categories of student collaborators. The first category comprises students in the industrial training (IT) programme (the second article in this chapter addresses this). Usually, statistics students (from UI and other neighbouring institutions) who are still undergoing their degree programmes apply to the lab as trainees. The second category comprises graduates (of statistics and other disciplines) who want to gain practical experience to enhance their job opportunities. All UI-LISA collaborators must go through software training and the rigorous application of statistical methods to real-life problems. The primary programming software for all collaborators is R, and they must be very proficient in its use for data visualisation, descriptive and inferential analysis. The undergraduate and postgraduate trainees are fully involved in the weekly statistics practical sessions facilitated by the Senior Collaborators. All IT students and graduate collaborators are assigned alongside Senior Collaborators to work on clients' projects.

In the following sub-sections, the programmes designed for the lab trainees and for promoting statistical literacy university-wide are discussed.

8.3.1 One Hour with a Statistician

This One hour with a Statistician programme is aimed at improving the level of statistical literacy among students and users of statistics at the university. During the one-hour meeting, an invited statistical expert briefly gives a discourse on a popular statistical concept including its uses and misapplications. This is followed by a constructive engagement in the form of questions and answers from the audience. The one hour with a statistician provides a platform for enlightening the university researchers and for correcting abuses and misuses of statistical techniques and their interpretations. The programme is now very popular with growing participation among staff and students from departments within and outside the Faculty of Science. Some of the subjects covered by eminent facilitators in the previous editions of the programme include

- Concepts and interpretation of the p-value
- Regression analysis: strength and abuse
- Multivariate methods in statistics
- Hypothesis testing
- Sampling and sample size determination
- Exploratory data analysis
- Statistical modelling: its strength and abuse
- Understanding statistical design and analysis of experiments
- Time series analysis: its misconceptions, abuses and strength in scientific research
- Questionnaire design
- Regression analysis and its interpretation

8.3.2 Mobile Statistical Clinic

The Mobile Statistical Clinic programme is aimed at bringing statistical education to the doorstep of university researchers and also publicising the activities of the laboratory to potential beneficiaries. Mobile clinic means that UI-LISA team move out and station at public locations such as halls of residence, conference/meeting areas, lecture theatre, parks, event centres and even recreational areas to provide on-the-spot solutions to statistical problems and enquiries. At the moment, the Mobile Statistical Clinic team consists of five lab collaborators led by the Senior Lab Collaborators. For problems that cannot be solved on-the-spot, clients are referred to the laboratory for further help.

8.4 Short Courses and Collaborative Training Workshops

Training workshops at UI-LISA are generally classified into two. The first is the workshop that is targeted at sundry users of statistics, specifically researchers in any discipline who are interested in the theme of the workshop. In recognition of the fact that disciplines

using statistical analysis in their research have peculiar training needs, the UI-LISA team conducts specialised training workshops. Thus, the second is collaborative training organised in partnership with non-statistics-based departments, centres, and faculties focusing on statistical methodologies tailored to the needs of their researchers and students. In the past, Collaborative Training Workshops have been organised with the Faculty of Science, Faculty of Veterinary Medicine, CPEEL, Department of Crop Protection and Environmental Biology, and Department of Zoology.

8.4.1 Collaborative Projects

UI-LISA has provided statistical advice to 65 research projects to date including 18 PhD theses, 46 masters' dissertations, and 1 NGO project. In collaboration with CPEEL, UI-LISA participated in a university-wide energy audit project commissioned by the Vice-Chancellor of UI in 2018. Indeed, the most productive collaboration UI-LISA has had is with CPEEL (<https://cpeel.ui.edu.ng/>). The collaboration has so far yielded two journal articles on renewable energy in Africa (see Olanrewaju et al., 2019 and Akintande et al., 2020). The lab has just completed a project on *Enhancing Election Participation in Nigeria* in collaboration with The Electoral Institute (TEI), a research and documentation unit of the Independent National Election Commission (INEC). The funding is provided by the LISA at the University of Colorado Boulder in cooperation with the US Agency for International Development (USAID) Accelerating Local Potential (ALP) Programme (Cooperative Agreement Number: 7200AA18CA00022). The project has produced three policy briefs and three research working papers. Additionally, the lab is currently engaged in a sanitation project funded by the USAID TEACH Fund in collaboration with the Ministry of Environment and Natural Resources, Oyo State, Nigeria.

8.5 Conclusion

The laboratory presently enjoys a good reputation and patronage among the university community. The environment of operation is becoming friendlier and more cooperative than when the laboratory was launched in 2015. In recent times, academic staff in the Faculty of Science (comprising 10 departments) have been directing their postgraduate students to the laboratory for statistical advice. Several applications are now received from those who have completed their degrees for industrial training experience in the laboratory. All these developments have created a huge window of opportunities for statistical capacity building, collaborations, statistical education and outreach efforts.

Overall, UI-LISA is doing the work of a statistical lab, and despite many challenges (such as limited funding) UI-LISA has demonstrated remarkable resilience in striving to achieve its vision and mission. The lab is developing the necessary infrastructure to quantify its success which is key to obtaining funding to sustain its activities. Emerging stat labs need to have clear and direct guidance on building the infrastructure necessary to sustain a statistical laboratory, including advising on software selection, metric development, and reporting. Also, it is pertinent to consider giving financial assistance to motivate students to participate as student collaborators and the spirit of volunteerism must equally be encouraged to ensure lab sustainability.

Appendix

Lessons from the Fountainhead

The visits to VT and Purdue Universities were arranged to come after the Conference on Statistical Practice (CSP) organised by the American Statistical Association (ASA) held in San Diego, CA from February 17 to 21, 2016. The conference was indeed a great learning experience for UI-LISA and it provided a good foundation for the sustainability of the lab.

Lessons from the 2016 Conference on Statistical Practice (CSP) in San Diego

This was the 5th ASA Conference on Statistical Practice. It was held at San Diego Westin Hotel. The conference brought together hundreds of applied statisticians and data scientists to focus and engage in discussions on innovations and best practices for the applied statistician. The presentations covered various issues in statistical applications including learning about new statistical techniques and best practices, how to better communicate with clients and colleagues, and how to have a positive impact on our organisations. The conference had the following four concurrent sessions:

- i. Communication Impact, and Career Development
- ii. Data Modelling and Analysis
- iii. Big Data Prediction and Analytics
- iv. Programming and Graphic

For obvious reasons, UI-LISA Coordinator attended all the presentations in Communication Impact and Career Development session. The presentations under this theme helped the participants to develop new skills and perspectives towards being effective as a statistician in performing one's role as a leader, strategist, consultant, and collaborator. Precisely, this conference provided new ideas, techniques, and strategies to communicate effectively in a way to make the lab record a greater impact on the university. Some of the lessons learnt include

- i. Business ideas for any statistics student to start his/her career as an independent statistical consultant after graduation;
- ii. Strategy to move from being a statistical consultant to a trusted adviser who can communicate better with clients and customers to have a positive impact on their projects and research;
- iii. The seven habits of a highly effective statistical consultant;
- iv. How to use video to improve statistical practise;
- v. Common pitfalls and misconceptions in statistics with suggested solutions;

- vi. Techniques based on ways to “Just say No!” to ethically, scientific or legally unjustified procedures and analyses;
- vii. Mentoring and influencing using motivational interviewing; and
- viii. Recognising acumen as a critical skill for all statisticians.

Lessons from Exchange Visit to Virginia Tech (VT) LISA

The visit to VT provided a lot of insights into the style of operation, funding, level of staff and students’ participation in VT LISA. The programme of activities during the visit included:

- i. Attending Path Meetings, Collaborators’ Meetings, and Video Review Meetings with members of VT LISA;
- ii. Giving a Departmental Colloquium Seminar presentation titled: *Sustaining a Virile Statistical Laboratory in Nigeria’s Premier University*;
- iii. Attending the classes on Statistical Consulting course taught by Prof. Eric Vance;
- iv. Having private meetings with some academic staff and postgraduate students in the department; and
- v. Creating a website for UI-LISA with the assistance of VT LISA’s Administrative Staff.

In VT LISA, statistical assistance was provided free of charge to faculty members, staff, and students. The reason for this is that VT LISA was funded jointly by the Office of the Vice President of Research, the College of Science, the Graduate School, the Office of the Provost and all seven other colleges (Agriculture and Life sciences, Architecture and Urban Studies, Engineering, Liberal Arts and Human Sciences, Natural Resources and Environment, the Pamplin College of Business, and the Virginia-Maryland Regional College of Veterinary Medicine) in the institution. The Department of Statistics also provided funding for many of the LISA statistical collaborators and provides other support for LISA’s activities.

Users of LISA engaged in sponsored research benefitted from in-depth help and were encouraged to include statistical collaboration in grant proposals. Usually, this took the form of a full or partial graduate research assistantship, partial funding of a faculty member’s salary, or a direct-cost line item. VT LISA provided occasional statistical consultation and collaboration on projects outside of VT for a fee. Through statistics in the Community (StatCom), students in the Department of Statistics also provided pro-bono statistical consultation and collaboration for researchers studying topics of local interest and for local community non-profits, schools, and government organisations. In summary, the following lessons were learnt from VT LISA.

- i. UI-LISA can emulate VT LISA by supporting UI researchers to benefit from the use of statistics in designing experiments, analysing data, interpreting results, writing grant proposals and using statistical software.
- ii. UI-LISA should explore the possibility of securing direct funding support from the UI or units such as Postgraduate College so that statistical services including

short courses can be provided free of charge to faculty members and student researchers.

- iii. UI-LISA should devise a means of motivating and attracting staff and students to seek statistical collaboration in their projects and studies to accelerate high-quality research outputs and publications in top-rated journals.
- iv. UI-LISA should be given the university's recognition and be empowered to provide out-of-classroom training in statistics to our students at all levels and prepare them for a professional career in statistical consulting.

Connecting UI-LISA with the Center for Open Science (COS)

Coincidentally, the visit came up during the Research Week (Monday–Wednesday, February 22–24, 2016) at VT. During this period, April Clyburne-Sherin, the Reproducible Research Evangelist from the Center for Open Science (COS) also visited VT. The Center is a non-profit organisation working to improve the inclusiveness, transparency, and reproducibility of scientific research globally. The Center provides free services to researchers and research institutions, including free infrastructure, free training and new incentives. UI-LISA engagement with the Center emphasised providing free infrastructure for implementing reproducible research and training to the researchers in UI. Some resources including CDs to train and educate researchers about reproducibility research were provided to UI-LISA by the COS Evangelist.

Lessons from the Exchange Visit to Purdue University

The visit to the Statistical Consulting Service (SCS) unit in the Department of Statistics, Purdue University, under the able leadership of Prof. Bruce A. Craig contributed in no small measure to the UI-LISA success story. The programme of activities during the 1-week visit included

- i. Participating in the SCS Weekly meeting;
- ii. Having lunch meetings with key members of the department including Head of Department, Prof. Hao Zhang; Prof. George McCabe, Associate Dean of the College of Science; Assistant Prof. Arman Sabbaghi, Associate Director of the SCS; Prof. Tom Kuczek, past Associate Director of the SCS; Prof. Kiseop Lee, a Visiting Professor of statistics and Ce-Ce Furtner, the Manager of the SCS;
- iii. Participating as an observer in seven Initial Meetings (IMs) of SCS with clients;
- iv. Attending Prof. Craig's Statistical Consulting (STAT 582) classes;
- v. Giving a colloquium on *Sustaining a Virile Statistical Laboratory in Nigeria's Premier University*; and
- vi. Attending a summit on Service-Learning and Engagement.

The Statistical Consulting Service (SCS) provides the university community with free advice on problems involving the use of statistics. The service consists of two parts. For individuals needing assistance with computer software, a drop-in service is provided during normal working hours. Problems involving the design of experiments, the statistical analysis of data, and the interpretation of results are handled via the booking of appointments. SCS staff includes faculty members from the statistics department, graduate students, and support staff. SCS staff members always strive to develop a working relationship with the clients and become involved in the process whereby research ideas are formulated, translated into the framework of a statistical model and investigated in the context of such a model. The emphases of the university are discovery, learning and engagement. The three functions are addressed by SCS staff by providing statistical consulting services. The service provided has a direct impact on the quality of research performed while also giving the graduate students who work as consultants a very valuable learning experience by working with real problems.

The following lessons were learnt from the structure and operations of Purdue's SCS:

- i. A line budget from the university provides a steady source of funding for the SCS, which enables it to offer its services free of charge to the members of the university community.
- ii. Staff involved in SCS are motivated with a reduction in their teaching workload to have sufficient time to attend to clients.
- iii. If the client is a student, the major professor or a member of the client's degree committee must attend the initial meeting and any formal follow-up meetings.
- iv. Researchers seem to have cultivated the habit of involving the statistical design consultants from the formulation and design stages of the projects.
- v. Consultants work directly with the clients to determine the appropriate analysis, recommend software procedures, and help to interpret results.

The lessons and the connections arising from these visits have been helpful in the following ways:

- Restructuring of UI-LISA for excellent service delivery similar to those visited;
- Mobilising university staff and postgraduate students to seek statistical advice and counselling at UI-LISA and gradually build their confidence and trust;
- Promoting statistical collaboration with non-statisticians by following them through the various stages of their research from study design to reporting writing;
- Training UI-LISA student collaborators to acquire skills and know-how to communicate effectively and prepare them for a career as statistical consultants as part of the effort to make them job creators rather than job seekers; and
- Continuing to pursue and securing stable funding support and infrastructure needed to deliver free consulting services to UI researchers.

The lessons drawn from both the commissioned and the exchange visits gave impetus to UI-LISA to design unique programmes for its operations.

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