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An Assessment of Innovative Student Monitoring Attendance System in Nigeria

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Abstract:
In today's world, a paper based approach is followed for marking attendance, where the students sign on the attendance sheets. This data is then manually entered into the system. Managing the attendance of the students during lectures is a difficult task and it becomes more difficult during the report v phase. This is because the process of marking attendance and maintaining the data is not fully automated and manual computation produces errors and also wastes a lot of time. For this reason, the development of Attendance Monitoring System (AMS) using android platform is proposed. Attendance Monitoring System (AMS), android platform, marking attendance on one click, user authentication, database, report generation, sending SMS.The School Attendance Monitoring System (SAMS) is a system that allows teachers to report enrolment and attendance of pupils by sending a simple SMS to a server. It offers near-real-time monitoring of pupil attendance, at individual or at aggregate level, and can also be used to monitor teachers' attendance.

Three pilot locations were chosen: Kaduna South and Kudan in Kaduna State, and Ibeju-Lekki in Lagos State. The primary objective of the pilot was to test whether Nigeria was ready – both technologically and in terms of stakeholder buy-in – for such an intervention, and to identify potential cross-cutting and location-specific challenges.

Key questions that we sought to answer during the pilot period were: Is there sufficient interest and buy-in at school-level, among teachers and head teachers, to support NSAMS reporting?

- *Is there sufficient interest and buy-in among stakeholders and policymakers, at Local Government and State levels, to make use of the data generated by NSAMS?*
- *What cross-cutting challenges are experienced during the different stages of the pilot (technical development, training, roll-out and data entry) that are specific to the Nigerian context?*
- *What challenges are experienced during the different stages of the pilot that are specific to the contexts of the different pilot locations (north vs south, urban vs rural)?*

The findings revealed that At LGEA level, the Education Secretaries reportedly been extremely involved in the system, checking the website on a near-daily basis using their personal smart phones, and following up on schools who were not reporting. NSAMS had made the ES aware of specific issues existing in their schools. The Education Secretaries felt that teachers feel a sense of ownership and accountability over the system, with teachers making sure they report accurate data as they understand that LGEA staff are able to cross-check with paper attendance. The findings also revealed that LGEA were using the attendance data to make more accurate estimates of the numbers of examination papers needed, which were previously based on enrolment numbers, leading to wastage. LGEA staff felt that NSAMS had become accepted by teachers as part of their daily routine, and that it was not an extra burden. The attendance is broken down into attending, not attending, no report and attending without being enrolled. It can also be disaggregated by gender. The findings shows that approximately two thirds of enrolled children are attending most days, but around 200 children are unaccounted for on any one day due to no report being submitted. It also revealed there are more enrolled boys than girls not attending school and between 50 and 100 children absent on any one day.

Keywords: Assessment, innovation, monitoring, attendance

1. Introduction

Problems affecting students' academic performance in Nigeria include absenteeism and truancy. These are behaviours that students exhibited that deviate from the social norms of the school. It has caused serious problems to the smooth running of the school system, the progress of the students and also the overall education programme. There are a lot of effects of truancy and absenteeism on a child and society in general. Absenteeism and truancy may lead a child to become hardened criminal in future life, if not curbed (Abayomi, 2002). When a child tends to get involved in acts such as running away from

school, he may not have time to concentrate onhis/her studies, whereby having negative impact on the academic performance of such a child. This will make such a child neglect his intended goals and if this happens, such a child will not be able to concentrate on his/her education and his/her career will come into a stand still. In a situation where a child is always playing the truancy, such a child will be missing a lot of lessons and definitely will not know anything being taught by the teacher. As a result, such a child will never achieve any goal in his/her education and career.

1.1. Concept of School Attendance Monitoring System

The School Attendance Monitoring System (SAMS) is a system that allows teachers to report enrolment and attendance of pupils by sending a simple SMS to a server. It offers near-real-time monitoring of pupil attendance, at individual or at aggregate level, and can also be used to monitor teachers' attendance. SAMS does not and should not replace paper record-keeping (of both enrolment and attendance) at school level, but offers interested parties (Government, community, NGOs, partners, etc.) near-immediate access to attendance data and a quick overview of attendance patterns or trends, enabling swift action to deal with immediate problems, as well as collecting information for long-term planning.

While developed to monitor attendance, the SMS reporting architecture developed through SAMS, and the network of schools reporting, can easily be extended to move additional information either up from school level to government, or down from government level to schools. It can effectively expand to offer a real-time Education Management Information System (EMIS), for lower operational costs and with greater flexibility than an Annual Education Census. In South Sudan, SAMS is operating effectively as a real-time education management information system, providing public and password-protected information on enrolment and attendance, school infrastructure and mapping, school budgeting and reporting, and accountability processes for cash transfers and capitation grants.

In its current form, SAMS was developed as part of the UK aid-funded Girls' Education South Sudan (GESS) programme, which is led by BMB Mott MacDonald. The South Sudan Schools' Attendance Monitoring System, or SSSAMS, also known as 'Ana Fii Inni', or 'I am here', has been rolled out across the ten states of South Sudan, and reporting through SSSAMS is one of the conditions that schools must fulfil to be eligible for capitation grants through GESS. To date, enrolment and attendance data on over one million pupils has been uploaded to SSSAMS, despite the significant disruption and displacement that the recent conflict has brought. (ESSPIN,2014)

2. Statement of the Problem

Every school has certain criteria for students regarding their attendance in class. That is why keeping the accurate record of attendance is very important. At present attendance is usually noted using paper sheets and the old file system, this approach is being used from a long time. It becomes difficult for the management to regularly update the record and manually calculate the percentage of classes attended. Keeping these issues in mind, a system is designed to overcome the problems associated with attendance system. Most of the attendance systems use paper based methods for taking and calculating attendance and this manual method requires paper sheets and a lot of stationery material. Previously a very few work has been done relating to the academic attendance monitoring problem. Some software's have been designed previously to keep track of attendance. But they require manual entry of data by the staff workers. So the problem remains unsolved. Furthermore idea of attendance tracking systems using facial recognition techniques have also been proposed but it requires expensive apparatus still not getting the required accuracy results have shown that this system can be implemented in academic institutes for better results regarding the management of attendance. This system will save time, reduce the amount of work the administration has to do and will replace the stationery material with electronic apparatus. Hence a system with expected results has been developed but there is still some room for improvement. A quantitative review of the attendance literature not only will help to resolve the on-going debate regarding the importance of class attendance and thereby assist in the continuing development of theoretical models of student performance that acknowledge both student characteristics and student behaviors. At a minimum, findings suggesting that class attendance is strongly related to class performance should provide instructors with evidence that might persuade a larger proportion of students to attend class voluntarily. Moore (2003), for example, found that simply stressing the importance of attendance to students at the beginning of a semester raised average grades by 9%when compared to a similar class in which attendance was not stressed—and reduced the failure rate by 70% (from 23% to 7%). This process however, eliminates the need for stationary materials and personnel for the keeping of records. Eighty candidates were used to test the system and success rate of 94% was recorded. The manual attendance system average execution time for eighty students was 17.83 seconds while it was 3.79 seconds for the automatic attendance management system using biometrics. The results showed improved performance over manual attendance management system. Attendance is marked after student identification (Shoewu and Idowu,2012). The study intends to investigate the usability of the software and the usefulness of the attendance monitoring system at the basic education level in Nigeria

The overarching objective of the pilot was to ascertain whether Nigeria is ready for a technological innovation such as SAMS, and to set up a sustainable technological system to allow for enrolment and attendance data to be captured. Key questions that we sought to answer during the pilot period were:
- Do Nigerian teachers have the technological capacity to report through NSAMS?
- Is the Nigerian technological infrastructure sufficient to handle NSAMS reporting?

- Is there sufficient interest and buy-in at school-level, among teachers and head teachers, to support NSAMS reporting?
- Is there sufficient interest and buy-in among stakeholders and policymakers, at Local Government and State levels, to make use of the data generated by NSAMS?
- What cross-cutting challenges are experienced during the different stages of the pilot (technical development, training, roll-out and data entry) that are specific to the Nigerian context?
- What challenges are experienced during the different stages of the pilot that are specific to the contexts of the different pilot locations (north vs south, urban vs rural)?

3. Methodology

During the course of the pilot, a total of 33 LGEA staff, 164 head teachers, and 1639 class teachers were registered on the system. 78,984 pupils were registered as being enrolled across the three pilot LGEAs. The table below captures this headline data, while enrolment and attendance data is captured in Table 2, below.

	Kaduna South	Kudan	Ibeju-Lekki	Total
Number Of LGEA Staff Registered	8	19	6	33
Number Of Head Teachers Registered*	37	89	38	164
Number Of Teachers Registered**	888	483	268	1639

Table 1: User Registration
One Ht per School, So Number of HTS= Number of Schools.
Only Class Teachers, I.E. Those Taking Attendance Were Registered on the System;
This Number Can Therefore Not Be Used as a Proxy to Estimate Numbers of
Teachers in Public Schools in the LGEAs Involved

3.1. Reporting Rates

The graph below, taken from the NSAMS website, shows the reporting trend for all three pilot LGEAs across Term 2. As expected, the figure shows a steep incline in reporting across the initial three weeks of the project, as training was carried out in the three LGEAs, and a more steady increase until mid-March, as those users who had been having trouble with the system received refresher training, followed by a decline at the end of March as schools began to close for the holidays.

The disparity between the green line, representing users, and the black line, representing 'arms' (i.e. forms), reflects the fact that in some schools, due to a shortage of teachers, a single teacher had to report attendance for multiple arms. This issue is discussed in more detail later in the report.

The downward spike in early February was the result of a technical problem that caused the gateway to go down for around 36 hours, during which time messages that were sent could not be received by the server.
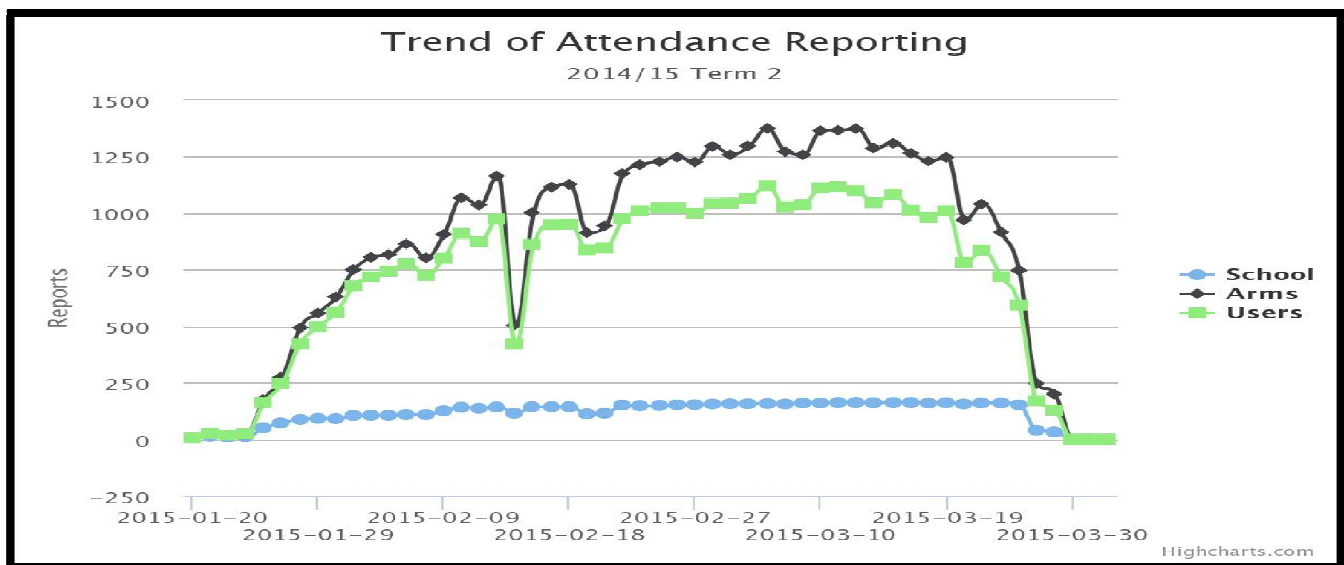

Figure 1

3.2. Pupil Enrolment and Attendance

The table below shows the average attendance and enrolment of pupils in the three pilot LGEAs for the two weeks of highest consistent reporting, i.e. late February – early March. As Figure 1, above, shows, there was a large variation in

reporting rates, with a staggered but steep increase at the start of the pilot, and a steep decline at the end, as schools began to close for holidays; for this reason, Table 2 only shows the attendance and enrolment data for the peak reporting period, as that information is less likely to be skewed by lower reporting rates.

The 'total number of pupils' consists of the number of pupils who had been reported as enrolled by their head teacher, as well as the (small) number of pupils for whom attendance was being reported but no enrolment data had been sent. Both the mean and the range are shown. Mean values in Table 2 reflect the mean of daily reports over the two-week period.

	Kaduna South	Kudan	Ibeju-Lekki
Total Number Of Pupils	Mean: 31426 Range: 31127 – 33344	Mean: 31364 Range: 30211 – 32243	Mean: 16780 Range: 16666 – 16884
Average (Mean) Number Of Pupils Reported To Be Attending	15054	12715	11289
Average (Mean) Number Of Reported Not To Be Attending	2869	5714	2145
Average Number Of Pupils For Whom No Report Was Received	13134	11409	3569

Table 2: Average Pupil Enrolment and Attendance

The figures below show the attendance trend over Term 2 for the three LGEAs involved in the pilot. The slightly different start dates for the three charts reflect the fact that the start of reporting in the three LGEAs was staggered, due to the training schedule.
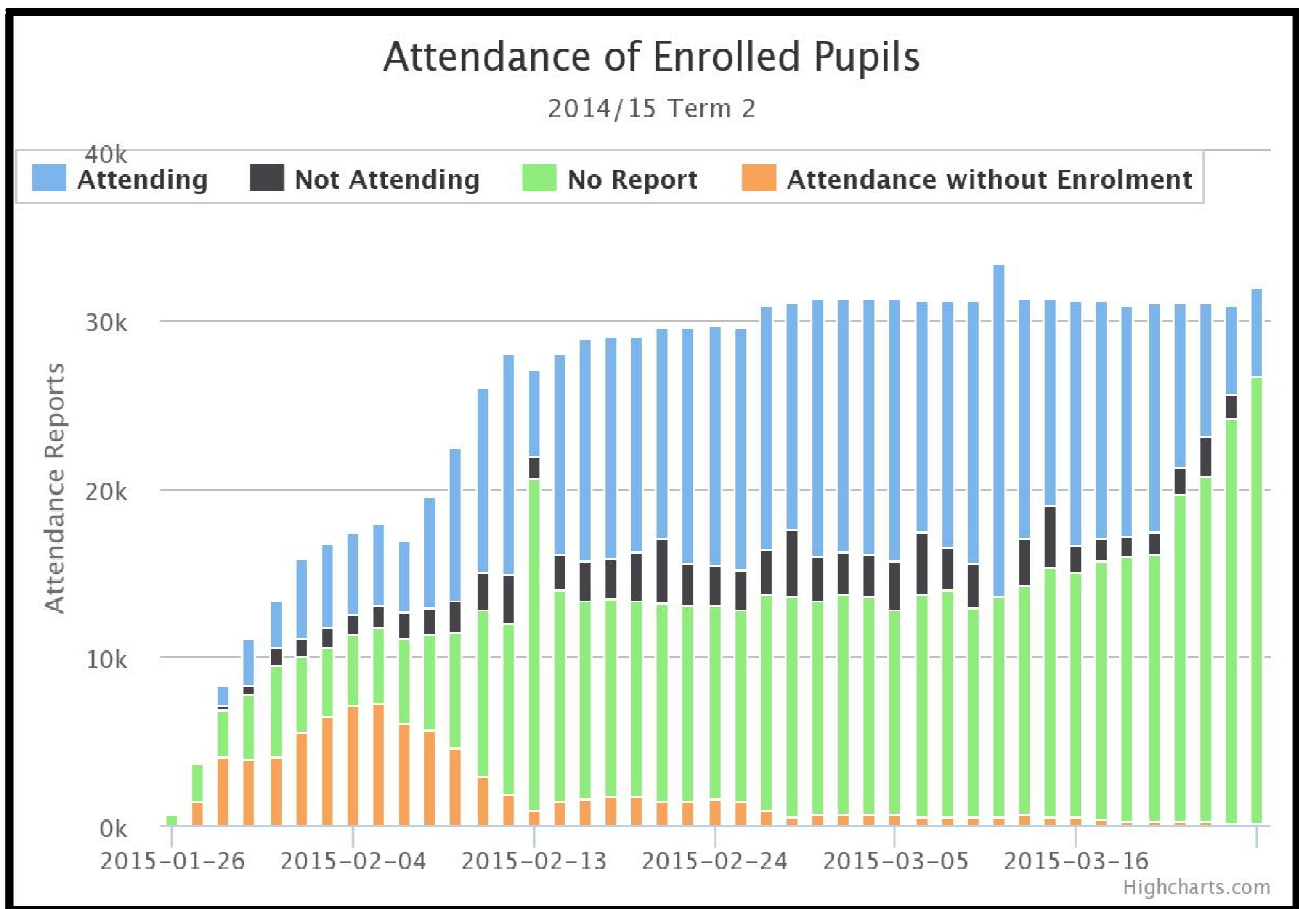

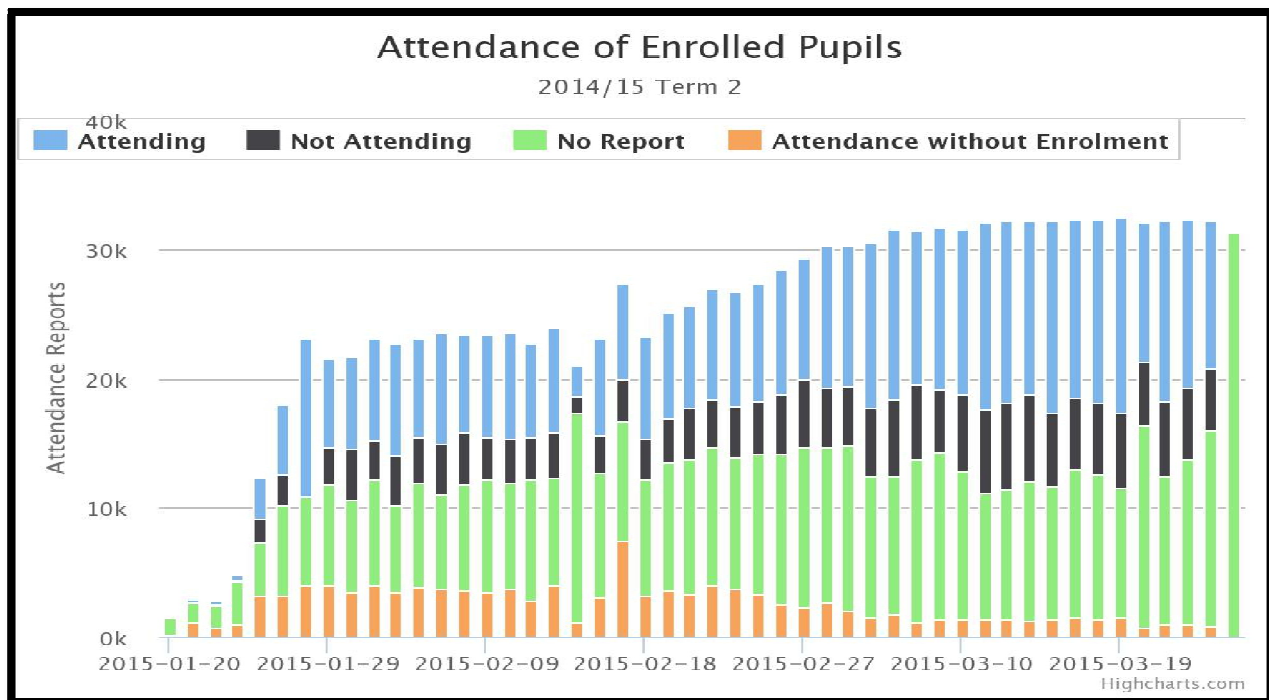*Figure 2: Reported Attendance of Enrolled Pupils, Kaduna South*

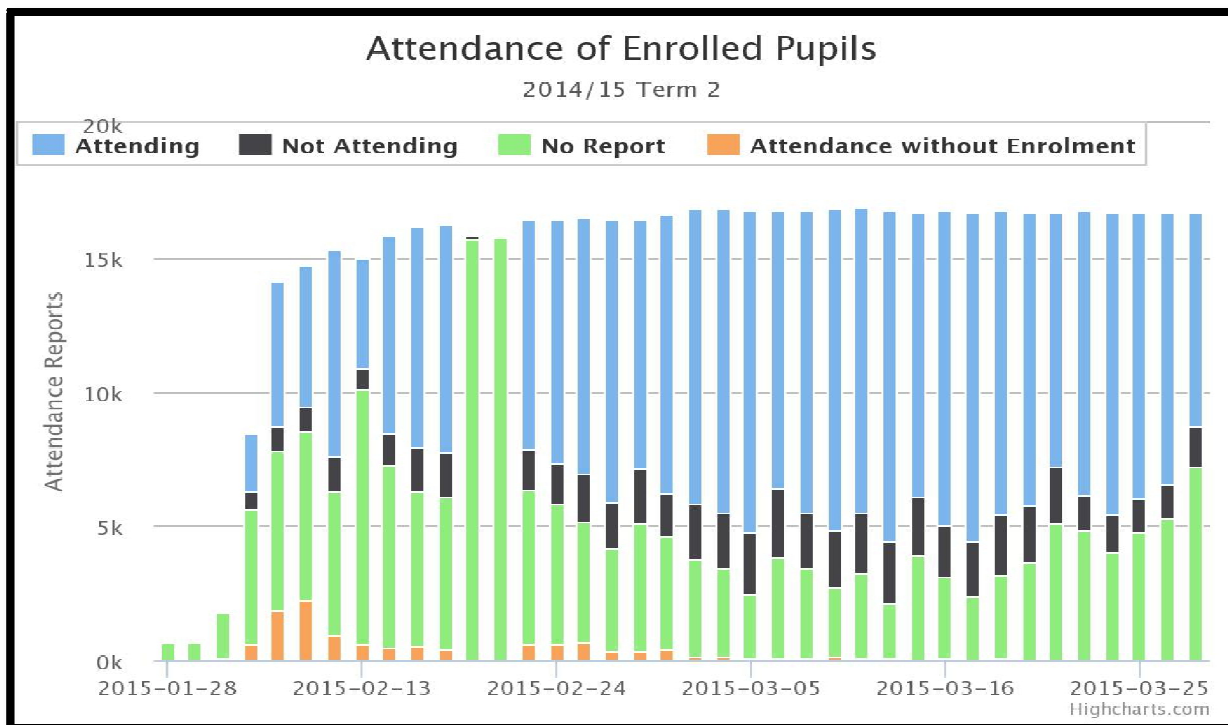*Figure 3: Reported Attendance of Enrolled Pupils, Kudan*

Figure 4: Reported Attendance of Enrolled Pupils, Ibeju-Lekki

3.3. Access Figures for the Website

The figure below shows the total number of hits received by the NSAMS website between early February and the end of March 2015, i.e. from the end of the training phase until the end of the pilot. Automatic hits from 'bots' have been removed, and the remaining hits have been broken down into hits from IPs in Nigeria, and hits from IPs elsewhere. Those hits from IPs in Nigeria can be broadly assumed to be from individuals involved in the pilot, primarily Nigerian education administrators. However the number of hits from Nigeria may be underestimated, due to the use of proxy servers by some smartphone browsers and by VSAT systems, which may record hits as coming from outside Nigeria.
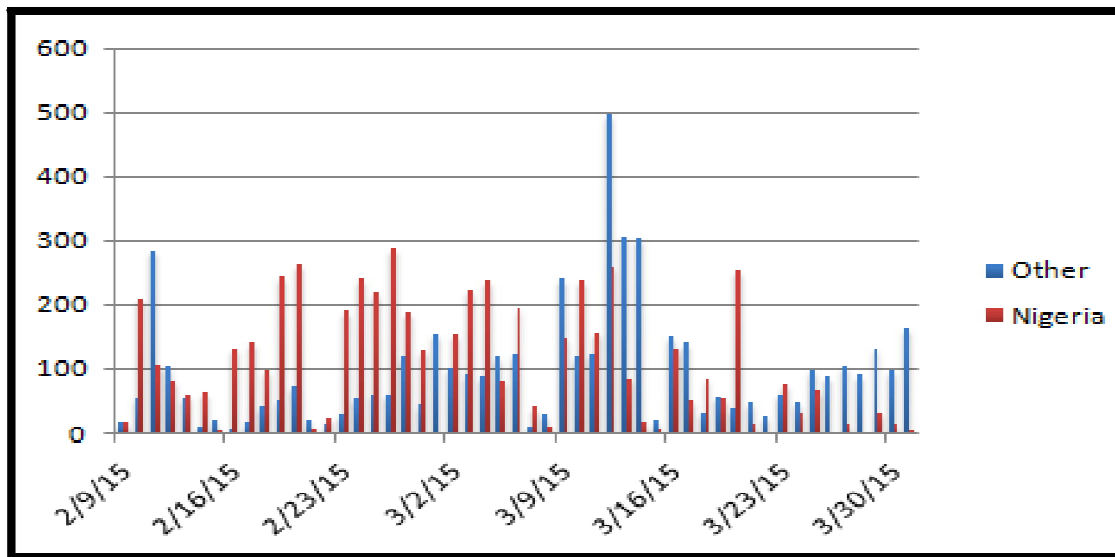
Figure 5: Hits on the NSAMS Website, Broken Down by Country, February – March 2015

3.4. Education Secretaries in Kaduna South and Kadun Had Used NSAMS Data to Inform Policy and Planning, Education Secretary in Ibeju-Lekki Had Been Less Involved

At LGEA level, the Education Secretaries in Kaduna South and Kudan had reportedly been extremely involved in the system, checking the website on a near-daily basis using their personal smart phones, and following up on schools who were not reporting. In both Kaduna South and Kudan, NSAMS had made the ES aware of specific issues existing in their schools. In Kudan, late reporting in many nomadic schools made it clear that pupils were being kept out of school to assist in grazing cattle, and so the ES had worked with communities to ensure families were able to graze their cattle close to schools in the morning so that children were able to attend. In Kaduna South, the LGEA and teachers found that, contrary to their expectations, attendance of girls was higher than attendance of boys, and remained steady over the course of the week, while attendance of boys declined as the week went on. Work is now on going to discover the reason for this, though it is thought that it is linked to familial pressures for boys to contribute to household finances, either by hawking or learning a trade.

By contrast, the ES in Ibeju-Lekki was found not to have used the system. This can be partly explained by the fact that he was not able to attend the training, as he was recently bereaved during the training period and was unable to leave his home for cultural reasons. In addition, his skill level and interest in technology is lower than the Education Secretaries in Kaduna South and Kudan. While the enthusiasm of Education Secretaries in Kaduna South and Kudan had driven enthusiasm among other LGEA staff, this was not the case in Ibeju-Lekki; the involvement of SIOs and schools in Ibeju-Lekki, which was high, was primarily driven by the NSAMS team.

3.5. Many Suggestions Were Made By LGE as To How the System Could Be Improved or Expanded

The following points outline the feedback received from the Education Secretaries in Kaduna South and Kudan.

- Kudan and Kaduna South ESs were both very pleased with how quickly they were now able to access information relating to their schools, with the Kudan ES reporting that previously it took a week for attendance data to reach him, but now he can access it in seconds. In Kaduna South, the ES reported that previously he had to visit schools to get information on attendance, but now it is much easier, and much quicker to identify potential attendance problems.
- The system has assisted LGEAs in identifying 'negligent staff': although the system is not directly monitoring teachers' attendance, it provides a proxy indicator. According to the ES of Kudan, "if not for this system, we would not even know that they [the teachers] are not in school." The ES of Kaduna South also felt that the system improved transparency, stating: "When I ask the head teacher if he has problems with attendance, he can lie to me and say he has no problems," but the system makes this more difficult.
- Both Kaduna South and Kudan ES had very high confidence in the data, and had cross-checked it with the scanned attendance data and headcounts carried out by SSOs on visits to schools. The ES of Kaduna South felt that teachers feel a sense of ownership and accountability over the system, with teachers making sure they report accurate data as they understand that LGEA staff are able to cross-check with paper attendance.
- Kudan LGEA were using the attendance data to make more accurate estimates of the numbers of examination papers needed, which were previously based on enrolment numbers, leading to wastage.
- In both Kudan and Kaduna South, LGEA staff felt that NSAMS had become accepted by teachers as part of their daily routine, and that it was not an extra burden. In Kaduna South, the ES stated that he thought teachers had accepted NSAMS as a system that makes their work easier and enables them to do their work more effectively.

A number of suggestions were made as to how the system could be expanded. In particular:

- Kudan ES felt that the SBMCs should be more directly involved in the system, taking a role in validating the information that is reported and confirming its accuracy.
- Both Kudan and Kaduna South ESs felt that there was potential for NSAMS to link more closely with other systems, such as EMIS, or HR management systems for teachers. There was also scope for the system to be expanded to collect information that is currently collected through monthly written reports from SMOs, SSOs and QA staff.
- Kaduna South ES would like to see the system capture information on the total number of teachers, as the system only reflects the number of class teachers in a school.
- Kaduna South ES would like to see NSAMS expanded to capture information on out of school children, information that could be captured through SBMCs and traditional leaders.
- Kaduna South ES felt that the training should involve more teachers: perhaps the head teacher, deputy and two additional teachers.
- Kaduna SUBEB suggested that teachers should report attendance to NSAMS twice a day, to capture levels of truancy after morning attendance.

3.6. School-Level Engagement Was Very High In All Three LGEAs as, and Teachers Reported Finding the System Easy To Use
Positive feedback was also received from all the schools visited across the three LGEAs, with the lack of involvement of Ibeju-Lekki LGEA not seeming to have made a difference to the willingness of head teachers and teachers to make use of the system.

- Schools visited in all three LGEAs reported that NSAMS had improved the timeliness of both teachers and pupils, with pupils wanting to be included in the message sent to NSAMS.
- Teachers in all three LGEAs indicated that it took them a very short time to report attendance using NSAMS, with estimates varying from less than a minute to between one and two minutes.
- Teachers in the schools visited reported that the cascade training worked well, and that it was easy to learn about the system. One of the teachers spoken to in Ibeju-Lekki had not personally attended the training by the NSAMS team but asserted that she found it easy to pick up the system nonetheless.
- Teachers reported that they had assisted each other in learning about the system, and in Kaduna South, teachers reported that teachers from different schools helped one another.
- One primary school in Ibeju-Lekki reported that "the system put us on our toes for taking accurate attendance at the right time," adding that teachers are now more organised because they are monitored by the system. Another primary school in Ibeju-Lekki reported that the system had made teachers more "serious" about taking attendance.
- A head teacher in Ibeju-Lekki indicated that NSAMS makes it easier for teachers to access the information that they need, commenting that "if the [attendance] information is in the air we can easily extract it, rather than looking for the file."

4. Conclusion
The system successfully took the attendance both school level at three Local Governments in two states. The prototype successfully captured new fingerprints to be stored in the database; scanned fingerprints placed on the device sensor and compared them against those stored in the database successfully. The performance of the system was acceptable and would be considered for full implementation especially because of its short execution time and reports generation. Everyone who tested the system was pleased and interested in the product being developed for use in schools.

5. Recommendations
While the NSAMS pilot achieved its overall objectives, the short amount of time available resulted in a small number of incomplete actions, which are outlined below.
The password-protected side of the website has not been developed, with efforts focusing on the public-facing side of the website. It was initially envisaged that the NSAMS website would have both a public side and a password-protected side, enabling authorized users (e.g. LGEA staff) to log in and access individual-level information relevant to their geographical area, including attendance data at the level of the individual pupil, and reporting data at the level of the individual teacher.
Suggested action: if NSAMS is continued beyond the pilot, the private side of the website would be developed as part of days remaining for the developer under the pilot contract.
A key action for successful roll-out beyond the pilot would be the granting of a VAS license by the NCC, allowing NSAMS to operate using a toll-free short code. This would enable the system to function at no cost to teachers when sending a report, and would avoid the necessity of distributing airtime to teachers, which is time-consuming, logistically difficult, costly and subject to wastage.
It was hoped that there would be sufficient time and capacity during the pilot period to work with LGEAs and SUBEB to help them understand what data is available through NSAMS, and how this data can be used for planning and policy-making. However, in the event, efforts had to be focused on making the system fully operational from the perspective of the users.

in the case of roll-out beyond the pilot, efforts would be focused on working with LGEA and SUBEB staff, to ensure that the data coming out of NSAMS is fully used in planning and policy-making.

The system could be adapted for human resource use i.e. attendance, pension, payroll processing, at the LGEAand State Ministries of Education personnel as well as other educational institutions

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