Consolidating Research and Education Networking in Africa

(CORENA)

MONITORING AND EVALUATION STRATEGY

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The Secretariat,
UbuntuNet Alliance for Research and Education Networking
HB House, Block C Shop,
Plot Number 4/4138
P.O. Box 2550,
Lilongwe, Malawi.
Tel   : +265 1 757 456,
Fax   : +265 1 756 090
Email : ceo@ubuntunet.net
Website: http://www.ubuntunet.net

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Goal

"African Education and Research Institutions exploiting their full potential in contributing to national and international human development; and increasing their countries' contribution to, and share in intellectual property output, through effective national, regional and international collaboration"

Purpose

"Enabling the integration of African universities and research institutions into the global research and education community through the provision of intra-African connectivity as well as access to sufficient and affordable international bandwidth"

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Acronyms

AAU	Association of African Universities
AfNOG	African Network Operators' Group
AfriNIC	African Network Information Centre
AU	African Union
BWC	Bandwidth Consortium
CEO	Chief Executive Officer
COMESA	Common Market for East and Southern Africa
CORENA	Consolidating Research and Education Networking in Africa
EAC	East African Community
ICT	Information and Communication Technology
IEEAF	Internet Educational Equal Access Foundation
M&E	Monitoring and Evaluation
MOV	Method of Verification
NREN	National Research and Education Network
OM	Outcome Mapping
OVI	Objectively Verifiable Indicator
REN	Research and Education Networking
SADC	Southern Africa Development Corporation
SLA	Service Level Agreement
VSAT	Very Small Aperture Terminal

Executive Summary

Introduction

This report outlines the Monitoring and Evaluation (M&E) strategy for Consolidating Research and Education Networking in Africa (CORENA) program of the UbuntuNet Alliance for Research and Education Networking, herein after referred to as UbuntuNet. The program objective is to secure high bandwidth connections at affordable rates to help inter-connect African National Research and Education Networks (NRENs) to each other, to other NRENs worldwide and to the Internet in general. The goal is to empower African researchers and academics to contribute proportionately to the world's intellectual output, hopefully generating proportionate intellectual property and respective development within their countries.

The main objective of the framework is to provide a set of parameters that UbuntuNet can adopt in developing its M&E systems in order to effectively monitor and evaluate the performance, intermediate outcomes and impact of the CORENA intervention. Effective M&E ensures that project strategies are properly aligned to changing contexts and that progress towards the program goal is tracked and any area needing attention is immediately attended to.

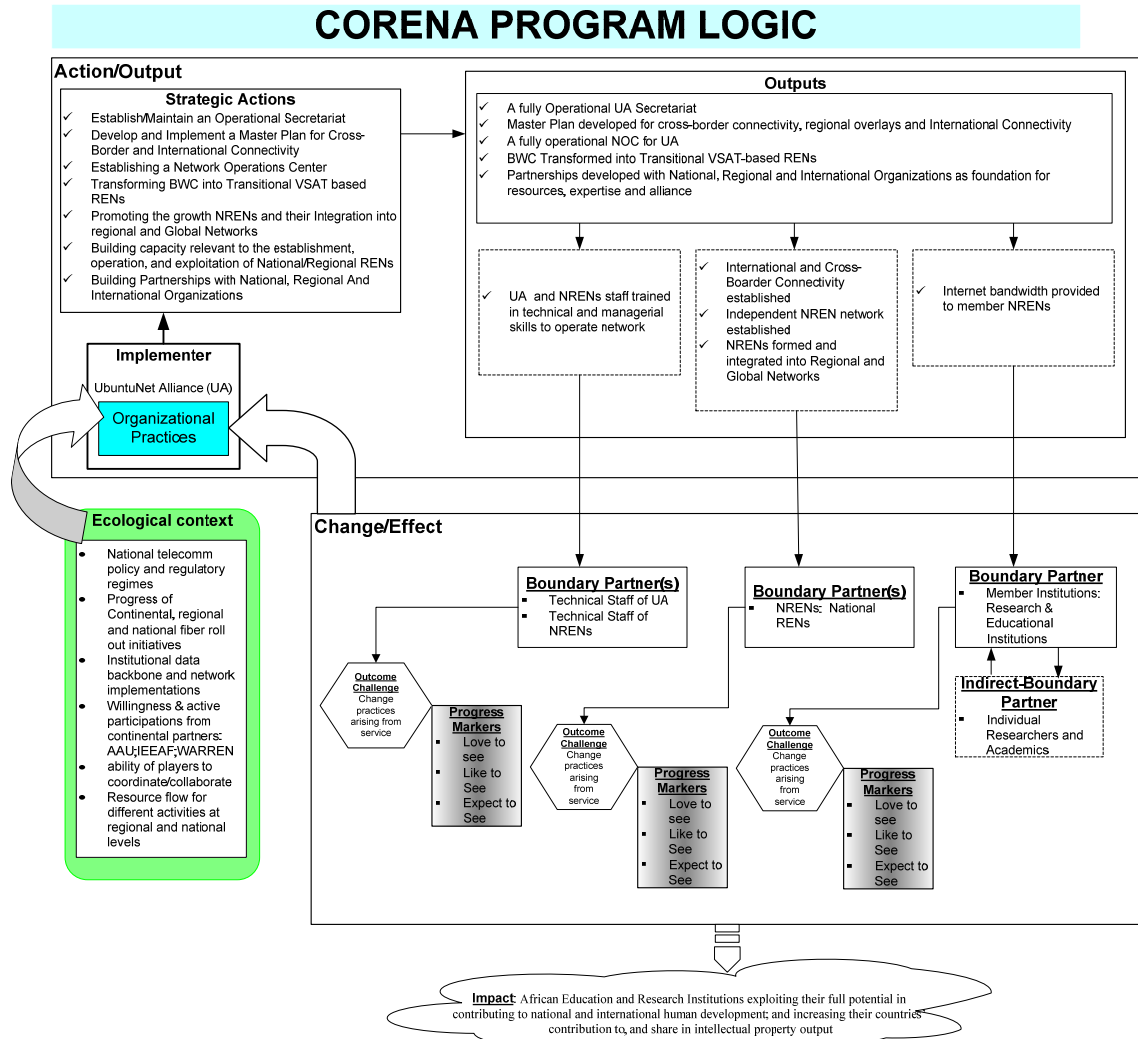## Background, organizational structure and context

Consolidating Research and Education Networking (CORENA) is a five-year project covering the period January 2008 to December 2012. The project is built on the rationale that a major cause of the limited contribution of African universities and research institutions to (1) national human development and (2) share of intellectual property output is their isolation from the global information infrastructure (GII). This isolation has come about through lack of sufficient and affordable connectivity. To address this gap, CORENA is focusing at provision of intra-African connectivity and securing high bandwidth connections at affordable rates to help interconnect African National (and Regional) Research and Education Networks (RENs) to each other and to other RENs worldwide. It is hypothesized that this will create an environment in which African Education and Research Institutions can exploit their full potential in contributing to national and international human development and in increasing their countries' contribution to, and share in intellectual property output through effective national, regional and international collaboration.

Operational Context

The success of Consolidating Research and Education Networking in Africa (CORENA) hinges on the effectiveness of UbuntuNet to forge relationships, design new products and services, prospect for new ideas and resources and expand its network. This is a high calling on the part of UbuntuNet, more so given the complex environment in which the project is delivered. Besides spanning multiple countries, diverse factors and many players at different levels do pose challenges and give rise to a variety of issues that UbuntuNet needs to address in order to achieve its goals. It will be necessary for UbuntuNet Alliance to institute a systematic process of knowing what the status of the project's operating context is and also know what the intentional/non-intentional changes in the behaviours of its beneficiaries are. This knowledge is important in ensuring that UbuntuNet adapts its strategies, competencies and approaches fittingly. In this strategy, four different levels (the institutional, NREN, Country and Regional) at which change is expected to happen and inevitably influence the implementation and effect of CORENA are conceived and used to define areas of focusing the monitoring.

The conceptual framework

The conceptual framework below was developed and provided a framework within which the M&E strategy is formulated.

CORENA PROGRAM LOGIC

Action/Output

Strategic Actions
- ✓ Establish/Maintain an Operational Secretariat
- ✓ Develop and Implement a Master Plan for Cross-Border and International Connectivity
- ✓ Establishing a Network Operations Center
- ✓ Transforming BWC into Transitional VSAT based RENs
- ✓ Promoting the growth NRENs and their Integration into regional and Global Networks
- ✓ Building capacity relevant to the establishment, operation, and exploitation of National/Regional RENs
- ✓ Building Partnerships with National, Regional And International Organizations

Outputs
- ✓ A fully Operational UA Secretariat
- ✓ Master Plan developed for cross-border connectivity, regional overlays and International Connectivity
- ✓ A fully operational NOC for UA
- ✓ BWC Transformed into Transitional VSAT-based RENs
- ✓ Partnerships developed with National, Regional and International Organizations as foundation for resources, expertise and alliance

- ✓ UA and NRENs staff trained in technical and managerial skills to operate network

- ✓ International and Cross-Boarder Connectivity established
- ✓ Independent NREN network established
- ✓ NRENs formed and integrated into Regional and Global Networks

- ✓ Internet bandwidth provided to member NRENs

Implementer

UbuntuNet Alliance (UA)

Organizational Practices

Ecological context
- National telecomm policy and regulatory regimes
- Progress of Continental, regional and national fiber roll out initiatives
- Institutional data backbone and network implementations
- Willingness & active participations from continental partners: AAU;IEEAF;WARREN
- ability of players to coordinate/collaborate
- Resource flow for different activities at regional and national levels

Change/Effect

Boundary Partner(s)
- Technical Staff of UA
- Technical Staff of NRENs

Boundary Partner(s)
- NRENs: National RENs

Boundary Partner
- Member Institutions: Research & Educational Institutions

Indirect-Boundary Partner
- Individual Researchers and Academics

Outcome Challenge Change practices arising from service

Progress Markers
- Love to see
- Like to See
- Expect to See

Outcome Challenge Change practices arising from service

Progress Markers
- Love to see
- Like to See
- Expect to See

Outcome Challenge Change practices arising from service

Progress Markers
- Love to see
- Like to See
- Expect to See

Impact: African Education and Research Institutions exploiting their full potential in contributing to national and international human development; and increasing their countries' contribution to, and share in intellectual property output

Elements of the CORENA Program Logic

There are four basic elements of CORENA program logic: the *Action/Output,* the *Ecological Context,* the *Change/effect* and the *Impact.* The *Action/Output* captures efforts of key partners and direct implementers in translating available resources into program deliverables. The *ecological context* describes the portion of the environment that directly interacts with CORENA and that can influence its effectiveness. The *Change/effect* captures the anticipated changes in the target audience as a consequence of CORENA. The *impact* describes contribution of CORENA to long-term changes within African educational and research institutions.

Monitoring and Evaluation at Different Levels

This strategy identifies three levels at which strategic and tactical information for different stakeholder groups will be required. It is posited that this abstraction is necessary to focus the monitoring and evaluation since each level serves a unique purpose. Additionally, the following guiding questions inform what data/information is worth considering at each stage:
   i.   What type of data does the strategy at a specific level need to capture, analyse and disseminate?
   ii. Who needs this data?

iii. Why do they need the data?
iv. How, who and when will the information be collected, analyzed and disseminated?

At each level, the strategy is a build up from a rationale, to the strategic information needs of that level, which inform the focus on the data that needs to be collected and eventually the methods of effecting the M&E function.

Following from the conceptual model, the proposed levels shall be:

- Output level - focusing on implementation (activities, deliverables, and organization arrangements);
- Outcome level – focusing on the effect on the target group
- Impact level – focusing on project worth/merit.

Strategy for Output Level Monitoring and Evaluation

For an effective process, most of the monitoring activities shall be carried out by the implementing staff. The strategy is therefore designed such that it does not create parallel reporting activities that will burden UbuntuNet and its staff. It ensures that collection and reporting of monitoring data is integral to the various management functions of UbuntuNet.

While the process of activity implementation shall not be ignored, the strategy is designed to place emphasis on tracking realization of outputs produced. As depicted in the program logic, the following aspects of the action model shall be tracked:

- Outputs related to the one-off establishment of the UA secretariat.
- The key deliverables through which CORENA is going to achieve its objectives
- Monitoring of the Internet and Intranet capacity shall start as soon as the service provisioned and will continue throughout the lifetime of its establishment, which shall be way beyond the CORENA project

The events within the 'ecological context' are not the mandate of UbuntuNet. However, they are contingent on the realization of the CORENA goal. As part of the Output level strategy, UA will monitor these events and implement a periodical review of its 'organizational practices' that ensure it can still achieve the stated objectives within the varying contexts through innovative and pro-active measures.

Strategy for Outcome Level Monitoring and Evaluation

At the outcome level, the strategy shall focus on ongoing defining, refining, measuring and assessing progress towards the ultimate goal of CORENA. A mapping of changes within the different target groups and institutions and the relationships therein shall be a periodical exercise of UbuntuNet and its stakeholders. The outcomes are constructs that need to be operationalized using measurable indicators. The expected outcomes of CORENA are fairly complex and need a comprehensive approach of measurement to ensure validity of claims. A mixed method approach, where both quantitative and qualitative measures are used to provide both a broad/more objective viewpoint and a subjective but thick description of the phenomenon shall be adopted. For each outcome identified, a set of progress markers (in the form of quantitative indicators) shall be defined. The qualitative measures shall complement the quantitative ones by adding more meaning to the nature and process of the change. This shall have the added benefit of providing lessons about the theory of change of the program.

Strategy for Impact Level Monitoring and Evaluation

The focus of the strategy shall be identifying, monitoring and assessing defining indicators of 'effective participation' by African scholars. At the start of the program, stakeholders shall be engaged in a process of visioning what they expect to see changing in the knowledge society arena as a result of CORENA's contribution. This expected change shall be defined and

crystallized using indicators against which impact shall be measured. To ensure effective assessment of impact, the strategy shall include a baseline study that will capture the state on all the identified indicators. This shall form a basis for the eventual impact study at the designated time after program completion.

The impact of CORENA may be realized during or way beyond the program life. It shall therefore be prudent to define a realistic time for carrying out an impact study. It is also advised that an impact study proceeds after proper process and outcome monitoring and evaluation studies. It will be futile to delve into an impact assessment of an intervention that was either wrongly implemented or had no effect on the target group. The process and outcomes evaluations shall therefore provide a precursor and preliminary input to the study and shall be a requirement for this stage to be flagged off.

1   Introduction

This report outlines the Monitoring and Evaluation (M&E) strategy for Consolidating Research and Education Networking in Africa (CORENA) program of the UbuntuNet Alliance for Research and Education Networking, herein after referred to as UbuntuNet. The program objective is to secure high bandwidth connections at affordable rates to help inter-connect African National Research and Education Networks (NRENs) to each other, to other NRENs worldwide and to the Internet in general. The goal is to empower African researchers and academics to contribute proportionately to the world's intellectual output, hopefully generating proportionate intellectual property and respective development within their countries.

The main objective of the framework is to provide a set of parameters that UbuntuNet can adopt in developing its M&E systems in order to effectively monitor and evaluate the performance, intermediate outcomes and impact of the CORENA intervention. Effective M&E ensures that project strategies are properly aligned to changing context and that progress towards program goal is tracked and any area needing attention is immediately attended to.

This document provides a framework for integrating Monitoring and Evaluation into the CORENA program. The document is structured as detailed below;

- Background and context – this section details the vision and objectives of CORENA; its governance, management and operational setup and the contextual environment in which its actors and beneficiaries operate;
- Conceptual framework – this section describes the major components of the conceptual framework developed for evolving the output, outcome and impact M&E strategies. The section also describes how the conceptual framework was used to evolve the output, outcome and impact M&E strategies;
- Monitoring and Evaluation at different levels – this section describes the rationale and key components of the output, outcome and impact M&E strategies. The section further proposes a framework of how to identify, collect and disseminate information needed to monitor and evaluate output, outcome and impact issues;
- The Output M&E strategy – in this section, a description of what information is required for tracking, measuring and assessing outputs is provided. Additionally, strategies to use in gathering and analyzing the required information and associated methods and tools for conducting the activity are also provided;
- The Outcome M&E strategy – this section describes what kind of information is required for tracking, measuring and assessing outcomes; the strategies to use in gathering and analyzing the information and the associated methods and tools for conducting the activity;
- The Impact M&E strategy – this section describes what kind of information is required for tracking, measuring and assessing impact; the strategies to use in gathering and analyzing the information and the associated methods and tools for conducting the activity;

2   Background, Organisational Structure and Context

Consolidating Research and Education Networking (CORENA) is a five-year project covering the period January 2008 to December 2012. The project is built on the rationale that a major cause of the limited contribution of African universities and research institutions to (1) national human development and (2) share of intellectual property output is their isolation from the global information infrastructure (GII). This isolation has come about through lack of sufficient and affordable connectivity. To address this gap, CORENA is focusing at provision of intra-African connectivity and securing high bandwidth connections at affordable rates to help interconnect African National (and Regional) Research and Education Networks (RENs) to each other and to other RENs worldwide. It is hypothesized that this will create an environment in which African Education and Research Institutions can exploit their full potential in contributing to national and international human development and in increasing their countries' contribution to, and share in intellectual property output through effective national, regional and international collaboration.

The project identified nine programmatic areas comprising of four short-term objectives (completion within 6 – 9 months from start) and five medium-to-long-term objectives (starting within the first 6 – 9 months and ongoing throughout the project and beyond) through which its set goal and purpose can be achieved:

Short-term objectives (completion within 6 – 9 months from start)
    i. Establishing and maintaining a distributed Secretariat;
    ii. Developing a Master Plan incorporating: cross-border connectivity, regional overlays as needed, and international connectivity; and engaging development partners for funding;
    iii. Establishing a Data Centre and Network Operations Centre;
    iv. Enabling member NRENs that currently have international access only via VSAT to acquire international backbone presence as VSAT based RENs;

Medium to Long Term (Starting within the first 6 – 9 months and ongoing throughout the project and beyond)
    v. Promoting the growth of national research and education networks and their integration into regional and global networks;
    vi. Building capacity relevant to the establishment, operation, and exploitation of national as well as regional research and education networks (Infrastructure level);
    vii. Building partnerships with national, regional and international organisations as a foundation for securing resources, acquiring expertise, and building alliances that will lead to the achievement of all objectives and delivery of an advanced research and education network;
    viii. Implementing the Master Plan for cross-border connectivity, regional overlays, and international connectivity: target - a price of $200 per Mbps-month within 4 years;
    ix. Carrying out ongoing monitoring and evaluation as an integral part of implementation;

2.1   Organisational Structure

The CORENA program is delivered in a complex environment spanning geographical regions and involving multiple players. The key player in the program is UbuntuNet – who is the principal implementer of the project. UbuntuNet works with other regional and continental organisations pursuing similar objectives or interested in supporting them in Africa to implement the project's objectives. Partners that UbuntuNet works with include the Association of African Universities Research and Education Networking Unit; the African Bandwidth Consortium (BWC) and Internet Educational Equal Access Foundation (IEEAF). In addition, UbuntuNet expects to build a business relationship with the Nigerian ICT Forum and the nascent regional research and education network in Western Africa as well as research and education networks in Northern Africa through

which infrastructure integration will lead to a continental research and education network overlay. It is evident that most of the project activities are performed by UbuntuNet in collaboration with both member NRENs and regional/continental partners. Figure 1 summarises the organisational and operational nature of CORENA.
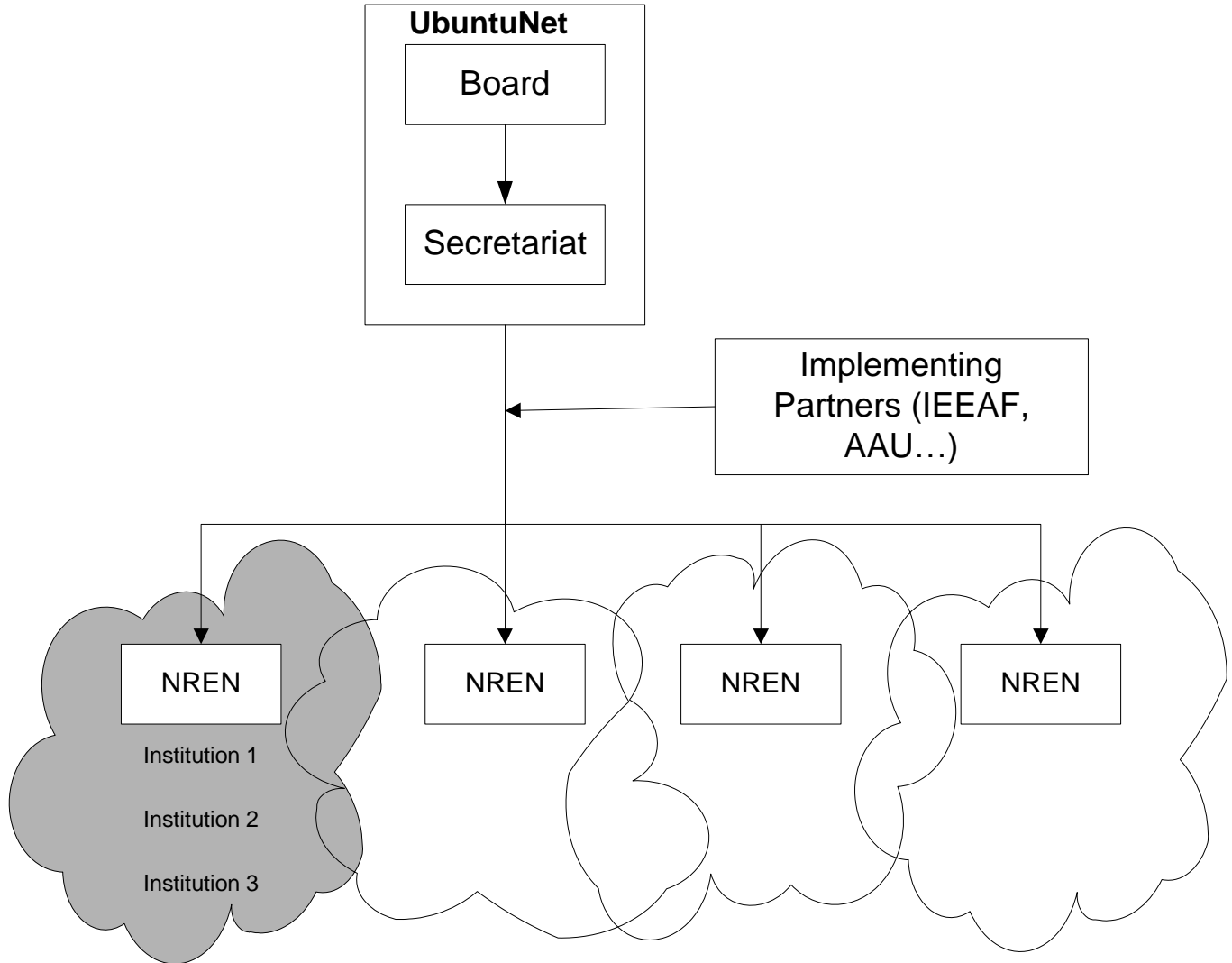

Figure 1. CORENA's operational context features issues at different levels that may include those that are institutional, at an NREN level, at a country level (shaded in grey) or even at a regional level interplay of countries)

2.2   Operational Context

The success of CORENA hinges on the effectiveness of UbuntuNet to forge relationships, design new products and services, prospect for new ideas and resources and expand its network. This is a high call on the part of UbuntuNet, more so given the complex environment in which the project is delivered. Besides spanning multiple countries, diverse factors and many players at different levels do pose challenges and give rise to a variety of issues that UbuntuNet needs to address in order to achieve its goals. It will be necessary for UbuntuNet Alliance to institute a systematic process of knowing what the status of the project's operating context is and also know what the intentional/non-intentional changes in the behaviours of its beneficiaries are. This

knowledge is important in ensuring that UbuntuNet adapts its strategies, competencies and approaches fittingly. In this strategy, four different levels (the institutional, NREN, Country and Regional) at which change is expected to happen and inevitably influence the implementation and effect of CORENA are conceived and used to define areas of focusing the monitoring.

Institutional level—this is the smallest aggregation unit at which UbuntuNet would like to see change or impact and comprises of the academic and research institutions. Although UbuntuNet may not directly work at this level, what happens here will have tremendous impact on its performance. While cognisant of the dynamics and differences that occur at this level, UbuntuNet will need to work with other players like NRENs who can have more influence at this level;

NREN level—NRENs are umbrella organisations created[1] in each participating country that bring together academic and research institutions into a research and education network. UbuntuNet works directly with NRENs to achieve success in its programs within different countries. On its part, UbuntuNet needs to adapt strategies, competencies and approaches to match peculiar situations that exist at each NREN[2];

Country level—Different countries have disparate regulatory and policy issues that can greatly influence UbuntuNet's activities. UbuntuNet will need to scan and keep track of infrastructure development and the regulatory and policy issues that hinder or promote their activities. Working with NRENs and other in-country partners, UbuntuNet will need to guide them on how to engage their own governments to foster positive changes that directly promote their broader goals and create a more conducive environment for research and education networking to thrive;

Regional level—Different countries, and thus NRENs, belong to different regional blocks for different reasons. The ability of UbuntuNet to rally support from regional bodies, leverage regional institutions such as East African Community (EAC), Common Market for East and Southern Africa (COMESA), African Union (AU) and Southern Africa Development Corporation (SADC) and leverage regional initiatives such as EASSy are key ingredients in attainment of CORENA's goals and objectives. UbuntuNet will need to adapt its strategies, competencies and approaches to match peculiar situations that exist at regional level. UbuntuNet is already working with a number of Pan-African organisations. An example is AAU that helps coordinate the appointment of the board chairperson from the region. There are other similar entities that can be leveraged to promote the success of different aspects of the CORENA program. Some of these will include:

- AfNOG—the African Network Operators' Group[3], which already presents annual regional forums for training of network administrators;
- AfriNIC—the African Network Information Centre[4], that is the regional Registry responsible for allocating Internet Number Resources for Africa.

While working with some of these institutions will help in accelerating the achievement of CORENA's project objectives, it also adds complexity to the operational environment in the sense that UbuntuNet needs to figure out how to best interface with such institutions without getting lost in process related issues.

In the next section, a conceptual framework that takes into consideration the complex nature of the CORENA program is proposed. The framework synthesises all the issues discussed above and provides a solid foundation for evolving a responsive monitoring and evaluation strategy.

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[1] By the time of preparing this strategy, some countries did not yet have NRENs formulated.
[2] NRENs are at different stages of development with different models, resource availability, political support and technical capabilities
[3] AfNOG—the African Network Operators' Group is found online at www.afnog.org
[4] AfriNIC—the African Network Information Centre is found online at www.afrinic.org

3   A Conceptual Framework

There are plenty of approaches and methods developed for program evaluation. The question of which approach is suitable for a given evaluation study continues to attract wide attention. Irrespective of the approach one chooses, gaining a clear understanding of the logic underpinning an intervention or program is the starting point for a successful evaluation study. It is only when one is clear about what the program is trying to achieve and how it is going to achieve it that the question of how to evaluate the program becomes relevant. In figure 2, a conceptual model of CORENA is presented. The conceptual model provides a basis upon which to develop the M&E strategy for CORENA.
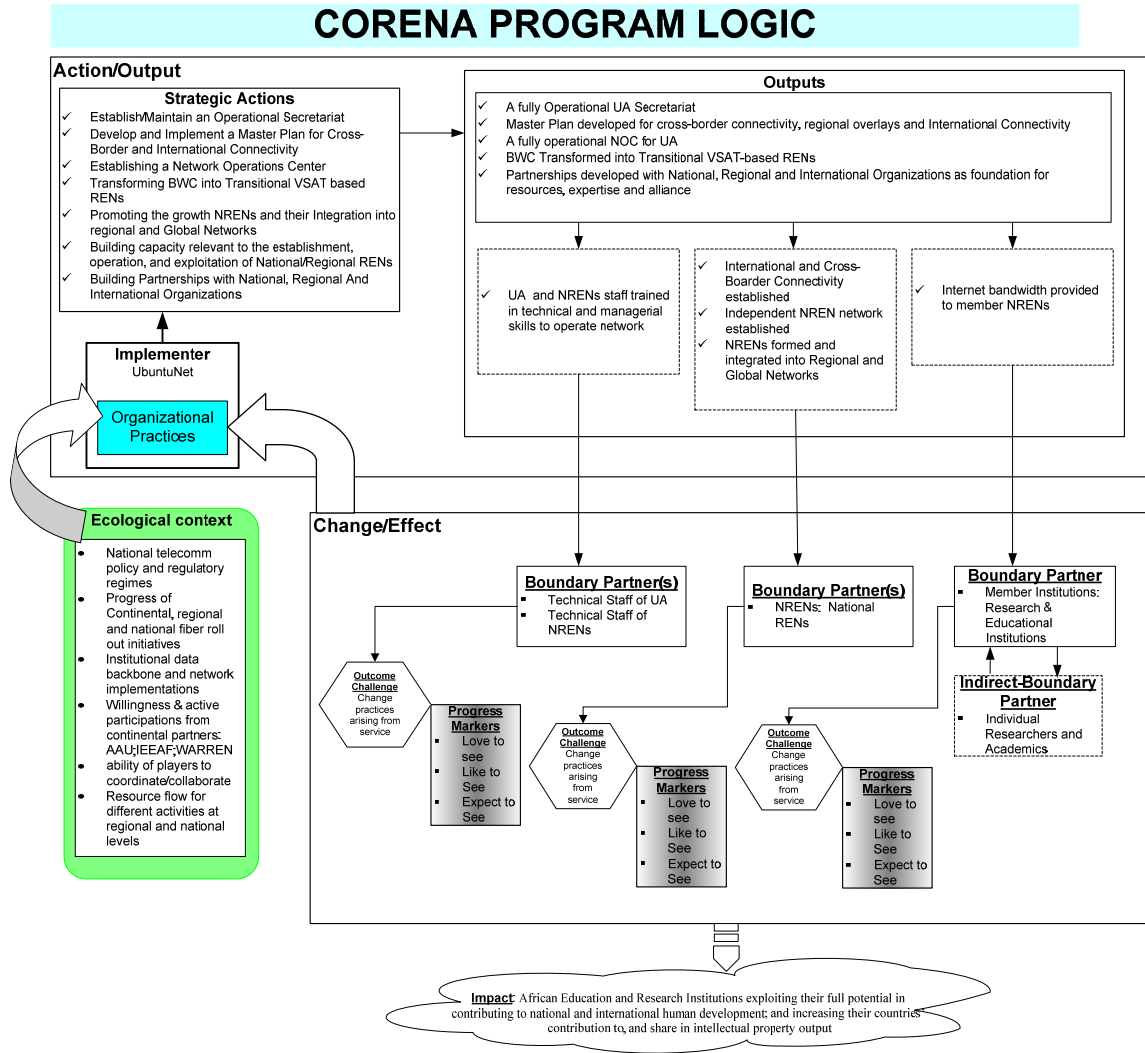

Figure 2. A conceptual model of CORENA's M & E strategy

3.1   Elements of the CORENA Program Logic

There are four basic elements of CORENA program logic: the *Action/Output,* the *Ecological Context,* the *Change/effect* and the *Impact.* The *Action/Output* captures efforts of key partners and direct implementers in translating available resources into program deliverables. The *ecological context* describes the portion of the environment that directly interacts with CORENA

and that can influence its effectiveness. The *Change/effect* captures the anticipated changes in the target audience as a consequence of CORENA. The *impact* describes contribution of CORENA to long-term changes within African educational and research institutions.

The logic embedded in Figure 2 can be read as: *UbuntuNet, using available resources implements various strategies (Strategic Actions) identified by CORENA as appropriate for effecting required changes. The implementations will naturally result into specific service outputs (Outputs) to different categories of beneficiaries (Boundary partners) with whom CORENA directly interfaces. If the strategies are successful, certain change practices eventually show-up on the boundary partners (Outcome Challenges). The change practices will however, not show-up at one go, but as a gradual build up (Progress Markers), starting with the simple signs (the expect to see) and then to the more difficult signs (the love to see). Periodically, the program collects information about its boundary partners and the environmental context (ecological context) in which it operates and uses the information to align its strategies accordingly (Organisational Practices). If the change practices that are observed in the boundary partners are sustained for extended period of time, there will be considerable contribution of CORENA towards African Education and Research Institutions exploiting their full potential in contributing to national and international human development, and increasing their country's contribution to, and share in intellectual property output (Impact).*

The above framework provides foundation for formulating the output, outcome and impact M&E strategies for CORENA.

3.1.1 The Action/Output

The action/output component is made up of three elements:

- **Implementer** – This comprises of two sub-components: *UbuntuNet* and *Organizational practices*. *UbuntuNet* is the implementing organisation and is the one accountable for the success or failure of the project. Its role includes appropriate allocation of resources; coordination of activities; recruitment, training and supervision of consultants/staff assigned specific duties. *Organizational practices* represent sets of processes and actions that will be required periodically of UbuntuNet in order to respond appropriately to changes in program context. This ensures that UbuntuNet is at all times relevant in delivering on its mission. For example, the project team has to be able to adapt its strategies, competencies and approaches in accordance with the (non-) intended changes in the practice of its boundary partners or changes in the program ecological context such as lack of willingness and participation from continental partners;

- **Strategic Actions –** comprising of carefully laid out plans of actions that UbuntuNet intends to implement for each boundary partner. Each boundary partner has its own strategic action, which indicates the relative influence CORENA is likely to have on a project partner. An overview of the strategies helps to pinpoint strategic gaps in the approach or determine whether the program is over-stretched; it also suggests the type of evaluation method appropriate to track and assess the performance of the project;

- **Outputs** - denoting key deliverables and services that are made available to various program beneficiaries and that are emanating from execution of CORENA's strategic actions. The outputs are grouped according to the different categories of stakeholders served: (1) UbuntuNet secretariat; (2) Technical personnel of UbuntuNet and NRENS; (3) the NRENs and (4) Research and academic institutions (member NRENs). In Figure 2, the outputs to UbuntuNet secretariat are represented with arrows leading into the three dotted-rectangles to show the dependencies between them. This is because the outputs specified inside the doted-rectangles are dependent on attainment of the outputs to UbuntuNet secretariat. For example, the master plan must be in place before the international and cross-boarder connectivity can be effectively established.

3.1.2 Ecological context

The ecological context represents major assumptions that can affect program delivery. As part of the M&E, the assumptions will have to be constantly watched so that necessary adjustments in program setup and strategies can be made to offset any unfavourable states in the ecological environment. This ensures that UbuntuNet remains relevant at all times in delivering on its mission.

The Interplay between the action theory, the ecological context and the change theory (discussed later) directly contribute to the realization of CORENA's stated purpose:

> *To enable the integration of African universities and research institutions into the global research and education community through the provision of intra-African connectivity as well as access to sufficient and affordable international bandwidth.*

The first level of accountability required of UbuntuNet is ensuring that the stated actions are executed and the required outputs produced. Generating the required outputs (see Figure 2) is not obvious: Lack of resources, poor implementation and coordination difficulties are examples of things that could go wrong. In order to minimize such occurrences, a routine monitoring and evaluation activity should be instituted. The output M&E strategy proposed in this document is aimed at ensuring that UA is at all times engaged in doing the right things. The following are key issues to consider in formulating the output M&E strategy:

i.   That strategies which UbuntuNet has developed for each boundary partner are matching the changes expected in the behaviours, actions and activities of the partner;
ii. That UbuntuNet is continuously and routinely tracking changes in the ecological context and devising innovative ways to counter negative effects that those changes could bring to the program. For example, how will UbuntuNet adjust its program if continental players/partners such as AAU, Internet Educational Equal Access Foundation (IEEAF) pull out?
iii. That UbuntuNet is continuously and routinely tracking effort exerted in trying to produce expected outputs, both from quantitative and qualitative perspectives;
iv. That UbuntuNet is continuously and routinely tracking sufficiency of capacity, infrastructure and resources required to deliver project activities;
v.   That UbuntuNet is continuously and routinely tracking level of functioning of project management systems.

3.1.3 The Change/Effect

The change/effect component is driven by the Outcome Mapping[5] (OM) concepts. It comprises of three elements:

- **Boundary partners** – Those individuals, groups, or organizations with whom CORENA interacts directly and with whom it can anticipate some opportunities for influence. A preliminary review of the program document reveals the following as an initial list of boundary partners for CORENA: technical staff of both UbuntuNet and member NRENs, NRENs and NRENs member institutions;

- **Outcome challenge** – Description of the ideal changes in the behaviour, relationships, activities, and/or actions of a boundary partner. This is captured in such a way that it

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[5] Outcome Mapping – Building Learning and Reflection into Development Programs

reveals how the partner would behave and relate to others if CORENA had achieved its full potential as a facilitator of change. In the program document, the outcome challenges are not explicitly provided and therefore will need to be developed for each boundary partner. The outcome mapping guideline from International Development Research Centre (IDRC) recommends a participatory approach for developing outcome challenges;

- **Progress markers** – A set of graduated indicators of changed behaviour for a boundary partner that focus on the depth or quality of change. They describe changes in actions, activities and relationships leading up to the ideal outcome challenge statement. The indicator markers are grouped into three levels: *expect to see, like to see and love to see*. The *expect to see* will most probably be observed before the *like to see* which will also most likely be observed before the *love to see.* The *expect to see* progress markers are reactionary behaviours of a boundary partner in relation to the services received. These are fairly easy to see and should follow immediately after activity implementation. The *like to see* are those behaviour, relationships, activities, and/or actions that signify that more active learning or engagement is occurring on the part of the boundary partner. The *love to see is* those behaviour, relationships, activities, and/or actions that signify that a truly transformative change is happening on the part of the boundary partner. The progress markers are thus useful representations of information that the program can gather in order to monitor achievements towards the desired outcome challenge.

As CORENA matures in implementation and service delivery, claims can be made regarding its contribution towards the integration of African universities and research institutions into the global research and education community. The validity of such claim will have to be measured against the extent to which CORENA influenced its boundary partners. This issue is central in developing CORENA's Outcome M&E strategy. The outcome strategy will thus be concerned about;

i. Correctly identifying those individuals, groups, or organizations with whom CORENA interacts directly and with whom it can anticipate some opportunities for influence – the boundary partners;
ii. A realistic description of the ideal changes in the behaviour, relationships, activities, and/or actions expected of each boundary partner as a consequence of the CORENA's intervention;
iii. A set of graduated indicators of changed behaviour for a boundary partner that focus on the depth or quality of change.

3.1.4 The Impact

UbuntuNet expects that through the CORENA intervention, it can make positive contribution towards African Education and Research Institutions exploiting their full potential in contributing to national and international human development and increasing their country's contribution to, and share in intellectual property output. Measurement of this contribution is the central issue for discussion in the proposed impact M&E strategy presented in Section 7. The issues that the impact strategy addresses are:

i. A design strategy which ensures that systematic measures are conducted at both pre and post implementation of CORENA;
ii. A design strategy which ensures that observable changes between pre and post CORENA measures are of significant counts and outweigh similar measures in non-participating institutions;

iii. A design strategy which ensures that credible evidence exist to show that the ideal changes in the behaviour, relationships, activities, and/or actions of the boundary partners is sustainable over an extended period of time.

4   Monitoring and Evaluation at Three Levels

This strategy identifies three levels at which strategic and tactical information for different stakeholder groups will be required. It is posited that this abstraction is necessary to focus the monitoring and evaluation since each level serves a unique purpose. Additionally, the following guiding questions inform what data/information is worth considering at each stage:

  v.   What type of data does the strategy at a specific level need to capture, analyse and disseminate?
  vi. Who needs this data?
  vii. Why do they need the data?
  viii. How, who and when will the information be collected, analyzed and disseminated?

At each level, the strategy is a build up from a rationale, to the strategic information needs of that level, which inform the focus on the data that needs to be collected and eventually the methods of effecting the M&E function.

Following from the conceptual model, the proposed levels shall be:

- Output level - focusing on implementation (activities, deliverables, and organization arrangements);
- Outcome level – focusing on the effect on the target group
- Impact level – focusing on project worth/merit.

In order to meet the information needs specified above, strategies to monitor and evaluate the project activities, outputs, outcomes and impacts is proposed. These strategies are expected to act as blue-prints to guide routine collection, analysis and reporting of information that ensures project stakeholders have the required information to make operational, tactical and strategic decisions.

4.1   The "what" question

The question of "what" data to capture becomes increasingly complicated when moving from output to impact. For the output strategy, the Logframe matrix does provide an indication of what to capture and how to capture it. This is through the objectively verifiable indicators (OVI) column and the means of verification (MOV) column respectively. The output-level strategy for CORENA will be driven by the Logical framework approach/tool. For the outcome strategy, the question of what is addressed by the outcome challenges and the corresponding progress markers defined for each boundary partner. The outcome-level strategy for CORENA will be driven by the Change/Effect section in Figure 2. For the impact strategy, the "what" will focus at learning and accountability and will be set by UbuntuNet and its stakeholders.

4.2   The "who" question

The "who" element represents key information stakeholders that require information generated by the strategies to address their diverse needs. The following people are the key information stakeholders[6] for CORENA:

- UbuntuNet Alliance;
- Implementing Partners: NRENs, IEEAF, AAU;
- Donors;
- Wider audience interested in regional research and education network.

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[6] This is an initial and draft list which was gleaned from the project document. As UbuntuNet operationalizes the strategy, this list will be further refined

4.3   The "why" question

The "why" question can fall into one or a combination of the following four broad reasons:

- To ensure project performance (efficiency and effectiveness) through informed management decision-making and control;
- To demonstrate accountability through transparency and documentation;
- To refine strategy, approach and methodology;
- To promote organisational learning through the testing of development hypotheses and the capture of lessons learned.

4.4   The "how" question

The "how" question is concerned about systematic collection, analysis and dissemination of information to inform practice and measure project worth. Key issues addressed are:

- What methods/methodologies are appropriate for collecting the information specified under the "what"? This is a design question;
- Who is responsible for collecting the information specified under the "what"? When will the information be collected? How often will it be done? Who will analyze and narrate the findings?
- How will the information collected and analyzed be disseminated to each of stakeholders categories specified in the "who"?

In the next three sections, we present the output, outcome and impact level M&E strategies for CORENA. These strategies are expounded from the four concepts discussed above.

5   Output Level Monitoring and Evaluation

The purpose of the output M&E strategy is to provide a framework through which UbuntuNet and its implementing partners can monitor on an ongoing basis the progress of various activities and their related outputs to assure alignment with plans and to furnish it with timely information necessary for tactical decision making.

The strategy is guided by the CORENA objectives as conceptualized in the Action/Output section of Figure 2. The strategy comprises of three components:

- The strategic information needs/indicators that are required to know the progress towards achievement of each defined output. Identification of the information/indicator is guided by a reflection on whether the information/indicator once gathered, can be used to effectively answer a given performance question;
- A strategy which specifies the approaches to be used in collecting the relevant data. They define the methods, frequency of data collection and mandated responsibility for the task. To engender utilization of M&E findings, the strategy proposes information use approaches specifically related to ownership/buy-in, reporting, feedback and responsibility;
- The data collection process which is concerned with the tools and methods of data collection.

5.1   Strategic Information Needs

The output M&E strategy is driven by the need to collect and analyze data to address the following issues:-

i.   Relevance of program concept/theory: Like most projects, the relevance of CORENA's program concept/theory is temporal and needs to be reviewed for relevance on an ongoing basis. On an agreed upon cycle, UbuntuNet and its partners will review the program logic, informed by the progress of the various activities and how the target audience is responding to the CORENA service to ensure that it is still aligned with the goal of the intervention;

ii.   Implementation: CORENA funders shall need to ensure that their grants are utilized as planned. They will therefore need periodic information on progress made by UbuntuNet and partners towards agreed outputs. Furnishing of this information shall be integral to the management activities towards the technical reporting;

iii.   Service quality: UbuntuNet shall need to keep track of the quality; availability and use of the service (Internet and Intranet) that it provides to the various research and education institutions (NRENs);

iv.   Context: the specific aspects of the ecological context on which CORENA is contingent and that surround the partner institutions, which are considered critical to the implementation of the CORENA activities. Aspects of the ecological context will inform UbuntuNet's organizational practices to ensure that it keeps relevant and innovative towards realizing the objectives despite the varying contexts.

5.2   Strategy

The output level strategy is designed to be supportive of the monitoring and evaluation needs of UbuntuNet, its partners and funders. For an effective process, most of the monitoring activities shall be carried out by the implementing staff. The strategy is therefore designed such that it does not create parallel reporting activities that will burden UbuntuNet and its staff. It ensures that collection and reporting of monitoring data is integral to the various management functions of UbuntuNet.

While the process of activity implementation shall not be ignored, the strategy is designed to

place emphasis on tracking realization of outputs produced. As depicted in the program logic (Figure 2), the following aspects of the action/output component shall be tracked:

i. Outputs related to the one-off establishment of the UbuntuNet secretariat. This shall focus on three areas:
   - The staffing – to ensure that the requisite human resource capacity is sufficient to carry out all planned activities;
   - The establishment of office premises - to support an environment though which the staff and CORENA partners shall effectively carry out their duties;
   - Availability of resources – to ensure that financial and networking (communications) resources is available and sufficient for the secretariat to function effectively.

ii. The key deliverables through which CORENA is going to achieve its objectives. These shall include: -
   - A fully Operational UbuntuNet Secretariat. At this level, focus shall be on assuring that the UbuntuNet establishment is at anyone time having the optimal staffing levels and that its establishment at an entity does not compromise its mandate;
   - International and Cross-Border Connectivity established for all participating institutions;
   - A fully operational network operations Centre established;
   - The Bandwidth Consortium (BWC) is transformed into a Transitional Very Small Aperture Terminal (VSAT) based RENs;
   - The target NRENs are integrated into the identified Regional and Global Networks;
   - UbuntuNet and NREN staff is equipped with technical and managerial skills to operate the network;
     For each of these deliverables, Objectively Verifiable Indicators (OVIs) shall be defined and used as a basis for reporting achievement;

iii. Monitoring of the Internet and Intranet capacity shall start as soon as the service provisioned and will continue throughout the lifetime of its establishment, which shall be way beyond the CORENA project. This shall mainly be at a technical level to ensure effective service delivery to all participating institutions. This will happen at four levels: -
   - At the NREN level, a monitoring of all institutional nodes to ensure that the terrestrial links are highly available and optimally utilized;
   - At the NREN level, to ensure that the uplink Internet providers meet the minimum levels as spelt out in the Service Level Agreements (SLAs);
   - At the institutional level, where a monitoring function shall be established to ensure that the services meet the SLAs specified with the NREN;
   - At the institutional level, to ensure that the usage of bandwidth both to the NREN and within the network is optimized through 'best practice' measures;

The events within the 'ecological context' are not the mandate of UbuntuNet. However, they are contingent on the realization of the CORENA goal. As part of the Output level strategy, UA will monitor these events and implement a periodical review of its 'organizational practices' that ensure it can still achieve the stated objectives within the varying contexts through innovative and pro-active measures. A preliminary list, teased from the CORENA proposal spells out the following issues which shall be monitored: -
   - Establishment of national and regional fiber backbones;
   - Establishment of partner institutional fiber backbones and all related infrastructure that assures effective and optimal use of the availed service;

- Supportive national and regional telecommunication policy and regulatory regimes that assure that implementation is not hampered in anyway.

5.3   Methods

5.3.1   Monitoring of Activities

Availability of monitoring data is critical not only to implementation assessment but also to the assessment of outcomes and impact of an intervention. Most (if not all) required monitoring information is largely generated during the process of implementing program activities. However, because this typically not a conscious activity, a lot of the information is discarded along the way. This leads to the requirement for a 'parallel' 'monitoring' activity, which in addition to 'appearing' burdensome to implementers has cost implications which could be avoided.

It is against this background that the M&E strategy at the output level shall ensure that monitoring shall be integral to the day-to-day management activities of CORENA. To ensure that relevant and important data is captured, CORENA shall need to identify all the activity monitoring information (basing on the defined logframe matrix) at the outset of the project that needs to be, captured. A framework for collecting, analyzing and reporting this information shall be defined. This shall specifically capture the responsibility of the various UbuntuNet staff in regard to ensuring that all information emerging from implementing their respective activities is collected and fed into a central repository that shall be used when reporting.

5.3.2   Performance Indicators

Performance indicators at the output level are quantitative measures that define a standard against which assessment is done to measure progress. The CORENA logframe matrix has defined a number of outputs and some Objectively Verifiable Indicators (OVIs). A review of each of these will be carried out at the outset to ensure that they are representative of the related outputs, are measurable and quantifiable. The Means of Verification (MOV) for most of these shall be document review of the various implementation and quarterly reports and site visits where necessary.

5.3.3   Process Evaluations

At an agreed upon timing an external process evaluation shall be conducted to assess progress of the various activities. The timing shall be such that it allows enough time to adopt improvement measures (if any) thereof. To ensure use of the evaluation findings, the approach shall engender processes (e.g. participatory monitoring and evaluation practices, self-assessments) that assure ownership and relevance of the report and recommendations therein. A clear purpose/rationale for the evaluation has to be defined, communicated and appreciated by all stakeholders if any benefit is to be got from it. UbuntuNet shall sequence this activity to align with the management functions in which strategic decision-making is made. It shall focus on the following issues: -
- Whether implementation is according to plan;
- Whether there is sufficient capacity within CORENA and partners and infrastructure to effectively deliver on the proposed service;
- Whether the service is being properly managed (delivered/monitored) and that management and operational systems are working well;
- How the target groups (NRENs and institutions) are responding to the intervention
  The monitoring activities will not have a specific budgetary implication. UbuntuNet shall however need to allocate adequate resources to cater for the process evaluation, which is typically outsourced.

6   Outcome Level Monitoring and Evaluation

The outcome M&E strategy will be guided by the Outcome Mapping (OM) concept. Realization of the CORENA goal is a result of a complex mix of outcomes and inter-relationships within and among different target groups. It is worth noting that these outcomes are not necessarily linearly related to the output(s). The flexibility of defining outcomes within and between targets accorded by the OM approach is therefore best placed to clearly elucidate the various changes in target group behaviour, actions and activities.

6.1   Strategic Information Needs

UbuntuNet, its implementing partners and funding organizations shall need to monitor the effect of the intervention on each target (boundary partners). At the start of the program, UbuntuNet, working together with various stakeholders shall map out its boundary partners. These shall be only those targets for which CORENA is doing something to effect a change. Boundary partners are conceived at two levels: - Individuals and institutions. A preliminary assessment identifies two groups at the individual level: - the first group is the technical staff of the institutions (Universities and NRENs). CORENA aims at equipping this group with skills to effectively operate a wide and complex educational network. This effort from CORENA should realize some changes within and between the individuals of this group to achieve a highly available, efficient and effective network service to the second group. The second group is the researchers at the partner NREN institutions. For this group, CORENA is going to provide adequate Internet bandwidth. The availability of this service shall effect changes in the practices, actions and relationships within and among this group towards realizing the CORENA goal of effective participation in the knowledge society. For each of these groups, changes shall happen gradually (not necessarily linearly) over varying time periods. The immediate changes shall be expected to happen as a result of effective implementation. The intermediate changes shall be those hoped to be seen if the expected changes occur. At the extreme end, changes much closer to realizing the CORENA goal are hoped to be identified within and among the different target groups.

At an institutional level, changes shall be expected at the member Universities, research institutions and the NRENs. The provision of adequate and affordable bandwidth to the Universities shall influence some policy and management aspects of these institutions. It is expected that the bandwidth shall catalyze specific institutions strategies and actions to support optimal, effective and sustained use of the availed bandwidth.

The NRENs are both implementing and boundary partners. Changes are expected within and among NRENs in the way they play their role in the CORENA initiative. These may include garnering membership, active participation and fostering relationships among the partner institutions; building capacities (human and financial) to effectively play their national roles; engaging national bodies to effect favourable policies among others.

At an agreed upon cycle (probably annually), UbuntuNet and its partners will review the indicators (progress markers) defined for each group to ensure that they are still relevant and responsive to the CORENA effort, the group dynamics and the ever-changing implementation contexts.

At agreed upon periods, outcome monitoring activities shall be commissioned as appropriate, preferably to be offered by external consultant(s) to provide an 'objective' assessment of progress of activities. This shall ensure that the conceived changes are on track and leading towards the goal. An outcome evaluation shall finally be conducted towards the end of the program. Since its focus shall be on individuals in the target groups, its timing shall be such that these individuals can be reached and consulted.

The CORENA funders shall need to ensure that their grants are having impact and that results are being achieved. They will therefore need periodic information on outcome monitoring and an assessment of how this is leading to the desired goal. This information shall be integral to the annual progress reports after an appropriate period, which UbuntuNet and stakeholders shall agree to as realistic to expecting outcomes.

UbuntuNet shall need to keep track of unexpected outcomes and how these impact on the implementation of the program. The design of the strategy shall be such that all identified changes can feed into and inform the planning/strategy activities of CORENA.

6.2   Strategy

At the outcome level, the strategy shall focus on ongoing defining, refining, measuring and assessing progress towards the ultimate goal of CORENA. A mapping of changes within the different target groups and institutions and the relationships therein shall be a periodical exercise of UbuntuNet and its stakeholders. The outcomes are constructs that need to be operationalized using measurable indicators. The expected outcomes of CORENA are fairly complex and need a comprehensive approach of measurement to ensure validity of claims. A mixed method approach, where both quantitative and qualitative measures are used to provide both a broad/more objective viewpoint and a subjective but thick description of the phenomenon shall be adopted. For each outcome identified, a set of progress markers (in the form of quantitative indicators) shall be defined. The qualitative measures shall complement the quantitative ones by adding more meaning to the nature and process of the change. This shall have the added benefit of providing lessons learnt about the logic of the program.

As depicted in the program logic model, the following aspects of the change model shall be tracked:

i.   Changes among the technical staff of the member institutions and NRENs. This shall focus on three areas:
   - Skills competence in managing and running the networks effectively and efficiently;
   - Ongoing skills development at own or CORENA initiative;
   - The forging of relationships with like minded persons and groups though which technical and managerial competences are nurtured.

ii.   Changes among the staff/researchers at the member institutions. These are seen at two levels: -
   - Internet bandwidth use patterns by each individual;
   - Relationships and networks forged with other research networks and researchers.

iii.   Changes within the member institutions related to facilitating the use and sustainability Internet bandwidth in particular and ICT services in general. These shall include issues like: -
   - Establishment of functional, operational and policy organs that assure a structured approach to ICT integration within the institution;
   - Enactment or enforcement of Policies that ensure optimal, effective and efficient use of the bandwidth;
   - Provision of financial and human resources that allow for a sustainable approach to service maintenance;
   - Changes within and among NRENs that assure that they are playing an effective role in forging the desired networks among member institutions within their countries. Some of the issues to be tracked shall include: -
     - o   NREN leadership role accepted and appreciated among various country stakeholders like: - member institutions, relevant Ministries and policy bodies, etc.

- o NREN is registered as a legal entity and well structured, facilitated and fully functioning.
- o NRENs have strategic plans with a vision leading to an effective nationwide research and educational network.
- o NRENs participate in forums that can propel their objectives and plans.

6.3 Methods

6.3.1 Monitoring of outcomes

The defined outcome 'progress markers' shall be the basis for monitoring the progress towards achievement of results. For each outcome, studies shall be conducted to measure the status of this progress. To make this an efficient and cost-effective exercise, it is proposed that this activity is part of the process evaluation activities under the output M&E strategy. The same staff members shall capture this information together. A structured approach shall be used, where pre-defined instruments (questionnaires, interview or observation schedules among others) shall be used to systematically capture the data.

6.3.2 Performance Indicators/progress markers

Progress markers are measures that define a standard against which assessment of progress towards realizing outcomes is done. The outcome mapping framework that shall be developed for each target group captures these indicators over a progressive period. These indicators shall be reviewed periodically to assure relevance. Through a forum (workshop) that brings together all the CORENA stakeholders, these indicators shall be defined and mapped out.

6.3.3 Outcome Evaluations

Towards the end of the program, an external outcome evaluation shall be conducted to assess effectiveness of CORENA. Though this is typically initiated and funded by the program funders, UbuntuNet will work together with them to ensure that a clear rationale/purpose, evaluation questions, design, reporting and dissemination is defined and agreed to by all stakeholders to ensure that a 'fair' approach is used. It shall focus on the following issues: -

- Whether the changes (expect, like and love to see) in the respective target groups have been realized. This shall build on the previous outcome monitoring activities through which the different stages (progress markers) were tracked;
- How these changes came about. While this is not necessarily the central aspect of the evaluation, it provides good lessons for similar initiatives for the future. Apart from knowing what worked or did not work, this process provides explanations of how this happened. It captures issues related to enabling contextual factors, limitations /redundancies in the design and effectively improves theory development for future initiatives.

7   Impact Level Monitoring and Evaluation

This component of the strategy focuses on monitoring and assessing the contribution of CORENA to its vision of ensuring that African Research and Education Institutions participate effectively in the global Research and Education networking community and Knowledge Society. Impact in this context is clearly delineated from outcomes, with a focus on the global knowledge society as opposed to changes in the target population, which is captured under outcomes. It is theorized that if the specified outcomes are sustained over a defined period (while expecting contextual factors to remain supportive), then the impact should be realized.

As acknowledged from the proposal, CORENA is one of many factors through which this vision shall be realized. Local contextual factors at the institutional and national levels (e.g. research funding, policies) and global trends (political, economic, research focus, etc) play a central influential role. It is however noted that the availability of Internet Bandwidth can on the other hand influence them too.   The impact context is therefore an interplay of many factors, not necessarily having a linear relationship to one another, but together having the desired impact. Efforts towards attribution of CORENA to this impact can prove futile. The focus of the study shall therefore be removed from impact 'attribution' to 'contribution'. The guiding question for the impact study will focus on creating an understanding of the contribution CORENA will have made to identified indicators of impact.

7.1   Strategic Information Needs

All stakeholders but specifically CORENA funders shall need to know what impact their funds have had on the knowledge society in relation to African Scholars in the target institutions. The construction 'effective participation' will need to be operationalized with Objective Verifiable indicators (OVIs) through which the impact can be measured. These indicators are not limited to the ICT related effects only but to the whole scope of variables that define 'effective contribution'. These may include aspects like: - patents, publications, publishing houses/University presses, established research groups, etc.

7.2   Strategy

The focus of the strategy shall be identifying, monitoring and assessing defining indicators of 'effective participation' by African scholars. At the start of the program, stakeholders shall be engaged in a process of visioning what they expect to see changing in the knowledge society arena as a result of CORENA's contribution.   This expected change shall be defined and crystallized using indicators against which impact shall be measured.   To ensure effective assessment of impact, the strategy shall include a baseline study that will capture the state on all the identified indicators. This shall form a basis for the eventual impact study at the designated time after program completion.

The impact of CORENA may be realized during or way beyond the program life. It shall therefore be prudent to define a realistic time for carrying out an impact study. It is also advised that an impact study proceeds after proper process and outcome monitoring and evaluation studies. It will be futile to delve into an impact assessment of an intervention that was either wrongly implemented or had no effect on the target group. The process and outcomes evaluations shall therefore provide a precursor and preliminary input to the study and shall be a requirement for this stage to be flagged off.

The timeliness of the impact study also relates to its purpose. Stakeholders should agree on the purpose of the study, who will need the information, how and of what use it shall be. This will provide a reasonable rationale for investing resources at this stage.

Noting that many factors contribute to the CORENA vision, there shall be need for a conscious monitoring of developments related to research at institutional, national and global levels. The information from such an ongoing process will enrich the impact evaluation by providing contextual explanations and helping to isolate CORENA's contribution from other influential factors. Additionally, it will enhance the learning experience in identifying what worked, how it worked and what made it work. This activity shall be part of UbuntuNets' management tracking functions.

7.3 Methods

7.3.1 Baseline study

A baseline study to benchmark the status of African Scolarly contribution to the knowledege society prior to the intervention shall be carried out. It shall follow from the defined indicators from the prior stakeholder process.

7.3.2 Impact Evaluation

The impact evaluation shall be designed to identify the specific contribution of CORENA. Noting the challenges of 'controlling' the context around the program targets, a quasi-experimental design shall be adopted. A comparison group (non-participating but fairly 'equivalent' institutions) shall be identified and also included in the baseline study. This exercise shall be outsourced to an external consultant to give it the 'objective' quality requirement.