Consultancy to Undertake the Development, Deployment and Maintenance of Digital Tools and Technologies for the AU Innovation Data Hub

under

The Support for Capacity Development of the AUC and other AU Organs Project (P126848): World Bank Group

ET-AUC-175214-CS-QCBS

TERM OF REFERENCE (TOR)

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1. Background

Project Development Objectives: The objective of the Project is to strengthen African Union Commission's capacity to facilitate socio-economic development results and transformation through enhanced institutional efficiency. This will be achieved by enhancing the AUC's internal human resources and management systems, and supporting result-oriented external partnerships and collective actions designed to enhance the implementation of regional economic development initiatives in priority areas (e.g. regional trade, energy, infrastructure, governance, natural resource management) for the benefit of African Union Member States, the Regional Economic Communities (RECs) and African citizens.

The Project consists of the following parts:

- **Strengthening Institutional Capacity:** Support for improvement of budget execution, staff capacity, and ICT to provide efficient corporate and functional services through: (a) enhancing corporate governance and management systems and procedures in strategic planning, financial management, budgeting, procurement, recruitment, conference management and all other services as per international standards; (b) driving operational efficiency by (i) modernization of ICT infrastructure; (ii) development of human resources; and (iii) peer-to-peer learning; and (c) enhancing stakeholder communication, feedback and participation through branding, media and outreach.

- **Facilitating Economic Development Results with Stakeholders:** Support for promotion of regional transformation and improvement of policy standards and African Union agreements monitoring through: (a) support for piloting select external institutional partnerships towards the advancement of common goals for regional transformation; (b) monitoring of African Union agreements and programs implementation; and (c) Project monitoring and evaluation and learning.

Project Beneficiaries: Project beneficiaries include the AUC and other AU Organs. Support for capacity development is expected to improve the beneficiaries' organizational performance and their ability to facilitate collective action in priority economic development areas (e.g. regional trade, agriculture, energy, infrastructure, governance, natural resource management) for the direct benefit of AU Member States and RECs. The project is also expected to indirectly benefit public and private entities and citizens, civil society and Diaspora groups in general in Africa. An improved and effective AUC would also benefit the development partners and other entities engaged in peace building and economic development programs in the region and beyond. Attention to strategic priorities would also benefit women, youth and vulnerable groups in society through better information on policies and programs.

2. Introduction and Context

Most African countries aspire to have innovation-led knowledge-based economies with the full spectrum of participation of citizens. For AUC and AUDA-NEPAD to effectively empower citizens on innovation for socioeconomic development, the public must have a greater say in shaping how innovation takes place and in selecting the best ways to support the processes. The prevailing gaps on data, digital tools and

knowledge use among citizens should be closed. Based on AUDA-NEPAD's years of experience in engaging with Member States, there is increasing demand for evidence-based impact of development programmes on the continent. The need to clearly demonstrate and account for the socioeconomic value of our work is not debatable. With coherent systems of innovation, the new knowledge generated is used to produce technologies, new goods, services and business processes that meet emerging needs for citizens. While it is great to have an impressive stock of knowledge, governments, businesses, social sectors and the general public are most interested in co-creating the knowledge and technologies that solve societal challenges and create job opportunities. The AUC and AUDA-NEPAD intends to use data and digital tools in ways that would engage citizens in decision-making at multiple levels and demonstrate that communities have a real voice in transformative development.

The primary aim of making data, digital tools and information on development accessible and reusable by the public and private agents is to generate *economic* and *social value*. To realize this goal, thoughtful and intentional engagement of citizens on the use of data and its governance, digital technologies and platforms is key. Digital technologies can be used to streamline information flows amongst government institutions, citizens, private sector, community leaders, reduce the marginal costs incurred by re-production and dissemination, making reuse economically feasible. Effective use of such technologies creates new opportunities and places to engage citizens, new and relevant content, connectivity among many citizens and spawn important innovations for socio-economic performance. This result is possible if citizens, public and private institutions not only have the opportunity, but are motivated and capable of using the data and digital tools to achieve the intended outcomes. Data and digital technologies can; improve the ease with which citizens access services, enhance development practitioners' problem-solving capacity, and provide citizens with a platform to answer big predictive questions.

In most African countries, progress on the use of data and digital tools to innovate for social and economic value creation is slow due to lack of appropriate governance frameworks for engaging citizens and non-state actors. As such the work under this consultancy is primarily to develop the tools and technologies for the AU Innovation Data Hub. The AU Innovation Data Hub will house the requisite digital technologies and tools (*data collection and curation tools, dashboards, apps* etc.) for the provision of a comprehensive access to information for citizens, private sector, civil societies, government entities, academia, media etc. The hub will provide a common technology platform for the data and analytics needed for an inclusive assessment of Africa's progress towards its development goals.

3. Aim and Objective(s) of the Consultancy

For AUC and AUDA-NEPAD to effectively empower citizens on innovation for socioeconomic development, the public must have a greater say in shaping how innovation takes place and in selecting the best ways to support the processes. The prevailing gaps on data, digital tools and knowledge use among citizens should be closed.

This consultancy is aimed at making data and digital tools useful for generating economic and social value in ways that would engage citizens in decision-making at

multiple levels and demonstrate that communities have a real voice in transformative development. To realize this goal, the consultancy will establish the AU Innovation Data Hub that provides the digital technologies and tools for thoughtful and intentional engagement of citizens on the use of data for socio economic development.

4. Scope and Specifications

The scope of this consultancy involves the engagement of a firm to develop, deploy and maintain the data and digital tools and technologies for the AU Innovation Data Hub. Specifically, the firm will be required to deliver on the following:

a) Develop and deploy all the digital tools and technologies for the AU Innovation Data Hub. These include data collection, data curation, data processing and dashboard tools for the hub.

   The deployment of the tools and technologies will be at AUDA-NEPAD Data Centre. The specifications for the tools are provided in Section 3. The full details of the functionalities and utilities tools for the AU Innovation Data Hub will be finalised during contract negotiation with the firm.

b) Develop and deploy data interfacing modules and tools in four (4) selected Member States for the linkage and transmission of data to and from the AU Innovation Data hub. This capability will also be made available to all AU organs (e.g. African Court for justice data) for linking and transmission of regional and continental socio-economic dataset and information.

   The interfacing modules and tools will be expected to suit the local context and technologies used in the selected Member States. The work under this objective also include the digitization of the civil records and registries (e.g., birth and death registries) of selected Member States for access and dissemination. The digitized civil records will be linked to socio-economic sector specific registries (e.g. Health, Social Services, Environment, Business etc., registries). The digitized records will also include administrative data that is linked to socio-economic sector specific registries, including the justice sector.

c) Provide maintenance services to the tools, technologies and interfacing modules for AU Innovation Hub.

   The firm must provide no-cost maintenance and support services for a period of two (2) years from the time of acceptance of the deployment and delivery of all outputs of the consultancy as specified in the agreed contract. During the above-mentioned period, the firm will be responsible for making minor changes as well as to fix bugs, if any. For the major changes, a separate change management contract will be agreed and signed between the firm and AUDA-NEPAD. The boundaries of the minor and major changes will be set during contract negotiation.

d) Provide comprehensive plans and roadmap for transferring knowledge and expertise on how to use and maintain the AU Innovation Data Hub and the Interfacing Modules for Member States.

   The firm is required to propose and implement suitable methods for transfer of knowledge to designed AUC, AUDA-NEPAD and Member States personnel for the sustainability of the systems. This can be done by actively involving the assigned staff of AUC and AUDA-NEPAD in all the phases of the system development and deployment.

The consulting firm will is expected to develop, deploy and maintain the tools and technologies for (1) AU Innovation Data Hub and (2) Interfacing Modules and Systems for the hub in four selected AU Member States (namely Malawi, Botswana, Rwanda and Ivory Coast; the criteria for selecting the four Member States is described in Section 4.2.1) and all AU organs. The section below provides details of the specification requirements for the different components of the consultancy.

4.1 AU Innovation Data Hub

The architecture of the AU Innovation Data Hub should be component-based where the components can be *separated* or *integrated easily*. The components must be well defined so that modules can be reused where and when required, with adoption of the modular approach of design. The firm must identify some of these modules and describe in their technical proposal document, how this would be achieved.

4.1.1 The Main Hub

The work here entails the development of a digital platform to capture and visually present innovation data on key sectors (Health, Agriculture, Environment, Industries, Education etc.,) using passive and active data acquisition modalities. The active data collection will be through (1) the use structured sub-sector innovation measurement instruments and (2) engagement with citizens and non-state actors. While not exhaustive, the following basic requirements for the main have been identified (the list of features will be further explained during contract negotiation):

- The data displayed on the hub from existing sources from Member States and RECs should update automatically.
- The proposed system must be a web-based system and should have built-in facility to capture and store data at centralized database at AUDA-NEPAD.
- The platform should provide offline capabilities, i.e., in absence of internet connectivity, the system should be also accessible through the LAN connection.
- The hub should have features such as notification system, specification for target devices and localization (Geo tagging)
- The platform should provide tools for spatio-temporal trends and exploratory analysis of socio-economic determinants of the outcomes of AUC Flagship programme.
- Electronic Data Capture (EDC) Module for the collection and collation of primary and secondary data by officials in Member States and RECs.
- The platform should have APIs for pulling (pushing to) data from heterogeneous sources (structured, unstructured, open data sources etc.).
- The system must also make use of any modern front-end UI frameworks (such as Twitter Bootstrap, Foundation, Google Material Design, Semantic UI and etc). The system must run on any screen sizes by using any of the UI frameworks for responsive design.
- The system would ensure that the admin and super users follow login procedures and protocols.
- A proper audit trail must be built within the proposed system.
- The hub should run on SSL Certificate Protocol.
- The applications interfaces should be designed in English, French and Arabic.

4.1.2 Collection and Collation of Innovation Data

The firm is expected to design, develop and deploy a multi-platform (Android, iOS, Windows) mobile application focused on harvesting innovations, ideas and knowledge for socio-economic development and performance appraisal. The application is intended to streamline information and data flows amongst government institutions, citizens, private sector, community leaders etc. The application will be used to illustrate AUC and AUDA-NEPAD impact, projects and results in all 55 AU Member States. It will also provide additional information such as information on the country or the region. The mobile platform will be linked to the main AU Innovation Data Hub and other existing web-based platforms of the AUC and AUDA-NEPAD. Data from the mobile application will provide leads on research hypothesis and ideation. It will have features for collating data from stakeholder interviews engagement at the headquarters of AUDA-NEPAD and the field (Member States).

4.1.3 Data Management

The backend data structures should be implementation in both structured storage systems (such as PostgreSQL or MariaDB) and unstructured data systems (such as Redis, MongoDB, Couchbase etc.). Meta-data driven utility tools should be provided to allow AUC and AUDA-NEPAD staff to upload, update, tag new content and manage the backend data-store. The firm is encouraged not use proprietary DBMS such MS SQL, Oracle etc., as the license fees for such systems will not be covered under this consultancy.

4.1.4 Data Processing and Analysis

There should be provision of ETL (Extract, Transform and Load) functionalities for processing and preparing analytical datasets. Functionalities for managing privacy (i.e., functionalities for anonymization, de-identification, declassifications etc.) as well as APIs for linking the platform to other analytics tools and languages such Python and R should be provided.

4.1.5 Dashboard and Visualization

The hub should provide dynamic dashboards that draw on real-time information and data from the ETL processes, making them interactive and capable of manipulation by the user. The dashboard should display how the innovations, ideas and knowledge from the hub are being translated into practical developmental solutions for AU Member States and RECs. The dashboard should display AUC and AUDA-NEPAD impact, projects and results in all 55 AU Member States.

4.2 Interfacing Modules and Systems for Member States

The interfacing modules is the link between the AU Innovation Data Hub to data sources in AU Member States and RECs. The work under this component of the consultancy entails:

- Developing and deploying context specific interfacing module for four[1] selected AU Member States. The interfaces will provide the needed APIs and services for pushing and pulling data to and from the AU Innovation Data Hub.
- Digitization of the civil records and registries (e.g., birth and death registries) of selected Member States for access and dissemination.
- Linking the digitized civil records to socio-economic sector specific registries (e.g. Health, Social Services, Environment, Business etc., registries).

[1] *The Member States are Malawi, Botswana, Rwanda and Ivory Coast*

- The solution should provide interactive web tools for spatio-temporal trends and exploratory analysis of socio-economic determinants of the outcomes of national programmes.
- Report generation functionalities for the generation and sharing insights and InfoBriefs with stakeholders.

4.2.1 Criteria for Selecting the Initial Four AU Member States

In selecting the initial countries for deploying and operationalizing the interfacing modules and systems, the following factors were considered:

- AU Member State that has relatively mature data systems for innovation (and research) performance measurement (Rwanda and Botswana)
- For peer-to-peer learning, AU Member State that has relatively weak data systems for innovation (and research) performance measurement were also considered (Ivory Coast and Malawi)
- Three regional distribution consideration (West Africa, East Africa and Southern Africa); Ivory Coast for West Africa, Rwanda for East Africa, Malawi and Botswana for Southern Africa.
- Language consideration; (1) Francophone: Ivory Coast and (2) Anglophone: Malawi, Rwanda and Botswana; and
- Past collaborative work with AUDA-NEPAD on research and innovation indicators (Rwanda, Malawi, Botswana and Ivory Coast).

4.3 Performance and Scalability

It is expected that firm would add all necessary tuning and configurations by incorporating suggestions and recommendations from AUDA-NEPAD, which will address issues of Performance, High Availability, Security, Scalability, and Manageability. The applications will be in Member States with different levels of ICT infrastructure. As such the system must run optimally (page load time below 15 seconds) on a PC connected to a network with minimum network bandwidth of 56 kbps. The modules and tools must be compatible with and well rendered in Microsoft Internet Explorer 11 and above, Mozilla Firefox 50.0 and above, Google Chrome 55.0 and above, and safari.

The data storage of the hub at AUDA-NEPAD and the interfacing modules at the four Member States should be design such that it can handle changing demands by adding or removing underlying hardware resources. The architecture should adapt to workload changes by provisioning and de-provisioning resources in an on-demand manner, such that, at each point in time the available resources match the current demand as closely as possible. These requirements apply to both the relational and the NoSQL data-store structures.

4.4 Ownership of Source Code and other Intellectual Property

AUDA-NEPAD will be the owners of the source code and all intellectual property associated with the technologies and tools developed under this consultancy and they will have full rights over the ways they can use these resources. The platforms so developed will be the sole property of the AUDA-NEPAD or any agencies designated by them. The consulting firm will have no right to commercially use or apply the software elsewhere.

5. Expected Deliverables

The following are the expected deliverables of consultancy

5.1 Inception Report

The consulting firm should produce an inception report within seven (7) days after the contract is signed. The report should provide a clear picture of how the firm understands the ToRs and intends to achieve the expected tasks. The inception report will also provide an opportunity to verify that the firm share the same understanding about the agreed deliverables during the contract negotiation. It should identify those components of the platform that will utilize existing developed patterns or components and should propose methodology for delivering on the rest of the assignment. The inception report should include an updated proposed schedule of tasks, activities and deliverables using the outcomes of the contract negotiations. The report will be discussed and agreed upon with all stakeholders.

5.2 System Design Deliverables

The firm is required to provide a *Software Requirement Specification* (SRS) that give AUDA-NEPAD an understanding of the design of the functionalities and parameters of the two components, i.e., the AU Innovation Data Hub and the Interfacing Modules for Member States. The SRS should provide comprehensive architectural design of the *data*, *service*, *application* and *view* layers of the platforms. The following are required under this deliverable within twenty (20) days after the contract is signed:

- Software Requirement Specification (SRS) Document;
- Software Design Document (SDD); and
- A Release Plan.

5.3 First Release

Based on the details of the release plan in 4.2, it will be required that the first release is hosted in a verifiable space sixty (60) days after the contract is signed. The first release is envisaged to cover 80% of the functionalities, tools and components of the AU Innovation Data Hub. The first release will be tested and validated by AUDA-NEPAD and a review note will be provided to the firm. The following are required under this deliverable within sixty (60) days after the contract is signed:

- Functional and tested tools and technologies for the first release as agreed in the release plan with all source code; and
- First Release Report.

5.4 Second Release

Based on the details of the release plan in 4.2, it will be required that the second release is hosted in a verifiable space sixty (80) days after the contract is signed. The second release is envisaged to cover 20% of the functionalities, tools and components of the AU Innovation Data Hub and 100% of the Interfacing Modules for Member States. The second release will be tested and validated by AUDA-NEPAD and a review note will be provided to the firm. The following are required under this deliverable within eighty (80) days after the contract is signed:

- Functional and tested tools and technologies for the second release as agreed in the release plan with all source code; and
- Second Release Report

5.5 Testing

To ensure that all the developed tools and technologies meet the requirements specified in ToRs, SRS and the contract documents, a comprehensive testing of all the functionalities and utilities of the platform is required. This will assist in identifying

any defects, bugs and errors that could possibly be made during the development phase. AUDA-NEPAD will require the following testing for the systems and tools developed: Unit Testing, Integration Testing, Interface Testing, Performance Testing, Compatibility Testing, Usability Testing and Acceptance Testing. The following are required under this deliverable within ninety (90) days after the contract is signed:

- Test Cases Document; and
- Testing Report

5.6 Deployment and Maintenance

The activities under this deliverable entails steps and processes that are to be taken by the firm to deploy the technologies and tools on the on-premises IT infrastructure at AUDA-NEPAD and the data infrastructure in the selected countries. As mentioned above, the firm must provide no-cost maintenance and support services for a period of two (2) years from the time of acceptance of the deployment tools and technologies. The following are required under this deliverable within hundred (100) days after the contract is signed:

- Setup and Release Notes for final release;
- Deployment and Setup Documentation; and
- A Maintenance Plan for two(2) years.

5.7 Knowledge Transfer and Training

It is expected that the firm develops a clear plan for transferring knowledge and technical insights on the platform to AUC and AUDA-NEPAD designed staff. The firm is also required to organize training sessions on the interfacing modules for each of the four selected Member States. The following are required under this deliverable within hundred and ten (110) days after the contract is signed:

- All sources and configuration files;
- Technical Manual for the system including Online Help; and
- User Guide.

5.8 Final Report

Upon completion of all the deliverables outlined in Sections 4.1 to 4.7, the firm should submit a final completion report. The report should outline all work undertaken, including characteristics of the system developed. Any follow-ups and/or recommendations should also be included in the report.

6. Duration of the Consultancy

The consultancy is for 120 full-time Man/days from the date the contract is signed. The consultancy is expected to be implemented between October 2020 and February, 2021.

7. Governance and Management of the Consultancy

The governance and management of this consultancy is under the direct supervision of the Directorate of Programme Innovation and Planning, AUDA-NEPAD. The consulting firm will report to the Division of Data Analytics and Research (Technology Innovation Hub). The division working with the procurement department, will manage the evaluation process including the provision of technical guidance, AUDA-NEPAD documents (e.g. Strategic Plan) and ensure that procurement policies and processes are followed.

8. Required Experience of the Firm

The following are the minimum requirements for the prospective firm:

- A technology company with more than 10 years proven record of innovation in the development of data systems for corporate and international organizations;
- Proven track record or experience in web technologies, including the development and deployment of web-based information systems;
- Have track record of deploying mobile platforms and applications for Android, IOS and Windows environments;
- A track record of metadata-driven systems development and deployment;
- A proven track record of developing and deploying distributed data systems;
- A team of experts that includes technology experts, programmers, database administrators, data visualization experts, social media experts, mobile platform innovation experts;
- An adequate number of technical human resources to carry out the project and complete it in a period of 4 months. All the professionals should be delegated responsibilities based on the standard data and software development team management;
- A working knowledge of international development issues and agendas is an asset; and
- A good understanding of results-based performance management systems.

In addition to the required experience, the firm should have experts with the following qualification, background and experiences:

8.1. Senior Systems Analyst

- A minimum of a BSc (Hons) degree in Computer Science or Informatics or Computer/Electronic Engineering or equivalent qualification degree.
- At least 7-10 years proven experience in leading software development teams
- Demonstrated knowledge and experience in systems development life cycle (SDLC) and methodologies
- Experience leading system development teams that work across multiple OS platforms such as Linux (CentOS, Red Hat, Ubuntu), Mac OS X and Windows systems
- Demonstrated experience in systems analysis and design; System architecture (technical design and implementation processes)

8.2. Software Engineer

- A minimum of a BSc. degree in Information Systems or Informatics or Software Engineering or equivalent qualification degree
- At least 5-7 proven OpenStack experience with open source software development
- Demonstrated knowledge and experience of coordinating testing interfaces of programmers and database developers
- Experience in Agile software methodologies and principles
- Demonstrated experience in technical designs and architectural guideline for software components

8.3. Programmer

- A minimum of a Diploma in Information Systems or Informatics or Software Engineering or equivalent qualification
- At least 5-7 proven experience in Web Stack Development such MVC .Net Core Framework (C#) or Java Spring Framework or Django (Python)
- Proficient in development and debugging on both Windows and Linux platform is required (revision control systems, build systems, troubleshooting, debugging and profiling tools)
- Demonstrated knowledge and experience of programming in containers such as Dockers, Apache Mesos, Kubernetes
- Demonstrated experience in ORM frameworks and technologies
- Experience in mark-up and scripting languages such as HTML, CSS, JavaScript, jQuery, XML, JSON

8.4. Database Engineer

- A minimum of a BSc. degree in Data Science or Statistics or Information Engineering or equivalent qualification
- At least 5-7 proven experience in deploying database systems in virtualized environments such as VMWare or equivalent
- Experience in high performance/scale technologies for data systems (Caching, Load Balancing, Profiling, Indexing etc)
- Demonstrated knowledge and experience in Relational Databases operations and transactions in RDBMs such Oracle, MS SQL or PostgreSQL
- Demonstrated experience in ETL Technologies
- Experience in NoSQL Technologies such as Riak, MongoDB, Hadoop

8.5. Data Visualization Expert

- A minimum of a BSc in Data Science or Statistics or Mathematics or equivalent qualification
- Experience in facilitating data analysis and visualization projects through concept, iterative design and execution, delivery and on-going support.
- Experience in analysing large dataset using R or Python Programming
- Demonstrated experience in deploying dashboards and visualization UI using technologies such as D3JS, ECharts, Telerik UIs
- Demonstrated experience in data story-telling designs using visualization tools

8.6. Mobile Platform Technologies Expert

- A minimum of a BSc in Computer Science or Data Science or Information Engineering or equivalent qualification
- Experience in embedded software systems development
- Experience with Xamarin or Android Studio, SDK Tools and publishing application to the Google Play or App Store
- Experience in REST API, Objective-C, JavaScript, AngularJS and Ajax
- Demonstrated knowledge in mobile development life cycle
- Demonstrated experience in engaging clients with mobile technologies and tools

9. Man/Days Estimates for Key Expects from the Firm

Task	KE1	KE2	KE3	KE4	KE5	KE6
The Main AU Innovation Data Hub	13	16	30	14	10	10
Collection and Collation Modules	8	17	10	14	5	40
Data Management Modules	8	17	10	14	5	10
Data Processing and Analysis Tools	8	17	10	14	5	10
Dashboard and Visualization Modules	8	17	10	17	35	10
Interfacing Modules for Member States	8	12	15	10	15	10
Deployment and Maintenance	11	4	15	8	15	10
Knowledge Transfer	15	3	10	8	15	10
Technical and User Guides	15	3	10	8	15	10
Total Man/Days	**94**	**106**	**120**	**107**	**120**	**120**

Legend
KE1: Senior Systems Analyst (Team Lead)
KE1: Software Engineer
KE2: Programmer
KE3: Database Engineer
KE4: Data Visualization Expert
KE5: Mobile Platform Technologies Expert

10. Schedule of Payments

The schedule of payment, outlined in the table below, is based on the deliverables in Section 5.

No	Description	% of Payment
1	Inception Report	10%
	System Design Deliverables	
2	First Release	30%
3	Second Release	20%
4	Testing	20%
	Deployment and Maintenance	
5	Knowledge Transfer and Training	20%
	Final Report	