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PRESENTED TO:

FOREIGN, COMMONWEALTH AND
DEVELOPMENT OFFICE (FCDO)

&

AFRICAN CENTRE FOR
TECHNOLOGY STUDIES

FEASIBILITY STUDY REPORT

PROJECT: WEB-BASED ST&I INDICATORS DASHBOARD





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Acronyms and Abbreviations

ACTS	Africa Centre for Technology Studies
ADKAR	Awareness, Desire, Knowledge, Ability, Reinforcement
AOSTI	African Observatory of Science, Technology and Innovation
ASTII	African Science Technology and Innovation Indicators
AUDA-NEPAD	African Union Development Agency – NEPAD
BI	Business Intelligence
BRD	Business Requirements Document
CSIR	Council For Scientific and Industrial Research
FCDO	Foreign Commonwealth & Development Office
FTE	Full Time Equivalent
GDPR	General Data Protection Regulation
ICT	Information and Communication Technology
ILO	International Labour Organization
ITU	International Telecommunication Union
KENIA	Kenya National Innovation Agency
MIS	Management Information System
NACETEM	National Centre for Technology Management
PIT	Project Implementation Team
PMI	Project Management Institute
PMP	Project Management Professional
POC	Proof Of Concept
QA	Quality Assurance
SDD	Software Design Description
SOW	Statement of Work



SRS	Software Requirements Specification
STI	Science Technology and Innovation
STII	Science Technology and Innovation Indicators
TOR	Terms of Reference
TOTs	Training of Trainers
UAT	User Acceptance Testing
WBS	Work Breakdown Structure
WIPO	World Intellectual Property Organization



General Information

The Africa Center for technology studies has been leading a research project to assess science, technology and innovation indicators in Africa with the support of FCDO. This has resulted in a ST&I scoreboard of input and output indicators in Africa from various data sources. There is now a growing need to share the indicators with policy experts and other interested parties to allow them to use these indicators for decision making. The FCDO and Acts thus seek to implement an interactive web dashboard for ST&I indicators.

Purpose

The purpose of this Feasibility Study was to assess the technical and financial viability of developing a web-based dashboard for science, technology and innovation indicators. The study aimed to highlight problems and risks that the operationalization of a web-based dashboard would face such as capacity, usability, data collection and so on.

Scope

The study was conducted in the framework of a pre-pilot. The pre-pilot consisted of the following core deliverables:

- Identify ST&I agencies in 3 countries to be able to anchor the web-based dashboard
- Deliberation and agreement with the country agencies on core indicators for publishing to the web-based dashboard
- Conduct Capacity assessment of potential anchor agencies for the dashboard
- Establishment of preliminary needs assessment in relation to the functionality of the dashboard
- Establishment of a basic online mock-up to server as a POC for the web-based dashboard



System Overview

The ST&I web-based dashboard is intended to be an online, highly interactive analytics dashboard that visualizes ST&I indicators. The web-based dashboard is expected to receive data collected from various ST&I data sources and output indicators in an aggregated and insightful manner for decision making.

Objective

The dashboard aims to collect, store, and report on science, technology and innovation indicators, in order to assist in high level policy decision making.

From the findings of this feasibility study, the proposed web-based dashboard can be grouped into four main modules. Each module will have its own access point and a set of authorized users. The modules and their main components are listed below:

- Data Collection
 - Online Data Entry Forms
 - Data Validation
 - Data Collection dashboard
- Data Warehouse
 - Data Extraction
 - Data cleaning
 - Data enrichment
 - Data Transformation
 - Data Integration
- Analytics
 - Indicators Dashboard
 - Analytics and Reporting on STI Indicators
 - Decision Support
- Web Portal
 - Dashboard portal and navigation interface
 - Content pages for the web-based dashboard



References

Below is a list of references for the preparation of this feasibility study report:

- STI Indicators data prepared by ACTS and host agencies in Kenya, Ghana, Nigeria and Zambia.
- Online Survey Responses from Agencies
- Kenya's Science, Technology and Innovation Indicators, by NACOSTI, August 2020

Points of Contact

Information

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Needs Analysis and Capacity Assessment

Approach

Data Collection Methods

Consultative Meetings

We participated in consultative meetings with NACOSTI, KENIA, NACETEM and CSIR. During these meetings, we were able to assess each agency's expectations of the web-based dashboard and their main challenges in relation to STI indicators. This was in line with our main objective of the consultative meetings, which was to capture additional information on the system expectations and agency capacity that would complement the surveys.

Online Surveys

Three groups were selected to serve as survey respondents, based on their potential roles in operationalizing the web-based STII dashboard. The groups are Coordinators, Operational Staff and ICT Staff.

Table 1: Agency Survey Groups

Group	Potential Role in STII Dashboard
CEO/Coordinator	Managing and Overseeing STIIs
Operational Staff	Data Input, Validation of published STII
ICT Staff	Supporting and maintaining the STII dashboard

Surveys were administered to individuals of each group as soon as they were identified for each agency. The surveys were administered online as questionnaires to collect information from each group. The questionnaires were designed with a mix of closed-ended questions and open-ended questions.

Outcomes

The results of the meetings and surveys gave a preliminary outlook of the functional requirements of the STII web-based dashboard and gave light to the operating environment and challenges within the host agencies. The proceeding section lays out details about these results.



Results

Environment

Organizations Involved

The following Organizations have been involved in this pre-feasibility phase of implementing of the web-based dashboard:

Table 2: Organizations Involved

Organization	Role	Main Contact	Role
FCDO	Project Sponsor	Dr. Emmy Chirchir	Science, Tech and Innovation Adviser
ACTS	Co-ordinating Agency	Nora Ndege	Science, Tech and Innovation Research
NEPAD	Co-ordinating Agency	Lukovi Seke	Programme Officer, African Science, Technology and Innovation Indicators (ASTII) Initiative
KENIA	Potential Host Agency	Dr Tonny Omwansa	Chief Executive Officer
NACETEM	Potential Host Agency	David Adeyeye	Assistant Director
CSIR	Potential Host Agency	Dr Emmanuel Tetteh	Senior Research Scientist
NACOSTI	Potential Host Agency	Margaret Muthee	Chief Analyst
Ministry of Education	-	Mr. Richard Mavisi	Former ASTII Kenyan Coordinator
National Statistics Office, Kenya	-	Rosemary Kongani	Former ASTII coordinator
Kenya National Bureau of Statistics	-	Godfrey Otieno	Economist/Statistician
Satch-mo Technology Ltd	-	Ademola Ajibade	Managing Director/ Chief Executive Officer
Federal Ministry of Science and Technology, Nigeria	-	Fatogun Moses Temitope	Assistant Director
Coperbelt University, Zambia	-	Ngawo Namukonde	Lecturer



National Institute for Scientific and Industrial Research, Zambia	-	Alinesi Chakwiya	Senior Scientific Officer/Head of Centre
Copperbelt Health education Project, Zambia	-	Mubiana Mukubuta	Accountant
Envirosmart solutions, Zambia	-	Chalwe Kasokota	Research and Development Officer
National Bureau of Statistics NBS, Nigeria	-	Paul Oshokumoboh	Data Analyst
Ministry of Higher Education, Zambia	-	Abel Simate	Analyst Programmer



Capacity Assessment

Through consultative meetings and online surveys, insights have been provided into the challenges and opportunities potential hosting agencies may face with the introduction of a web-based dashboard.

KENIA, Kenya

Current STII Systems

KENIA is currently in the process of rolling out an online data collection tool for innovation indicators. The data collection tool will allow KENIA to prepare a report by June that will focus on 6 framework areas:

1. Policies and strategies
2. Leadership & Governance
3. Infrastructure (Incubation facilities and Knowledge transfer offices)
4. Funding towards innovation
5. Networks and partnerships
6. Skills on commercialization and innovation

Staffing

KENIA is a relatively new agency and do not yet have all the experts needed internally to support the STI Indicators process. KENIA currently have no ICT staff to maintain a web-based dashboard and lack manpower for STII data collection. Due to these staffing constraints questionnaires could only be issued to the CEO.

Hosting and Internet Connectivity

KENIA are willing and able to fund the cloud hosting infrastructure for the web-based dashboard for Kenya.

NACETEM, Nigeria

Current STII Systems

The National Centre for Technology Management is responsible for the collection of R&D and Innovation data in Nigeria. The data are collected through surveys. For R&D Surveys, a census of Institutions is undertaken for Higher Education and Government sectors within a particular reference year while for the business and private non-profit sectors, a stratified sampling technique is used.

NACETEM currently employs the Frascati Manual methodology for R&D surveys and the Oslo Manual for innovation surveys carried out around innovation data.

NACETEM currently has no web-based systems in place for collecting and publishing STI indicators.



Staffing

NACETEM are confident that they have the required number of staff and skill sets to effectively host a web-based dashboard for STI indicators in Nigeria. They have three available staff members that would be dedicated to the STII dashboard. They also have an ICT department that will be able to support the platform.

The agency however faces funding challenges around data collection due to COVID-19 and other factors. The data collection process is also quite resource intensive as many institutions that provide the required data do not have data in the expected format.

Online surveys were issued for operational and ICT staff to respond. The responses received showed that the ICT team is very well experienced and capable of supporting a web-based dashboard, needing only specialized administration training on managing the final web-based dashboard. The ICT personnel skills are outlined as below:

1. Ability to diagnose hardware and software problems and replace faulty components
2. Ability to perform data backups and recovery operations
3. Can perform routine network startup and shutdown procedures and maintain control records.
4. Ability to design, configure and test computer hardware, networking software and operating system software.
5. Programming in scripting languages, such as Javascript, PERL, Vbscript, web programming etc

NACETEM currently also have an organizational change management strategy in place. This will be aligned to in order to drive the change management initiatives needed for the successful implementation for a web-based dashboard in Nigeria.

Hosting and Internet Connectivity

From the consultative discussions carried out with NACETEM, they are in a good position to host the platform and have adequate internet connectivity. Responses from the ICT staff clearly indicate that NACETEM are ready and willing to host a web-based dashboard on their cloud infrastructure at hostcolor.com

CSIR, Ghana

Current STII Systems

The Council for Scientific and Industrial Research (CSIR) is a well-established organization in Ghana mandated to carry out scientific and technological research for national development. CSIR currently conducts R&D surveys that capture information including indicators around science, technology and innovation.

CSIR currently has no automated systems in place for collecting and publishing STI indicators. Currently, R&D Surveys are not always extensive due to funding constraints that lead to



occasional gaps in data collection. This has resulted in some surveys having different results from ASTII outputs e.g. innovation infrastructure i.e. labs etc.

Staffing

CSIR are well of staffed and have the required skill sets to effectively host a web-based dashboard for STI indicators in Ghana.

CSIR however experiences difficulties in securing funding for R&D surveys in Ghana. They also experience logistics challenges.

Online surveys were issued for the coordinator, operational and ICT staff to respond. Responses were received from the Coordinator and Operational questionnaires, filled in by two senior research scientists. The response indicated that CSIR are willing and able to support a web-based dashboard for Ghana.

Hosting and Internet Connectivity

From the consultative discussions carried out and survey responses received from CSIR, they are willing to support and host a web-based dashboard for Ghana. They also have adequate internet connectivity. No responses were received for the ICT capacity survey.

Copperbelt University, Zambia

Current STII Systems

Copperbelt University currently collect data around STII from documents and databases held in several institutions. This is done biannually, annually and every 2-4 years. The documents are mainly in Excel, Word and MS Access formats. Data is cleaned by removing unwanted fields or enriching data in excel or available databases.

Staffing

Copperbelt University is adequately staffed with both STII operational users and ICT staff to support a web-based dashboard in Zambia. However, based on the survey feedback received, they face challenges in terms of funding especially for their ICT department.

Hosting and Internet Connectivity

Responses from the ICT staff around connectivity indicate good internet connection for all staff members. Copperbelt however do not have a data center or cloud alternative for hosting a web-based dashboard.

Kenya National Bureau of Statistics

Current STII Systems

KNBS currently has two departments (Science and Technology, National Research Funds) that collect administrative data on Research and Development. The last data collection exercise was however done in 2012. STII data collection was done using a domesticated questionnaire.



Staffing

The organization is very well staffed. As stated in the Coordinator's questionnaire response, there are ICT officers in the Bureau who can readily support the STI web-based dashboard. KNBS also has qualified STII staff and an organizational change management strategy is in place.

Hosting and Internet Connectivity

No response was given on the ICT aspects of internet connectivity and hosting capabilities.

Federal Ministry of Science and Technology, Nigeria

Current STII Systems

Based on questionnaire feedback, the ministry rarely collects or disseminates science, technology and innovation indicators as this is a primary role undertaken by NACETEM in Nigeria.

Staffing

No response was given on the STII staffing aspects, presumably as the ministry sees this as a primary role of NACETEM.

Hosting and Internet Connectivity

No response was given on the ICT aspects of internet connectivity and hosting capabilities.

National Institute for Scientific and Industrial Research, Zambia

Current STII Systems

Currently, the institute relies on data from various data providers. However, there are challenges of data providers being reluctant to provide data in a timely manner. Data when received is cleaned by ICT staff. The institute is mainly involved in analyzing STI information provided from other data providers with a keen interest in Science, Agriculture, Forestry, Health, Education and Economics.

Staffing

The organization is very well staffed. There are ICT officers in the institute who currently retrieve data from data providers and perform data clean up. Other institutions, however, collect this data and the institute is heavily reliant on them.

Hosting and Internet Connectivity

No response was given on the ICT aspects of internet connectivity and hosting capabilities.



Readiness Assessment

Using feedback from the questionnaires and consultative meetings, our team has summarized the preliminary readiness assessment of various agencies as shown in the table below.

Table 3: Preliminary Readiness Assessment

Group	# of Users Assessed	Awareness of Change	Buy-in & Willingness	Organizational Change Influence	Knowledge & Skill Set Level
NACETEM, Nigeria					
CEO/Manager/Coordinator	1	High	High	High	High
Operational Staff	1	High	High	High	High
ICT Staff	1	High	High	High	High
KENIA, Kenya					
CEO/Manager/Coordinator	1	High	High	High	High
Operational Staff	N/A	N/A	N/A	N/A	N/A
ICT Staff	N/A	N/A	N/A	N/A	N/A
CSIR Ghana					
CEO/Manager/Coordinator	1	High	High	High	High
Operational Staff	1	High	High	High	High
ICT Staff	TBD	TBD	TBD	TBD	TBD
Kenya National Bureau of Statistics					
CEO/Manager/Coordinator	1	High	High	High	High
Operational Staff	N/A	N/A	N/A	N/A	N/A
ICT Staff	N/A	N/A	N/A	N/A	N/A
Federal Ministry of Science and Technology, Nigeria					
CEO/Manager/Coordinator	N/A	N/A	N/A	N/A	N/A
Operational Staff	1	High	High	High	High
ICT Staff	N/A	N/A	N/A	N/A	N/A
Copperbelt University, Zambia					
CEO/Manager/Coordinator	N/A	N/A	N/A	N/A	N/A
Operational Staff	1	High	High	High	High
ICT Staff	2	High	Medium	Medium	High
National Institute for Scientific and Industrial Research, Zambia					
CEO/Manager/Coordinator	N/A	N/A	N/A	N/A	N/A
Operational Staff	1	Medium	Medium	High	High
ICT Staff	N/A	N/A	N/A	N/A	N/A
Envirosmart solutions, Zambia					
CEO/Manager/Coordinator	N/A	N/A	N/A	N/A	N/A
Operational Staff	1	Medium	Medium	Medium	Medium
ICT Staff	N/A	N/A	N/A	N/A	N/A
National Bureau of Statistics NBS, Nigeria					



CEO/Manager/Coordinator	N/A	N/A	N/A	N/A	N/A
Operational Staff	N/A	N/A	N/A	N/A	N/A
ICT Staff	1	High	High	High	High
Ministry of Higher Education, Zambia					
CEO/Manager/Coordinator	N/A	N/A	N/A	N/A	N/A
Operational Staff	N/A	N/A	N/A	N/A	N/A
ICT Staff	1	Medium	Medium	Medium	Medium



Needs Assessment

The following outlines the preliminary high-level requirements for the web-based dashboard. These will be comprehensively elaborated upon during the requirements gathering phase of the implementation assignment.

Preliminary High-Level Requirements

Functional

1. The dashboard should receive data on various indicators that have been outlined in various STI data drafted by ACTS and Country Agencies.
2. The dashboard should have a data collection component for collecting additional data around STI indicators.
3. The data collection module should be directly integrated to the analytics portal for feeding in data for indicators
4. The dashboard should be able to perform complex statistical formulas and visualize STI indicators.
5. The dashboard should support different levels of user access from read-only, editing, administrator access etc.
6. The dashboard should allow for update of indicators and data sources for indicators. Authorized users should be able to add new indicators on to the platform and upload associated data for those indicators
7. The dashboard should have an interactive, user friendly interface that displays STI indicators. Interactivity should include the ability to filter, manipulate, share and download indicator information
8. The dashboard should allow users to view indicators by various frameworks, activities and categories.
9. The dashboard should support the upload and analysis of historical data.
10. The dashboard should be able to display insights from past data and allow for comparison, trend analysis and extrapolation.
11. The dashboard should implement search engine optimization to ensure indicators are readily available and easy to find online.
12. The dashboard should show indicators on the dashboard by both the value and ranking. Multiple indicators should be ordered by ranking such that the first 10 indicators are the best ranked
13. The dashboard should have decision support components designed to help support decisions by policy makers.
14. The dashboard should have indicators designed for a variety of policy makers to make decisions
15. The dashboard should support multiple languages including English and French. Translations will be dependent on each country.



Security

The web-based dashboard should maintain security baseline requirements. The following is a set of security requirements the solution should incorporate:

1. The system shall protect the data and services from unauthorized access. The system shall also provide authentication and secure access.
2. The system shall ensure secure and tamper proof data exchange between parts of the system and the user.
3. All administrator users will have a login ID and a password to connect to the System via Web Application.
4. Users will be divided into User Groups / Roles so that different types of access can be given based on the forms authentication the user belongs to
5. The system shall provide a mechanism of user authentication to unambiguously identify a user. User groups / Roles will have privileges based on their requirements and authority. The system shall implement a Role based Authorization / Access control model.
6. All the communication Messages in the communication of a log-in session should be encrypted.
7. Dashboard access must always be via https
8. Encryption – Have all sensitive data (passwords and API Keys) encrypted throughout.
9. Protection mechanism against Denial of Service (DOS) attacks including DOM Parsers, SAX parsers, large document attachments, Jumbo messages, in-memory replication and recursion, and numerous small files.
10. Protection against injection attacks including XPath and SQL injections.
11. Protection against buffer overflow attacks.
12. Protection against XSLT transformation attacks.
13. Protection against cross-site scripting attacks.
14. Protection against replay attacks.
15. Protection against communication protocol attacks e.g. http-based attacks.
16. Protection against brute-force attacks, e.g. cryptanalytic attacks.
17. There will be a provision for configurable timeout period after login
18. There will be an intrusion detection capability within the application layer
19. The system will have a functionality for managing of forgotten passwords



Summary

Capacity and Needs Assessment Matrix

Table 4: Capacity and Needs Assessment Matrix

Agency	Country	Current Activities	Challenges	STI Staffing Requirements	Core Indicators of Interest
NACETEM	Nigeria	R&D Surveys, Innovation Surveys	Funding, Data collection	-	GERD, R&D intensity, gender data, headcount and FTE of R&D personnel, innovation propensity
KENIA	Kenya	Data collection tool for innovation indicators	Staffing for ICT and data collection	ICT, Data Collection	Policies and strategies, Leadership & Governance, Infrastructure, Funding towards innovation, Networks and partnerships, Skills on commercialization and innovation
CSIR	Ghana	R&D surveys	funding for R&D surveys	-	Indicators to drive government policy
NACOSTI	Kenya	R&D surveys	Collection of credible data on STI performance	-	STI Expenditure, Human Resources in STI, STI environment/outputs, STEM Education, Firm Activities, Tech Infrastructure, Tech Adoption
Kenya National Bureau of Statistics	Kenya	Surveys	Data collection, Timely sharing of ST&I indicators	-	Number of Innovative Research Undertakings, Expenditure on Research and Development and Innovation by various organizations including the



					Government, Personnel by qualifications involved in ST&I activities by different organizations including the Government
Federal Ministry of Science and Technology , Nigeria	Nigeria	Monitoring and evaluation	Non availability of data, Where available, it's hoarded, Lack of funds to gather data	-	-
Copperbelt University, Zambia	Zambia	STII data collection, data cleaning and analysis	Uncoordinated storage of data and information essential to track and share core STI indicators.	Platform Hosting Required	STI indicators related to the well being of nationals- access to basic needs i.e. clean water, clean energy, health & education, etc.
National Institute for Scientific and Industrial Research, Zambia	Zambia	Analysis of STII data from data providers, Data cleaning	Uncooperating data providers, Information is not shared among institutions, Mistrust amongst partners	-	Science, Agriculture, Forestry, Health, Education and Economics.



Recommendations

Table 5: Recommendations

Item	Recommendation
Staffing Support	<p>For KENIA to effectively host the platform, it is recommended that KENIA be given extra support for:</p> <ol style="list-style-type: none"> 1. ICT Manpower: whether through the implementing software vendor or onsite consultants. of which the responses will determine who to train for basic 2. STII Data Collection Staff
Data Collection Automation	<p>Given the central role of data collection in STI indicators, the web-based dashboard should be implemented with components for online data collection. Furthermore, the online data collection tool should be directly integrated to the web-based dashboard and form a data integration pipeline that will allow for as much automation as possible in cleaning and feeding data into the dashboard, with staff supervision of the entire process.</p> <p>This will go a long way in achieving the following:</p> <ol style="list-style-type: none"> 1. Streamlining the data collection process 2. Mitigating against the current data availability gaps 3. Reduction of the data collection staffing burden. 4. Supporting a real-time web-based dashboard
Hosting Support	<p>It is recommended that support for hosting the platform for Zambia be considered as none of the potential agencies surveyed currently have infrastructure in place to host a web-based dashboard.</p>



Proposed System

Description of Proposed System

We propose an integrated solution for the 4 components laid out [System Overview](#). These proposed components are:

1. Analytics tool that for analytics, visualization and dashboard management using data from a variety of data sources.
2. Data Warehouse: The data warehouse component will have the following sub-components:
 - a. A central database: The database will be a relational database management system (RDBMS) that will store all STI data that are relevant to indicators of interest.
 - b. Extraction, Transformation & Loading Component: to pull data from data sources, transform it and ingest the reformatted data into the data target i.e. the central database. The ETLs component will consist of data extraction, transformation, and loading tools used for performing all the conversions, summarizations, and changes needed to reformat data into a unified format in the data warehouse.
 - c. Metadata: The data warehouse will come with a component for system administrators to manage and maintain the data within a data warehouse by keeping record of data attributes, data sources and modification history.
 - d. Query Component: The query component of the data warehouse will assist administrators in creating/analyzing data sets for indicators.
3. Advanced Decision Support Functionality for from Phase 2 of the proposed workplan. The Decision support functionality will include scenario modelling and a subset of other features to drive tangible results around policy decision making over time.
4. Web Portal
 - a. The web portal will be the gateway to the STI indicators dashboard and will provide the user interface necessary for end users to interact with the dashboard. The web portal will also have informational components to disseminate information about STI indicators for the country in question.

A phased approach is proposed for a full implementation cycle in order to exploit marginal gains over the course of the project and ensure a solid foundation is the main focus of the first phase of the dashboard implementation. This will further lead to more added value enhancements over time, where need be.

Proposed System Mockup

A mockup of the proposed dashboards for each country has been developed with the data provided this far. The links are as follows:



- Nigeria: <http://acts.otbafrica.com/dashboard/2/NGA/>
- Ghana: <http://acts.otbafrica.com/dashboard/2/GHA/>
- Kenya: <http://acts.otbafrica.com/dashboard/2/KEN/>
- Zambia: <http://acts.otbafrica.com/dashboard/2/ZMB/>

The mockup also includes a sample dashboard that combines data from all 4 countries above to give 'Africa-wide' insights on STI indicators. The link for this is <http://acts.otbafrica.com/>

Table 6: Web-Based Dashboard Mockup Screenshot 1

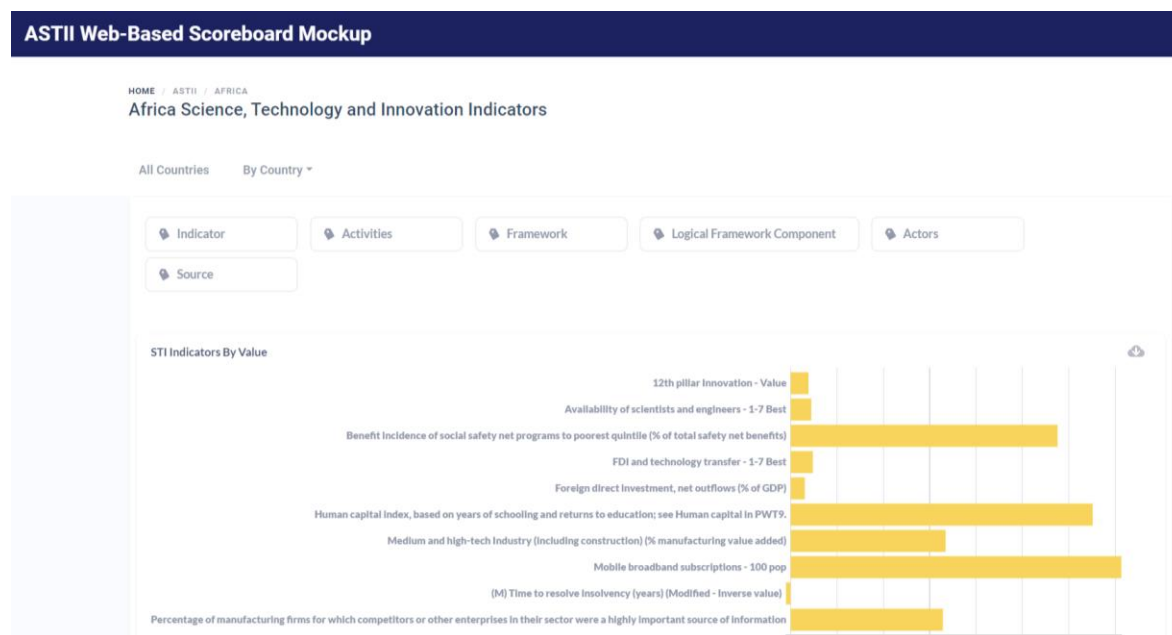
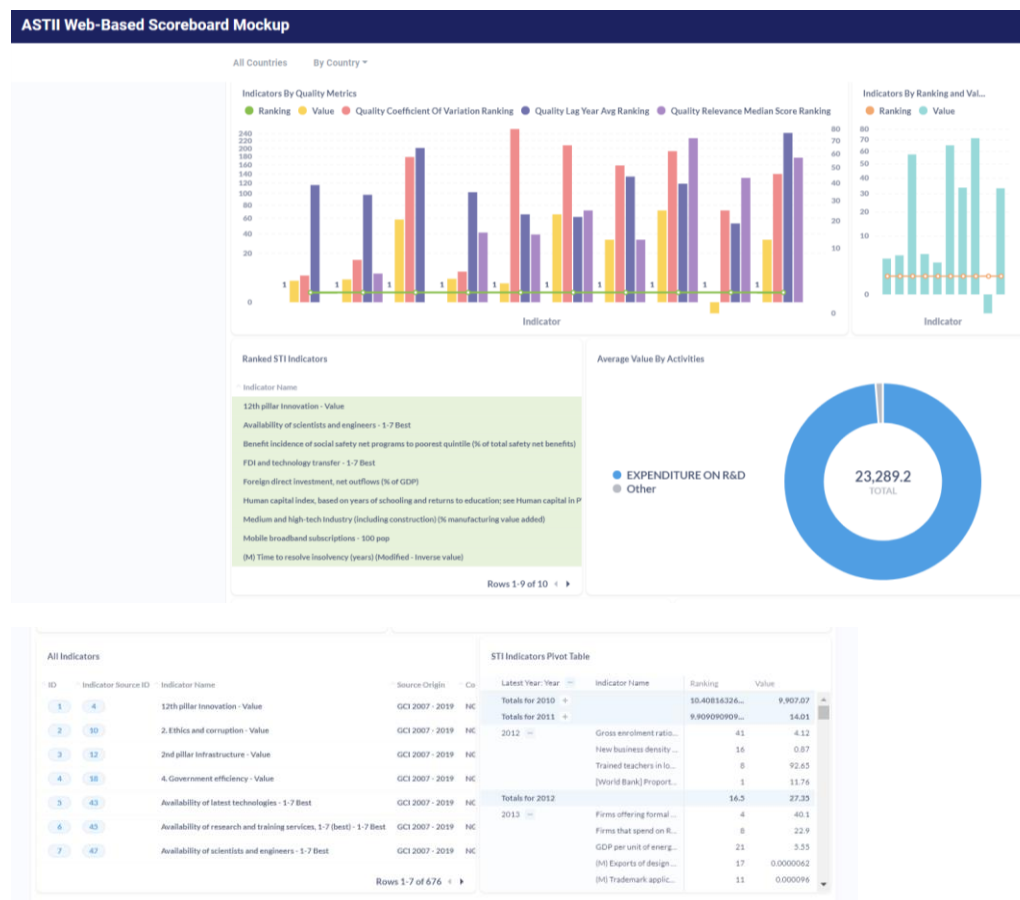




Table 7: Web-Based Dashboard Mockup Screenshot 2



Improvements

One of the major challenges for the success of the platform roll out is data collection. The platform needs to be fed with data that will be analyzed to give indicators that are meaningful. For this we recommend the inclusion of an online data collection tool that will help in data collection from the identified sources. The tool will make use of online surveys that feed data directly into the analytics tool and will be available both on the web portal and as a mobile application.

With powerful APIs the analytics tool could also integrate with stakeholder systems to pull/push data to have seamless data collection.



Time and Resources

Preliminary Timelines

It is proposed that the full project implementation be done over 3 phases, with a first phase focusing on implementing the required technology and country indicators for 3 countries. The subsequent phases will involve expanding the platform to accommodate more countries to be specified, as well as accommodate more advanced features around decision support.

Extend to additional countries																			
Capacity Building and Training of additional operational users																			
Quality Assurance and Testing																			
Enhancements Based from Phase 1 Feedback																			
Phase 3																			
Data integration from various data sources																			
Extend to additional countries																			
Capacity Building and Training of additional operational users																			
Quality Assurance and Testing																			
Enhancements Based from Phase 2 Feedback																			

Phase 1: Software Implementation Budget Estimate

Implementation Estimate For 3 Countries

Table 8: Implementation Cost

Item	Cost (GBP)
Implementation Cost Estimate	
Requirements Gathering	13,000
Installation of BI platform and data warehouse	8,000
Setup Indicators & Data Sources on Analytics platform & Data Warehouse	27,000
Design and Development of Online Data Collection Components	35,000
Design and Development of Web portal	25,000
Capacity Building and Training of operational users	27,000
Quality Assurance and Testing	10,000
2 Month Pilot	20,000
Total	165,000

Recurring Cost Per Country

Table 9: Recurrent Cost

Recurring Cost Estimates (Per Country)	
One Year Support and Maintenance	15,000
One Year Cloud Hosting	5,000
Metabase One Year Enterprise License	15,000
Total	35,000

Hosting Resources

The table below shows the **minimum hosting requirements** for the proposed system:

Table 10: Hosting Resources

Item or Equipment	Specifications
Application Server I	6 Core CPU processor, >2.70 GHz, 32GB RAM, 1GB NIC
Application Server II	6 Core CPU processor, >2.70 GHz, 32GB RAM, 1GB NIC
Primary Database Server	8 Core CPU processor , >2.70 GHz , 32GB RAM, 8TB Hard Drive, 1GB NIC
Secondary Database Server	8 Core CPU processor , >2.70 GHz , 32GB RAM, 8TB Hard Drive, 1GB NIC



Desktop/Laptop Specifications (Super Users)

The desktop/laptop specifications for Super Users at the country agencies are captured in the below table:

Table 11: Desktop/Laptop Specifications

Component	Specifications
Operating System	<ul style="list-style-type: none"> Windows 10 Pro or higher 64 bit
Processor	<ul style="list-style-type: none"> Intel Core i7-6500 8 Core 2.5 GHz
Memory	<ul style="list-style-type: none"> 8GB RAM
Hard Disk	<ul style="list-style-type: none"> 1TB capacity Solid State Drive (SSD)
Security	<ul style="list-style-type: none"> Antivirus Software
Connectivity	<ul style="list-style-type: none"> Wifi connectivity Ethernet connectivity

Agency Internet Connectivity Minimum Requirements

The agency Internet connectivity minimum requirements are as captured in the below table:

Table 12: Agency Internet Connectivity Requirements

Component	Specifications
Bandwidth	<ul style="list-style-type: none"> 20Mbps (Shared or Dedicated)
Contention Ratio	<ul style="list-style-type: none"> 4:1

End User Internet Connectivity Minimum Requirements

The End user internet connectivity minimum requirements are as captured in the below table:

Table 13: End User Internet Connectivity Requirements

Component	Specifications
Bandwidth	<ul style="list-style-type: none"> 5Mbps (Shared or Dedicated)



Contention Ratio	● 4:1
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Mobile Device Minimum Requirements

The mobile device minimum requirements are as captured in the below table:

Table 14: Mobile Device Minimum Requirements

Platform	OS	Android OS, v4.4.2 (KitKat) or above Or iOS 7 or above
	CPU	Quad-core 1.2 GHz
	Memory	1.5 GB RAM
Comms	GPRS	Yes, GPRS connectivity should be available
	WLAN	Wi-Fi 802.11 a/b/g/n, dual-band, Wi-Fi Direct, hotspot

Impacts

Equipment Impacts

The platform will require a hosted server to run, and the specifications have been outlined in the previous section.

Users will be required to access the new system via the web browsers hence the only equipment needed for end users will be computers and/or mobile devices. Specifications have been outlined in the previous section.



Software Impacts

There will be no additions or modifications to existing applications and support software in order to adapt them to the proposed system.

Organizational Impacts

Capacity building and change management from an organizational level will be required for the successful implementation of the new system. As identified from the capacity assessment task, some organizations already have an organizational change management strategy in place and this will be married with the change management approach for the system implementation.

The approach to Capacity Building and Change Management will identify the inherent “people-related” risks that can impact the success of the system’s implementation. Through our experienced team that includes a competent ICT Change management consultant, at each phase of development, we will further review and assess overall readiness of each organization and department for change by evaluating various stakeholder groups across the enterprise.

Developmental Impacts

- Users will be required to undergo training at different levels – management, operations, ICT
- Data clean up and migration of any available data will need to be provided for successful pilot of the new system
- Piloting the platform will require hosting resources and the users will require computers with basic processing power running any web browsers
- General Data Protection Rules will need to be put in place to address Privacy and security implications of the new system. The GDPR data protection and privacy policy will be clearly outlined in the web portal.

Site or Facility Impacts

There will be no building or office modification requirements for the new system

Security and Privacy Impacts

A security policy for the new system needs to be put in place. The policy will be a concise statement, by those responsible for a system (e.g., senior management), of information values, protection responsibilities, and organizational commitment. The policy can be implemented by taking specific actions guided by management control principles and utilizing specific security standards, procedures, and mechanisms.

The policy will describe organizational needs for information security and trust in systems in terms of three major requirements:

- Confidentiality: controlling who gets to read information.



- Integrity: assuring that information and programs are changed only in a specified and authorized manner; and
- Availability: assuring that authorized users have continued access to information and resources.

Operational Impacts

Maintaining the system will be a key component in ensuring continued system operations; We will ensure that the system is always with 99.999% uptime by monitoring the system and resolving all technical problems and implementing any enhancements as shall be required.

Redundancy and recovery procedures will be put in place to ensure system uptime of 99.999%

Our approach to system maintenance shall be geared towards ensuring availability and reliability as well as effective prioritizing of system issues. The first crucial step will be to design and write support documentation, the Service Level Agreement (SLA), highlighting the quality, availability, responsibilities and maintenance charter together with the stakeholders.



Appendix A: Survey Responses



CEOs_Managers_Coordinator Responses.pdf



Operational Staff.pdf



ICT Responses.pdf