INTERNATIONAL FOUNDATION FOR SCIENCE

EVALUATION OF THE PRISM
(Procurement, Installation, Service, Maintenance and Use of Scientific Equipment)
PROJECT IN NIGERIA

Final Report

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Acronyms

AVCNU	Association of Vice Chancellors of Nigerian Universities
CIL	Central Instrument Laboratory (UNIPORT)
EMDC	Equipment Maintenance Development Centre (ABU)
EMT	Equipment Monitoring Team (UNIPORT)
GLP	Good Laboratory Practices
IFS	International Foundation for Science
MCRL	Multi-disciplinary Central Research Laboratory (UI)
M&E	Monitoring and Evaluation
MF	MacArthur Foundation
MOU	Memorandum of understanding
MSRL	Multi-User Science Research Laboratory (ABU)
NGOs	Non-Governmental Organizations
NUC	National University Commission
O&F	Operation and Financial plans
OM	Outcome Mapping
PME	Planning, Monitoring and Evaluation
PRISM	Procurement, Installation, Service and Use of Scientific Equipment
R&D	Research and Development
RMU	Research Management Unit (UNIPORT)
SOP	Standard Operating Procedures
TET-Fund	Tertiary Education Trust Fund
TOC	Theory of Change
TORs	Terms of Reference
UNICEF	United Nations Children Fund

Executive Summary

The overarching long-term goal of the IFS Procurement, Installation, Service, Maintenance and Use of Scientific Equipment (PRISM) project is to enable universities to start generating reliable scientific results from their laboratories using functional scientific equipment to address the development needs of the people. The implementation of the project involved the introduction of a set of activities aimed at addressing the existing poor state of scientific equipment (especially sophisticated and highly sensitive ones) at the participating scientific institutions as a result of lack of maintenance, servicing, spare parts, and a dearth of competent local equipment vendors. There is a lack of vendors that can supply the right kinds of equipment and provide the necessary back-up that is needed to take advantage of the rapidly growing stock of global scientific knowledge and effectively tap the existing potential among Africans to exploit this stock of knowledge for the benefit of the continent.

The project attempted to erect four building blocks to achieve this goal:

- development of Operational and Financial plan templates informed by lessons learnt from an earlier auditing exercise;
- development of support packages which were informed by participatory strategic planning using the *Outcome Mapping* methodology;
- a system for the procurement and installation of scientific equipment and provision of requisite training to technicians and technologists guided by the agreed Operational and Financial plans; and,
- development of partnerships aimed at institutionalizing "best practice" equipment procurement and management procedures and practices.

The findings of the evaluation show that aspects of all the project-level outputs as well as the anticipated higher-level outcomes were achieved even though there were shortcomings in some areas. Operational and Financial plans were developed by all the participating universities and these helped pave the way for the erection of the project's *Building Blocks*. Following consultations between the Boundary Partners in each participating university, areas that would benefit the most from the acquisition of new equipment and/or the rehabilitation of older equipment were identified, the equipment to be purchased within the budget limits were selected for procurement, and a procurement process involving "preferred equipment suppliers" initiated. Operational training workshops were organized to build equipment installation, management, and maintenance capacities. Arrangements were put in place to network the *Boundary Partners* and build their capacities.

Because the Operational and Financial planning processes of the project did not evolve exactly as designed, the full benefits accruable from it may have been limited. Another serious difficulty encountered by the project in all the participating universities was the inability to put in place the necessary conditions and capacities for measuring the experiences of the project and for gauging the changes taking place as they unfolded. These shortcomings notwithstanding, the project has provided a useful road map on how universities can go about addressing their knowledge gaps with respect to the kinds of equipment they need and how best to go about procuring and maintaining them. Experiences obtained with respect to the coordination of procurement and installation of equipment and how to cope with the inevitable bureaucratic procedures that can prevent efficient equipment procurement and the importance of critical mass and cost saving procedures, are all important contributions of the project. The IFS-PRISM project has also demonstrated that significant

benefits are accruable from partnerships between equipment manufacturers, suppliers and clients as well as from information sharing between and among the parties.

There are however, several reasons why, despite the apparent success of IFS-PRISM and its widespread acceptance in Nigeria, sustainability remains a significant challenge. First, because the stimulus for the project was externally generated, even though important stakeholders in Nigeria have embraced its underlying goals and principles, the widespread adoption of its principles could be resisted, since they will involve dramatic departures from normal practices especially as they relate to established public procurement procedures. Second, because some of the changes being proposed by PRISM may have political ramifications with regards what is to be done, how it is to be done, and how the benefits accruing from the changes engendered, should be distributed. There will inevitably be winners and losers and some of the losers may be entrenched enough and in positions to exercise strong and effective opposition. However, an interim institutional home for the advocates of the PRISM approach in the form of an association called the PRISM Scientific Association of Nigeria (PSAN) at the National Institute for Pharmaceutical Research and Development (NIPRD) in Abuja augers well for the continuing efforts of the IFS-PRISM project stakeholders. In addition, the interest indicated in support for the IFS-PRISM approach from significant potential donors is a positive platform on which PSAN may build.

The reviewers' suggested recommendations of the evaluation for the way forward are as follows:

Recommendation 1: Once the PSAN is created policy-makers and relevant government officers should be targeted not only to gain their confidence but also to help popularize the PRISM concept by raising awareness about its benefits.

Recommendation 2: The Association of Vice Chancellors of Nigerian Universities (AVCNU) and authorities of the National University Commission (NUC) and Tertiary Education Trust Fund as well as donor agencies in Nigeria should be encouraged to buy into the PRISM concept as a "preferred" strategy for finding a lasting solution to the dearth of scientific equipment, not only in universities and other tertiary institutions in Nigerian but the approach developed by the IFS-PRISM project should be widely shared across the continent through IFS partners including the African Academy of Sciences.

Recommendation 3: A high-level advocacy and sensitisation of key stakeholders in the education sector and members of the African Union should also be undertaken for the purpose of dismantling any apparent conflicts between the provisions of existing Public Procurement Acts and the procurement principles and procedures called for by the IFS-PRISM project.

Recommendation 4: The IFS-PRISM project experience in Nigeria has confirmed that the continent's scientific institutions can play an important role in facilitating economic development in African countries by tapping into the increasing growing global stock of scientific knowledge and using cutting-edge equipment on offer from a constantly improving global stock but, for this to happen, there is an urgent need for African governments to recognize and squarely face the problems of scientific equipment in their universities. IFS and its partners are well placed to support the sharing of the concept and advocacy for its widespread uptake, including through its Contributing Innovation Approach and through building on the existing links to the members of the proposed PSAN.

Recommendation 5: There is need for a more open selection process for membership into the "Preferred Suppliers" of equipment "club". These should always be competent and internationally-recognized suppliers. The participating scientific institutions should be involved in the selection process to avoid sharp practices such as mistaken procurement and the possibility of dumping obsolescent scientific equipment in Nigerian and African university laboratories.

Recommendation 6: Measures are needed to minimize delays in securing custom waivers and other factors that militate against seamless and timely delivery and full and complete installation of procured equipment. One way of doing this is to document and share widely the detailed understanding of the process of procurement and delivery of scientific equipment, including securing of waivers for customs duty payment and other custom formalities by members of the PRISM network. In other words, in the remaining months of the project to prepare a Country Importation Handbook building on the learning from the IFS-PRISM project. Another is to avail of the professional services of those who are professionally qualified to support customs clearance.

Recommendation 7: Capacity building/training of *Boundary Partners* including researchers, technologists/technicians and postgraduate students should be intensified to guarantee efficient laboratory management and quality research output that meets international standards.

Recommendation 8: 'Train-the-trainer' capacity-building programmes should be organized for technicians/technologists in order to create a critical mass of trainers.

Several lessons can be learned from the experience in implementing the PRISM project in Nigeria. The relative success of the IFS-PRISM project in Nigeria proves that PRISM is not only about the availability of funds to procure much needed equipment in African universities, but about creating and supporting an environment where all the key stakeholders (university administrators, researchers, technologists and technicians, and equipment suppliers) can start talking to and among themselves. Strategic planning should be in place to identify and procure necessary equipment and to facilitate and coordinate networking, so that when donor funds become available the IFS-PRISM concept and its principles can be successfully started in any country, or to be sustained once started. The MacArthur Foundation was able to make available significant amounts of financial resources to kick start the IFS-PRISM approach in Nigeria. The interest shown by the World Bank augers well for continued development of the PRISM approach. The 20:20 Vision of the Government of Nigeria for the country to attain a top twenty position in the league table of industrialised nations by 2020 represents an important opportunity for an association like PSAN to leverage government support for policy instruments in support of the IFS-PRISM approach which can facilitate a solid scientific research base for industrial development. Indeed, this is not unprecedented, and military as well as medical imports are already fast tracked through supportive policy instruments. This could help to enable the required human and financial resources to be set aside or dedicated to supporting the national science base through the implementation of the IFS-PRISM approach. In Nigeria, as in many African countries, where there is perennial budgetary austerity and great competition for dwindling capital budgets, strongly advocating the IFS-PRISM approach, through PSAN at the national level, and through the African Academy of Sciences, which is most prominently supported by a substantial trust fund put in place by President Obasijo of Nigerian support, at the continental level.

Second, such advocacy would begin to support the modifications in stakeholder organizations that will be required to achieve success, such as that clearly demonstrable in the University of Ibadan,

which is already attracting significant attention. The wider implementation of the IFS-PRISM approach involves new tasks and procedures, especially with respect to public procurement, expectations for the re-design and modifications of existing institutional arrangements to conform to IFS-PRISM principles. This will be *easier said than done*. Success here will depend on the "legitimization" of the IFS-PRISM concept, which will require the emergence of PRISM "champions" who are willing to risk their political capital in support of the implementation PRISM principles. Such champions in Nigeria include successful IFS-PRISM project partners (including the University of Ibadan) and those driving of the development of PSAN (including NIPRD) who could play a catalytic role in addressing equipment procurement short-comings in Nigeria, and their example could be highlighted across the continent through continent wide advocates who are already sensitized by IFS such as the African Academy of Sciences. Because compliance with the principles requires significant breaks from existing practices and calls for changes in attitudes and behaviours, it would be essential for a clear message to come out from the national and continental "legitimisers" that adherence to the IFS-PRISM principles represents the preferred way forward.

Third, for the IFS-PRISM concept to "catch fire" in Nigerian and African universities and scientific institutions it will be imperative to demonstrate its superiority over existing practices in an evidence-based way. This will require a credible system for periodic review and evaluation as well as tracking the changes being brought about by the project over multiple players, over multiple agencies, and over multiple periods. The Outcome Mapping (OM) methodology used to plan and operate the IFS-PRISM project appears to have been suited for this purpose. Its strength is its non-linear credentials which focus on behavioural changes of the *Boundary Partners* and beneficiaries. Its weakness is that by side-stepping the issue of attribution, it also side-stepped the issue of accountability. What is more, its procedures are quite long and complex and need extensive hands-on nurturing and tedious documentation to create the various *Journals on Outcomes, Strategies, and Performance*. The evaluation suggests that, in future, before the OM methodology is used exclusively, there should be more practice and sharing of experiences in its application. A preferred compromise might be to use the OM as a learning tool but to still rely on the orthodox Logical Framework analyses to ensure accountability.

Finally, the implementation of the IFS-PRISM project in Nigeria has taught us that the significant behaviour changes called for by IFS-PRISM require that many stakeholders adapt and modify to new tasks and ways of doing business. Changes in the operation of public organizations such as those in which the *Boundary Partners* operate are possible but not always easy. What is more, these changes are neither linear nor with specific timelines. Instead they are often multi-directional, fragmented, frequently interrupted, unpredictable and very long-term. How to sequence the necessary actions and what to give priority to, can vary significantly. What the Nigerian PRISM experience teaches us is that behaviour changes in an area such as equipment procurement can only proceed one step at a time, should not be short-circuited or necessarily rushed and requires continued adaptation through dialogue and communication. In this regard, *the IFS-PRISM process* is *the product*.

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1. INTRODUCTION

1.1. The purpose of the evaluation was to review the achievements of the MacArthur Foundation[1] funded and the International Foundation for Science (IFS) managed initiative for the Procurement, Installation, Service, Maintenance and Use of Scientific Equipment (PRISM) project since its inception in 2007 and to collate key lessons on improving the scientific infrastructure base in Nigerian and African universities. The consultants were requested to:

- provide answers to questions relating to the changes that were brought about by the project with regards the way universities procure and maintain scientific equipment and;
- determine the sustainability of the changes and the extent of awareness of the project as well as to see if there was evidence of spill over and replication beyond the direct beneficiaries.

The evaluation also examined what aspects of the project worked well and what did not work so well as well as the extent to which the risks involved were addressed.

1.2. The report is structured as follows. Section 2 describes the methodology that was applied in carrying out the assignment. Section 3 summarizes the historical context of the project while Section 4 reviews its monitoring and evaluation framework. Section 5 presents the evaluation findings. The recommendations of the evaluation are presented in Section 6. Annex 1 presents the Terms of Reference (TORs) for the evaluation and Annex 2 shows the table of progress made at the participating universities against the building blocks that were anticipated. The research projects selected by the participating universities are presented in Annex 3. Annex 4 presents the list of equipment that was identified for procurement at each participating university. Annex 5 presents the questionnaire that was administered to the Boundary partners and Annex 6 presents the list of persons met.

2. METHODOLOGY

2.1 The study was carried out by a team of three consultants, Daniel Ugwu, Robbie Gregorowski, and George Abalu[2] (Team Leader), and was contracted by the UK-based consulting firm ITAD, which specialises in monitoring and evaluation. The consultants reviewed the Draft PRISM Final Report and the Evaluation Terms of Reference (TORs) and held preliminary discussions with the staff of IFS. George Abalu and Daniel Ugwu then started the field work

[1] The John D. and Catherine T. MacArthur Foundation supports creative people and effective institutions committed to building a more just, verdant, and peaceful world. The International Foundation of Science was established in 1965 to address the stultifying conditions under which younger faculty members in the universities of developing countries were attempting to do research.

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by holding interviews with key stakeholders in Abuja and later proceeded to the four locations[3] in which the project's participating universities are located to interview as many key partners of the project as possible. The list of people with whom discussions were held is presented as an annex. The aim of the interviews was to solicit evaluation information on project implementation, the expected outcomes, interventions that were introduced to achieve the expected outcomes and how the envisaged change processes had actually unfolded. The interview sessions were guided by a set of pre-designed interview questions which were sent to the contact persons at the participating universities in advance.

2.2 The PRISM project was designed in three meetings with 30 prospective PRISM beneficiaries comprising policy-makers, researchers, technologists, and technicians from the six participating institutions using *Outcome Mapping* (OM) tools. The uniqueness of the OM methodology derives from its shift away from measuring impact to focusing on *"behaviour*al *changes"* which are termed *"Outcomes"* and which are defined as changes in the relationships, activities, or actions of the people, groups and organizations (*Boundary Partners*) with whom the project works directly. Although, as defined, these *"outcomes"* can be logically linked to the project's activities and processes, the OM methodology is not aimed at measuring impact but at capturing changes in the behaviours of the *Boundary Partners*, especially changes in their behaviours as a result of project interventions.

2.3 The OM approach comprises three stages. The first stage (*Intentional Design*) is used to clarify and arrive at consensus on the overall changes (*Outcomes*) that are being sought and to plan the strategies that would be used to bring about the needed changes. During this stage an attempt is made to answer the following four questions:

- Why? - *Vision statement*;
- How? – *Mission Statement*, *Strategy Maps*, and *Organizational Practices*;
- Who? – The *Boundary Partners*; and
- What? – *Outcome Challenges* and *Progress Markers*.

The second stage (Outcome Performance Monitoring) provides a framework for on-going monitoring of the project's actions in support of the Boundary Partners' progress towards the achievement of the Expected Outcomes. The third stage (Evaluation Planning) is used to set priorities so that M&E can target resources and activities where they will be most useful.

2.4 In addition to the interviews conducted by the Evaluation Team, a questionnaire was administered to randomly-selected people from the different groups of *Boundary Partners* and PRISM beneficiaries most of whom had been involved in PRISM activities in the past. The questionnaires were used to seek their views about the existing situation at their respective universities with regards the *Outcome Markers* that were earlier identified by a group of 100

[3] The four locations are Ibadan, Kano, Port Harcourt and Zaria. Because of on-going security incidences in Kano at the time of the visits, the consultants suspended their travel to Kano. Telephone interviews were, however, held with the key stakeholders at Bayero University and arrangements were made for the evaluation questionnaires to be administered by the Boundary Partners at the university. The completed questionnaires were then delivered to the consultants in Zaria.

PRISM beneficiaries.[4] The purpose of the exercise was not so much to collect information that would be used to compare with the responses they had offered earlier, but simply to find out how they presently felt about the different outcome areas encapsulated in the questions that were earlier posed to them. In other words, the aim was to find out, albeit in a crude way, the changes that they thought might have occurred in the behaviours of the Boundary Partners and that they felt could be associated with the activities of the project (see the *"Theory of Change"* reconstructed by the evaluation in the section below).

2.5 A total of 92 individuals completed the questionnaire. Most of the people who completed it were researchers (including post-graduate students) and technologists and technicians who were involved in varying degrees with the procured equipment and/or the laboratories where the equipment were located. Anyone who had participated in PRISM activities at one time or another since its inception and was familiar with its progress was allowed to take part in the survey. The table below shows the distribution of the respondents who completed the questionnaires including an indication of their level of involvement with the project at the time of the evaluation.[5]

2.6 The questionnaire was used to quantify opinions about the absolute and relative extent to which the graduated levels of *"Outcomes"* that were earlier envisaged had actually been achieved. The survey questionnaire is presented in Annex 5. It contains a set of brief statements relating to the existence or otherwise of each *Outcome Marker* which were first presented to the respondents. They were then asked to agree or disagree with the "assessment statements" about how well they felt a particular change process associated with a given *"marker"* had actually taken place in their university. The respondent was then asked to state how strongly they agreed or disagreed with the statement with the aid of a three point scale in which the number "1" was used for a mild strength of agreement or disagreement and the number "3" was used to register strong agreement or disagreement. If the respondent was indifferent to the statement, both "agree" and "disagree" were circled. During compilation, the responses were further transformed into a seven point scale with "disagree 3" represented by 1 and "agree 3" represented by 7. Indifference was given the value 4. The means and Standard Deviation of responses for each *Outcome Marker* were then obtained. Summing over all the *Marker* indicators provided an aggregate index of the overall extent to which the *Boundary Partners* felt a particular change process had occurred.

[4] Although these individuals had received some training on the OM methodology, most of those who said they took part in the exercise confessed that they did not quite understand its purpose and were not conversant with the OM methodology and its use.

[5] It should be emphasized that this was not a statistically rigorous sampling process. Anyone who was familiar with PRISM activities at the participating university and/or was benefiting from the services on offer from PRISM equipped laboratories could fill the questionnaire.

Table 1: Distribution of respondents from the participating universities who responded to the evaluation questionnaire

Involvement With PRISM Project Since 2007	*Universities*				*Total*	*%*
	ABU	BAYERO	IBADAN	UNIPORT		
Highly Involved	6	11	7	6	**30**	**32.61**
Moderately Involved	7	15	10	6	**38**	**41.30**
Little Involved	5	4	1	2	**12**	**13.04**
Not Involved	5	4	2	1	**12**	**13.04**
TOTAL	**23**	**34**	**20**	**15**	**92**	**100.00**

3. SUMMARY OF THE HISTORICAL CONTEXT OF THE PRISM PROJECT

3.1 A meeting[6] was held at the University of Buea in Cameroon in 2002 at which it was agreed that, although lack of funds was a serious obstacle, inadequate scientific infrastructural base and lack of functioning scientific equipment was just as critical in explaining deteriorating capacities in African universities to design and execute credible research projects for sustainable African development. It was at this meeting and following a Concept Paper presented by the International Foundation for Science (IFS) and the receipt of financial support from the MacArthur Foundation that the idea of a PRISM project was born.

3.2 It was decided to initiate the project in 15 universities by first conducting an audit to get an idea of the situation concerning equipment procurement and use in African universities. This constituted the first phase of the project. The audit found the situation of equipment procurement, maintenance, and use in the audited universities to be appalling with 40 per cent of the equipment not functioning. Most of the equipment was not installed, broken down or obsolete. Following the audit, a decision was taken to address issues of selection, procurement, transportation, installation and use of scientific equipment and training in African universities. A three-person Advisory Committee[7] was established to oversee the project. Funds[8] were made available to provide the equipment needed for the conduct of research and the training of students in the targeted universities and scientific institutions. Six pilot scientific institutions were selected for the project.[9] Each of these scientific institutions was to be facilitated in defining and prioritize its research needs and putting in place a set of procedures and support packages for the selection, procurement, transportation, installation, servicing, maintenance and use of the procured equipment. Issues relating to participatory planning, monitoring and evaluation were also addressed. This represented the second phase of the project.

3.3 The third phase of the project was the establishment of *"PRISM Partnerships"*,[10] voluntary associations of members who undertake to accept and comply with a *"PRISM Partnership Agreement"*. The agreement specifies the mission of the partnership and its objectives, its

[6] The meeting brought together stakeholders from all over Africa including policy makers, university administrators, technical staff, teachers and researchers, organizations with experience in the procurement and maintenance of equipment as well as prospective donor partners.

[7] The members of the Advisory Committee included: Professor Karniyus Gamaniel of Nigeria; Dr. Amah Klutsé who was then based in Burkina Faso but is now with the United Nations Children's Fund (UNICEF) in Bujumbura, Burundi; and Dr. Sune Eriksson based in Sweden.

[8] The budget for the second and third phases of the project combined was said to be about $US 3,500,000.

[9] The scientific institutions were: Ahmadu Bello University, Zaria (Nigeria); Bayero University, Kano (Nigeria); Insitut Malagache de Recherches Appliqués (Madagascar); University of Antananarivo (Madagascar); University of Ibadan (Nigeria) and University of Port. Harcourt, (Nigeria).

[10] The PRISM Partnership which was to be governed by a Governing Council was to provide advice and oversight on quality and reliability of the suppliers of scientific equipment and related services. The Partnership was expected to organize educational and training programmes for management staff, policy makers, and researchers and technicians and technologists and to also monitor the development and implementation of PRISM-facilitated Operational and Financial Plans at the participating institutions. These partnerships were to be financed by their members and their main operational and management activities focused on organizing Annual General Meetings as well as periodic subject-matter-specific meetings.

governance and management principles and its membership rules. Membership in the partnerships is open to all African universities (federal, state and private). The expectation was that these types of partnerships, starting with the pioneer ones in Nigeria, would serve as "best practice" examples to be emulated in other Africa countries and possibly in Asian and Latin American countries.

4. THE PROJECT MONITORING FRAMEWORK

The Outcome Monitoring M&E Framework

4.1 The project's Planning, Monitoring and Evaluation (PME) framework was designed during the series of three meetings involving 30 project beneficiaries from the six participating institutions described earlier on. The Draft Final Report of the PRISM project indicates that during these meetings the OM tool was used to;

- arrive at a *Vision Statement* describing the long-term goals of the project,
- agree the *Boundary Partners* with whom the project will work,
- specify the *Mission*, *Outcome Challenges*, and *Strategy Maps* that showed how the project will contribute to the long-term goals of the project, and,
- describe the organizational practices that would be put in place to guide the project towards its destination.

Issues relating to project outputs such as the preparation of Operation and Financial (O&F) plans, support packages, institutional arrangements, partnership arrangements and performance measurement arrangements, including the identifications of *Progress Markers*, were also said to have been discussed and resolved.

Lack of an Explicit Performance Measurement Framework

4.2 The review has been constrained somewhat by the fact that the PRISM project was started without a clear framework for explicitly monitoring and evaluating its performance. Although the OM approach is based on an innovative but relatively new M&E framework which down plays project impact and attribution, the lack of a framework for assessing the results of the project even in terms of its own expectations (i.e. the extent to which it influenced the behaviours of its *Boundary Partners* and the targets with which to mark progress or lack of it) made it difficult to avoid the dangers of arriving at anachronistic judgements about the project's performance. This is not to say that efforts were not made to measure the performance of the project. The O&F plans that were prepared by the participating institutions were supposed to contain PME arrangements. However, the OM methodology requires an intensive and elaborate step-by-step iterative and participatory strategic planning process not only for creating but also, and more importantly, for revising the constructed O&F plans as well as the associated *"Outcome"*, *"Strategy*" and *"Performance" Journals* – a process which the project apparently could not afford.

4.3 To avoid arriving at baseless conclusions about the project's performance, it became necessary for the Evaluation Team to reconstruct a *Theory of Change* (TOC) to use it to

hypothesize about how the early and intermediate *"building blocks"* that were erected by the project would set the stage for reaching its higher-level long-term goals.

The Reconstructed Theory of Change of PRISM

4.4 The evaluation identified a growing demand in Nigeria[11] for useful knowledge, skills and competencies to keep up with the explosive growth of the stock of global scientific knowledge and for creatively adapting this stock of knowledge to addressing the development challenges facing the country. Following initial discussions with a number of the PRISM key stakeholders[12], it was confirmed that the long-term goal of PRISM was "to ensure the production of reliable scientific results from laboratories in Nigerian universities using functional scientific equipment to address the country's development needs". According to the draft final report of the PRISM project, the four building blocks for achieving these long-term goals are:

a. The development of operational and financial plan templates informed by lessons learnt from the auditing that was carried out.

b. Development of support packages which are informed by participatory strategic planning using the *Outcome Mapping* methodology.

c. Putting in place an effective system for the procurement and installation of scientific equipment and providing requisite training to technicians and technologists at the universities using the O&F plans and the support packages that had been developed.

d. Development of Partnerships for institutionalizing PRISM-compliant equipment procurement and management procedures in accordance with "PRISM principles".

4.5 The hypothesis posited by the evaluation about the change process associated with the PRISM project is that, by successfully erecting the four building blocks identified above, the participating universities will kick-start much needed changes in the behaviours of each of the four *Boundary Partners* to the extent that entrenched negative ways and routines that had hitherto perpetuated the following existing situations, will begin to be reversed:

a. Equipment procurement at the university is not properly coordinated resulting in equipment being bought that cannot be used due to lack of space, incorrect specifications, or lack of training;

b. Researchers carry out research in a haphazard manner and where there is no functional system in place for prioritizing research in line with the core purpose of the university;

c. Technical personnel responsible for the operation and maintenance of scientific equipment and whose support is essential for the work of academicians and researchers do not have the requisite training and are poorly motivated resulting in sub-standard scientific performance and output all around;

[11] Note should be taken of the fact that although the PRISM project involved participating institutions in Nigeria and Madagascar, this evaluation only focused on Nigeria. It is, however, hoped, that the lessons learnt from the Nigerian experience would serve a useful purpose not only for Madagascar but also for other African countries.

[12] This involved meetings with officials in Abuja who were involved in the activities of the PRISM project.

d. University administrators do not give equipment procurement and maintenance the high priority it deserves, there is little or no strategic planning that ties resources allocated to the purchase of scientific equipment to the short- and long-term needs of the university, there is lack of university policies on the procurement and maintenance of new equipment or receiving donated equipment, there is no system for replacing and/or retiring obsolete equipment, and there is an absence of staff training programmes on equipment management and maintenance.

e. Overseas equipment manufacturers and suppliers neglect markets in developing countries because of the "thinness" of these markets and difficulties of doing business in them and where local suppliers and agents charge much more than their oversees counterparts, do not provide adequate after service support, are inadequately staffed and cannot meet their client's demands in an efficient and effective way.

4.6 The PRISM TOC reconstructed by the evaluation can be summarized as follows*: "The extent and speed with which the erection of the specified PRISM building blocks contribute to reversing and rolling back the above negative trends, the quicker the participating universities and countries will move towards having a network of world-class scientific laboratories that are self-sustaining, are producing R&D results that meet international standards and using scientific equipment of the highest standard, quality and reliability to address the country's developmental challenges".*

4.7 Based on the above TOC, the findings of the evaluation with regard to the extent to which the above building blocks have been erected in each of the four participating universities in Nigeria and how those building blocks may have contributed to reversing and rolling back the hitherto un-desirable behaviours, are presented in the following section.

5. EVALUATION FINDINGS

5.1 The specifications for the erection of the building blocks outlined above were informed by the results of the audit that was carried out during the first phase of the project. O&F plans which outlined the processes for managing the transportation, installation, operation, and maintenance of new and/or repaired equipment and the associated costs were prepared by each university based on these results. The requirements that have to be in place and the set of procedures and processes that would be followed to ensure smooth operation were also specified. These support packages served as the basis for the implementation of the project in the participating institutions. Simultaneously, partnership arrangements to spread the PRISM *Concept*[13] to other departments within universities, between universities, and within the African region were also being developed.

Project Level Output Results Areas and Progress to Date

5.2 The four building blocks have been regrouped into the following three to help streamline the evaluation exercise.

a. Development of Operational and Financial plans that are informed by lessons learnt from the auditing that was earlier carried out.

b. Development of support packages through participatory strategic planning for:

- Equipment procurement and installation
- Equipment management
- Capacity strengthening
- Monitoring and evaluation
- Dissemination of research results

c. Development of partnerships leading to the institutionalization of PRISM-based principles and procedures for future equipment procurement installation, servicing, and maintenance.

5.3 The table presented in Annex 2 provides details against these three main areas in terms of tracking progress about what worked well and what did not work so well, the key elements of which are summarised in the next three sub-sections here-below.

[13] A distinction should be made between the ***PRISM Project*** and the ***PRISM Concept***. The PRISM Project represents a set of specific activities aimed at addressing the existing poor state of scientific equipment (especially sophisticated and highly sensitive ones) at the participating scientific institutions due to lack of maintenance, servicing, spare parts, and a dearth of competent local equipment vendors that can supply the right kinds of equipment and provide the necessary back-up that is needed to take advantage of the rapidly growing stock of global scientific knowledge. The *PRISM Project* can be regarded as a micro-component of the *PRISM Concept* which is seen as the creation of partnership and networking (based on the principles of the PRISM project) between university administrators, researchers, technologists, and equipment vendors aimed at improving and leveraging the linkages between scientific research and national development.

Development of Operational and Financial Plans

5.4 Each university was expected to develop O&F plans proactively even before they placed orders for equipment in line with best practices. The O&F plans were to be used as road maps for constructing the four PRISM building blocks and included such items as:

- governance and institutional arrangements to manage the project;
- procedures for the identification and prioritization of the equipment to be procured;
- arrangements for the transportation, installation, protection and maintenance of the procured and repaired equipment (including supply of needed utilities); and,
- arrangements to ensure maximum operation and use of the procured equipment including the appointment of trained personnel to take care of the purchased equipment and provisions for routine training and support of technical staff.

An important aspect of the O&F plan was provisions for developing and using appropriate M&E tools.

5.5 It would appear that, although the Evaluation Team did not see any formal documentation to this effect, that there was an understanding that the operation of the PRISM project would involve shared responsibilities between the fund provider (MacArthur Foundation), the project implementing agency (IFS) and the university administration. The donor was to supply the funding for the equipment, the IFS would give management support and the university would provide the laboratories where the procured equipment would be housed, as well as longer-term funding to continue and sustain the project.

Findings

5.6 O&F plans were developed by each of the participating universities as agreed in the operational workshops that were held. Committees dedicated to PRISM activities were set up in all of them to manage the affairs of the project. These O&F plans had several positive outcomes. First they raised awareness about the importance of developing a systematic and participatory process for linking the selection of equipment to be purchased to the actual needs and research priorities of the university. Thanks to the requirement that each participating university prepares an O&F plan, all of them went through a systematic process of identifying research areas and topics that each felt would contribute significantly to solving the pressing development problems facing the country in accordance with the university's core purpose. The O&F plans were then used as the main basis for selecting the scientific equipment that would be most amenable to high-quality research and that should be procured.

5.7 Second, by requiring that each participating university set up a committee dedicated to managing the affairs of the PRISM project, this encouraged the university to take steps to establish structured complimentary equipment maintenance arrangements where they did not already exist and, where they existed, to strengthen and link their operations to those of the PRISM project. Third, the requirement for a dedicated laboratory which met the specified specifications for effective storage, use and protection of the equipment to be procured appears to have been an important factor in the implementation of the O&F plans that were drawn up by the participating universities. The University of Ibadan, the Ahmadu Bello

University and the University of Port Harcourt all succeeded in establishing functional central laboratories based on PRISM principles. The extent to which these central facilities were well planned and the quality of the oversight provided by their management committees, appeared to have been important factors in determining how well the PRISM principles were adhered to.

5.8 In all cases, the existence of the central laboratory facilities, created in all the participating universities, with the exception of Bayero University in Kano[14], has served as "best practice" and their reputation has spread to other departments in the participating universities as well as to other neighbouring universities. For example, at the University of Ibadan, PRISM-funded equipment, even though it constitutes a small proportion of the total value of the university's collective equipment stock, is now being used by a range of departments throughout the university. In addition, the University's Multi-Disciplinary Central Research Laboratory (MCRL) is presently providing laboratory services to neighbouring universities. At the Ahmadu Bello University in Zaria, the staff of the University's Equipment Maintenance Development Centre (EMDC) are *con-joint* staff of the PRISM supported Multi-User Science Research Laboratory (MSRL) and the university has constituted a group of technicians and technologists from both units that meet regularly to discuss the status and situation of equipment at the different laboratories in the university including those at the PRISM-supported MSRL.

5.9 There were, however, a number of shortcomings in the design and implementation of the O&F plans. First, it would appear that the purpose for preparing them was not properly understood. In all cases, while the processes followed were adequately participatory, the plans that emerged appeared to be a list showing the participating university's operational needs for new equipment and the extent to which the minimum requirements for receiving the identified equipment from IFS had been met or would be met. Second, the plans were not O&F plans in the true sense, as no attempt was made to define how the PRISM project will actually operate in practice in their respective universities, what capacities would be required, how financial resources would be engaged, how sustainability will be assured, and most importantly, they failed to identify anticipated risks and how they will be mitigated. Third, most of the *Boundary Partners* who participated in the preparation of the O&F plans did not appear to have a good understanding of the *Outcome Mapping* methodology that was used as the design and planning tool for the project.

5.10 This deficiency comes out clearly in the results of the *Baseline Outcome Journal* that was prepared by the *Boundary Partners*. It is also reflected by the fact that while all the participating universities were aware that they had to report on how well the prescribed PRISM *building blocks* were erected, none of them was able to develop a functional M&E plan with a credible set of indicators that could be used to assess the extent to which the *building blocks* (PRISM's main interventions) were being successfully introduced. The two that attempted (ABU and the University of Ibadan), simply came out with a log book for registering the usage of the procured equipment. The fourth shortcoming is that it appears that the PRISM project administrators grossly under-estimated the complexity of the *Outcome Mapping* methodology as well as the long gestation period required to get the *Boundary*

[14] Bayero University is the only university among the four that did not have a central laboratory. The university chose, instead, to distribute the PRISM-procured equipment to the different departmental laboratories.

Partners and other stakeholders to grasp its fundamentals. Finally, it would appear that the responsibilities of each of the shared partners in the actualization of the O&F plans were not clearly defined, were not unambiguously agreed, and were not effectively communicated.[15]

Development of Support Packages

5.10 Support packages were proposed to ensure research relevance, cost effective equipment procurement and effective equipment management at the participating institutions. The key areas to which support was directed to achieve this goal can be categorized as follows:

- Support for equipment procurement and installation
- Support for equipment management
- Support for capacity building

Support for equipment procurement and installation:

5.11 The institutionalization of a process that leads to the identification of a set of reliable suppliers of scientific equipment and related services was considered to be a key building block for the PRISM project. The aim was to establish a practical process and criteria for the selection of qualified equipment suppliers (Preferred Suppliers) who will ensure a cost-effective, safe, efficient and reliable procurement of equipment for the participating universities as well as ensure seamless installation and provision of pre- and post-installation training and quality assurances. Arrangements for freight forwarding and travel insurances as required and hassle-free and expeditious processing of custom documents including tax exemption certificates, import license agreements, and Form M were also supposed to be critical requirements for support in this area.

Findings

5.12 Following internal meetings and workshops the participating universities identified research and training areas that would benefit the most from new equipment and contribute the most to the development challenges facing the country. In each of the participating universities, serious attempts were made to identify research and scientific areas which they felt would produce quality scientific results. Following the selection of these areas of research (see Annex 3), each participating university compiled a list and drew up proposals for the equipment to be procured including accessories, consumables, training, services, and maintenance (See Annex 4 for the list of equipment that were eventually selected for procurement by each of the participating universities). Each university agreed to be responsible for importing equipment that had been identified for procurement and to take care of its clearance through customs and transportation to their respective laboratories. Almost all the participating universities were unable to perform this task expeditiously. The

[15] For example, a number of operations that were included in the O&F plans did not materialized due to lack of funding and a number of vital negotiations between the IFS and the participating institutions with regard to shared responsibilities took place informally largely through electronic communications. It was indicated by the Project Manager that the O&F planning process was meant to be used to arrive at agreement on the division of responsibility between the Fund Provider (the donor), the IFS (project management support) and the university administrators where the expectation was that the donor would provide the funding for the equipment, the IFS, management support and the university, the required laboratories and longer-term funding support to sustain the project.

risks involved in importing goods into Nigeria were not adequately anticipated and the complications surrounding the Government's Public Procurement policy were not factored into the operational arrangements for importation that were made by the universities. In the end, the universities had to resort to individual ad-hoc and emergency measures. This resulted in serious delays in finalizing the procurement and installation of the equipment that had been ordered. In fact, the operational risks in Kano were so bad that as of the time of the evaluation, almost all of the equipment procured for Bayero University had not been installed. At the University of Ibadan some of the equipment that was procured is still stacked up in a corner in the laboratory unpacked and uninstalled.[16]

5.13 All the participating universities appreciated the value of using "Preferred Suppliers" to procure their equipment. The arrangement made it possible for the acquisition of expertise on the latest equipment with which the local technicians and technologists were not yet familiar, to be made available at no cost to them. It also enabled training for researchers on how to use the procured equipment. Furthermore, the discounts provided by the suppliers for the equipment (sometimes up to 40%) were greatly appreciated although this may have had its own ramifications in terms of how to use the savings so obtained.[17] There were, however, a number of bottlenecks associated with the operations of these "Preferred Suppliers". First, not too many people at the participating universities were able to benefit from the training on offer by the experts that were made available by the suppliers because many of the technicians and technologists who could have benefited from these training were not involved and did not benefit from the training provided.[18] Second, while the participating universities benefited from pre-installation and installation training, training in the operation of the installed equipment and the needed protocols were generally considered to have been inadequate. Third, most of the key people at the universities initially had little or no information about the costs of the equipment that was being procured for them. This became a problem when the time came for seeking waivers for customs clearance which, in turn, contributed to the delays in obtaining the need clearances. Fourth, as mentioned above, in all cases serious difficulties were experienced with regards freight and forwarding arrangements, the obtaining of customs documents including tax exemption or waiver documents and the finalization of Form M, and import licensing agreements. Finally, all the universities had problems with the local representative of the supplier. The quality of his post installation services, including training were generally considered to be inadequate.

[16] The local agent of the equipment supplier has still not been able to install the equipment.

[17] Although it was not clear to the evaluation to what use this savings was put, there was some debate on how future savings should utilized. One school of thought was that the savings should be used to augment the cost of running the PRISM association in the country. Another is that it should be used to obtain more elaborate after sales support.

[18] One explanation is that departments and individual researchers whose projects were rejected simply lost interest in the activities of PRISM and ceased to be actively involved.

Support for equipment management

5.14 Support for equipment management was to be based on the O&F plans that the participating institutions had earlier developed. Meetings were expected to be organized to identify any remaining constraints and appropriate solutions sought on a continuous and continuing basis.

Findings

5.15 As stated above the O&F plans did not evolve as they should have and, as such, were not used to systematically identify and address the unfolding equipment management issues at the universities. Nor were they used for anticipating and taking corrective actions as implementations problems emerged. What is more, there is no evidence that any of the participating universities entered into any formal after-service and longer-maintenance agreements with the supplier. As indicated above, while installation-specific training was provided by the equipment supplier, much-needed training for routine maintenance, servicing, general operation and quality assurance was not provided in any of the participating institutions. Furthermore, the impression was given that 50% of the total amount allocated for the procurement of equipment at the participating universities would be reserved and used for maintenance and supplies. It was not obvious to the evaluation the extent to which this strategy was implemented.[19] Furthermore, while the participating universities have been able to coordinate the activities of their respective equipment maintenance units with those of the PRISM-supported laboratories, a pool of trained technicians capable of providing sustained and sustainable servicing and maintenance of PRISM-funded equipment and PRISM-supported laboratories has not yet emerged as was expected with the possible exception of ABU where a dedicated university-wide equipment maintenance group has been formed.

Capacity-Building

5.16 Capacity building was expected to happen in an on-going way through the organization and servicing of meetings and workshops involving policy-makers, government officials, development organizations, Non-Governmental Organizations (NGOs), private sector officials, the media, etc. It was expected to build and maintain on-going capacity for identifying demand-driven research projects, procuring and maintaining the right equipment in an efficient and cost-effective way, conducting the required research, and facilitating the translation of the research results on offer into practical solutions for the country's development problems.

Findings

5.17 Four Operational Training Workshops were conducted by IFS at the participating universities.[20] While the key players at the participating universities confirm that these

[19] The participating universities were even requested to draw up a list of their maintenance and supplies requirements and these were forwarded to IFS.

[20] The first Regional Workshop which was designed to introduce the PRISM Concept and the elements of Good Laboratory Practices (GLP) and Standard Operating Procedures (SOP) was held in August 24th to 28th, 2009, in Kano. This was followed by another workshop at Bayero University, Kano, from 26th April – 4th May, 2010. The third workshop was held at the University of Ibadan from 26th -31st October, 2011 and the last one was in Abuja in December 14th -16th, 2011 at NIPRID, Abuja. Beside these training workshops, several

workshops did indeed improve their understanding of the PRISM concept, their views on whether the workshops were able to address their needs and ultimately improve their performance, varied form university to university. The University of Ibadan gives credit to the PRISM project for the emergence of a comprehensive capacity-building and training programme for its technicians and scientists while the other three universities felt that the capacity-building provided by the project had been inadequate. These three institutions believed that the main reason was the project's inability to establish on-going, systematic and planned capacity-building processes with measurable performance objectives, defined outcomes, and implementation strategies.

Development of PRISM Partnership

5.18 The building of a PRISM partnership was an important building block for achieving and sustaining the goals off the project. The plan was to establish partnerships between university administrators, researchers, technologists/technicians, and equipment vendors to improve the Research and Development (R&D) environment in the country by facilitating commercial and technical linkages between buyers of scientific equipment and equipment sellers. One of the primary functions of the partnerships was to serve as a hub for information on high quality and reliable supplies of scientific equipment and related services.

Findings

5.19 The general belief among all the stakeholders was that, although the PRISM Project had come to an end in the country, the seed for the PRISM Concept to grow and multiply had been sown. It was thought that the challenge would be how to carry the concept forward. While there was understanding that funding for the project had ran its course, there was a sense that the project's proposed partnership-building activities may have ended prematurely before the pilot could demonstrate their full impact. The enthusiasm for the future of the PRISM Concept in Nigeria is, however, not without foundation.

5.20 The PRISM concept is generally accepted as legitimate by all the Boundary Partners. There was consensus at all the participating universities that the process, if successfully applied, is likely to help resuscitate scientific academic excellence in Nigerian universities. This expectation has been enhanced by the fact that a number of potential "PRISM Champions" have emerged. The Association of Vice Chancellors of Nigerian Universities (AVCNU) and the Tertiary Education Trust Fund (TET-Fund) have both been openly supportive of the creation of a proposed PRISM Association of Nigeria.[21] This is particularly important for the sustainability of the PRISM concept.

Achievement of Higher Level Outcomes

5.21 The PRISM project in Nigeria was aimed at achieving project level outputs involving the four main building blocks whose performance have been evaluated in the preceding section. The expectation was that by successfully erecting these building blocks significant changes in

on-site training workshops on equipment installation, operation, application, and quality assurance were also held at the individual universities.

[21] There are still legal issues to be resolved with the Corporate Affairs Commission regarding an appropriate name for the Nigerian PRISM.

behaviours will occur in the four main *Boundary Partners* – researchers, technicians and technologists, university administrators, and equipment suppliers – which will, in turn, lead to the production of reliable scientific results from laboratories in Nigerian universities using functional scientific equipment to address the country's development needs.

5.22 The expectation was for changes involving university researchers whereby they become increasingly involved in the identification, procurement and use of scientific equipment, leading to innovative results that can successfully address developmental problems and which are publishable and form the basis for teaching undergraduate and graduate students. Formal collaboration between the researchers, technicians/technologists, university administrators and equipment suppliers will increase and functional networks for the exchange of ideas, experiences and best practices will be formed. Technicians and Technologists would play a central role in the identification, installation and operation of procured equipment and would interact closely with equipment suppliers.

5.23 University administrators were expected to begin to demonstrate their commitment to improving the quality of their laboratories and making them self-sufficient. They were to do this by dedicating additional new resources (human, financial, space facilities) to the acquisition and housing of new scientific equipment and putting in place attractive conditions of service and incentives for their staff aimed at enhancing their capacity and developing in-house expertise.

5.24 Equipment suppliers were expect to provide a new set of suppliers capable of making available high quality equipment in a timely manner based on the actual needs and specifications of the clients and adapted to the peculiar operating conditions of their locations. Furthermore, they were expected to contribute towards capacity building by;

- providing training for researchers, technicians and technologists on the application, operation and maintenance of equipment;
- providing regular updates on new and emerging developments in both software and hardware; and
- making available high grade consumables, spare parts and service as well as relevant literature in a reliable and timely way.

5.25 A *Baseline Outcome Journal*[22] was developed in August 2010 which was to provide the framework for on-going monitoring of the behavioural changes taking place in the Boundary Partners *vis a vis* the expectations outlined above. These expected changes were grouped into three graduated categories of outcomes which could be logically linked to the project's activities even though they may not necessarily have been caused by them i.e., the outcomes that the respondents would *"expect to see", "like to see"*, and *"love to see".* We have alluded several times to the fact that responding *Boundary Partners* erroneously thought they were involved in a simple scoring exercise. This evaluation has taken advantage of the wish list that emerged from that exercise and used the TOC constructed to arrive at the following three higher level outcome areas which formed the basis of the three sets of questions posed to *Boundary Partners* in the present questionnaire as follows:

[22] It has since been suggested and confirmed that the PRISM Boundary Partners who completed the survey that formed the basis of the journal did not quite understand the concept, the methodology used, and the objective of the exercise.

a. The outcomes which the *Boundary Partners* "expected to see"
b. The outcomes which, if they occurred, would be "beyond (their) expectation"
c. The outcomes which, if they were observed, would be "over and beyond (their) expectation"

5.26 The wish list of behavioural changes that fall into each of these three groups of graduated outcome areas for each of the four *Boundary Partners* are presented in Table 2 below. The expectation is that, as a set, these questions can help tell the complex story of the changes in behaviours that may have occurred in the *Boundary Partners*. The aim was to simply engage in an honest quantitative dialogue around the sorts of results that Boundary Partners believe are realistic in the present equipment procurement, maintenance and use context in Nigeria using the three outcome areas above as the basis for the quantitative dialogue. It should be emphasized that the purpose of the exercise was not to track the *progress markers* against the timeline since 2010 or to attribute any progress observed to the introduction of the project. That would be ill-advised not only because the available *Baseline Outcome Journal* data was not properly done but, more importantly, because *"progress markers*" are about changes in the behaviours of the partners and not about the interventions themselves".[23]

[23] Private communication from one of the inventors of the Outcome Mapping Approach supplied by Cecilia Oman

Table 2: Graduated Expectations of Boundary Partners (Progress Markers)

Expected Outcome

Researchers	Technicians/Technologists	Scientific Organization Authorities	Equipment suppliers
1. They become more actively involved in equipment selection, installation and maintenance as well as pre and post installation training. 2. Research activities are increasingly been carried out using the new equipment. 3. Research activities are contributing to more training and education of students. 4. Research results based on the use of equipment are accepted and published more easily.	1. Technologists and technicians are now participating more in pre-installation training 2. They have started collaborating with equipment manufacturers and vendors as well as researchers in installation of equipment. 3. They are participating in post-installation training on equipment maintenance and application, and they carry out routine maintenance of the equipment. 4. They regularly receive request to carry out analysis with the equipment and they are now obtaining high quality scientific results for researchers, students and the private sectors and other organizations.	1. They have started consulting with researchers, technicians/technologists, scientific organizations and equipment suppliers on the nature and type of equipment to be acquired and they follow recommendations of these Boundary Partners. 2. They see the value and provide an enabling environment for stimulating creativity and minimize administrative tediousness. 3. They create opportunities for professional and academic growth for the technical staff operating the equipment. 4. Appropriate in-house resources are being made available for the operation and maintenance of the equipment.	1. They are now providing information and sharing their expertise on the selection of equipment and accessories. 2. Equipment prices are now fairer and procured equipment is now delivered timely within the foreseen deadline (including local transport, custom clearance, etc). 3. Spare parts and consumables are now being provided in a regular manner. 4. There is now more on-site training in application, operation and maintenance.

Beyond Expectation Outcome

Researchers	Technicians/Technologists	Scientific Organization Authorities	Equipment suppliers
1. Multi-disciplinary research teams are being set up to use the equipment and it is resulting in innovative research. 2. Research results are accepted and published more easily as a result of the new equipment. 3. Improved research results are contributing to career promotion of researchers 4. Researchers are engaging in new research areas as a result of the presence of a new equipment 5. The university is receiving more research grants as a result of improved research environment brought about by the purchase and maintenance of new equipment 6. Researchers and technicians meet regularly under the PRISM umbrella and the local and regional level.	1. The results obtained by the technicians and technologists are published in reputable journals by researchers, and the technologists are appropriately acknowledged in the publications 2. The technicians and technologists participate actively in a network among themselves and interact actively with other Boundary Partners and relevant international organizations 3. Their works generate significant revenue for meeting the operational costs of the laboratory.	1. They recognize laboratory excellence as an important milestone towards overall excellence in their strategic plan. 2. They permit the laboratories to operate as autonomous cost centres in order to optimize the use of the equipment and secure funding for further operation and maintenance 3. They encourage industries and cooperation to establish agreement with their laboratories.	1. They are providing reliable and timely maintenance 2. There are open channels of communication for feedback between suppliers and end-users (such as telephone, Skype, etc.) 3. They are sharing information about new techniques, technologies and products with end users.

Over and Beyond Expectation Outcome

Researchers	Technicians/ Technologists	Scientific Organization Authorities	Equipment suppliers
1. Innovation research results are being applied by local communities and end-users in addressing their social, environmental and livelihood challenges as a result of improved laboratory facilities 2. Researchers are sharing and disseminating their PRISM experiences in other regional and international networks that they belong to 3. The innovative works of researchers are leading to their increased recognition nationally and internationally.	1. The work of the technicians and technologists in their laboratories attract international accreditation for the laboratory 2. They use the highly specialized skill and expertise that they have acquired in PRISM to provide advisory services to other laboratories outside their network	1. They support critical research which address the social, environmental and health problems of their catchment area and of the country in general 2. They have put in place policy and procedures that enable laboratories to pursue international accreditation	1. They are adapting their equipment to local conditions (humidity, dust, unstable electricity, etc.) 2. They are opening local offices in different part of the country in order to bring their services closer to their clients

5.27 The scores for the different set of outcome areas for the four participating universities are presented below in Figures 1, 2, 3, and 4. The maximum score obtainable on any of the *"expectation areas"* was 7. The suggestion from the figures is that the *"expect to see"* the *"beyond expectation"* and the *"over and beyond expectation"* markers have manifested themselves reasonably well. What they suggest is that the expected behavioural changes that these markers point to may be showing up stronger than expected despite the implementation challenges encountered in erecting the PRISM *building blocks*.

5.28 The figures suggest that aspects of all of the outcome change areas outlined above were achieved in varying degrees. This was also the case with regards the findings about the project-level output and results areas. It can, however, be argued whether these three categories of graduated expectation areas represent concrete higher levels of PRISM outcomes especially in a situation of considerable uncertainty and unpredictability about causality. The question can also be asked if they qualify as attitudinal changes that can be associated with the PRISM project. What is not in doubt, however, is that they do tell us something about the kinds of "creations" that the *Boundary Partners* have the potential of becoming if the PRISM *building blocks* are successfully erected. Just as important is the fact that they can serve a useful purpose in the future by providing an informed basis for follow-up with the *Boundary Partners* to collect more information, learn more, deepen understanding and adjust expectations about the future of the PRISM concept not only in Nigeria but also in the wider African university community.

Figure 1: Mean Score of Outcomes Expectations of Boundary Partners at the University of Port Harcourt

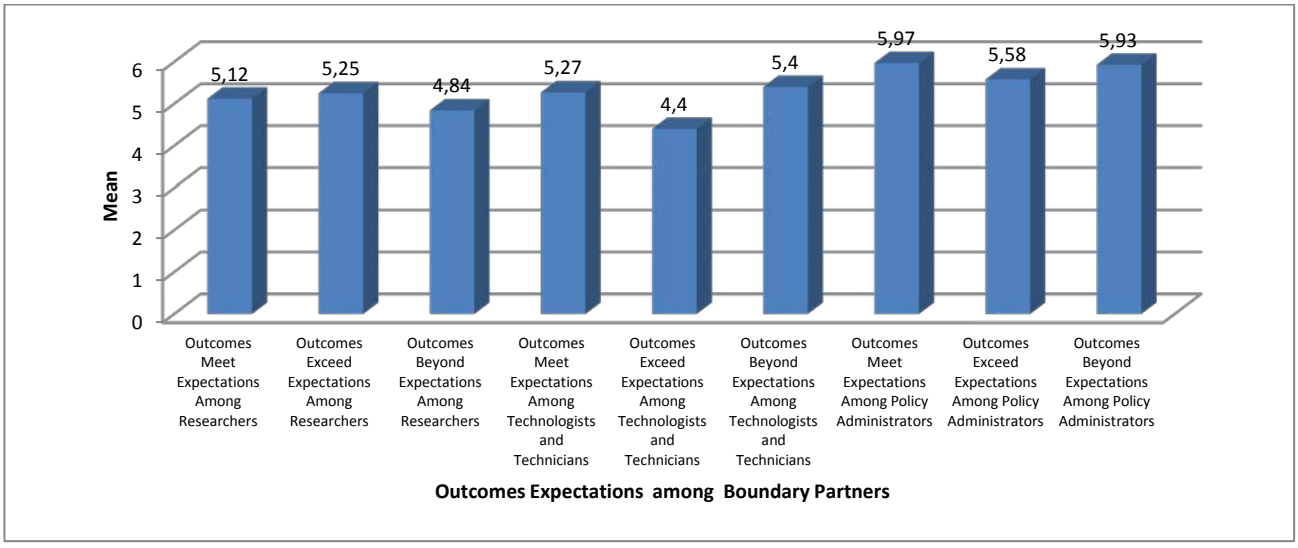


Figure 2: Mean Score of the Outcome Expectations of Boundary Partners at the University of IBADAN

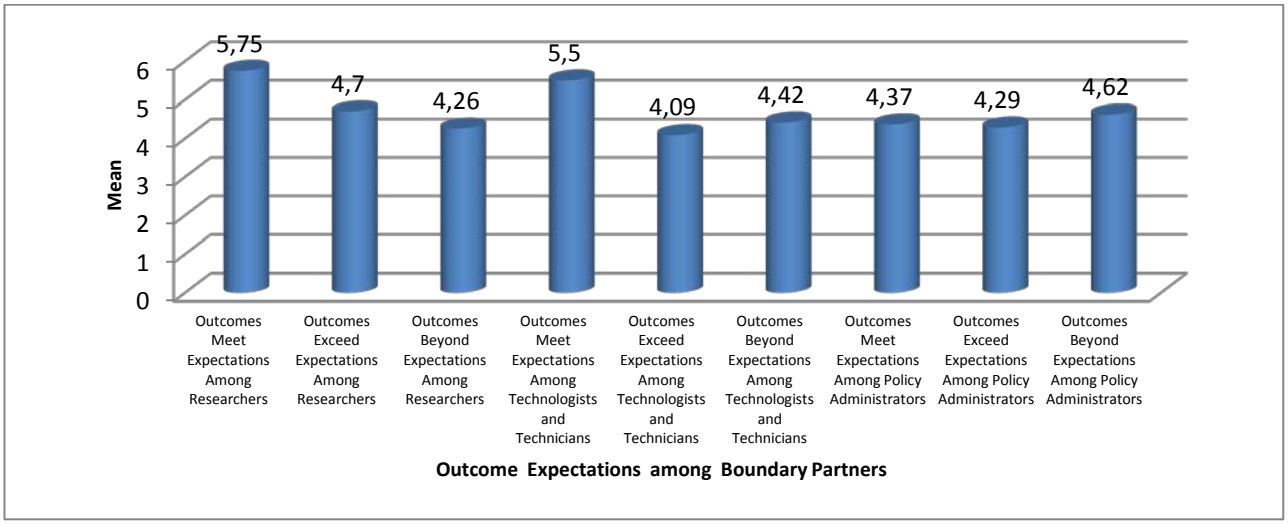


Figure 3: Mean Score of the Outcomes Expectations of Boundary Partners at ABU

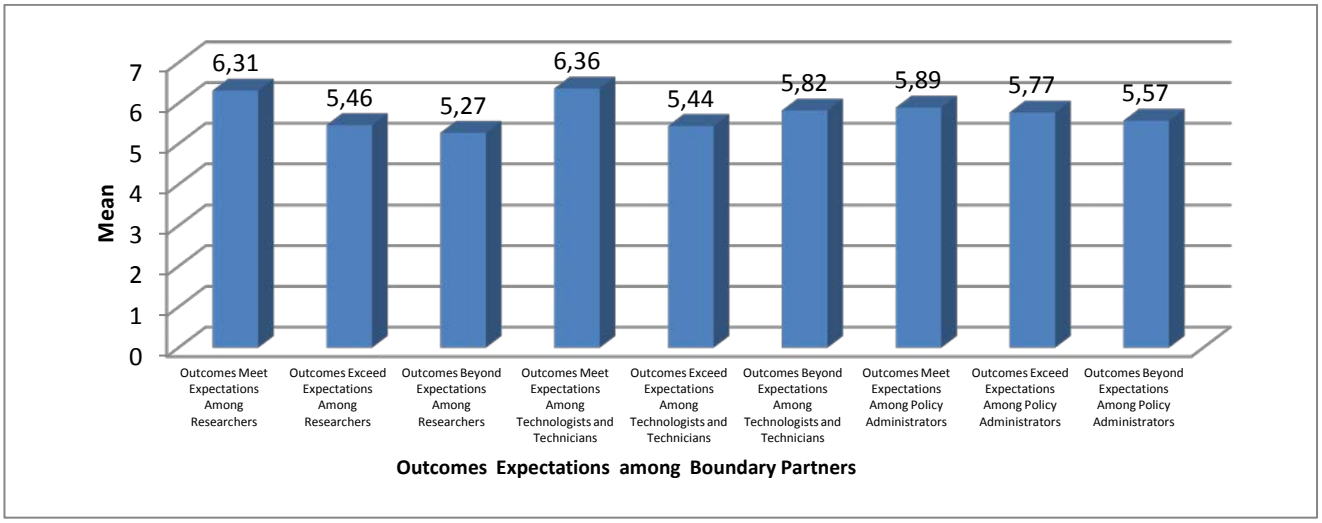
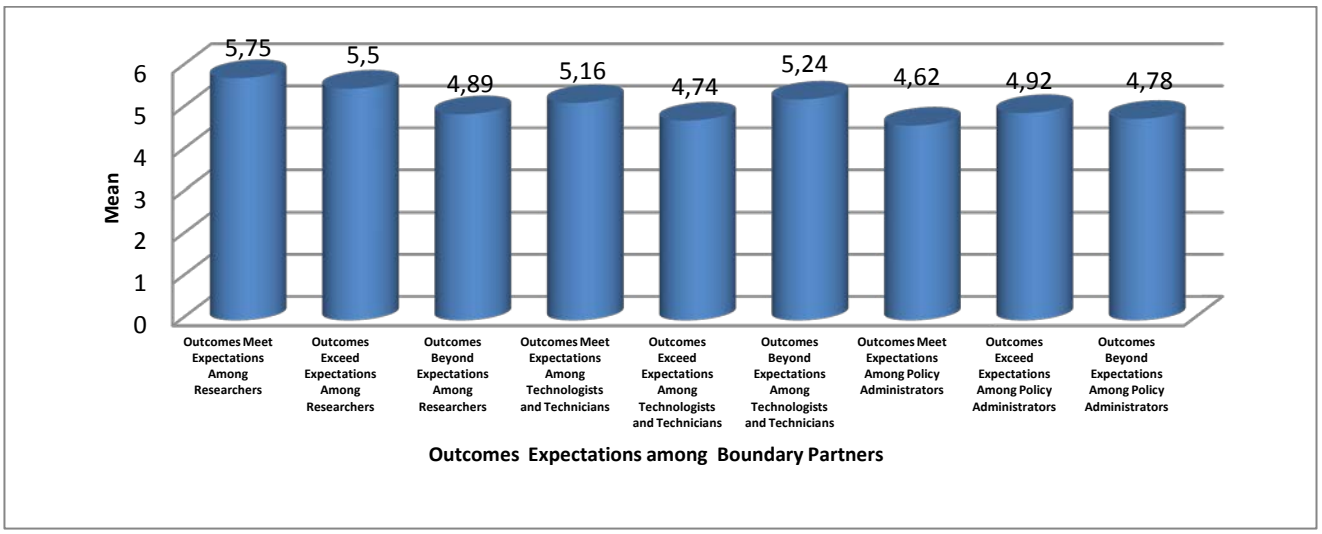


Figure 4: Mean Score of the Outcomes Expectations of Boundary Partners at Bayero University



6. CONCLUSIONS

6.1 The findings of this evaluation show that aspects of all of the project level outputs and higher level outcome areas of the PRISM project in Nigeria were achieved even though there were shortcomings in a number of areas especially with respect to the institutionalization of the O&F planning processes. PRISM provides a road map on how universities can go about addressing their knowledge gaps with respect to the kinds of equipment they need and how best to go about procuring and maintaining them. Experiences obtained with respect to the coordination of procurement and installation of equipment and how to cope with the inevitable bureaucratic procedures that can prevent efficient equipment procurement and the importance of critical mass and cost saving procedures, are all important contributions of the project. The PRISM project has also demonstrated that significant benefits are accruable from partnerships between equipment manufacturers, suppliers and clients as well as from information sharing between and among the parties.

6.2 There are however, several reasons why, despite the apparent success of PRISM and its widespread acceptance in Nigeria, sustainability remains a significant challenge. First, because the stimulus for the project was externally generated, even though important stakeholders in Nigeria have embraced its underlying goals and principles, the widespread adoption of its principles could be resisted, since they will involve dramatic departures from normal practices especially as they relate to established public procurement procedures. Second, because some of the changes being proposed by PRISM may have political ramifications with regards what is to be done, how it is to be done, and how the benefits accruing from the changes engendered, should be distributed. There will inevitably be winners and losers and some of the losers may be entrenched enough and in positions to exercise strong and effective opposition. However, an interim institutional home for the advocates of the PRISM approach in the form of an association called the PRISM Scientific Association of Nigeria (PSAN) at the National Institute for Pharmaceutical Research and Development (NIPRD) in Abuja augers well for the continuing effort of the IFS-PRISM project stakeholders. In addition, the interest indicated in support for the IFS-PRISM approach from significant potential donors is a positive platform on which PSAN may build.

6.3 There is also the issue of funding. There is the fear that this could be a serious sustainability issue that could derail the expansion of the PRISM concept in Nigeria especially if “critical persons” in important prospective equipment funding sources misunderstand its purpose and fail to buy into it.

7. RECOMMENDATIONS

Building a PRISM Constituency

7.1 The usefulness of the PRISM concept has generally been accepted in Nigeria. However, this general acceptance will not be enough to keep it alive. The concept has to be nurtured and aggressively marketed. A strong constituency for PRISM will need to be developed. The aim is to mobilize important decision- and policy-makers outside of the main *Boundary Partners* in favour of the concept. The reviewers suggested recommendations of the evaluation for the way forward are as follows:

7.2 **Recommendation 1**: Once the PSAN is created policy-makers and relevant government officers should be targeted not only to gain their confidence but also to help popularize the PRISM concept by raising awareness about its benefits.

7.3 **Recommendation 2**: The Association of Vice Chancellors of Nigerian Universities (AVCNU) and authorities of the National University Commission (NUC) and Tertiary Education Trust Fund as well as donor agencies in Nigeria should be encouraged to buy into the PRISM concept as a "preferred" strategy for finding a lasting solution to the dearth of scientific equipment, not only in universities and other tertiary institutions in Nigerian but the approach developed by the IFS project should be widely shared across the continent through IFS partners including the African Academy of Sciences.

7.4 **Recommendation 3**: A high-level advocacy and sensitisation of key stakeholders in the education sector and members of the African Union should also be undertaken for the purpose of dismantling any apparent conflicts between the provisions of existing Public Procurement Acts and the procurement principles and procedures called for by the IFS-PRISM project.

7.5 **Recommendation 4**: The IFS-PRISM project experience in Nigeria has confirmed that the continent's scientific institutions can play an important role in facilitating economic development in African countries by tapping into the increasing growing global stock of scientific knowledge and using cutting-edge equipment on offer from a constantly improving global stock. For this to happen, there is an urgent need for African governments to recognize and squarely face the problems of scientific equipment in their universities. IFS and its partners are well placed to support the sharing of the concept and advocacy for its widespread uptake, including through its Contributing Innovation Approach and through building on the existing links to the members of the proposed PSAN.

Supply of Equipment

7.6 Local equipment suppliers usually do not have the requisite knowledge and information about the equipment market. What is worse, they usually offer to sell their equipment at much higher prices than suppliers from outside. On the one other hand, the local suppliers often act as agents for different equipment, are inadequately staffed, are poorly trained and tend to have little interest in the equipment from which they do not make as much profit. On the other hand, overseas suppliers neglect the market in developing countries because it is considered to be too thin, dispersed, and difficult to do business in.

7.7 Recommendation 5: There is need for a more open selection process for membership into the "Preferred Suppliers" of equipment "club". These should always be competent and internationally-recognized suppliers. The participating scientific institutions should be involved in the selection process to avoid sharp practices such as mistaken procurement and the possibility of dumping obsolescent scientific equipment in Nigerian and African university laboratories.

7.8 Recommendation 6: Measures are needed to minimize delays in securing custom waivers and other factors that militate against seamless and timely delivery and full and complete installation of procured equipment. One way of doing this is to document and share widely the detailed understanding of the process of procurement and delivery of scientific equipment, including securing of waivers for customs duty payment and other custom formalities by members of the PRISM network. In other words, in the remaining months of the project to prepare a Country Importation Handbook building on the learning from the IFS-PRISM project. Another is to avail of the professional services of those who are professionally qualified to support customs clearance.

Capacity-Building

7.9 Capacity building will be required to improve the ability of the *Boundary Partners* to achieve the desired behavioural changes, address their needs and, ultimately, change the overall process of equipment procurement for good. Given the PRISM architecture, this capacity-building endeavour must be on-going, systematic and should involve planned processes with clear performance objectives, defined outcomes, and implementation strategies and include skills for measuring performance over time.

7.10 **Recommendation 7**: Capacity building/training of Boundary Partners including researchers, technologists/technicians and postgraduate students should be intensified to guarantee efficient laboratory management and quality research output that meets international standards.

7.11 **Recommendation 8**: 'Train-the-trainer' capacity-building programmes should be organized for technicians/technologists especially with regards on-the-job, off-the-job, short-term and long-term training.

8. LESSONS LEARNED

8.1 Several lessons can be learned from the experience in implementing the PRISM project in Nigeria. These are discussed in the rest of this section.

8.2 The first is that the relative success of the IFS-PRISM project in Nigeria proves that PRISM is not only about the availability of funds to procure much needed equipment in African universities, but about creating and supporting an environment where all the key stakeholders (university administrators, researchers, technologists and technicians, and equipment suppliers) can start talking to and among themselves. This is not to say that money is not important. Strategic planning should be in place to identify and procure necessary equipment and to facilitate and coordinate networking. The IFS-PRISM concept and its principles can be successfully started in any country, or to be sustained once started. The MacArthur Foundation was able to make available significant amounts of financial resources to kick start the IFS-PRISM approach in Nigeria. The interest shown by the World Bank augers well for continued development of the PRISM approach. The 20:20 Vision of the Government of Nigeria for the country to attain a top twenty position in the league table of industrialised nations by 2020 represents an important opportunity for an association like PSAN to leverage government support for policy instruments in support of the IFS-PRISM approach which can facilitate a solid scientific research base for industrial development. Indeed, this is not unprecedented, and military as well as medical imports are already fast tracked through supportive policy instruments. This could help to enable the required human and financial resources to be set aside or dedicated to supporting the national science base through the implementation of the IFS-PRISM approach. In Nigeria, as in many African countries, where there is perennial budgetary austerity and great competition for dwindling capital budgets, strongly advocating the IFS-PRISM approach, through PSAN at the national level, and through the African Academy of Sciences, which is most prominently supported by a substantial trust fund put in place by President Obasijo of Nigerian support, at the continental level.

8.3 Second, such advocacy would begin to support the modifications in stakeholder organizations that will be required to achieve success, such as that clearly demonstrable in the University of Ibadan, which is already attracting significant attention. The wider implementation of the IFS-PRISM approach involves new tasks and procedures, especially with respect to public procurement, expectations for the re-design and modifications of existing institutional arrangements to conform to PRISM principles, and this will be easier said than done. Success here will depend on the “legitimization” of the PRISM concept, which will require the emergence of PRISM “champions” who are willing to risk their political capital in support of the implementation PRISM principles. Such champions in Nigeria include successful IFS-PRISM project partners (including the University of Ibadan) and those driving of the development of PSAN (including NIPRD) who could play a catalytic role in addressing equipment procurement short-comings in Nigeria, and their example could be highlighted across the continent through continent wide advocates who are already sensitized by IFS such as the African Academy of Sciences. Because compliance with the principles requires significant breaks from existing practices and calls for changes in attitudes and behaviours, it would be essential for a clear

message to come out from the national and continental "legitimisers" that adherence to the IFS-PRISM principles represents the preferred way forward.

8.4 Third, for the IFS-PRISM concept to "catch fire" in Nigerian and African universities and scientific institutions it will be imperative to demonstrate its superiority over existing practices in an evidence-based way. This will require a credible system for periodic review and evaluation as well as tracking the changes being brought about by the project over multiple players, over multiple agencies, and over multiple periods. The Outcome Mapping (OM) methodology used to plan and operate the IFS-PRISM project appears to have been suited for this purpose. Its strength is its non-linear credentials which focus on behavioural changes of the Boundary Partners and beneficiaries. Its weakness is that by side-stepping the issue of attribution, it also side-stepped the issue of accountability. What is more, its procedures are quite long and complex and need extensive hands-on nurturing and tedious documentation to create the various Journals on Outcomes, Strategies, and Performance. The evaluation suggests that, in future, before the OM methodology is used exclusively, there should be more practice and sharing of experiences in its application. A preferred compromise might be to use the OM as a learning tool but to still rely on the orthodox Logical Framework analyses to ensure accountability.

8.5 Finally, the implementation of the IFS-PRISM project in Nigeria has taught us that the significant behaviour changes called for by PRISM require that many stakeholders adapt and modify to new tasks and ways of doing business. Changes in the operation of public organizations such as those in which the Boundary Partners operate are possible but not always easy. What is more, these changes are neither linear nor with specific timelines. Instead they are often multi-directional, fragmented, frequently interrupted, unpredictable and very long-term. How to sequence the necessary actions and what to give priority to, can vary significantly. What the Nigerian PRISM experience teaches us is that behaviour changes in an area such as equipment procurement can only proceed one step at a time, should not be short-circuited or necessarily rushed and requires continued adaptation through dialogue and communication. In this regard, the PRISM process is the product.

ANNEXES

Annex 1: Terms of Reference for the PRISM Evaluation

Procurement, Installation, Service, Maintenance

and Use of Scientific Equipment (PRISM)

Evaluation

Terms of Reference

April 2011

About PRISM

In 2007 the MacArthur Foundation provided funding to IFS to conduct a scientific audit of selected universities in Africa. The purpose of the audit was to assess the status of scientific equipment and the needs for future investment. The two organisations agreed to cooperate on a project to strengthen scientific infrastructure in African universities, hereinafter called the PRISM project. Its overall purpose was to 'Improve the Science Infrastructure Base of African Universities'.

A proposal for phase 1 was submitted in June 2007 and a grant of 160,000 USD was approved on the 5th November 2007. The project was for one year. A proposal for a phase 2 and 3 was submitted 14 of July 2008 and an amendment was submitted 15 August. A grant of 3,500,000 USD was approved 2 October 2008.

The initial phase of the project consisted of a process of auditing equipment at 15 universities in Africa. The audit concluded that a large portion of the equipment that had been procured by universities was not installed, broken down or obsolete. In total, 563 pieces of equipment were found in the laboratories during the audit, of which 42 % were not functioning. The audit also showed that there was no firm policy in place for long-term equipment servicing and maintenance at any of the universities.

The second phase of the project addressed issues of selection, procurement, transportation and installation of scientific equipment, and training. Selected scientific institutions committed to arrange necessary infrastructure improvements as well to provide the support of technicians and technologists. An Advisory Committee, with extensive expertise in experimental research from various disciplines and of laboratory scientific equipment, was established for phase two of the project. This phase worked with six universities:

Table 1: The scientific organizations included in phase 2 and 3

University	Abbreviation	Country
Ahmadu Bello University	ABU	Nigeria
Bayero University	BUK	Nigeria
Institut Malgache de Recherches Appliquées	IMRA	Madagascar
National Institute for Pharmaceutical Research and Development	NIPRD	Nigeria
University of Antananarivo	UA	Madagascar
University of Ibadan	UI	Nigeria
University of Port Harcourt	UNIPORT	Nigeria

The design included the use of Outcome Mapping (OM) and was based on national and local ownership, aspirations to equal partnership, and knowledge sharing. In meetings with thirty PRISM project beneficiaries from the six institutions, including policy makers, technicians, technologists and researchers, the Outcome Mapping tool was used in developing a Vision and Mission, and in identifying Boundary Partners, Outcome Challenges, Progress Markers and a Strategy Map.

The support package at each of the universities described a set of procedures to coordinate the scientific equipment management including: the selection, procurement, transportation, installation, servicing, maintenance and use of equipment. It also addressed planning, monitoring and evaluation.

Baseline Outcome Journal was identified by each of the institutions in August 2010, and an Operational Journal was developed by each institution in November and December 2011. A PME Work Committee was installed in order to generate the Outcome Journal annually from 2012.

To facilitate the implementation of the PRISM concept at other institutions and to maintain it at the six institutions selected for the second phase of the project, an institutional framework for a PRISM Partnership was developed, a PRISM Nigeria office was opened and a PRISM Madagascar office was prepared for.

Objective of the Evaluation

The purpose of this evaluation is to assess the achievements of PRISM since 2007, and collate key lessons on improving the scientific infrastructure base of African universities.

The evaluators will assess the level of success against the project's own performance metrics, and other reasonable measures of success in this field. The evaluation will review the degree to which the logframe outputs have been achieved and their benefits are likely to sustain beyond the end of the grant period. The evaluation should also seek evidence of high-level change, for example in the quality science, the type of research being conducted and the retention of scientists in African universities. The evaluation will identify key lessons on improving scientific infrastructure in African universities that can be shared to a broad audience by IFS.

Scope of the Work

The evaluation team will examine how well PRISM has been able to achieve its objectives in the four Nigerian universities. The evaluation should assess whether the Outputs have been delivered, and seek and examine evidence for higher order (Outcome and Impact) achievements.

Specific questions to address include:

1. How has PRISM changed the way universities procure and maintain scientific equipment? (How was it done before; how is it done now; is this attributable to PRISM?)
2. Is this change likely to sustain? If not, why not?
3. How wide is the awareness of PRISM, and is there any evidence of spill-over and replication beyond the direct project beneficiaries?
4. What worked well in PRISM?
5. What worked less well? How well was risk considered and addressed?
6. What are the key lessons from PRISM for improving the way scientific equipment is procured and maintained in African universities?

Methodology

The evaluation team should select their own methods. These are likely to include:

- review of PRISM project documentation: reports, outputs from the M&E system, and Outcome Mapping results
- interviews with key staff at the four universities: academic, technical and administrative/management staff

The team may also consider the use of a web-survey as a pre-cursor to the interviews.

The team may wish to construct a theory of change for PRISM, as a device against which to evaluate, and to help identify the process steps by which higher order results were and are expected to occur. Higher order results may be identified from a most significant change type of approach, and followed-up with case studies.

The evaluation team should meet and interview staff from all four Nigerian universities. However the team should take advice on the prevailing security situation, and decide whether it is possible to physically visit all the universities. The team should be aware of recent security concerns in northern cities (Kano and Kaduna), and a long-time advisory for Port Harcourt. Phone or Skype interviews will be possible whether visits are not, and some staff may be persuaded to travel to meet the team.

Reporting

A concise report of 20 pages plus annexes should be produced.

The team may also be asked to present their findings and conclusions at the PRISM conference in Nairobi in May.

Team Composition and Timeline

The team will consist of two consultants, who will work together to complete the evaluation. The team should have a strong track-record in project and programme evaluation in developing countries. They should have experience of working in West Africa, with Nigerian experience being a distinct advantage. Some familiarity with the academic research environment would be useful.

The evaluation team will report to Dr Graham Haylor, Director of the IFS.

The report is due by 21st May, in order for IFS to review it prior to the PRISM conference in Nairobi in week commencing 28th May.

We anticipate that it will require up to 15 days per consultant to complete the review.

A draft workplan is presented below:

	Weeks							Days	
	1	2	3	4	5	6	7	Consultant 1	Consultant 2
Phase 1. Inception									
1.1 Preparatory reading / research								1	1
1.2 Develop evaluation tools								1.5	1
1.3 Phone briefing and interview with IFS								0.5	0.5
Phase 2. Field Work									
2.1 Meet MacArthur - Abuja								1	1
2.2 Northern trip (Zaria, Kano)								5	
2.3 Southern trip (Ibadan, Pt Harcourt)									5
2.4 Compare findings								1	1
Phase 3. Write-up									
3.1 Draft report								3.5	2
3.2 Circulate for comments								-	-
3.3 Finalise report								1.5	0.5
								15	**12**

Annex 1 – Document list

- IFS (2012) Procurement, Installation, Service, Maintenance and Use of Scientific Equipment (PRISM). Draft Final Report.

Others to be added

Annex 2: PRISM Outcome Mapping Progress Markers

Progress markers

Boundary Partners	Progress markers		
	Expect to see	Like to see	Love to see
Researchers	• Re1 :Researchers are actively involved in equipment selection, installation and maintenance as well as pre and post installation training • Re2: Research activities carried using the new equipment is contributing to training and education of highly qualified graduate students. • Re3: Research results are accepted and published more easily thanks to the presence of new equipment	• Rli1: Multi-disciplinary research team are established and are developing innovative research work that is linked to the equipment • R2li: Research results are accepted and published more easily thanks to the presence of new equipment • R3li: Improved research results are contributing to the career promotions of the researchers • R4li: Researchers are engaging in new research areas that were difficult to address without the presence of the equipment • R5li: More research grants are being attracted due to the improvement of the research environment and the presence of the equipment • R6li: Researchers and technicians are meeting regularly under the PRISM umbrella at the local and regional levels	• R1lo: Innovative research results are applied by local communities and end-users in addressing their social, environmental and livelihoods challenges through improved laboratory facilities • R2lo: Researchers sharing and disseminating their PRISM experience in other regional and international networks that they belong to • R3lo: The innovative work of researchers is leading to their recognition nationally and internationally
Technicians and technologists	• T1e: Technologists and technicians participate in pre-installation training • T2e: They collaborate with equipments manufacturers & vendors as well as researchers in the installation of equipment • T3e: They participate in post installation trainings on equipment maintenance and applications and carry routine maintenance of the equipment • T4e: They are regularly solicited to carry analysis with the equipment and obtain high quality results for researchers, students and the private sector and other organizations.	• T1li: Results obtained by the technicians and technologists are published in reputable journals by researchers and technologists are acknowledged in these publications • T2li: Technicians and technologists participate actively in a network among themselves, and interact actively with other Boundary Partners and relevant international organizations • T3li: The work of the technicians and technologists generates significant revenue for meeting the operational costs of the laboratory	• T1lo: The quality work of the technicians and technologists in their laboratories attracts international accreditation for the laboratory. • T2lo: Technologist, use the highly specialized skills and expertise acquired in PRISM to provide advisory services to other laboratories outsides the network

Boundary Partners	Progress markers		
	Expect to see	Like to see	Love to see
Scientific organisation Authorities	• A1e: Scientific organisation Authorities consulting with other Boundary Partners on the nature and type of equipment to be acquired and endorsing the recommendations of the Boundary Partners • A2e: They provide an enabling working environment that stimulates creativity and minimizes the administrative burdens to the greatest extent possible • A3e: They offer opportunities for professional and academic growth for the academic and technical staff operating the equipment • A4e: They dedicate the appropriate in-house resources for the operation and the maintenance of the equipment	• A1li: Scientific organisation Authorities acknowledge laboratory excellence as an essential milestone in the overall excellence plans of the scientific organisation • A2li: They enable laboratories to operate as autonomous cost-centers in order to optimize the use of the equipment and secure funding for further operation and maintenance • A3li: They encourage industries and corporations to establish agreements with the scientific organisation laboratories	• A1lo: Scientific organisation Authorities support critical research which addresses the social, environmental and health problems of the country in general and the region served by the scientific organisation in particular • A2lo: They put in place policies and procedures that enable laboratories to pursue international accreditation
Equipment suppliers	• E1e: Suppliers are providing information and sharing their expertise on selection of equipment and accessories • E2e: Equipment is priced fairly and delivered timely within the foreseen deadlines (including local transportation, custom clearance, …) • E3e: Suppliers are providing spare parts and consumables in a regular and reliable manner • E4e: Suppliers are providing on-site training on application, operation and maintenance (and possibly sponsorship for international training)	• E1li: Suppliers providing reliable and timely servicing and maintenance • E2li: Open channels of communication for feedback between suppliers and end-users (such as telephone and Skype among others) • E3li: Suppliers sharing with information about new techniques, technologies and products	• E1lo: Manufacturers adapting their equipment to local conditions in low income countries (humidity, dust, unstable electricity, etc…) • E2lo: Suppliers opening local offices in each participating country in order to bring services closer

Annex 3: Table of progress against the PRISM Building Blocks at the participating Universities

AHMADU BELLO UNIVERSITY (ABU)		
PRISM Building Blocks	**Findings**	**Comments and Observations**
Development of Operational and Financial Plans	• The development of the Operational and Financial Plan was done mostly through communication and very little face to face contact took place– i.e. there was no sitting round a table together to do it with IFS. After preparing the plan, it is forwarded to IFS who will look at it, make recommendations and send it back to the university through the University PRISM Management Committee who in turn sends it to the Vice Chancellor for implementation. This perhaps the reason the O&P plan prepared was not as good as expected. • The O&P preparation process sometimes experienced serious delays when such reports are sent to the VC and he is too busy to respond. For example when the university was asked to constitute the Management Committee as a precondition for IFS support, it took quite some time before it was implemented. • The university constituted a Management Committee whose responsibility it is to ensure that the lab is operated according to the operational plan. The committee also draws policies for the lab so that the experience that is gained from the operation of the MUSRL will then be translated to other unit of the university. All recommendations made by PRISM were implemented. For example, following PRISM recommendations the centre has its own bank account and there is a quarterly allocation from the university to the laboratory's account. • To ensure the sustainability of the lab a token fee is being charge for every analysis. The present fees charged are said to be too low.	
Development of Support Packages	• The support packages were adequate and the input made by IFS during their visit is highly commended. For example, the institution would not have paid more attention to the issue of dust in the lab because it thought that the windows already put in place were okay- but following IFS suggestions changes were made and the lab now has a more conducive environment for the protection of the equipment. • The support packages assisted in design modifications of the laboratory and made it more humidity proof and more dust proof. • The relative cost of PRISM-funded equipment compared to the overall cost of equipment at ABU relatively small. Within the Multi-User Science Research Laboratory itself it is about 35%. However, the PRISM project has made huge impact in terms of demonstrating best practice for the procurement and management of equipment. • The discount presently enjoyed under the PRISM arrangement has been significant. While the equipment	

	manufacturer/supplier should be encouraged to continue to give discounts, was for discounts not be only in monetary terms alone but should also be in terms of services to be rendered by equipment supplier to the university. .	
• **Support for equipment procurement and installation**	• Several pieces of research equipment, namely AAA, Elemental Analyzer and FT-IR have been procured and installed using the PRISM approach. • Each university was asked to secure its customs waiver and take charge of the transportation of the procured/donated equipment. Many universities including ABU were unable to accomplish this within the stipulated time frame and this caused significant delays in the delivery of the equipment from South Africa and the consequent expiration of the support conditions and commitments that were supposed to come with the equipment. • The idea of Preferred/Specialized equipment suppliers was very useful especially when the company's technicians came to offer pre- and post- installation training–A sizeable number of technical staff of the University benefitted from this on-site training on equipment installation, maintenance and handling. • The institution was not aware of the cost of the procured equipment until the issue of securing Tax waiver became a problem. • The University has a central procurement committee which is different from PRISM's but PRISM's presence has added value to the activities of the Committee and enhanced its performance especially since the committee is adopting the concept of PRISM in carrying out its own responsibilities. For example, every department is expected to submit their proposals for equipment procurement to the Committee using the same processes and procedures that PRISM uses. In other words the PRISM concept has been accepted at the university and is being applied by the Committee on behalf the university.	
• **Support for equipment management**	• One of the advantages of the PRISM process is that some of the equipments came along with accessories that were not anticipated.	
• **Support for capacity building**	• The University benefited from four operational training workshops conducted by IFS under the PRISM concept. These include the first regional workshop on the IFS (PRISM) concept, GLP and SOP, held in Kano 2009; another workshop at Bayero University, Kano, in May, 2010; the third workshop was held at the University of Ibadan in October, 2011 and the last one in Abuja in December 2011 at NIPRID, Abuja. • Though the On-site training on equipment installation was adequate, capacity building in terms of equipment operation, application and protocol was inadequate. • PRISM had a well defined plan for training but most of those training were never carried out. In other words, the PRISM project at ABU did not stick to its original capacity-building plan.	
Development of partnerships	• The co-operation between the MUSRL and Equipment Maintenance and Development Centre (EMDC) of the University has been good and has ensured that hitherto non-functional or non-installed equipment are now	

	serviceable and being put to good use. • Partnership with other department and units has helped to consolidate efforts on what is being done and also help the partners to know what others are doing. The hope is that in the long run, the PRISM experience will consolidate university-wide efforts at cost effective equipment procurement and management, avoid wasteful duplication and ensure maximum value for money. • There is a Teaching Research and Equipment Committee In the university, with the Director of EMDC as a member of the PRISM Management Committee. This committee ensures that when equipment are being received into the university – not just for MUSRL, the EMDC and other members from other units are involved in the process, checking on each item and participating in their installation. • The EMDC partnership is not limited to the multi-user lab alone – there are ongoing partnership between the lab and other departments in the university since almost every department is now involved in equipment selection and installation and it is hoped that this will be built upon over time. • There is a constituted group of technicians and technologists that meet every week within the university to review the scientific equipment situation at the university, thanks to the PRISM project. • Although partnership arrangements between departs within the university has worked reasonably well, it has not worked so well between the four participating universities since there was no effective coordination or interaction mechanisms to share information except when they meet in workshops and these workshops suddenly came to an end in 2010 • On the wider Nigerian scale, there is a movement to keep the PRISM spirit alive through the creation of a PRISM Association/Consortium. When this is accomplished it will be helpful to ABU since most of the equipment procurement will then go through the PRISM process and internal mechanism at ABU which will then be sub-summed into a larger Nigerian-wide PRISM. That is why all the universities are encouraged to come together to form the Association Consortium because if they are going through different channels, they are likely going to be buying equipment from different sources and managing it will be difficult and consequently making progress will be difficult.	
	BAYERO UNIVERSITY KANO (BUK)	
Development of Operational and Financial Plans	• The Operational and Financial (O&F) plan were developed by the universities and followed to determine whose responsibility it is to do what and to solve other problems confronting the institution.	
Development of Support Packages	• When the PRISM project was extended for two years with a new focus on programme support, a programme on Arid Zone Agriculture was initiated in BUK. • The key stakeholders (researchers, technicians, technologists and university authorities were adequately involved in the design of the support packages.	

	• Each laboratory was supplied with a stand-by generator and provision for fuelling as part of the support packages from PRISM. • The strategy mapping helped the university in use of the operational and financial plan and other tools through the coming together of relevant people to develop research topics. • One of the challenges has been lack of support for the packages from the university authorities.	
• **Support for equipment procurement and installation**	• The PRISM equipment procured was housed in the various departmental laboratories because there is no central laboratory. • All aspect of PRISM – the Operational and Financial Plan, and the support packages worked fine until it came to the procurement. • When the team from SMM came to the university, they were not prepared in terms of site preparation So, the team went back without installing most of the equipment - about 90% of the equipment procured were not installed • The equipment that was installed are functioning well and contributing to research development in the university. • Among the equipment supplied, they were some missing components and non-functional equipment.	
• **Support for equipment management**	• As a means of coordinating the departmental laboratories, equipment given to the department are accompanied with a log book for the record of whatever analysis that is done with the equipment. • The management of the university has made it mandatory for each department to follow the concept of PRISM in procuring equipment.	
• **Support for capacity building**	• The research capacity of researchers and students to perform high quality research as a result of the PRISM project has improved considerably. • Training of technicians and technologists is not adequate	
Development of partnerships	• There is sharing policies in the University between departments which has enhanced the coming together of researchers to do collaborative research.	
	UNIVERSITY OF IBADAN (UI)	
Development of Operational and Financial Plans	• Operational and Financial (O&F) plans were developed by the University of Ibadan Multi-disciplinary Central Research Laboratory (MCRL). • Administrative Committee set up by the Vice Chancellor was put in place to oversee the Laboratory and provide overall leadership in all matters including Finances. The committee formulates and implements policies that ensure efficient management and sustainable development of the Laboratory. • User Sub-committees, made up of scientists with the respective items of equipment and chaired by senior academics, were also set up to ensure proper use and regular maintenance of equipment and effective cost recovery for sustainability through the charging of appropriate fees for the use of the equipment and to cover cost of consumables.	The UI administration and boundary partners demonstrate lots of understanding of the PRISM concept and adequate commitment to the PRISM project. Almost all the requirements for the development and use of an

	• Arrangements were also put in place for the transportation, installation, protection, adequate supply of needed utilities, repair and maintenance of scientific equipment as well as arrangements to ensure maximum operation and use of the procured equipment. The MCRL is on the priority line of electricity supply to the University through the national grid, and has electric generators to ensure uninterrupted, constant voltage electricity supply. In terms of water supply, the MCRL is connected to the university water supply network and has adequate overhead water storage facility that ensures that water pressure is adequate and that water runs in the laboratory at all times. The MCRL is equipped with split-type air conditioners that ensure optimum air temperature, tiled floors and window blinds in all the rooms for effective dust control, and four (4) 20-litre capacity dehumidifiers to regulate humidity for highly sensitive equipment (e.g. FTIR). All rooms are well lit. • Regarding maintenance and repairs, user sub-committees ensure proper use and regular maintenance of equipment through adherence to standard operating procedures and quality assurance protocols for specific items of equipment. A good stock of critical spare parts and accessories were procured with all major equipment accompanied with operational/user manuals. The University has an Equipment Maintenance Centre (EMC). Consumables and gases are procured from reputable local vendors with the capacity to supply very high quality products which are produced locally or imported. • Wide consultations are made in procuring new items of equipment to ensure that they are truly, multidisciplinary in application and for the benefit of a large segment of the research scientists of the university based on the PRISM concept. • A comprehensive programme for capacity building/training is in place to ensure that technical staff and users are conversant with the principles, applications and routine maintenance of the various items of equipment in the Laboratory. • M&E tools with clearly defined indicators exist to which the PRISM equipment have been put to proper use. However, the use of the PRISM equipment has been very limited because there has not been much M&E activities specifically related to this equipment.	operational and Financial (O&F) plans are in place
Development of Support Packages		
• **Support for equipment procurement and installation**	• The University of Ibadan has a well established Multi-disciplinary Central Research Laboratory (MCRL) located in the Abadina area of the university on a large expanse of land with a total area of 2,127m^2. The main laboratory is a storey building (two floors) with several wings. Attached to it is a Wet Laboratory for preliminary, preparative laboratory work. • With respect to the housing of appropriate equipment, seventeen (17) different kinds of scientific equipment, apart from routine equipment (PH meters, balances, ovens, incubators, water baths, rotary evaporators, etc) are housed in the MCRL. In addition, six (6) equipment donated by MacArthur Foundation under the IFS-PRISM	The Multi-disciplinary Central Research Laboratory (MCRL) of the University provides a good physical environment for PRISM development and sustainability.

	project have been procured and are also housed in the laboratory.	
• **Support for equipment management**	• MCRL is administered by a Committee appointed by the Vice Chancellor that oversees the Laboratory and provides overall leadership in all matters including finances as well as formulates and implements policies that ensure efficient management and sustainable development of the laboratory. • User Sub-committees, made up of scientists familiar with the respective items of equipment chaired by senior academics are also in place. They ensure proper use and regular maintenance of equipment and effective cost recovery for sustainability through the charging of appropriate fees for use of the equipment and to cover cost of consumables.	With the existence of an administrative committee and sub-committees the performance of the laboratory activities is considered satisfactory. However, the MCRL is faced with numerous challenges bordering on procurement process and equipment installation and maintenance.
• **Support for capacity building**	• A comprehensive programme for capacity building/training is in place to guarantee quality research output for development in Nigeria. In order to have maximum impact on the university and the surrounding institutions and beyond, provision is made for training courses and workshops for technicians, scientists and post-graduate students using the facilities at the MCRL. • The MacArthur overseas training grant is already enjoyed by users (scientists) to be extended to technicians. • A PRISM International training workshop for technologists, technicians and scientists on equipment management was successfully organised at the University Conference Centre, 26 – 30 September, 2011. It was aimed at equipping the boundary partners with knowledge and skills on issues dealing with sustainability of research laboratories, and the principles, instrumentation and application of advanced modern analytical technique for research. A 2-day in-house training programme was held at the premises of MCRL in November 2012 apart from regular meetings to foster interaction, learning and experience sharing among researchers, technologists, technicians and postgraduate students, among other boundary partners.	Although there is evidence of capacity training of staff including researchers and technologists, capacity building of boarder partners is considered inadequate. There is the need for intensified capacity building in order to enhance efficient use and management of equipment and quality research output.
Development of partnerships	• Partnership as perceived by boundary partners at the University of Ibadan means an association of all stakeholders in the PRISM project (donors, vendors, policy makers, researchers and technicians) for the purpose of mutual benefit to all, and for achieving the PRISM goals and objectives. • The PRISM network currently involves about five (5) institutions in Nigeria and two (2) in Madagascar. It has been effective for trainings, meetings, group networking, workshop activities and policy formulation. The University of Ibadan (UI) has been involved in all PRISM related activities and participated actively. • UI as a partner in the PRISM project has developed significantly its capacity to formulate and implement Operational and Financial (O&F) plans, even in relation to equipment outside the PRISM project.	The potential benefit of PRISM partnership among boarder partners cannot be over-emphasized. However, the level of partnership thus far is below the expected standard for optimal results or performance. There is the

	• The benefits achieved will become more obvious and further enhanced when most of the equipment procured are all installed and operational. • The successful implementation of the PRISM partnership model depends very much on its recognition and adoption by the government of Nigeria because the model restricts procurement to only products supplied by few preferred vendors. The public procurement procedure of the government does not allow this. Funding of the partnership office/administration is also a critical challenge.	need for promotion of enhanced networking between local and international institutions especially among researchers, technologists, technicians, policy makers/administrators and equipment suppliers/vendors in order to promote quality research in Africa.
	UNIVERSITY OF P/HARCOURT (UNIPORT)	
Development of Operational and Financial Plans	• The University of Port Harcourt has a Central Instrument Laboratory (CIL) which serves as a key academic resource providing state-of-the-art facilities for teaching, research and learning to all faculties in the institution, as well as consultancy services to industry. • A structural modifications and upgrading has been carried out in the CIL with support from the IFS-MacArthur Foundation. These modifications include the following: -Installation an exhaust chamber in the AAS room -Placement of ailing in all the instrument rooms in the CIL. -Provision of ceiling to all the instrument rooms to prevent dripping of water from overhead piping. -Provision of constant power supply to the CIL with the provision of tripartite electricity source, viz: national grid (PHCN), university-wide generator and generated specifically dedicated to the CIL. Inverters were also provided for every instrument plus more sockets and heavy duty fuses for heavy equipment. -Provision of air conditioners for every instrument room. -Readjustment of the power points (sockets) in relation to water sink as well as that there are no water points in the instrument rooms. -Closed up some of the water basins to create more space for equipment. • The University established a Research Management Unit and Equipment Monitoring Team (EMT) for effective management of the research projects and the IFS equipment. • In order to guarantee the protection of the equipment against dust temperature, humidity and poor lightening, action were taken. For instance, aluminum Frame sliding windows were provided to replace the original lower windows, additional number of A/C units to control temperature, additional dehumidifiers to eliminate humidity and lightening protection facility to control damage of equipment by lightening. • With respect to supplies, the CIL is assured of back up electricity at three (3) levels, steady water supply including the availability of water purification unit in the CIL building. Gas cages are already in place with adequate supply	The PRISM concept is clearly demonstrated by the availability of a Central Research Laboratory in the University. Although a good number of activities in the O&F plan have been successfully executed, there is a lot of room for improvement in order to achieve optimal performance.

	of different types of gases. Consumables and glassware are adequately supplied through the Chemistry Storage facility. Repair and user manuals including photocopies plus CDs are placed in drawers and cabinets in the CIL. Service tools provided by the university are housed in the already established Service and Maintenance Unit (SMU) for the benefit of appropriate users. Also each piece of equipment in the CIL has a computer attached to it with internet connection for online repairs. The university provides vehicles for field visits for the research projects that are addressed under the PRISM project. • Equipment are centrally placed at the CIL Log books are used as well as procedures (SOPs) to monitor and track the use of each of the scientific equipment including the PRISM equipment. • Although the University has established an Equipment Monitoring Team (EMT) and appoints a four man membership of the team, it is not evident that effective monitoring and evaluation (M&E) activities are undertaken with clearly defined indicators as well as the practical application of the Outcome Mapping (OM) tool.	
Development of Support Packages		
• **Support for equipment procurement and installation**	• The University of Port Harcourt (UNIPORT) has a Central Instrument Laboratory (CIL) in fulfilment of pre-condition or initial requirement. A total of eleven (11) pieces of PRISM equipment are being housed in the CIL. So far six (6) of the piece of equipment have been installed. These were UV-Visible Spectrophotometer, HPLC, GC, Centrifuge and Milli RO Water Purifier and Millipore Filtration Unit. Others like the AAS, Epifluorescence Microscope, Petrographic Microscope and Garmin GPS are yet to be installed	Although a good number of PRISM equipment have been procured and housed in the CIL, a reasonable number of them have not been properly installed and useable. Those that have been installed have problems of missing components and accessories thereby making them dysfunctional. This amounts to mis-procurement.
• **Support for equipment management**	• The University of Port Harcourt fully agrees to the Operational and Financial (O&F) plan as a proactive approach to project implementation and sustainable development. The Vice Chancellor has given the undertaken to the Memorandum of understanding (MOU) to provide facilities for the success of the PRISM project. • The University has established committees such as the Research Management Unit (RMU) and Equipment Monitoring Team (EMT) to oversee the efficient management of the CIL, the PRISM equipment and other laboratory facilities. • Technologists and technicians have been engaged for the operations and maintenance of these equipment and the use for scientific research.	The operational and Finance (O&F) plan is in place but the implementation of the provisions of the plan is not yet optimal for better performance in the implementation of the PRISM project.

• **Support for capacity building**	• UNIPORT boundary partners including researchers, technologists and technicians, etc have benefitted from in-house PRISM trainings organised under the PRISM project locally and nationally. • However the level of capacity building support for staff and stakeholders are actually low. There is the need for enhanced capacity building on the equipment use and application for quality research as well as in equipment repair and maintenance.	Capacity training of the key stakeholders especially the technologists and technicians is abysmally low and therefore should be intensified for better quality research results.
Development of partnerships	• Presently, Partnership in University of Port Harcourt is at a low level as it was limited to the partnership opportunities offered through linkages with other PRISM beneficiary institutions in terms of workshops conferences, capacity trainings and meetings. • Other partnership opportunities with other local and foreign institutions including donors, equipment suppliers/vendors, and research networks, among others are yet to be explored in terms of fund raising, technical support and information sharing, etc.	The benefits of PRISM partnership have not been adequately explored by the University of Port Harcourt. Thus a lot of efforts and commitment is required of the University to attract optimal benefits of PRISM partnership with respect to funding, technical assistance and networking.

Annex 4: Research Projects selected by the participating institutions

Scientific Organization	Project Title
ABU	• Upgrading and strengthening research facilities of the Multi-user research laboratory in the faculty of science. The laboratory support research projects addressing Chemistry, geology, physics, pharmacy, agriculture, environment and related topics. • Detection and molecular characterization of agents of mastitis and strategies for improvement in traditional milk safety in Nigeria • Geophysical investigation of ground water potential in the Arid Zone of Nigeria
BUK	• Intensification of Cereal-Legume cropping in crop/ livestock production systems of the Sudan savannah • Purification and inhibition of inducible nitric oxide syntheses from rat neutrophil
IMRA	• Drug discovery
UA	• Metabolites from Madagascar polypore fungi • Biologically active lipophilic alkaloids from mentilla skin extracts • Water management
UI	• Utilization of the Nigerian biodiversity for drug discovery, agro-forestry and environmental insecticides • Biotechnology research in the development of diagnostics, genetically improved plants and vaccines for food animals in Nigeria
UNIPORT	• Equipping the central instrument laboratory scientific organization of Port Harcourt for research and training in food pesticide and environmental analysis • Application of ligands in liquids-liquid separation metals in the absorption studies of metal ions and as corrosion inhibitors. Synthesis of materials and modification of waste materials for application of bio- resource technology. • Research on food production in the Niger Delta

Annex 5: Equipment identified for procurement by the participating institutions

Equipment	\Manufacturer	QTY	Comment
ABU			
AAS	Varian	1	AA240 FS which is a flame AAS supplied with GTA120 furnace including FSD120 Autosampler and UltrAA Lamp Module
XRF	Oxford	1	X-Supreme 800 Oxford Energy Dispersive X-ray Fluorescence Spectrometer XSP Packages with sample preparation
Microplate Reader washer	Biochrom	1	Expert plus, Microplate reader with ELISA kit for Affatoxin Analysis
Balances	Sartorius	2	AE224S analytical balance
Water testing/handheld	HACH	2	Hach Advance Portable laboratory Water Analysis Kit with five instruments and reagents sets for 26 parameters
Water Purification/MilliQ	Millipore	1	Direct-Q@ 3 Water Purification System
BUK			
UV/Vis Spectrophotometer	Varian	1	Cary 50-UV-Vis spectrophotometer with accessories for enzyme kinetics
GC-FID/ECD	Varian	1	GC 450, 2 channels with FID/ECD detector auto injector for sample handling and with analytical kit for amino acid as a complement
HPLC	Varian	1	ProStar 210 modular analytical HPLC system with variable UV detector and fluorescence detector and special equipment for aflatoxin analysis
FTIR 640	Varian	1	640 FTIR spectrometer with accessories and libraries for pesticides and agricultural chemicals, amino acids and pesticides, fats waxes and derivates, and sugars and carbohydrates.
Resistivity analyzer	Bridge Tech	2	Four point probe
Microscope	Leica	1	DM 1000 la Microscope with DFC290 digital camera
Autoclave	Rauserv	1	Vertical autoclave RAU-530D
Rotary Evaporator	Buchi	1	Rotavapor with vacuum pump and recirculating chiller
Balance	Sarftorius	1	ED224S analytical balance
Sample clean- up accessory	Varian	1	Bio-Rad Logic LP system 2110 fraction collector with different column materials for preparative chromatographic work (including ion exchange columns
MilliQ water	Millipore	1	Direct Q@ 3 Water Purification System
UA			
GC-FID/ECD	Varian	1	Varian GC 450 2 channels with FID/ECD detector and auto-injector for sample handling
LC-MS	Varian	1	500-MS with ESI, varian 212 pumps and 410 auto-injector
Generator 20KVA	GESAN	1	DHAS 25 E ME
Internet		1	
UI			
GC-MS	Varian	1	240-MS/450-GC including accessories with 2nd year warranty
Gas generator and installation, accessories for	Varian	1	Accessories for existing GC with gas generators and UBS

existing GC			
Re-install of Varian GC	Varian	1	Re-installation of existing varian GC system
Microscope (Inverted)	Leica	1	DM16000B with IMC and Leica DFC Camera (Kit for PC and MAC) and Leica LAS Application
Microscope (light and fluorescence)	Leica	1	DM2500 for Transmitted Light and Flourescene and Leica DFC Cameras
Microscope (Teaching light)	Leica	1	DM750 Configurable Microscope
MilliQ water purification	Millipore	1	Direct-Q 3 System
UNIPORT			
UV/Vis Spectrophotometer	Varian	1	Cary 50 UV/Vis Spectrophotometer
AAS(55B + VGA-77	Varian	1	AAS with hybrid system and lamps for As. Hg,Se,Si and Sn
GC-FID/ECD	Varian	1	GC450, 2 channels with FID/ECD detector and auto-injector for sample handling and with analytical kit for amino acids as a complement
HPLC + Aflatoxin	Varian	1	ProStar 210 binary modular analytical HLPC system with variable UV-detector and fluorescence detector and special equipment for aflatoxin analysis
Microtox	Microtox	1	Model 500 Analyzer with starter package
Patrographic Microscope	Leica	1	
EPI Fluorescence	Leica	1	Combined Transmitted Light and Fluorescence Microscope
Centrifuge	Hettich	1	Universal 320R Refrigerated benchtop centrifuge
GPS	Garmin	5	GPSMAP 76CSx Handheld GPS Receiver
Water Filtration Equipment	Varian	1	Water filtration Equipment for microbiology analysis
MilliQ Water	Millipore	1	Direc-Q@ 3 Water Purification system
IMRA			
Chameleon	Hidex	1	Plate Chameleon TM\: V with possibilities of doing ELISA plate reading for Liquid Scintillation Counting, Luminescence, Flourescence Intensity, Time received Fluorescence, Flourescence Polarization and/or Absorbance

AAS – Atomic Absorption Spectrophotometer
XRF – X-ray Fluorescence
FTIR- Fourier Transform Infrared
HPLC- High-Performance Liquid Chromatography
LC – Liquid Chromatography
GC – Gas Chromatography

Annex 6: PRISM – Questionnaire Administered to PRISM Boundary Partners at the Participating Universities

Respondent Background **Respondent Number:**

Your University? Uni-Port [ ] University of Ibadan [ ] ABU [ ] Bayero University [ ]

What Boundary Partner best describes your relationship with PRISM? *(Please tick the appropriate Box below)*

Researcher [ ] Technician/Technologist [ ] University Administrator [ ] Equipment Supplier [ ]

Other [ ] Specify_____

How involved would you say you have been with the PRISM Project in your university since 2007?

Highly involved [ ] Moderately involved [ ] Little involved [ ] Not involved [ ]

(*Please agree or disagree with the following statements concerning your views about the changes that appear to have been brought about as a result of the introduction of PRISM in your university. If you agree or disagree with the statement, circle the word "agree" or "disagree" then state how strongly you agree or disagree with the statement with the aid of the relevant point scale on which the number '1' stands for mild strength of agreement or disagreement and the number 3 stands for very strong agreement or disagreement. If you are indifferent to the statement, then circle both "agree" and "disagree")*

BPR - A – Changes involving Researchers

1. Researchers are actively involved in equipment selection, installation, maintenance, and pre and post installation training.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

2. Research activities are being carried out using the new equipment

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

3. Research activities are contributing to training and education of highly qualified graduate students.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

4. Research results based on the use of the equipment are accepted and published more easily

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

5. Multi-disciplinary research teams are being set up to use the equipment and it is resulting in innovative research.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

6. Research results are accepted and published more easily as a result of the new equipment.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

7. Improved research results are contributing to career promotion of researchers.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

8. Researchers are engaging in new research areas as a result of the presence of a new equipment.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

9. The university is receiving more research grants as a result of improved research environment brought about by the purchase and maintenance of new equipment.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

10. Researchers and technicians meet regularly under the PRISM umbrella and the local and regional level.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

11. Innovation research results are being applied by local communities and end-users in addressing their social, environmental and livelihood challenges as a result of improved laboratory facilities.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

12. Researchers are sharing and disseminating their PRISM experiences in other regional and international networks that they belong to.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐

Disagree	☐	☐	☐

13. The innovative works of researchers are leading to their increased recognition nationally and internationally.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

BPTT - B – Changes involving Technicians and Technologists

1. Technologists and technicians are now participating more in pre-installation training.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

2. They are collaborating with equipment manufacturers and vendors as well as researchers in installation of equipment.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

3. They participate in post-installation training on equipment maintenance and application, and they carry out routine maintenance of the equipment.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

4. They regularly receive request to carry out analysis with the equipment so that they can obtain high quality results for researchers, students and the private sectors and other organizations.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

5. The results obtained by the technicians and technologists are published in reputable journals by researchers, and the technologists are appropriately acknowledged in the publications.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

6. The technicians and technologists participate actively in a network among themselves and interact actively with other Boundary Partners and relevant international organizations.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

7. Their works generate significant revenue for meeting the operational costs of the laboratory.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

8. The work of the technicians and technologists in their laboratories attract international accreditation for the laboratory.

	Very slightly	*Moderately*	*Very strongly*

Agree	☐	☐	☐
Disagree	☐	☐	☐

9. They use the highly specialized skill and expertise that they have acquired in PRISM to provide advisory services to other laboratories outside their network.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

BPSO – C Changes involving Scientific Organizations

1. The scientific organization authorities consult with other Boundary Partners on the nature and type of equipment to be acquired and they follow the recommendations of the Boundary Partners

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

2. They provide an enabling working environment that stimulates creativity and minimizes administrative tediousness

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

3. There are opportunities for professional and academic growth for the technical staff operating the equipment.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

4. Appropriate in-house resources are being made available for the operation and maintenance of the equipment.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

5. They recognize laboratory excellence as an important milestone towards overall excellence in their strategic plan.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

6. They permit the laboratories to operate as autonomous cost centres in order to optimize the use of the equipment and secure funding for further operation and maintenance.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

7. They encourage industries and cooperation to establish agreement with their laboratories.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

8. They support critical research which address the social, environmental and health problems of their catchment area and of the country in general.

	Very	*Moderately*	*Very*

	slightly		*strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

9. They have put in place policy and procedures that enable laboratories to pursue international accreditation.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

BPES – D Changes involving Equipment Suppliers

1. Suppliers are providing information and sharing their expertise on the selection of equipment and accessories.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

2. Equipment price is fairly and delivered timely within the foreseen deadline (including local transport, custom clearance, etc)

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

3. They are providing spare parts and consumables in a regular manner.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

4. They are providing on-site training in application, operation and maintenance.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

5. They are providing reliable and timely maintenance.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

6. There are open channels of communication for feedback between suppliers and end-users (such as telephone, Skype, etc.)

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

7. They are sharing information about new techniques, technologies and products with end users.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

8. They are adapting their equipment to local conditions (humidity, dust, unstable electricity, etc.).

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐

Disagree	☐	☐	☐

9. They are opening local offices in different part of the country in order to bring their services closer to their clients.

	Very slightly	*Moderately*	*Very strongly*
Agree	☐	☐	☐
Disagree	☐	☐	☐

Annex 7: List of Persons Met

S/No.	Name	Department/University
Abuja		
1	Prof. Karniyus Gamaiel	NIPRD
2.	Kole Shettima	MacArthur Foundation
3	Olayewole Adigu	Association of Vice Chancellors
4	Mr.Umar Bukar	Tertiary Education Trust Fund
5	Dr.Tunde Adekola	World Bank Nigeria
Ahmadu Bello University (ABU)		
1	Prof. Ali M. Adamu	DVC(Academics), Chairman, Management Committee Multi-User Science Research Laboratory (MUSRL)
2	Mary O. Onimisi (Mrs)	Chemistry Department -
3	Zubairu Inusa A.	Equipment Maintenance Development Center (EMDC)
4	Abechi E. Stephen	Chemistry Department
5	Yau Mukhtar	Equipment Maintenance Development Center (EMDC)
6	Garba Salamatu (Mrs)	Veterinary Pathology & Microbiology
7	M.B. Sani	I.C.T.D
8	Maryam Abubakar(Ms)	Chemical Engineering Department
9	Dr.Nafiu Abdu	Soil Science Department
10	Ihu Ibrahim	Soil Science Department
11	Prof. M. Garba	Pharmacy & Medicine
12	Prof. Y.K.E Ibrahim	Equipment Maintenance Development Center (EMDC)
13	Daniel D. Afuwai	Multi-User Science Research Laboratory (MUSRL)
14	Dr.M.S. Shenu	Pathology/Dean of Medicine
15	Musa Bashir	Multi-User Science Research Laboratory (MUSRL)
16	Emmanuel Madah	Equipment Maintenance Development Center (EMDC)
17	Prof. G.N.Akpa	Dean Faculty of Agriculture
18	Andrew Jivox	Dean Faculty of Science
19	Silas Ekwuribe	Multi-User Science Research Laboratory (MUSRL)
Bayero University Kano(BUK)		
1	Dr. A.J. Alhassan	
2	Dr. Ado Isah	
University of Ibadan (UI)		

1	Prof. Charles Aworh	Chairman, Multidisciplinary Central Research Laboratory (MCRL)
2	Prof. P.C. Onianwa	MCRL, Department of Chemistry
3	Mr. J.O.A. Ogundeyi	MCRL, Department of Chemistry
4	Omobusuyi David O.	Crop Protection and Environmental Biology (CPEB)
5	Ajayi, Joel O.	Department of Chemistry
6	Nwuba, Rose Angela	Department of Zoology
7	Elizabeth O. Oloruntoba	Department of Environmental Health Sciences.
8	Oduola, Ademola	Equipment Maintenance Center (EMC)
9	Salami O, Ademola	Equipment Maintenance Center (EMC)
10	Dr. Oladosu, I.A	Department of Chemistry
11	Olufunke O. Ezekiel	Department of Food Technology
12	Akiniola Abimbola	Geology
13	Odeh, Chris. A	Zoology
14	Korede Aderonke O.	Multidisciplinary Central Research Laboratory (MCRL)
15	Ebaddan Curtis William	Agronomy
16	Dr. Gregory O. Adewuyi	Chemistry
17	Mrs. Olusola, O. Balogun	Multidisciplinary Central Research Laboratory (MCRL)
18	Ogunsanya K.,	Multidisciplinary Central Research Laboratory (MCRL)
University of P/Harcourt(UNIPORT)		
1	Prof. Gideon C. Okpokwasili	Department of Microbiology, Chairman UNIPORT PRISM
2	Prof. G. O. Abu	Central Instrument Laboratory (CIL)
3	Prof. E.N.Okike	Biochemistry
4	Mr. Nwagbo Okike	Pure and Industrial Chemistry
5	Ibekwe, S.E	Department of Microbiology
6	Okele Clinton C.	Pure and Industrial Chemistry
7	Mrs. Patricia E. Ijente	Pure and Industrial Chemistry
8	Onyagbodor O. Peter	AEB Department
9	Suotor Gift	Central Instrument Laboratory (CIL)
10	Namiesimagha Fiberesima I.	Pure and Industrial Chemistry
11	Odogwu, Blessing A.	Plant Science and Biotechnology Department
12	Dr. (Mrs.) C.B.Chikere	Department of Microbiology