



iMENTORS

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D2.4 Final Report on Virtual Observatory on for e-Infrastructure development projects in sub-Saharan Africa

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Abstract: D2.4) This is the final report on the Virtual Observatory for e-infrastructure development projects in Sub-Saharan Africa. It reports on the progress made in populating, maintaining and updating iMENTORS (the database for e-infrastructure projects in Sub-Saharan Africa) since the previous deliverable (D2.3). It provides a breakdown of all entities (projects, organizations, research infrastructures, networking infrastructures and virtual research communities) in the database at the end of the project. Also covered in this report are the efforts of the iMENTORS consortium in trying to integrate the Virtual Observatory with other databases. We particularly highlight efforts to integrate iMENTORS with IATI database. Lastly, we also report on the achievements of the critical success targets of iMENTORS project and make recommendations for possible improvement of the Observatory.

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List of abbreviations

CANARIE	Canada's Advanced Research and Innovation Network
CORDIS	Community Research and Development Information Service
D	Deliverable (of the project)
DG	Directorate-General
DG CONNECT	European Commission Directorate General for Communications Networks, Content and Technology
DoW	Description of Work (of the project)
DSV	Department of Computer and System Sciences of Stockholm University
EC	European Commission
EFTA	European Free Trade Association
e-IRG	e-infrastructures Reflection Group
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
FP7	Seventh Framework Programme
GEANT	Pan-European Data Network
Gov2u	Government To You
HEIs	Higher Education Institutes
HIV	Human Immunodeficiency Virus
i.e.	That is
ICT	Information and Communication Technology
ICT4D	ICT for Development
IDRC	International Development Research Centre
IDRIS+	IDRC Development Research Information
ISP	Internet Service Provider
IT	Information Technology
M	Month (of the project)
MDG	Millennium Development Goal
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental organization
NOC	Network Operations Centre
NREns	National academic and research networks
PDF	Portable Document Format
PEST analysis	Political, Economic, Social, and Technological analysis
PRACE	Partnership for Advanced Computing in Europe
PRD	Programme Director
PU	Public view
RedCLARA	Latin American Advanced Networks Cooperation
REns	Research and Education Networks
RREns	Regional Research and Education Networks
S&T	Science and Technology
SAB	Stakeholders Advisory Board
Sida	Swedish International Development Cooperation
SMEs	Small and Medium Enterprises
Spider	Swedish Program for ICT in Developing Regions
SU	Stockholm University
SWOT analysis	Strengths, weaknesses, opportunities and threats analysis
T	Task (of the project)
TEIN	Trans-Euroasia Information Network
UN	United Nations
UNECA	The United Economic Commission for Africa
URL	Uniform Resource Locator
USAID	The United States Agency for International Development
VO	Virtual Observatory
WP	Work Package

Executive Summary

iMENTORS – e-infrastructures Monitoring Evaluations and Tracking Support System – was launched on 15th April 2012 as a 30 months' long Coordination and Support Action, co-funded by the European Commission DG Connect under the 7th Framework Programme.

iMENTORS aims to enhance the effectiveness and coherence of national and EU research policies and the international cooperation in the field of research infrastructures. In close consultation with the stakeholder community, the project will build a virtual observatory, equipped with an advanced Geographic Information System, and a robust decision-support system to position itself as the one-stop-shop data warehouse to retrieve up-to-date information on all e-infrastructure development projects of the past 5 years in Sub-Saharan Africa. In doing so, iMENTORS will create an online community for support to policy development and programme implementation, by launching a dedicated space for online collaboration, facilitating interaction and knowledge sharing, in order to offer to stakeholders the opportunity to create synergies and plan future projects.

The purpose of this deliverable (D2.4), entitled 'Final Report on the Virtual Observatory for e-infrastructure development projects in Sub-Saharan Africa' is to document the achievements of the consortium in relation to the establishment of the Virtual Observatory in accordance with the set out goals for the project. However, the consortium is also pleased to report over-achievements of some target. One such highlight is the geographical coverage of the Observatory. Whereas the original specification was to map e-Infrastructure projects relevant to sub-Saharan Africa, the consortium has successfully mapped all available data on the entire African continent instead.

This report is divided into five sections. The first section covers the data collected and the methodology used in populating the database. In this section, we provide overview of the entries we managed to upload into the observatory in each iMENTORS category. This section will report on the number of projects, organizations and e-Infrastructures uploaded into the database until the end of the project. The second section covers the integration of iMENTORS with external databases. The section also contains a description of the efforts carried out to link iMENTORS with the International Aid Transparency Initiative registry, in an effort to ensure the sustainability of the Observatory beyond the present project period. The third section covers the vital role of validating the data collected to ensure reliability and validity of the Observatory. Lastly, the fifth section provides a summary of the challenges and successes of the consortium in developing iMENTORS. It also provides recommendations for policy and practice.

This report was produced through a collaborative effort of the project partners. The final version therefore incorporates the inputs from all WP2 team members and the project manager. The information included in this deliverable is interrelated with all WP2 deliverables.

Finally, this report is intended for iMENTORS partners, the stakeholders and the European Commission (EC). Public use of the contents of this report ought to make appropriate reference to the authors and may need the approval of the European Commission (EC) who funded iMENTORS project. However, EC is not responsible for any errors or omissions in this report.

1 Data collection and uploading into the database

1.1 Organisations

This subsection reports on the overall total number of organizations uploaded into iMENTORS. It highlights the percentage increase in the number of organizations since the last deliverable D2.3.

We reported in D2.3, that we had recorded a total of 1067 and that about 50% (1986) of the organizations had been uploaded to the database. We can now report that overall, we have populated the database with 3359 organizations, a three-fold increase over the D2.3 entries we reported previously.

The different types of organizations we recorded into the database include both national and international organizations, governmental and non-governmental organizations, private and public organizations as well as national and multinational donor agencies. The following subsections provide an overview of the types of organizations in iMENTORS that are involved in e-infrastructure development in Africa. Each sub-section is based on the iMENTORS categorization of organizations. The following pie chart summarises the different categories of organizations we uploaded into the database which are then discussed further in the subsections that follow.

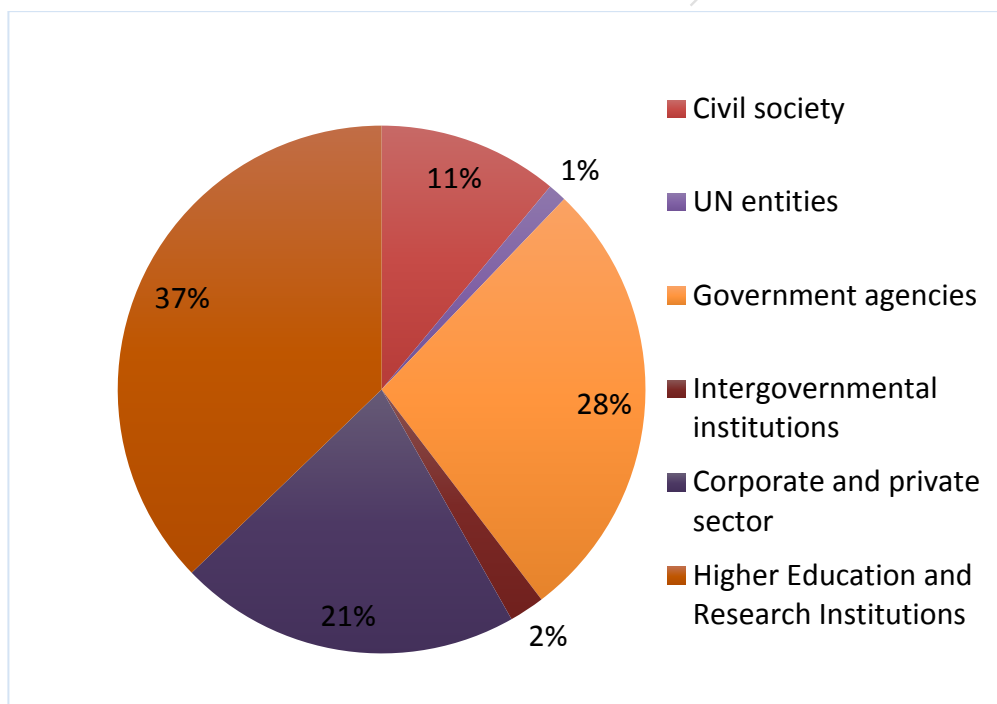


Figure 1: Types and Distribution of organizations in iMENTORS

Overall, more than a third (37%) of the organizations currently available on the platform are classified as Higher education and/or research institutes, closely followed by Government agencies such as government ministries or specialised agencies (28%). As can be seen from the figure above, private sector entities represent 21% of the entities in iMENTORS. A significant number of the private sector organizations are SMEs involved in science and research as well as Large Telecommunication Companies for the most part such as cable owners, operators and Internet Service Provider (ISP) organizations as reported in D2.3.

The following subsections provide more details on each category of organization in iMENTORS.

1.1.1 United Nations Entities

The consortium has successfully collected and uploaded a total of 43 United Nations entities that are relevant to iMENTORS.

1.1.2 Inter-Governmental Bodies/Institutions

The consortium has recorded and uploaded a total of 82 inter-governmental bodies, excluding UN Entities, into iMENTORS. The pie chart below illustrates the geographical distribution of the intergovernmental organizations. The data is based on the information on the physical location of the individual organization's headquarters.

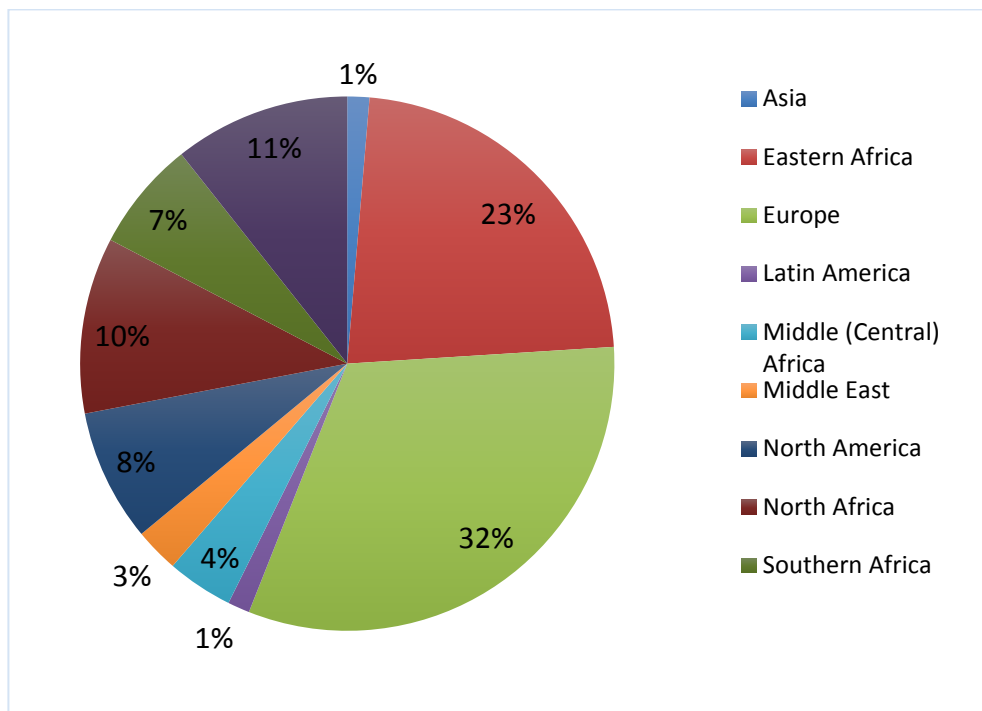


Figure 2: Geographical Distribution of intergovernmental organisations

Figure 2 above illustrates that a third of all intergovernmental organizations involved in e-Infrastructures in Africa are based in Europe, including non-EU member countries. But more than half of such organizations are based in Africa itself.

1.1.3 Government Agencies and Public Institutions

iMENTORS contains a total of one thousand and forty one (1041) national ministries and public institutions. However, this category also includes public universities which are also tagged also tagged separately under the category of higher education and research institutions as outlined above.

We focussed primarily on recording the national ministries and governmental departments that were most relevant to iMENTORS such as Science and Technology, Information and Communication, Education, Infrastructure, Health and Finance. We also included National Assemblies and Parliaments, along with a "Government of ..." entry for each country in order to link the relevant government as the parent organization for all relevant ministries and agencies.

1.1.4 Higher Education and Research Institutes

We reported in D2.3 that a total of 1448 entities tagged as higher education and research institutes were recorded. However, after validation process, the database has a total of 1410 organizations in this category. About 70% (977) of all entities in this category are universities.

1.1.4.1 Universities

As outlined above, a total of 977 universities were recorded. The illustrated below shows that the universities involved in e-infrastructure developments in Africa are not just African universities. Whilst 75% of the recorded universities are indeed located in Africa, the pie chart (see Figure 3 below) shows that a significant number of universities across the globe, mainly European and North American universities, are also actively involved in e-infrastructure developments in Africa (through projects). We have also recorded a significant number of Universities in all countries of Africa with the exception of Western Sahara, French Mayotte, and St. Helena, where little or no information is available.

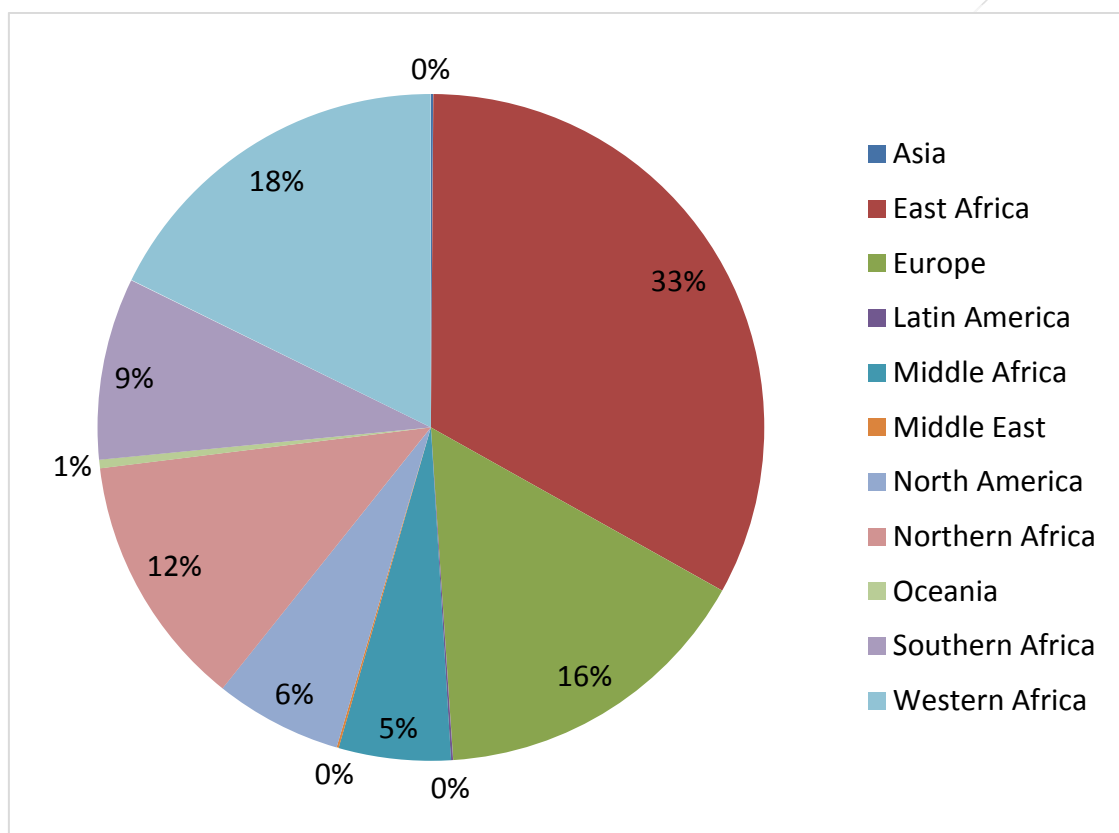


Figure 3: universities recorded in iMENTORS

1.1.4.2 Research and Education Networks

iMENTORS contains information on four regional Education and Research Networks (RRENs) and thirty (30) individual National Research and Education Networks (NRENs) as outlined in table 1 below. The table shows a breakdown of the RRENs with individual member NRENs and the corresponding countries.

Full names of Regional Research and Education Network (RRENs)	Full names of National Research and Education Network (NRENs)	Abbreviation	Year established
Arab States Research and Education Network	Moroccan Academic and Research Wide Area Network	ASREN	2010
	Algerian Research Network	MARWAN	1998
	Egyptian Universities Network	ARN	1990
	Tunisia Research and Education Network	EUN	1987
	Sudanese Research and Education Network	TUREN	1997
	Somali Research and Education Network	SudREN	2004
			SREN
UbuntuNet Alliance		UbuntuNet	2005
	Research and Education Network of the Democratic Republic of the Congo	Eb@le	2007
	Ethiopian Education and Research Network	EthERNet	2001
	Kenya Education Network	KENET	1999
	Madagascar Research and Education Network for Academic Learning Activities	iRENALA	2012
	Malawi Research and Education Network	MAREN	2005
	Mozambique Research and Education Network	MoRENet	2005
	Namibia Education and Research Network	Xnet	2007
	Research and Education Network of Rwanda	RwEdNet	
	Somali Research and Education Network	SREN	2006
	Tertiary Education and Research Network of South Africa	TENET	2000
	Sudanese Research and Education Network	SudREN	2004
	Tanzania Education and Research Network	TERNET	2007
	Research and Education Network of Uganda	RENU	2006
	Zambia Research and Education Network	Zamren	2011
West and Central African Research and Education Network		WACREN	2006
	Nigerian Research and Education Network	NgREN	2009
	Ghanaian Academic and Research Network	GARNET	2006
	Gabon National Network of Education and Research	GabonREN	2001
	Research and Education Network of Mali	MaliREN	
	Réseau Ivoirien de Télécommunications pour l'Enseignement et la Recherche, Research and Education Network of the Ivory Coast	RITER	2012
	Création du Réseau National d'Éducation et de Recherche du Togo, Research and Education Network of Togo	RNERT	2012
	Senegal Research and Education Network	SenREN	2011
	Gabon National Research and Education Network	GabonREN	2012
	Benin National Research and Education Network	RerBennin	2013
	Niger National Research and Education Network	NigerREN	2013

Table 1: African NRENs

The above table also includes information on NRENs that are not yet fully developed or established such as Xnet or NigerREN, and on which we have limited information. Some upcoming NRENs are not recorded in the database due to lack of information. For instance, potential members of UbuntuNet still under development are not listed in iMENTORS. These are; Botswana NREN, Burundi NREN, Lesotho NREN, Mauritius NREN, Swaziland NREN and Zimbabwe NREN. Lastly, the above table also shows that SudREN is a member of both UbuntuNet and ASREN. This dual membership could become common in the future due to geopolitical and socioeconomic alliances across Africa.

1.1.5 Civil Society Organisations (non-profit)

We recorded a total of 418 civil society (non-profit) organizations into the platform, an increase of 400 entries over the previous reporting period (D2.3). However, some educational and research organizations including universities categorically specify on their websites that they are non-profit civil society organizations. As such, some of the organizations tagged under this category are also reflected in other iMENTORS' categories such as higher education

and research. Most of the organizations recorded under civil society organization were retrieved when recording information on projects. They were mainly stakeholders in various projects recorded in the platform. The pie chart below (figure 4) illustrates the geographical spread of the civil society organizations in iMENTORS. The information is based on the geographical locations of the offices of such organizations.

Geographical distribution of civil society/non-profit organizations in iMENTORS

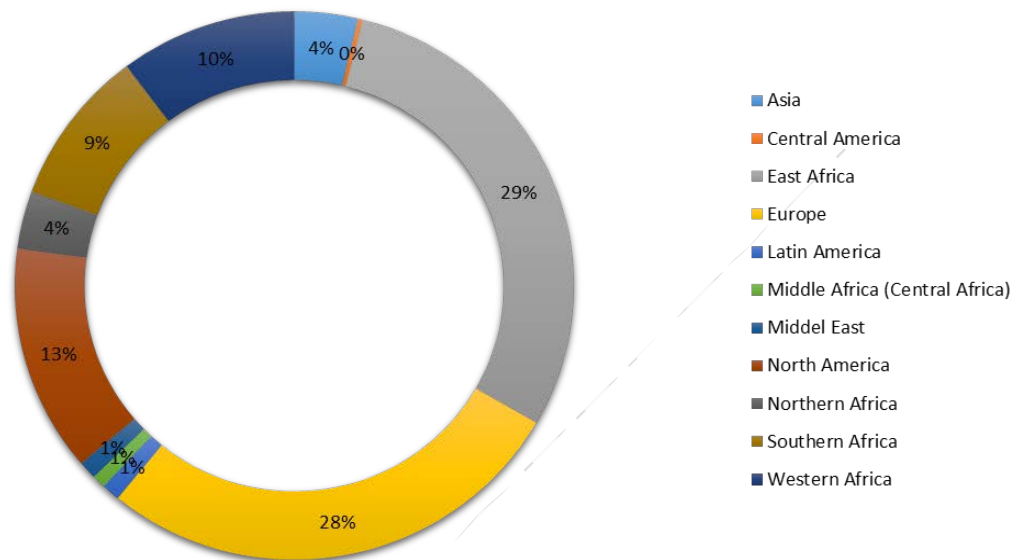


Figure 4: spread of CSOs with an interest in e-Infrastructures in Africa

1.1.6 Private Sector Companies

A total of 795 organizations tagged as private sector organizations were recorded into iMENTORS, representing 22% of the total organizations in the platform. Most of the organizations under this category are cable and telecommunication operators, and Internet Service Providers (ISPs), as discussed previously in D2.3.

1.2 Research Infrastructures and e-infrastructures

This subsection outlines the data that we have recorded under networking infrastructures as well as Research infrastructures. However, the previous report D2.3 elaborately covered all the details on networking infrastructures. This subsection this pays attention to Research infrastructures, entities that were retrieved and uploaded into iMENTORS after D2.3.

Overall, there are a total of 167 entities recorded into the database as networking infrastructures. These include terrestrial links, submarine cables and internet exchange points as previously reported in details in D2.3. We also recorded a total of 386 entities that were categorised as Research Infrastructures (RIs). The pie chart below (figure 5) provides an overview of the entries tagged as research infrastructures in the database.

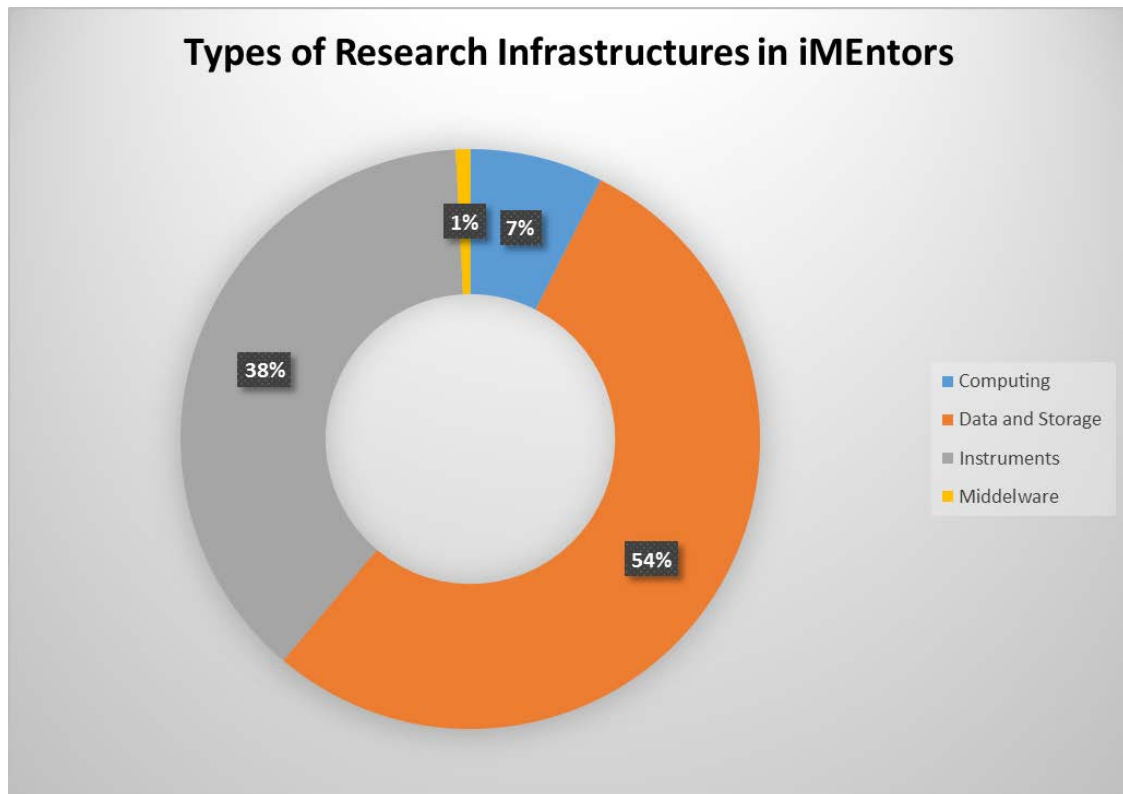


Figure 5: the types of Research Infrastructures in iMENTORS

RIs could be tagged as computing, Data and storage, instruments or middleware. Figure 5 above illustrates that over half of all RIs in iMENTORS were tagged as data and storage infrastructures whereas 38% were instruments. There were only four entries recorded as middleware in iMENTORS. The RIs in iMENTORS were further categorised based on their location, in other words whether they are single sited, distributed or virtual entities. The pie chart below provides an overview of these RIs based on their location type. An RI could only be tagged once in this category, thus the illustration below is based on the total number of RIs recorded.

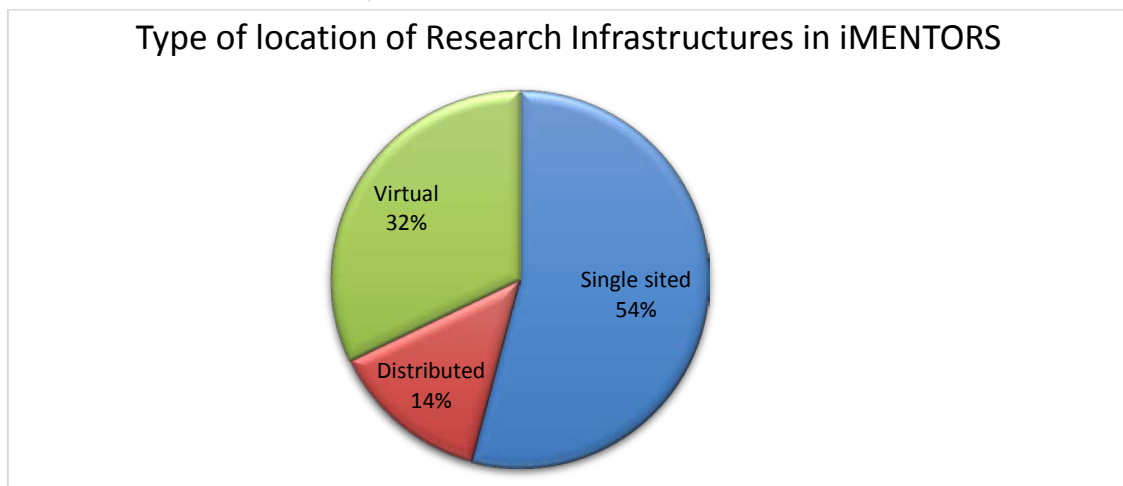


Figure 6: The types of RIs in the iMENTORS

As the figure above illustrates, more than half of all RIs recorded in iMENTORS are single sited and a third are virtual. Single sited RIs means that the facilities located on and accessible from

a single site. Lastly, RIs were also categorised according to their field of scientific application. The pie chart below (figure 7) illustrates the distribution of RIs recorded in iMENTORS across different scientific disciplines.

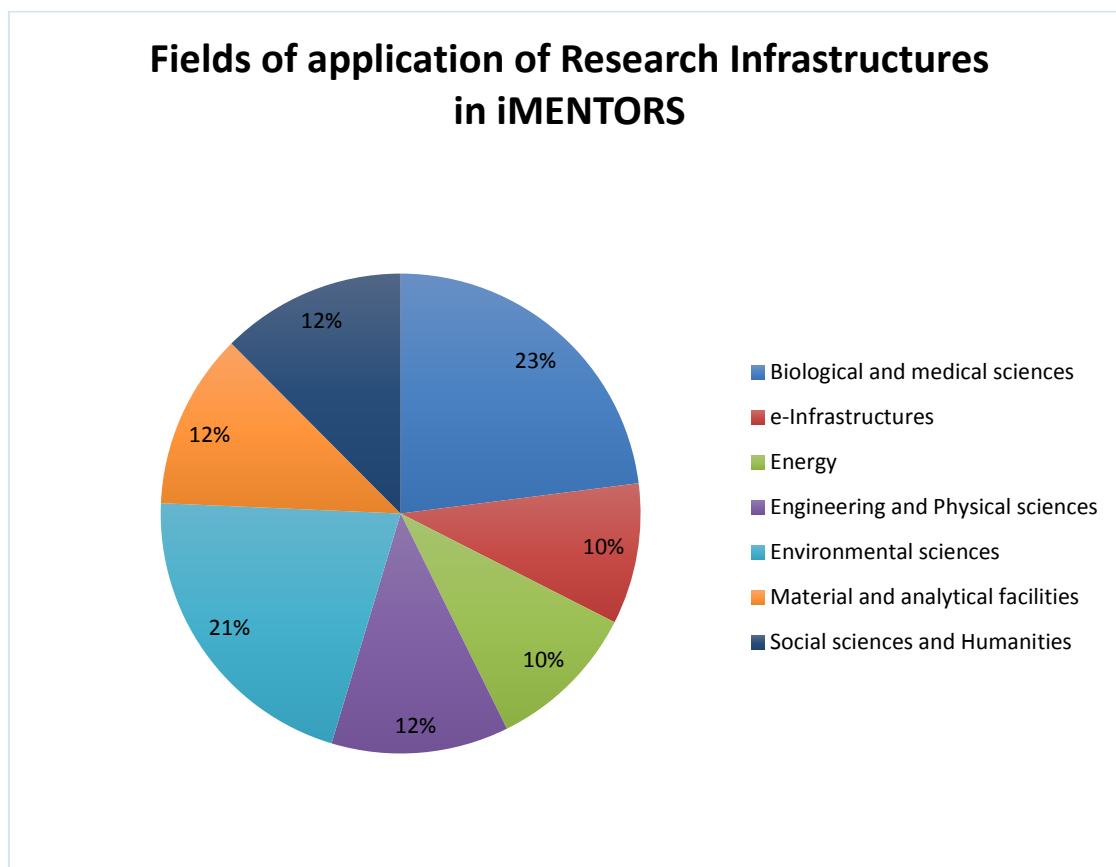


Figure 7: fields of application of RIs in iMENTORS

As illustrated above, a significant number of RIs in iMENTORS are concerned with biological and medical sciences followed by environmental sciences, mainly agricultural sciences related. This observation can possibly be linked to the disproportionate burden of ill health and inadequate supply of nutritious food as occasioned by frequent hunger outbreaks in sub-Saharan Africa.¹

The method used & sources of information

Like Universities, the quality of the data varied widely depending on the country. We used Google, to identify Research Infrastructures in each country. After identifying the Research infrastructure or the owners of the facility, the information to be recorded in the database was, in most cases, found on the relevant organizations' individual websites. Some of the search terms used to retrieve data included: Research centres, Research institutes, Technology centre, Innovation centres, Research facilities and ICT. These terms were searched in combination with individual countries, e.g. research facilities Kenya. This means the same terms were used for each country in Africa and resulting information was then checked for relevance to the iMENTORS database categorization.

¹ C Y Wright et al., 'Human Health Impacts in a Changing South African Climate', *SAMJ: South African Medical Journal* 104 (2014): 568–73.

The website of PAERIP (Promoting African – European Research Infrastructure Partnerships), a project funded under FP7 (Theme INFRA-2010-3.2) was another useful website that was used to retrieve data on RI. We also retrieved significant amount of data from CHAIN-REDS, another FP7 project co-funded by the European Commission (DG CONNECT).

1.3 Projects

Overall, we have recorded and uploaded a total of 432 e-Infrastructure projects into the database. We therefore tripled the number of projects in the database from the figures we reported in D2.3. More so, the projects in the database are based on accessible data covering the whole of Africa and not just sub-Saharan Africa. Figure 8 below provides an overview of the types of projects in iMENTORS database. The entries are categorised as Core funding, Reports and Studies, e-Infrastructures, Meetings Events and Conferences, and General ICT projects.

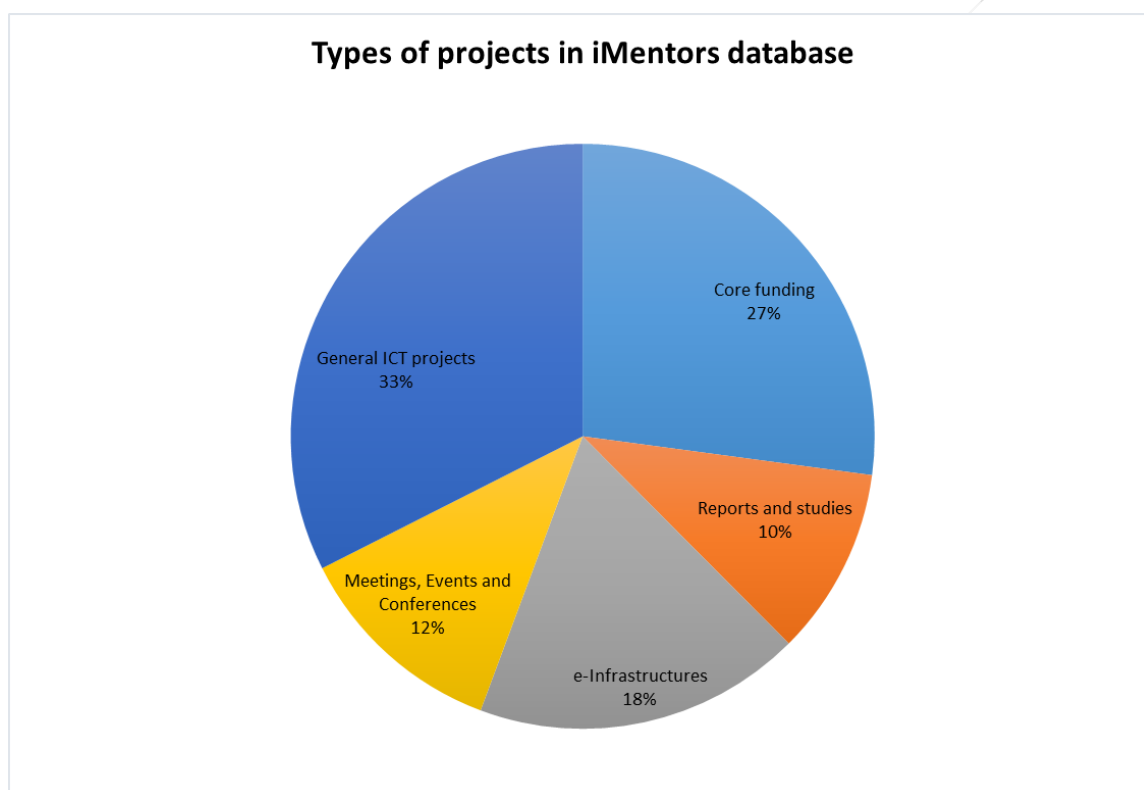


Figure 8: types of projects in iMENTORS

As illustrated above, a third of the projects we recorded into the database were concerned with ICT in general and a quarter were those projects that provided core funding for the recipient organizations. Slightly more than half (51%) of the projects were ongoing and just under half (48%) were closed by the time we recorded them into the database. We only retrieved and recorded two projects that were planned at the time of their entry into iMENTORS platform.

Regarding the project funders, the data we collected indicates that the international actors that are funding the largest share of global and regional e-infrastructure projects are the European Union (through the DG Development and Cooperation in association with DG CONNECT), Canada's International Development and Research Council (IDRC), and the World

Bank. We retrieved iMENTORS relevant projects from the websites of the three main donors as outlined in the next section.

The other projects recorded in iMENTORS from other sources were retrieved through Google search and snowballing. Thus we followed up leads to follow on projects or precursor projects from some of the projects we had retrieved already. We also searched websites of the organizations involved in the projects that we retrieved to find out if they had participated in any other relevant projects as part of snowballing.

In addition, the iMENTORS database was built in such a way that it dissociates physical networks from the funding or investment required to build them. The physical infrastructure was recorded first, and then linked with its funding or investment source or sources. Therefore, in addition to mapping the physical network as described in the “networking infrastructure” subsection above in this report or any other research infrastructure, the research team recorded the associated investments as projects which are managed by consortia or legal entities created for this specific reason. For networking infrastructures, iMENTORS acquired the data needed by purchasing the Hamilton Maps. Each network was associated with different news sources which typically also provided financial data. For research infrastructures, the team carried out a web-survey as described in the subsection above to gather relevant information on projects that led to the development of the RI or projects utilizing the RI. In some cases, where contact details were available, we contacted the owners of the RIs to gather information on relevant projects of details about the RI.

Lastly, we also integrated iMENTORS with International Aid Transparency Initiative (IATI) system to enable retrieval of relevant projects listed in IATI database. This was also part of the sustainability plan for iMENTORS. To ensure that iMENTORS platform can automatically update its data by fetching most recent data from IATI and to ensure compliance with IATI standards.

2 Integrating iMENTORS with the different external databases

The aim of iMENTORS initiative was to create a comprehensive database of e-infrastructure projects in Africa. In order to make the most of the new opportunities that ICTs provide for interoperability and flow of information between organizations and platforms, the consortium intended to create a mechanism which would synchronize iMENTORS with other databases. Such system has the potential to provide certain economies of scale, which we deemed vital for the sustainability of iMENTORS platform beyond the current funding term. The process of integration of iMENTORS with other databases took place in several stages.

A review of publicly available databases was performed in period 1 to select an appropriate database for a test run. Relevant databases were evaluated in terms of the amount, the quantity and the quality of data they provided. The most suitable candidate proved to be the World Bank Database, as it fulfilled all three criteria.² A framework was then created to allow the various categories and data from API to be “translated” to the corresponding entries in iMENTORS. The developing team not only created the synchronization tool, it also incorporated it directly in the iMENTORS platform. The only synchronization option was through the API, but the system promised a potential for expansion to include more databases, which in turn could become directly available as an option on iMENTORS.

All relevant projects funded by the World Bank over the past five years were retrieved from the World Bank database using its dedicated API. The process was documented in D2.3

On a second stage, the research team focused on extending the number of external databases that were connected with iMENTORS. The team contacted both the IDRIS+ (IDRC) and the CORDIS (EU) database administrators and support staff to request support for iMENTORS objectives.

For EU projects, we used the CORDIS database (http://cordis.europa.eu/home_es.html) to search for EU funded projects. The database has a wide range of filtering options for selecting different project categories and whilst it does not export files that can be integrated automatically, the consortium discussed with the CORDIS administrators who proved very collaborative in providing us the data based on the filters that we asked. The database was integrated with iMENTORS database and the projects were automatically retrieved into iMENTORS platform. After validation and the removal of projects irrelevant to the objectives of iMENTORS, the CORDIS database effectively delivered 132 e-infrastructure projects.

For projects that were funded by Canadian Aid Agency IDRC, we retrieved the information from the agency’s online database (IDRIS+, <http://idris.idrc.ca/app/Search>). However, these projects were not automatically exportable to the iMENTORS database mostly because the IDRS+ does not offer extraction capabilities. After assessing the amount of information that is directly or indirectly connected to the aims of the project, we identified a total of 69 projects. Those projects were retrieved manually.

Adapting the platform to the IATI standards

Whilst initially the consortium rejected the integration with the International Aid Transparency initiative registry because of the inaccuracy of its data (lack of possibility to verify data on projects because governments did not, for most part, offer any unique identifiers to trace individual project entries), a breakthrough in our discussions with the Swedish International Development and Cooperation Agency led the consortium to re-assess

²<http://search.worldbank.org/api/v2/projects>

the possibilities to store IATI-compatible datasets in the same way than with the other external databases.

A working group was set up to look into the possibilities in integrating the two databases. The team explored the two databases in detail, exploring the similarities and differences in the data they contained and the way the projects and organizations were recorded. The team found that whereas there were significant differences in how projects were for example described in both databases, the biggest difference was the use of codes in IATI database. To fully integrate the two databases therefore implied synchronizing their coding systems. It was also noted that iMENTORS had some useful information that IATI did not have such as projects outputs, objectives and contact details including physical location details of organizations which are used for mapping in iMENTORS. The IATI integration team therefore suggested that WP2 team should retain all iMENTORS categorization of projects and organizations. Finally, a stand-alone version of iMENTORS database was created in which the IATI projects can be semi-automatically fetched and integrated into the iMENTORS system. New categories were added into advanced search options on the iMENTORS map to enable filtering of projects from the IATI. Today, iMENTORS holds 29,354 projects retrieved from the following organisations:

International HIV/AIDS Alliance, Netherlands Ministry of Foreign Affairs (BUZA), United States Agency for International Development (USAID), Department of Foreign Affairs and Trade (Irish Aid), Swiss Agency for Development and Co-operation (SDC), African Development Bank Group, Homeless International, DFID CSCF, Australian Government - Department of Foreign Affairs and Trade, European Union Institutions (European Commission - Service for Foreign Policy Instruments, European Commission – Enlargement, Europeaid), Ministry for Foreign Affairs of Finland, The Global Fund to Fight AIDS, Tuberculosis and Malaria, Inter-American Development Bank, Ministry of Foreign Affairs and Cooperation, Spain, MAEC - Ministerio de Asuntos Exteriores y de Cooperación, Save the Children UK, Price Waterhouse Coopers, Sweden, Swedish International Development Cooperation Agency, United Nations Development Programme, WaterAid, World Bank Group, International Development Association, International Bank for Reconstruction and Development.

Whilst the integration with IATI is not part of the direct objectives of the iMENTORS platform, they became part of the sustainability plan for iMENTORS as the project comes to a conclusion. It also acts as an example of how a concluding project can be linked to an existing project with a longer lifespan. This has the potential to create and maintain relevance to potential funders (donors), who already adhere to IATI standards, for further development of iMENTORS.

At this stage the functionality is still experimental. Whilst the datasets can be imported and matched to create relevant profiles in iMENTORS automatically, more work is needed to make the data meaningful. For instance, developers at Stockholm University are currently working on associating the projects to the reporting organisations, without requiring a manual validation. Developments on the IATI are ongoing, and the consortium will continue to work on the integration in order to make iMENTORS 100% compatible.

As the outcome of our discussion with the Swedish International Development and Cooperation Agency suggest, the goal is to re-use iMENTORS to display, visualise and streamline our evaluation for all SIDA's development aid projects.

3 Validation process

Assessing the progress made: 60% of Actors involved in e-Infrastructure projects

Providing accurate estimates when attempting to predict whether the platform contains a specific percentage of the total number of actors in e-Infrastructures in Sub-Saharan Africa is in itself a tremendous challenge for the simple reason that in the absence of a baseline indicator (100%), any estimate runs the risk of being significantly inaccurate. The consortium nevertheless focused on certain assumptions and methodologies in an attempt to estimate its progress.

Initially the consortium planned to collect data on organisations in relation with their projects. In other words, only when an organisation had a direct involvement in a project, would the consortium proceed with recording it. The objective was to avoid collecting data on organisations that were irrelevant (at least directly) with e-infrastructures in the sense that they did not have a direct involvement in a project or a physical infrastructure (evidence-based data collection), therefore making data collection on organisations dependent on the data collection on projects. However, the consortium quickly realised that there were several risks with this method.

First of all, the consortium had to meet the target of identifying 20% of actors involved in e-infrastructures by Month 12 whilst the target of collecting data on 80% of projects was set at Month 20. In addition, the consortium deemed that in the event that the data collected on projects fell short of the 80% target, the risk that iMENTORS would also fall short of its target with regard to actors was not negligible.

Therefore, the consortium opted for dissociating data collection on organisations with data collection on projects. Whilst, the risk of having a good number of irrelevant organisations recorded in iMENTORS was unavoidable, it was the only solution at the time to ensure that the consortium would meet the target of collecting data on at least 20% of organisations involved in e-infrastructures. However, there were also other perceived advantages in this method as it seemed to be a superior method to assess our progress vis-à-vis our objectives.

After several weeks of surveying databases to establish the classification of entities involved in e-infrastructures, the consortium quickly realised that the world of e-infrastructures usually involves a very typical set of actors. Amongst them, we found bilateral or multilateral donors, research institutes, NRENs (which are in a category apart due to their heterogeneous legal structure), national ministries and occasionally (at least within the frameworks of projects) the private sector (technology market). Upon this realisation, the consortium pursued a data collection strategy that was focused on exhausting category after category of organisations in order to ensure that all entities in those categories had been recorded. In addition, whilst it was impossible at the time to identify a database containing a list of e-infrastructures in Africa, it was relatively easy to find inventories containing data on all universities, ministries, NRENs, and even cable operators. As such, instead of seeking to identify organisations through their projects, the consortium proceeded by doing the opposite. Another argument in favour of this method, was that although the bulk of organisations found in iMENTORS are not linked to e-infrastructures today, these entities, by their nature, would be very likely to be linked to infrastructures in the future (at least Higher Education and/or Research Institute which represent over a third of the organisations recorded today).

In a second period, once those categories were exhausted, the consortium proceeded with a snowballing method, consisting of revisiting the profiles of the organisations that had been already recorded to identify new ones through their website. In a third period, the

consortium was collecting data on organisations only by association with e-infrastructures and e-infrastructure projects. At that stage, it became very obvious that the recipients of international grants for the purpose of deploying or maintaining e-infrastructures in Africa were essentially limited to handful of well-established organisations.

Against this background, provided that the requirement of the project is to identify only 60% of the actors we can safely estimate that the quota has been met.

Assessing the progress made: 80% of all e-Infrastructure projects from 2007 and on.

As regards our progress on e-infrastructure projects the challenges are even greater.

At the beginning of the exercise, it was relatively easy to retrieve relevant data. But as the work progressed, and as we were exhausting the information available in the online databases it became more challenging to retrieve any relevant data on e-Infrastructure projects. Just like with projects or organization, it is extremely difficult to predict the total number of these entities in sub-Saharan Africa. Proving attainment of 80% of the unknown was therefore a challenge. As such, contacting experts in different categories of RIs appeared to be the only way to find out whether we had missed out on some data. Dr Bruce Becker of CSIR (South Africa), an expert in supercomputing in Africa provided us with meaningful insights in this particular field. The fact that these experts more or less confirmed that the data we recorded in iMENTORS is all there knew in their areas of expertise (See appendix 3) is an indication that we achieved the critical success factor. Nevertheless, 80% is a very ambitious target. For this reason, one must apply extreme caution when stating that the target has indeed been met.

Because the definition of what constitutes an e-infrastructure project can vary from one interpretation to another the exercise of assessing our progress becomes even more challenging. For instance, research projects shared amongst different institutions that may or may not use advanced e-infrastructures for collaboration can be interpreted as an e-infrastructure project, or funding consolidating research infrastructures can also be considered as an e-infrastructure project in a broader sense simply because the organisation is connected to the NREN although technically they could also be regarded as research infrastructures in the strict sense. As such, whilst it is unrealistic to properly assess or even claim that iMENTORS has achieved its target of recording data on 80% of e-infrastructure projects, we can safely conclude that to the very least, iMENTORS contains all the data that is currently stored in databases other than iMENTORS, and that to the best of the experts on the ground, no other e-infrastructure project has been left out.

Validating and consolidating the data: The final phase of data collection and entry into iMENTORS involved validation of the data. This was the process of ensuring that the data in the platform was relevant to the database, and tagged appropriately based on the established iMENTORS categorization. Validation also involved making sure that the information in iMENTORS correctly reflected the views and values of the owners of such information. However, given that information on websites change all the time, the data we recorded into iMENTORS are only correct as at the date of publication. Also, some of the information was translated using functions such as google translate and may not accurately reflect the intentions of the authors or owners of such information. Validation was an ongoing exercise throughout the project duration. It only formed part of the main focus at the end but it was done at all the stages of the project. The illustration below is used to illustrate the process of data validation, using Research Infrastructures as an example. But the process was the same for all categories of data we retrieved and recorded; projects, organizations, Research and Educational Networks, networking infrastructures and virtual research communities.

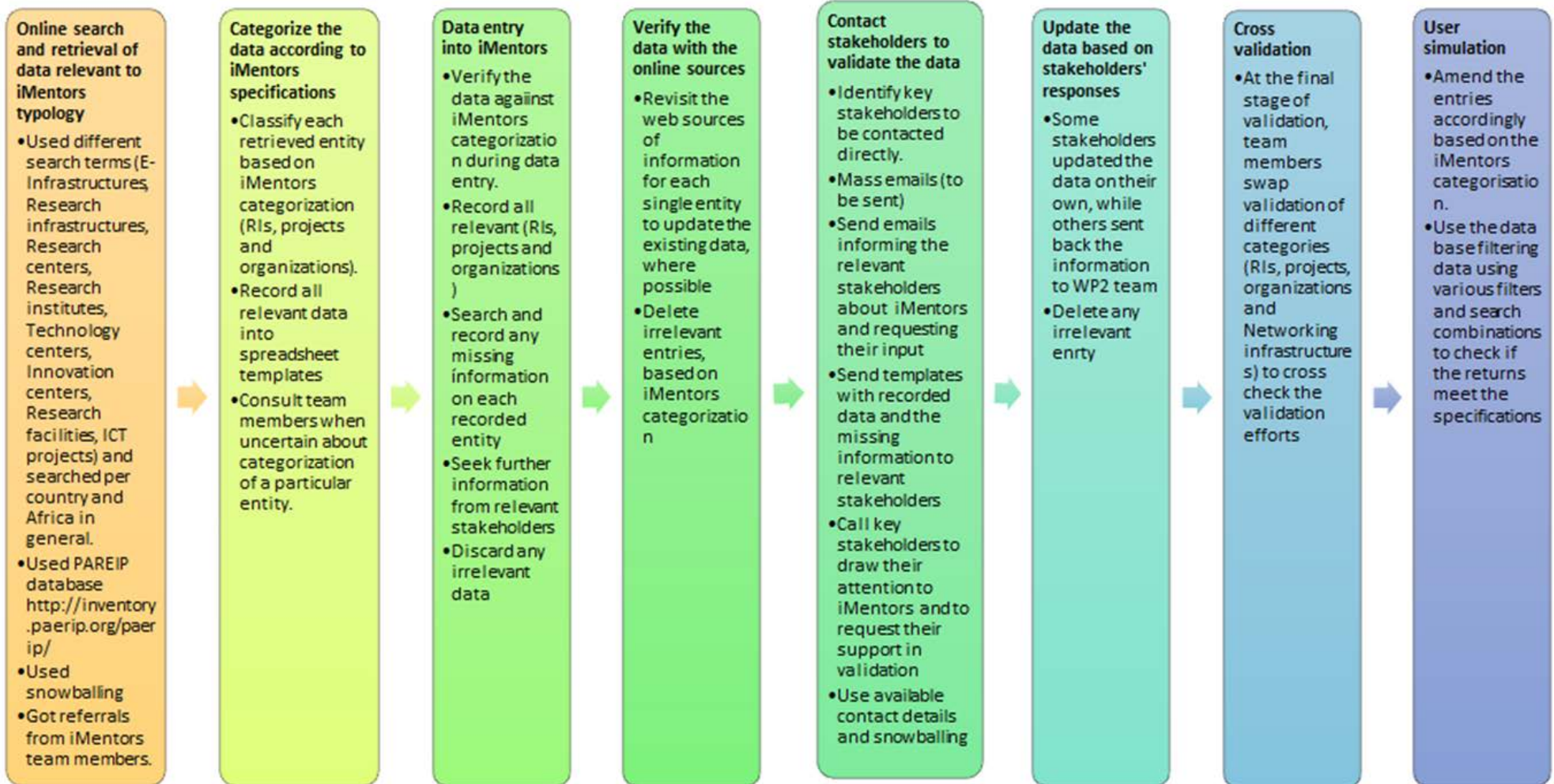


Figure 9: Data validation process

4 Conclusion and recommendations

D2.4 attempts to highlight the achievements of the iMENTORS project in retrieving and recording information to populate a virtual platform on e-Infrastructures. Overall, we successfully recorded 432 projects, 3359 organizations, 386 research infrastructures, 167 networking infrastructures (physical networks) and four virtual research communities.

Our task of populating the database involved several challenges which we successfully overcome as outlined below.

- i) Defining categories. It was a challenge to come up with specific definitions to be used to differentiate some of the entities. For example defining e-Infrastructures, research infrastructures or middleware. However, the consortium came up with agreed definitions that were used by all WP2 team members to classify the data appropriately.
- ii) Sources of information. It was a challenge getting the right information without knowing specific sources to explore. The team had to rely on general internet searches in most cases to get the data, without any guarantee on the quality of information from such online sources. Related to information sources was the language challenge. The team members were not fluent speakers of French, Portuguese or Arabic, yet some of the information was only available in these languages. We used google translate, whenever we could not get assistance from experts from such languages. In the end, we would like to believe we got the best available data, which were verified in some cases by the relevant stakeholders as discussed in the previous section.
- iii) Physical location of team members. WP2 team members were based in two different countries, while the overall team manager was based in a third country. Whereas the distance posed a potential risk to coordinated teamwork, we used ICT to overcome the distance challenge. We relied on Skype for example to hold regular team meetings and emails to communicate any project related issues whenever necessary. We would like to believe that we managed to successfully work as a team irrespective of the distance between the countries by delivering expected outputs on time.
- iv) Limited support from some stakeholder. It was a challenge getting support from stakeholders whose information we recorded in the database. For instance, it was very hard to get private operators of cable networks to provide additional details on their network. There was a sense that they did not perceive any commercial benefits of doing so. Even if they did, the situation on the ground was changing all the time and the data was only correct as at the time of entry into the system. To overcome this apparent lack of support, we contacted several experts in various areas of interest such as physical networks and supercomputing to verify the information had gathered. For instance we relied in experts on networking infrastructures such as Professor Björn Person, a renowned personality in the field of e-Infrastructures, to validate some of the data we had collected.

Despite of the challenges we faced, some of which are outlined above, we would like to believe that iMENTORS achieved tremendous successes that are worth highlighting here

- i) We have managed to populate the most comprehensive database of its kind, starting from very limited information. Although there are other databases such

as Chain-Red or PAREIP, as outlined in the previous sections of this report, iMENTORS is an All-African database that covers different disciplines and stakeholders. Other databases such as IATI for example are geared towards donor agencies whereas iMENTORS is relevant to donors, policy makers at all levels, researchers, civil society and anyone with an interest in e-Infrastructures in Africa. We have created a database that has surpassed the original remit, by including the whole of Africa, not just sub-Saharan Africa as originally envisaged.

- ii) We believe we have achieved the critical success factors set up as the projects targets. It is difficult to tell the exact number of e-Infrastructures projects over the past five years or online communities relevant to sub-Saharan Africa. But we believe we successfully identified and recorded at least 80% of the e-Infrastructures projects found in the external databases that were surveyed, and more than 60% of actors involved in the development of e-infrastructures.
- iii) Another achievement of iMENTORS was the successful (at least partial) integration with IATI as discussed in the previous section. This opens new prospects for iMENTORS and is a step forward for the sustainability of the observatory. This development will also create confidence among users because it implies that iMENTORS is also IATI compliant.
- iv) iMENTORS also successfully integrated a Decision Support System which can use public data from online databases to provide policy support and aid projects planning and implementation.
- v) We would also like to point that the collaborative work that has led to development of iMENTORS platform is a success story in itself. Different work streams were performed by different teams from different locations to create a robust virtual platform that will serve as a meeting point for all stakeholders with interest in e-Infrastructures in Africa.
- vi) The interactive map based on advanced geographical and visualizations systems makes iMENTORS unique compared to previous similar attempts. We have mapped all the Networking infrastructures and users can see their physical locations and their various landing points. By just looking at the map, one can for example easily identify the connectivity gaps across entire Africa.

After the successful completion of iMENTORS, there are several lessons we learnt along the way that we believe could be used to improve on the virtual observatory we have created. We propose the following to improve on our current work and make iMENTORS more useful in the future.

- i) Fully integrate it with IATI or other similar platforms that would ensure continuous update of the database.
- ii) Translate all the information in iMENTORS into at least French and Arabic languages. Although that would still leave out Portuguese speaking audiences in Africa, French and Arabic are the official languages in bulk of West Africa and North Africa. The current use of English potentially alienates people from 20 different African countries where French is the Official language. These countries between themselves have a combined population of about 28 million people. But the intended users of iMENTORS span beyond Africa, thus inclusion of at least French and Arabic pages makes a viable business case.

A. Appendix 1. Examples of validation communication between iMENTORS team and stakeholders

1.

From [Odido, Mika](#) 

To [John Owuor](#) 

Date 2014-05-08 06:59

Dear John,

a couple of comments:

(i) the correct acronym is ODINAFRICA and not ORDINAFRICA as in this mail or ORDNIAFRICA as indicated in the website.

(ii) the location of the office is the UNESCO Regional Office for Eastern Africa - the name of the office was changed towards the end of 2013.

(iii) it is not a Non-Profit **Civil Society** Organization. It is a network of government institutions coordinated by UNESCO.

Best regards,

Mika.

Mika Odido
IOC Sub Commission for Africa and the Adjacent Island States
UNESCO Regional Office for Eastern Africa
UN Gigiri Complex Block C
P.O. Box 30592-00100
Nairobi, Kenya
Tel: +254 20 7621244
Email: m.odido@unesco.org

2.

To: Athina Vrakatseli

Subject: Re: iMENTORS has information on your organization in its open and on-line database

Hi Athina,

I looked at our entry per your email below. If you could make the following changes, that would be great.

Our name has changed and is now simply: Muso

Our zip code is 20010

Thanks so much,

Marc

Subject: Re: iMENTORS has information on your organization in its open and on-line database

Hi Athina

May you kindly update the following info please for Jembi (<http://www.iMENTORS.eu/database/organizations.html?task=organizations.details&id=2537>):

1. *URL:* should be www.jembi.org not "<http://www.healthnet.co.za/>)
2. *Primary Address should be our South Africa (Cape Town office):* Westlake Square, Westlake Drive, Westlake, Cape Town,
3. *Phone:* +27 21 701 0939
4. *E-mail:* info@jembi.org

Thanks

On Mon, Sep 22, 2014 at 2:46 PM, Athina Vrakatseli <communication@iMENTORS.eu> wrote:

Dear Madam/Sir,

The EU-funded iMENTORS project for collecting information on organizations and projects in relation to infrastructures in Africa has information on your organization in its open and on-line database. The main purpose of the database is to support donors and policymakers in planning support to these kind of projects and organizations. The project partners are Stockholm University and Gov2U.

Please check out what's recorded on your organization at <http://www.iMENTORS.eu/>. To do that, click on 'database', then select 'organizations'. You can then type in the name of your organization in the search box and click search icon or you can use the different filters, such as the country in which your organization is based, to retrieve the relevant information. Once you locate your organization, click on it to view the details.

If you would like to correct or add information we have on your organization, please create a free user account at <http://www.iMENTORS.eu/login.html>, and then log in to the database to make the corrections. When you log in to the database, follow the same procedure (above) to retrieve the organization. Once you find your organization, click on it to view the details and then click on the 'Edit' icon represented by a pencil picture. You can also click on the edit button against the name of your organization in the tabulated list of organizations. Alternatively, you can email the information to communication@iMENTORS.eu and we will update the database accordingly

Please feel free to forward this email to all your contacts who may be interested in or benefit from iMENTORS database. If you are not sure who that person could be, we suggest you forward it to someone managing or working with research or with support to research.

You can also respond to the sender of this email.

We really hope you appreciate the website, the database and the related functions that iMENTORS project has created. We would also like to point out that iMENTORS is fully compatible with International Aid Transparency Initiative standards (IATI standards)

If you have any comments please respond to the sender of this email or send an email to communication@iMENTORS.eu.

Regards,

Athina Vrakatseli

B. Appendix 2. Communication regarding validation of RRENs and NRENs

Cc [Nils Jensen](#) , [David Silva Parra](#) 

Date 2014-06-20 16:53

- [TENET data collection spreadsheet.xlsx](#)

Dear John,

An updated spreadsheet is attached.

Regards
Duncan

2.

Subject RE: ASREN in iMENTORS database

From [Ola Samara - ASRENorg](#) 

To [John Owuor](#) 

Cc [Salem Alagtash](#) 

Date 2014-06-15 17:50

- [Arab NRENs Contacts 11June14.xlsx](#)

Dear Mr. John,

First, apologies for late reply, as you said, busy time always!

Thank you for contacting ASREN to support you in iMENTORS project. I find it easier to share our NRENs contact list for the north Africa region ;). Now, you can contact each NREN directly.

Commenting on your 3rd point, all up to date members are listed on the website.

Please let me know if you need more assistance and/or information.

Best regards,

Ola Samara

Administrative Officer

Infrastructure Deployment Engineer

Arab States Research and Education Network - ASREN

P.O.Box: 921100 Amman 11192 Jordan

Tel: +9626 5100900 Ext.: 4304

Fax: +9626 5100901

Email: osamara@asrenorg.net

Website: www.asrenorg.net

-----Original Message-----

From: John Owuor [mailto:achwal@dsv.su.se]
Sent: Monday, June 09, 2014 12:54 PM
To: ASREN INFO
Subject: ASREN in iMENTORS database

Dear Sir/Madam,

I am John and I work for Stockholm University on an ICT project called iMENTORS , [http://www.iMENTORS .eu](http://www.iMENTORS.eu).

iMENTORS is mapping e-infrastructures in Africa to create the most comprehensive data warehouse on ICT and improve international aid coordination.

I am aware you are extremely busy and you barely have time to spare, but I would really like your help completing missing information and validating the data we have on ASREN and the associated member NRENs.

I would like your support in any of the following ways, which will best work for you.

1. Mail the spreadsheet to key individuals in each NREN, requesting them to send feedback directly to me.
2. Help me with the current contact details of key individuals from each WACREN member NREN. I will then contact them individually to update relevant data.
3. Are there any new ASREN members not yet listed on your website.

Thank you very much for your support.

Sorry for the inconvenience this request might cause you

Yours sincerely

John Owuor

Subject Re: UbuntuNET in iMENTORS database

From [Tiwonge Banda](#) 
To [John Owuor](#) 
Cc [Nils Jensen](#) , [David Silva Parra](#) 
Date 2014-06-11 16:18

- [UbuntuNET data collecti...eadsheet -tmb edits.xlsx](#)

Dear John,

Many thanks. I have updated the information based on what I know. This includes contacts for all NRENs. You can contact them directly to provide the information. I have also corrected the spelling for UbuntuNet from UbuntuNET.

Best wishes,
Tiwonge

C. Appendix 3 Critical success factor through key stakeholders

An example of supercomputers

Cc [Nils Jensen](#) , site-directors@africa-grid.org 

Date 2014-09-18 14:11

Dear John,

I'm putting the Africa-Arabia Regional Operations Centre site directors in cc. They can verify or expand on the information below.

My apologies for the delay in getting back to you; we are in a development sprint at the moment which is taking a high priority.

So far, we have the information on the following High Performance Computing facilities. Do you know of any recent additions of Supercomputers across the continent that we might have missed?

Please see information below :

1. The Ghana-India Kofi Annan Centre of Excellence in ICT (AITI-KACE) High Performance Computing facilities - Ghana

this one is new to me ! Thanks.

2. Param Serengeti (HPC) at the Centre of Excellence in ICT in DIT – Tanzania
Still operational

3. iHUB High Performance Computing (iHUB) – Kenya
Yes, last I checked (March), it was still idling, but exists

4. ILRI Research Computing – Kenya

This is full of workload and highly subscribed.

5. High Performance Computing, Meraka Institute, South Africa
Ditto

6. Sudan – Details unavailable
yes, I don't have any information.

7. Ethiopia – Details unavailable

There were murmurings in Ethiopia, but the contact I had has moved to Germany, unfortunately.

8. Egypt – Details unavailable (Tried to contact the University, with no luck)

There is a pretty big centre in ASRT that belongs to the Egyptian Network for High-Energy Physics (ENHEP). It's registered in the GOCBD and we are monitoring it in the ROC. See www.enhep.eg.net

Apart from that, we have a small site in Nairobi at the University of Nairobi, but it's not ready for use yet.

There is some activity in Zambia, connected with ei4Africa, but no concrete details yet. We also have two sites registered in Senegal, but they are not registered in our ROC (they are in NGI_France for some reason) and monitoring seems to be telling us that they are not operational. I will follow up on this.

Since you include Egypt and Sudan, I propose that you include as well the sites in Morocco and Algeria:

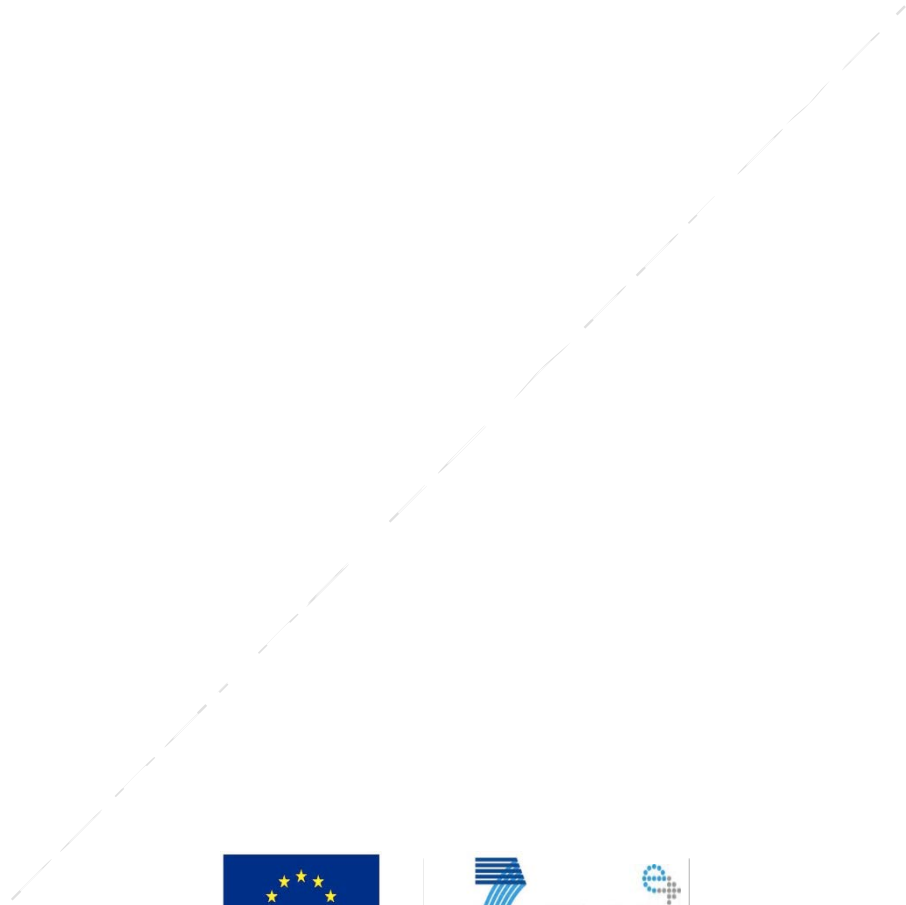
<http://www.grid.arn.dz/>

<http://www.magrid.ma/>

Let me know if I can provide you with more detailed information.

Thanks !

Bruce



iMENTORS is a project co-funded by the European Commission's DG CONNECT under the 7th Framework Programme.

www.iMENTORS.eu

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