Technical Assistance to Tanzania Local Government Infrastructure and Transportation Research Centre (Interim Phase)

Progress Report 3: Knowledge Management Study

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Cover photo: President’s Office, Regional Administration and Local Government in Dodoma, Tanzania

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Abstract
The President’s Office, Regional Administration and Local Government (PO-RALG) of Tanzania, is in the process of setting up a Local Government Infrastructure and Transportation Research Centre (LoGITReC) in Dodoma. One of the capacitation initiatives outlined in the LoGITReC Strategic Plan is the establishment of an Information Centre. This study was undertaken to determine the organisational expectations for the proposed Information Centre and to consider the services, associated resources and infrastructure required to meet these expectations. In addition knowledge management principles were applied in support of strategic initiatives to establish mechanisms for creating greater visibility of LoGITReC and for disseminating and demonstrating its achievements.

The study consisted of a review of relevant material including the draft LoGITReC Strategic Plan, AfCAP technical assistance progress reports and knowledge management publications; an appraisal of internal DID processes and procedures pertinent to information generation, analysis, storage and dissemination and; a series of in depth interviews with stakeholders from DID and PO-RALG to gain an understanding of stakeholder expectations.

Study results are presented according to a knowledge management framework focused on three highly interdependent initiatives, i.e. the enhancement of research capability by strengthening the knowledge creation and evaluation processes of the organisation; optimisation of knowledge dissemination to stakeholders and the enablement of a knowledge sharing culture; and enablement of the core functions of the organisation through good data and information management procedures as well as the effective management of the organisational knowledge base.

Specific recommendations in support of these knowledge management initiatives include:

- Establishment of a library and information service to negotiate and provide access to reliable information resources; to provide specialist intermediary services; to preserve and make accessible the intellectual property created by the Research Centre; and to facilitate knowledge exchange, scientific interaction and networking
- Provision of virtual collaboration platforms in support of collaborative research activities
- Development of internal and external web based knowledge portals to enhance knowledge dissemination, both inside as well as outside the organisation
- Establishment of and participation in communities of practice to build relationships and networks across service and disciplinary boundaries and to increase knowledge through case-based learning and inter-professional knowledge exchange
- Formulation of a publication strategy to increase the visibility and impact of the organisation’s research output
- Strengthening and fostering an organisational culture of knowledge creation and sharing
- Enhancement of records management activities to efficiently manage, store and retain data, documents and other forms of information (records) for specific periods of time and thus ensuring compliance with applicable legislation; corporate governance; long term access to records; and proper project and contractual management.

The study is concluded with a high level implementation schedule for these activities.

Key words
Road Research Centre, knowledge management, capacity building, Research & Development, information centre, knowledge dissemination
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Safe and sustainable transport for rural communities

AfCAP is a research programme, funded by UK Aid, with the aim of promoting safe and sustainable transport for rural communities in Africa. The AfCAP partnership supports knowledge sharing between participating countries in order to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources. AfCAP is brought together with the Asia Community Access Partnership (AsCAP) under the Research for Community Access Partnership (ReCAP), managed by Cardno Emerging Markets (UK) Ltd.

See www.afcap.org
Acronyms

AfCAP : Africa Community Access Partnership
CMRL : Central Materials Research Laboratory
COP : Community of Practice
COTUL : Consortium of Tanzania University and Research Libraries
CSIR : Council for Scientific and Industrial Research
DAHRM : Division of Administration and Human Resources Management
DFID : Department of International Development
DICT : Division of Information and Communication Technology
DID : Division of Infrastructure Development
EDMS : Electronic Document Management System
EFL : Electronic Information for Libraries
ICT : Information and Communication Technology
IEC : International Electrotechnical Commission
INASP : International Network for the Availability of Scientific Publications
ISO : International Organisation for Standardisation
IT : Information Technology
KLC : Knowledge Life Cycle
LGA : Local Government Authority
LGTI : Local Government Training Institute
LMS : Library Management System
LoGITReC : Local Government Infrastructure and Transportation Research Centre
NGO : Non-Governmental Organisation
OPAC : Online Public Access Catalogue
OSF : Open Science Framework (OSF)
PO-RALG : President's Office, Regional Administration and Local Government
ReCAP : Research for Community Access Partnership
SHEQ : Safety, Health, Environment and Quality
TRL : Transport Research Laboratory
VPN : Virtual Private Network
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1 Executive summary

The President’s Office, Regional Administration and Local Government (PO-RALG) of Tanzania, is in the process of setting up a Local Government Infrastructure and Transportation Research Centre (LoGITReC) in Dodoma. One of the capacitation initiatives outlined in the LoGITReC Strategic Plan is the establishment of an Information Centre. This study was undertaken to determine the organisational expectations for the proposed Information Centre and to consider the services, associated resources and infrastructure required to meet these expectations. In addition knowledge management principles were applied in support of strategic initiatives to establish mechanisms for creating greater visibility of LoGITReC and for disseminating and demonstrating its achievements.

The study consisted of a review of relevant material including the draft LoGITReC Strategic Plan, AfCAP technical assistance progress reports as well as various knowledge management publications; an appraisal of internal DID processes and procedures pertinent to information generation, analysis, storage and dissemination and; a series of in depth interviews with stakeholders from DID and PO-RALG to gain an understanding of stakeholder expectations.

1.1 Current status

The 3-day site visit to Dodoma during June 2016 afforded the opportunity to assess the PO-RALG and DID infrastructure, procedures and working milieu as environment in which LoGITReC will be established.

The PO-RALG ICT infrastructure is well established. The Division of Information and Communication Technology (DICT) has approximately 30 staff members in Dodoma and ICT officers in the regional offices. It supports the IT requirements of all PO-RALG divisions and consequently consists of IT specialists, accountants, statisticians and staff with educational backgrounds. The linked support structure between PO-RALG, the regional and district offices provide, via VPN, the two systems critical to expenditure and revenue collection. The two PO-RALG buildings in Dodoma are equipped with a reasonable ICT infrastructure and a department-wide network. One pass word protected file server, which is regularly backed up to an offsite recovery centre, is shared between the two buildings. It is not accessible by staff in the district or regional offices but some district offices have their own file servers.

The Dodoma main data centre has application, web and database servers in place with software monitoring network performance. Both buildings have working Wi-Fi and internet connectivity. The Government e-mail system is used for official communication. File sharing with regional offices is not currently possible. PO-RALG does not currently have an electronic document management system (EDMS). DICT staff is however working on an OS version of Microsoft SharePoint which will provide an EDMS with a document library; an Intranet solution; and task assignments and workflows. An electronic file tracking systems is also being developed for the Registry section. PO-RALG has an external website (www.tamisemi.go.tz) but an internal website/Intraweb is still under development. It is foreseen that LoGITReC and the Central Materials Research Laboratory will have their own file servers.

The Central Materials Research Laboratory (CMRL) was established on the premises of the Municipal Council in Dodoma as temporary measure until the new LoGITReC building is completed. The CMRL will support LoGITReC research activities and conduct quality control testing of materials used in Local Government road works. The laboratory will also operate as a reference laboratory for
the regional materials laboratories. The laboratory has been fitted out with basic equipment required for the testing of soils, gravels and aggregate.

At present the laboratory has no IT infrastructure. This is being planned in conjunction with DICT staff who is aware of the need to incorporate laboratory test results into the central Road Maintenance Management System. The necessary operational systems for the laboratory to operate optimally are also not yet in place and protocols for the handling and storage of samples and test results are urgently required.

Presently there are two existing PO-RALG libraries, a smaller library in the Head Quarters building in Dodoma and a larger library providing services to the staff and students of the Local Government Training Institute in Hombolo.

The PO-RALG Library in Dodoma supports all PO-RALG divisions. The library has a staff compliment of two but it is under resourced and staff consequently has to rely on the Internet to obtain information and publications required by PO-RALG employees.

The Local Government Training Institute (LGTI) library in Hombolo provides information services to the Institute’s staff and students. The library is housed in a modern state of the art building which provides ample space for students to work and study in. It is headed by a librarian supported by 10 library assistants. The library does not subscribe to any electronic journal platforms and internet connectivity is problematic from time to time. Of particular interest to this study is that the Institute offers certificate and diploma courses in Records Archives and Information Management.

It is foreseen that the proposed LoGITReC Information Centre will serve the technical information needs of the LoGITReC researchers, PO-RALG and the roads sector of Tanzania as a whole. A temporary location for the Information Centre has been identified, adjacent to the CMRL. The floor area is 3.15m x 3.45m. The necessary IT and basic infrastructure should be in place before the Information Centre can become operational.

In terms of records management, PO-RALG has a well administered centralised Registry with standardised procedures for all its Divisions. The Registry manages all correspondence (incoming and outgoing; paper and electronic), financial records, HR files as well as project files. It consists of two sections, the Open Registry and the Confidential Registry. Staff members implement records management principles in accordance with the training course offered by the LGTI. An electronic registry system is currently being developed by DICT for the PO-RALG Registry.

1.2 Knowledge management framework and initiatives

Study results are presented according to a knowledge management framework focused on three highly interdependent initiatives, i.e. the enhancement of LoGITReC research capability by strengthening the knowledge creation and evaluation processes of the organisation; optimisation of knowledge dissemination to stakeholders and the enablement of a knowledge sharing culture; and enablement of the core functions of the organisation through good data and information management procedures as well as the effective management of the organisational knowledge base.

Knowledge management activities considered in support of the abovementioned initiatives are summarised below:

• Establishment of an Information Centre to provide library and information services

The Information Centre will be a repository for, inter alia, text books, local and international conference proceedings and journals, research reports, technical guidelines, norms and standards.
Initially information resources will focus on low-volume district roads along with urban roads, however, resources and services will be expanded as the spectrum of LoGITReC research activities is broadened. To afford its distributed client base easy of access to its information resources it is suggested that the collection development strategy should focus on electronic products which should be negotiated for the entire PO-RALG Ministry through participation in existing national and international library consortia. In terms of skills development and service improvement it is advisable that the three PO-RALG libraries work closely together.

The Information Centre will be required to maintain a grey literature collection consisting of relevant reports and publications from agencies other than LoGITReC such as other Government departments (e.g. the Ministry of Works and Ministry of Transport) and PO-RALG agencies, reports on investigations originating from the districts as well as publications from national, regional and international research centres.

Information specialist intermediary services focused on the detailed scientific, business and management information requirements of the LoGITReC staff as well as researcher enablement through training should be provided.

Information Centre staff will be responsible for the preservation of and provision of access to the intellectual property created by the LoGITReC through services focused on the management of research records. As such it will establish and maintain a Research Outputs Database which will act as a repository for all research and consultancy project outputs. Selected publications captured in the database should be exported to a web-based institutional repository through which LoGITReC publications can be made accessible to external stakeholders.

The use of ‘knowledge spaces’ should form an important part of the Research Centre’s knowledge management strategy as the physical work environment can encourage knowledge sharing practices, internal dialogue, networking and science communication. Dedicated spaces should therefore be provided as part of the Information Centre where LoGITReC staff (and external stakeholders) can meet, think together, have conversations and dialogues, collaborate and promote science and research on both a formal and informal basis. To ensure optimum utilisation of these spaces the Information Centre staff will be responsible for the conceptualisation, planning, and implementation of an events plan and the scheduling of talks, lectures and presentations by LoGITReC staff and external speakers on a regular basis.

An Information Centre Manager should be appointed in Year 1 to establish, manage and operate the Information Centre. As the demand for information increases, both from the perspective of PO-RALG and LoGITReC researchers, an Information Specialist could be appointed at a later stage. The Information Centre will be highly reliant on the ICT department for both systems implementation and support. Access to the internet with sufficient bandwidth and a reliable supply of electricity is an essential prerequisite for a sustainable service. To support the proposed Information Centre service streams the infrastructure needs to make provision for a Library Management System, database and institutional repository software.

- **Provision of virtual collaboration platforms in support of collaborative research activities**

Research is increasingly done collaboratively in teams, both within the organisation and between organisations, and is often interdisciplinary in nature. It is foreseen that LoGITReC research projects will be achieved through a combination of delivery mechanisms involving external stakeholders such as academic institutions, consultants and other national and international research centres. While the final research outputs of these collaborative research projects will be captured in the Research
Outputs Database, access to web based collaboration platforms will be required to allow file sharing and collaborative report writing between team members during project duration.

- Development of internal and external web based knowledge portals to enhance knowledge dissemination, both inside as well as outside the organisation

Both internal and external web portals are required. An intraweb will serve as a portal for staff to find organisational information and to learn about developments and news about the organisation. It will afford staff quick and efficient access to the information and operational systems. The external website will provide a snapshot of the organisation to the outside world and will contribute to its knowledge dissemination efforts. A sustainable, easily accessible knowledge portal providing a clear description of the Research Centre’s purpose and services will assist it in building a strong reputation in the transport sector. It will also make research output accessible to external stakeholders through the institutional repository and thereby support research uptake. As such it is an important marketing and communication tool for the organisation.

- Establishment of and participation in Communities of Practice

A Community of Practice (COP) is useful for building relationships and networks across service and disciplinary boundaries, increasing knowledge through case-based learning and inter-professional knowledge exchange and providing space for reflective practice. LoGITReC would benefit from the establishment and fostering of COPS as these networks of research peers and stakeholders facilitate low-threshold ways of exchanging experience and of lessons learnt between the key target groups. In addition networks can enrich research through discussion and interaction between peers. They also serve the purpose of getting more research evidence exposed in order to promote research uptake through transferring, replicating and identifying policy impacts of research.

- Formulation of a publication strategy to increase the visibility and impact of LoGITReC research output

To establish LoGITReC as a reputable research organisation and to promote knowledge dissemination and uptake its researchers should be supported to publish their research in high standing, peer-reviewed journals and to present their research at conferences. Publishing further provides the opportunity to influence policy and practice through academic channels. LoGITReC should however ensure a balance between academic publication and information intended for decision makers. The organisation’s communication strategy should also consider newsletters and website content in which research outputs are transformed into targeted information products such as technical briefs synthesising best practice in key areas; policy briefs targeted at decision makers in which the policy implications of research are documented; and abstracts summarising new knowledge.

- Strengthening and fostering an organisational culture of knowledge creation and sharing

The organisational culture of LoGITReC will play a crucial role in the successful implementation of its knowledge management initiatives as it can either hamper or empower knowledge creation and sharing activities. A knowledge culture in the organisation should be promoted through management attention, compliance requirements and incentives to share.

- Records management activities

LoGITReC will have a responsibility to efficiently manage, store and retain data, documents and other forms of information (records) for specific periods of time and thus ensuring compliance with
applicable legislation; corporate governance; long term access to its own records; and proper project
and contractual management. This will require a sustainable records management system for both
records relevant to its research and consulting services as well as to its support services.

The Research Outputs Database will be used to record research and consultancy project outputs and
related material such as project proposals, progress reports, research reports, learning briefs, safety
documents, laboratory reports, technical manuals and guidelines as well as information published
externally by LoGITReC staff, e.g. conferences papers and posters, journal articles, books and book
chapters, and training material. In addition to file servers, which are useful for day to day research or
laboratory activity, an Electronic Document Management System (EDMS) is proposed for research
document and content management, collaborative writing, version and access control. Other project
specific records such as risk assessments; contracts and proof of delivery of contracts; project
management plans; relevant protocols and standards; research ethics approvals; equipment
calibration reports and operating procedures; laboratory workbooks; project finances and records of
client interaction should be stored in project files (either in paper format, e.g. arch lever files, or
electronic on file servers). Project files could be managed by the Registry function of the
organisation. Research data sets created as part of the research activity form part of the research
outputs of the Research Centre and, as such, it is important for on-going research as well as
verification of research results that these data sets be preserved along with the context giving
documentation, research reports and results.

LoGITReC’s records management plan and procedures should also make provision for records
relevant to the its regulatory framework (policies & procedures); organisation and control (executive
matters, strategic and operational plans, SHEQ records); as well as records created by support
services such as its Legal, HR and Finance departments. The associated infrastructure required
includes the individual departmental systems as well as a corporate archive and correspondence
registry. It is recommended that the electronic registry system currently being developed by DICT for
the PO-RALG Registry should be implemented to manage LoGITReC’s Registry function.

1.3 Implementation schedule and resource requirements

The proposed implementation schedule is discussed in detail in Section 7. The degree to which the
proposed knowledge management initiatives are put into practice will be determined by
organisational priorities as well as enabling factors such as funding, ICT infrastructure and support,
along with staff capacity and skill levels. The proposed high level schedule for the implementation of
recommended knowledge management initiatives is available in graphic format in Annex C. This
implementation schedule was created with a fully operational LoGITReC in mind. This is not
currently the case. Furthermore, as the new LoGITReC building has not yet been conceptualised or
built the knowledge management implementation plan for LoGITReC will have to provide for a
phased approach which should take into consideration its temporary location as well as its final, yet
to be built, premises.

- Start-up actions

A temporary location for the Information Centre was allocated adjacent to the CMRL on the
premises of the Municipal Council in Dodoma. Start-up actions for the establishment of the
Information Centre and its services will entail the following: the installation of ICT infrastructure in
the temporary location of the Information Centre and CMRL; the confirmation of the Information
Centre mandate; the appointment of the Information Centre Manager to conceptualise and
establish the service, its infrastructure, systems, policies and procedures; the planning of the various
physical spaces required by knowledge workers in the new LoGITReC building; procurement of furniture, equipment and shelving for the room allocated to the temporary Information Centre; provision of individual manual library systems to address the required standard technical library services; and provision of information resources and database functionality.

LoGITReC records relevant to its research and consulting services as well as to its support services will need to be managed and an interim **records management** solution is proposed.

The infrastructure required to establish the interim Information Centre and records management functions is provided in graphical format in **Annex D**.

- **Medium to longer term actions**

The expected growth in LoGITReC research activities and staff compliment as well as the planning and occupation of its new building will require the following additional actions: the planning and implementation of a comprehensive **content management** solution aimed at the integration of all LoGITReC systems, databases and procedures; optimisation of the PO-RALG knowledge portals and the implementation of a publication strategy; provision of electronic journal platforms and databases and the implementation of an online Library Management System; and the establishment of a sustainable records management system for LoGITReC.

Institutional setup will significantly influence the implementation plan, i.e. should LoGITReC become a semi-autonomous agency it will no longer be fully integrated in DID and it will therefore not be able to rely on the support services and infrastructure provided by PO-RALG. The knowledge management implementation plan will then have to be revised accordingly.
2 Introduction

The Division of Infrastructure Development (DID) in the President’s Office, Regional Administration and Local Government (PO-RALG) of Tanzania, is in the process of setting up a Local Government Infrastructure and Transportation Research Centre (LoGITReC) in Dodoma. The LoGITReC Strategic Plan\(^1\) for implementation of its research priorities addresses, amongst others, the **capacitation of LoGITReC in terms of human resources and research infrastructure** as well as establishing mechanisms for creating greater visibility of LoGITReC and for sharing/disseminating/demonstrating its achievements. This study aims to support both strategic initiatives as described below.

The **capacitation of LoGITReC in terms of human resources and research infrastructure** initiatives outlined in the Strategic Plan includes the establishment of an Information Centre. The contribution that information centres (libraries) make to institutional research performance is well documented\(^2\):

- **Good libraries help institutions to recruit and retain top researchers.** There is global competition for top researchers, and institutional reputation is key to attracting them. Many factors contribute to a good institutional reputation, including the quality, nature, and extent of the library’s collections, its staff and the services they provide.
- **Libraries promote and exploit new technologies and new models of scholarly communications.** Libraries are critically important in helping researchers to exploit the full benefits and opportunities of the networked world, including such developments as open access and social media.
- **Repositories increase the visibility of the institution and raise its research profile.** In general libraries manage institutional repositories which store and make available institutional assets such as research publications. These repositories increase the visibility of the institution’s outputs and thereby raise its research profile.
- **Outward-facing libraries contribute to institution-wide initiatives.** In recent years, many libraries have demonstrated that they can seize opportunities to help institutions respond to changes in the research environment. Recent research data management initiatives undertaken by libraries are but one example.
- **Specialist staff work in partnership with research departments.** Information specialists work in partnership with researchers and act as consultants. This contributes to an increased understanding of researchers’ needs and subsequent improved service delivery.
- **Dedicated spaces provide a better work environment for researchers.** For some researchers the physical library is valued as a place to work and study, particularly if they do not have their own departmental space or if they rely for their research on printed or manuscript content held in the library.
- **Easy access to high-quality content is a key foundation for good research.** Access to high-quality content remains crucial to research, and its value is recognised by researchers and senior managers alike.

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\(^1\) Magafu F and Verhaeghe B. 2015. *Technical assistance to PMO-RALG to develop road research capacity in Dodoma: draft road research strategic plan for first five years in operation*, Project AfCAP/TAN2010A, Cardno Emerging Markets (UK).

This study will consider the services and associated resources and infrastructure of the future LoGITReC Information Centre.

Knowledge management principles will be applied in support of strategic initiatives to establish mechanisms for creating greater visibility of LoGITReC and for sharing/disseminating/demonstrating its achievements.

In the knowledge based economy, research centres, whether industrial or public, play a fundamental role. In terms of knowledge management, these organisations have a special status, because their production is knowledge and only knowledge. The knowledge capital they accumulate in their activities therefore is a strong strategic issue and the management of these assets has become crucial3.

Numerous academic definitions for knowledge management are available, however, in general knowledge management refers to any initiative that focuses on knowledge as primary resource of the organisation, and attempt to make it more productive by increasing access to it, developing it, capturing it in databases, or applying it to enhance processes, products, and services4. Knowledge management is a managerial activity aimed at enhancing the organisation's capability of creating and integrating its information and knowledge in support of its business strategy. It refers to the organisational optimisation of knowledge to achieve enhanced performance, increased value, competitive advantage, and return on investment, through the use of various tools, processes, methods and techniques5.

The above is in line with the definition of knowledge management adopted by ReCAP for the purpose of its Knowledge Management and Communications Strategy, Sep 2015: ‘Knowledge management is the systematic management of an organization’s knowledge assets for the purpose of creating value and meeting tactical & strategic requirements; it consists of the initiatives, processes, strategies, and systems that sustain and enhance the storage, assessment, sharing, refinement, and creation of knowledge’6.

Knowledge is produced and optimised in organisations through individual and shared processes which can be represented by the following Knowledge Life Cycle (KLC), a simplification of the framework originally developed by McElroy and Firestone7.

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The above is useful to help organisations focus on relevant knowledge management interventions (initiatives, tasks and activities) required to manage the various knowledge processes (creation, evaluation, dissemination, storage and application) as everything done under the banner of knowledge management should support the KLC. Knowledge management interventions should therefore be focussed on the optimisation of:

- **Knowledge creation** in response to problem identification or detected knowledge gaps through knowledge generating activities such as individual/group learning; research activity and/or the customisation of existing knowledge; and information acquisition
- **New knowledge evaluation** through peer review or management approval structures
- **Dissemination** of new knowledge through publishing, broadcasting, teaching and sharing
- **Knowledge storage** in the organisational knowledge base which is held ‘subjectively’ in the minds of individuals and groups and ‘objectively’ in recorded or expressed form
- **Knowledge application** or use in the organisational environment.

These are the knowledge management topics and issues that the study will consider and make recommendations towards. The establishment of a fully functional research centre will require concerted managerial activity aimed at enhancing LoGITReC’s capability of creating, managing and integrating its information and knowledge in support of its business strategy.
3 Study process

AfCAP 2 is providing technical support to the DID, PO-RALG, to achieve its objective of setting up a transportation and infrastructure research centre in Dodoma. The purpose of this assignment is to assist with the mapping of the knowledge management requirements of LoGITReC and to schedule recommended activities in support of the establishment of a LoGITReC information centre.

The study consisted of a review of relevant material including the draft LoGITReC Strategic Plan, AfCAP progress reports and knowledge management publications; an appraisal of the internal DID processes and procedures pertinent to information generation, analysis, storage and dissemination; and a series of in depth interviews with stakeholders from DID and PO-RALG to gain an understanding of:

- stakeholder expectations in terms of the client groups and the service scope of the proposed Information Centre
- the known information requirements of the future users of the Information Centre
- policy makers and stakeholders that would be influenced by LoGITReC research outcomes
- how research outcomes will be translated for and disseminated to specific target audiences
- the knowledge culture of the organisation
- required databases (e.g. of research publications)
- similar functions (library / information services; archival and records management services) and relevant policies already existing within PO-RALG
- the ICT infrastructure and support available within DID, including internet connectivity; existing and planned internal and external websites; content management solutions; and virtual collaboration platforms.

Abovementioned interviews took place in Dodoma during the week of 13 June 2016. A list of persons consulted is attached to this report as Annex A.

The results of this assignment will feed into the Terms of Reference of a 12 month technical assistance project aimed at making progress with priority activities for the establishment and operationalisation of LoGITReC and at achieving the key performance indicator targets set out in its draft Strategic Plan for the first year of operation. This interim phase of technical assistance is intended as a bridge between the initial formulation stages of LoGITReC and longer term technical assistance that is expected to be provided under AfCAP.
4 Present situation

The 3-day site visit to Dodoma during June 2016 afforded the opportunity to assess the PO-RALG and DID infrastructure, procedures and working milieu as environment in which the proposed LoGITReC will be established. It also initiated the mapping of LoGITReC knowledge management requirements and the determination of general expectations for its proposed Information Centre.

PO-RALG has two buildings in Dodoma, an office in Dar es Salaam as well as regional and district offices. The two PO-RALG buildings visited in Dodoma are well maintained and equipped.

4.1 ICT infrastructure

PO-RALG has a well-established Division of Information and Communication Technology (DICT) with approximately 30 staff members in Dodoma and ICT officers in the regional offices. DICT staff has to support the IT requirements of all PO-RALG divisions and consequently consists of IT specialists, accountants, statisticians and staff with educational backgrounds. The linked support structure between PO-RALG, the regional and district offices provide, via VPN, the two systems critical to expenditure and revenue collection.

The two PO-RALG buildings in Dodoma are equipped with a reasonable ICT infrastructure and a department-wide network. One file server is shared between the two buildings. The file server is password protected and regularly backed up to an offsite recovery centre. (A real-time replication facility will be in place soon.) Once logged in, a user has access to all files stored on the file server. The Dodoma file server is accessible by staff in the two PO-RALG buildings but not by those in district or regional offices. Much information is, however, stored on individual computers without proper back up procedures in place. PO-RALG does not currently have an electronic document management system (EDMS). Some district offices have their own file servers. The Dodoma main data centre also has application, web and database servers in place with software monitoring network performance.

Both buildings have working Wi-Fi and internet connectivity. The Government e-mail system is used for official communication. (It has a 5MB restriction on file size applicable to outgoing mail.) File sharing with regional offices is not currently possible and documents such as budget and progress reports are transferred via e-mail and stored on individual computers.

DICT staff is currently working on an OS version of Microsoft SharePoint which will provide an EDMS with a document library; an Intranet solution; and task assignments and workflows. An electronic file tracking systems is also being developed for the Registry section. PO-RALG has an external website (www.tamisemi.go.tz) but an internal website/Intraweb is still under development.

DICT has a well-equipped training centre in place which is available for use by all PO-RALG divisions as shown in Figure 2.

It is foreseen that LoGITReC and the Central Materials Research Laboratory will have their own file servers. DICT staff is aware of the need to incorporate laboratory test results into the central Road Maintenance Management System.
LoGITReC established a Central Materials Research Laboratory (CMRL) on the premises of the Municipal Council in Dodoma as temporary measure until the new LoGITReC building is completed. The CMRL will support LoGITReC research activities and conduct quality control testing of materials used in Local Government road works. The laboratory will also operate as a reference laboratory for the regional materials laboratories. The laboratory has been fitted out with basic equipment required for the testing of soils, gravels and aggregate. It is expected that all systems and processes implemented in the laboratory are such that it will operate as an accredited laboratory. The current staff complement consists of a Laboratory Manager and five civil engineering technicians.

At present the laboratory has no IT infrastructure. This is being planned in conjunction with DICT. The necessary operational systems for the laboratory to operate optimally are also not yet in place and protocols for the handling and storage of samples and test results are urgently required. Currently samples are kept for 6 months but samples for LoGITReC research projects will have to be stored for longer periods.
Typical information resource requirements of the laboratory staff include Tanzanian test methods; TANROADS Central Materials Laboratory procedures and testing manuals; national and international standards; international journals, e.g. Elsevier journals; manuals for the design of different infrastructure; and guidelines, e.g. from TRL.

4.3 PO-RALG libraries

Presently there are two existing libraries within PO-RALG, a smaller library in the Head Quarters building in Dodoma and a larger library providing services to the staff and students of the Local Government Training Institute in Hombolo.

The PO-RALG Library in Dodoma falls under the Government Communication Unit. As is reflected in its information resources, it supports all PO-RALG divisions. The library has a staff compliment of two: a head librarian and an assistant librarian. The library does not have an online catalogue but instead uses a Microsoft Access database to manage its collections. Records older than 2007 are recorded in a paper based Library Accession Register.

Due to space limitations only few PO-RALG publications are stored. Reports from the regions, districts and councils are submitted to the library on an ad hoc basis but the Government records store/archive keeps most important records. Inter library loans are only arranged with the Local Government Training Institute and not with other university or research libraries. Due to organisational structure, the annual budget assigned to the library does not always filter through to the library. The library is therefore under resourced and staff consequently has to rely on the Internet to obtain information and publications required by PO-RALG employees.

Figure 4: PO-RALG Library in Head Office, Dodoma

The Local Government Training Institute (LGTI) library in Hombolo supports the information requirements of the Institute’s staff and students. The Institute is the leading training organisation for PO-RALG. It was established to serve as practical oriented professional centre for demand driven training, research, advisory and consultancy in the field of Local Government Finance,
Administration and Management\textsuperscript{8}. The Institute also facilitates and approves all other training courses offered to the Ministry. The Institute has three campuses with the main campus in Hombolo accommodating 2000 students. The Kigwe campus has 150 students and the Dodoma Town campus 335 students.

The Acting Rector, Dr Mpamila Madale, indicated the need for e-Learning systems. The Institute will also benefit from the establishment of an institutional repository to make its research publications available to stakeholders.

The Institute’s Library is housed in a modern state of the art building which provides ample space for students to work and study in. It is headed by a librarian supported by 10 library assistants. The library does not subscribe to any electronic journal platforms and internet connectivity is problematic from time to time. Students seldom have their own computers and the Institute is looking for NGO sponsorship in this regard.

Of particular interest to this study is that the Institute offers certificate and diploma courses in Records Archives and Information Management.

\textbf{Figure 5: The Local Government Training Institute Library, Hombolo campus}

It is foreseen that the proposed \textbf{LoGITReC Information Centre} will serve the technical information needs of the LoGITReC researchers, PO-RALG and the roads sector of Tanzania as a whole. A temporary location for the Information Centre has been identified, adjacent to the CMRL. The floor area is 3.15m x 3.45m. The necessary IT and basic infrastructure should be in place before the Information Centre can become operational.

The January-March 2016 progress report on the AfCAP technical assistance to PO-RALG\textsuperscript{9} indicated that an information specialist from DICT will be appointed to head the Information Centre. It should however be noted that, while the head of the Information Centre should have advanced computer

\textsuperscript{8} \url{http://www.lgti.ac.tz/}

skills, ideally the Information Centre should be headed by an incumbent with a background in Library and Information Science and not in Information Technology. (See Section 6.1.2.)

The Information Centre will be a repository for, inter alia, text books, local and international conference proceedings and journals, research reports, technical guidelines, norms and standards. Initially Information Centre resources will focus on low-volume district roads along with urban roads, however, resources and services will be expanded as the spectrum of LoGITReC research activities is broadened. Annex B, a list of suggested initial information resources, was compiled based on discussions with a number of Dodoma municipal engineers and DID technical staff. To afford its distributed client base ease of access to its information resources it is suggested that the collection development strategy of the Information Centre should focus on electronic products.

Figure 6: Temporary location for the LoGITReC Information Centre

Subscription to electronic databases and platforms should not be negotiated for the LoGITReC Information Centre only. Rather, it would be to the advantage of all PO-RALG staff if electronic access is negotiated for the entire Ministry. Publisher licensing agreements might exclude municipal engineers from access, however, these engineers should be able to utilise the e-resources on a library ‘walk-in’ basis. User training on the functionalities of the electronic platforms and databases is essential. The DICT computer training centre would be ideal for such training sessions.

In terms of skills development and service improvement it is advisable that the three PO-RALG libraries work closely together. Staff from the three libraries will also benefit from closer interaction with their university counterparts as well as from active participation in library association and consortium activities. The faculty libraries of the University of Dodoma have made significant progress in the provision of electronic resources and services as well as with the establishment of institutional repositories and much can be learned from them. DID staff in particular will gain from stronger ties with the Faculty Library of the College of Informatics as this library is currently also providing services to the College of Earth Science which offer engineering subjects. The LGTI will also be able to gain first-hand knowledge from the University on e-Learning systems.
4.4 Records management

PO-RALG has a well administered centralised Registry with standardised procedures for all its Divisions. The Registry falls under the Division of Administration and Human Resources Management (DAHRM). The Registry manages all correspondence (incoming and outgoing; paper and electronic), financial records, HR files as well as project files. It consists of two sections, the Open Registry and the Confidential Registry. Registry staff members implement records management principles in accordance with the training course offered by the LGTI.

An electronic registry system is currently being developed by DICT for the PO-RALG Registry. Key features include:

- Recording of incoming and outgoing mail
- Electronic file tracking linked to the biometric attendance file
- Bar code scanning and reading
- Management of file view rights
- Automatic SMS notification for overdue files
- Various management report options

It is foreseen that the electronic system will be adopted by other Government ministries and that training will be provided by the LGTI.

It is recommended that the electronic registry system currently being developed by DICT for the PO-RALG Registry should also be implemented to manage the LoGITReC Registry function.
5 Proposed knowledge management framework

Each organisation is unique and knowledge management initiatives should be aligned closely with the strategic goals of the organisation. In light hereof the draft LoGITReC Strategic Plan was reviewed to inform the knowledge management objectives of the organisation.

LoGITReC is to serve the Tanzanian road infrastructure engineering needs, focussing on Local Government roads, through the development, application and dissemination of new knowledge, the provision of laboratory testing services, opening opportunities for technological development of equipment/tools, and the development of human capital. Its goal is to provide practical, innovative, cost-effective R&D based solutions that address the current and future road infrastructure needs of Local Government Authorities (LGAs); support sustainable development and asset preservation; and enhance socio-economic impact. These strategic goals will influence the knowledge management initiatives recommended for LoGITReC.

The review of the draft Strategic Plan also highlighted a number of aspects which might influence the knowledge management solutions implemented. These are (in no particular order):

- **LoGITReC will support PO-RALG and therefore all LGAs.** Its Central Materials Research Laboratory (CMRL) based in Dodoma will act as a reference laboratory for the regional laboratories. Coordination and standardisation of data and information management activities will thus be required to ensure both service delivery to and compliance by the regional offices.

- **Since the publication of the draft Strategic Plan a change in name from the District Road Research Centre to the Local Government Infrastructure and Transportation Research Centre (LoGITReC) came into effect.** The name change implies that the research centre will be involved in a broader spectrum of activities, i.e. not only low-volume district roads, but also urban roads, water infrastructure and buildings, as well as transportation and traffic safety. Given that LoGITReC is in an embryotic stage, it does not yet have the capacity to target all envisaged research areas. The LoGITReC Steering Committee consequently advised that LoGITReC should focus on only one specific research area, excel in this area and only then expand to other research areas. In view of the current membership of the Steering Committee and current LoGITReC documentation (e.g. the Road Research strategic Plan), it was recommended that this area should be road research. Initially Information Centre resources will therefore focus on low-volume district roads along with urban roads, however, resources and services will be expanded as the spectrum of LoGITReC research activities is broadened.

- **The establishment of strong linkages with similar international organisations, research centres and regional universities and the facilitation of cooperative projects are foreseen.** Resultant issues to address include the provision of collaborative electronic research platforms as well as ownership of the intellectual property created through joint research activities. In addition clear guidelines regarding research records management will have to be established.

- **The vision is for an information centre that would be a repository for, inter alia, text books, local and international conference proceedings and journals, research reports, technical guidelines, norms and standards.** In light of the distributed client base it is recommended that information resources should be in electronic format to allow for web based access.

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- The Information Centre would serve the technical information needs of the LoGITReC researchers, PO-RALG and the roads sector of Tanzania as a whole. The size and range of the Information Centre client groupings will significantly influence the subscription costs of electronic resources and access to electronic information resources will also have to be monitored in terms of publisher/supplier license stipulations.

- Information transfer activities should target all stakeholders, both internal and external, to ensure support to fulfil the mandate of the organisation. The generated evidence base of low volume rural road and transport services knowledge should be widely disseminated to, and easily accessible by, policy makers and practitioners. This will contribute to the high level aim of facilitating effective research uptake into policy and practice.

In support of the strategic organisational goals, and to enable the KLC processes described previously, knowledge management activities proposed for LoGITReC will focus on the following three highly interdependent initiatives:

- The enhancement of research capability by strengthening the knowledge creation and evaluation processes
- Optimisation of knowledge dissemination to stakeholders and the enablement of a knowledge sharing culture
- Enabling the core functions of the organisation through good data and information management procedures as well as the effective management of the organisational knowledge base

These initiatives are discussed in more detail below.

5.1 The enhancement of research capability by strengthening the knowledge creation and evaluation processes

In knowledge intensive organisations, such as research institutions, knowledge generation and evaluation processes should be optimised. Knowledge management efforts should therefore support knowledge generating activities such as individual/group learning, research activity and information acquisition; as well as new knowledge evaluation.

LoGITReC knowledge generation activities will focus on the development of innovative local, cost-effective solutions for local problems; the adaptation of appropriate technology and solutions from elsewhere to satisfy local conditions and; the coordination of long-term, demand-driven research activities to maximise benefits to PO-RALG and the country as a whole. Individual/group learning, capacity building and research activities are covered as part of the interim phase technical assistance\(^\text{11}\) to LoGITReC and will not be addressed further in this study. The focus will rather be on the acquisition of new information, specifically through library and information services (Section 6.1), and the support of collaborative research activities through the provision of virtual collaboration platforms (Section 6.2).

New knowledge generated through research activity and individual/group learning needs to be evaluated before it can be put into practice. In a knowledge intensive organisation such as the proposed LoGITReC, this evaluation typically is done through internal or external peer groups and/or the authority structure of the organisation.

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Peer review is a system of self-regulation that has evolved in science to ensure scientific quality, validity and relevance. It means that at two important stages - the research proposal and the research report - the work is exposed to people who are knowledgeable in that field for critical assessment. If they find it lacking, the work is unlikely to be funded or accepted until the faults are corrected.

Project monitoring and evaluation should, where possible, be done through both internal and external review processes. External peer review platforms should include the proposed LoGITReC Technical and Steering Committees which will be responsible for the prioritisation and coordination of national road and transport research activities and which will inform and oversee research on behalf of stakeholders and the research community. Monitoring and evaluation is essential to determine effectiveness of the research activities and to inform future policy improvements.

In terms of published literature such as journals articles, books and conference papers, peer review is understood to be the pre-publication refereeing or evaluation of complete manuscripts by independent experts in the field in order to ensure quality and determine whether manuscripts are publishable or not. Besides ensuring academic quality the review process also assist the publisher in deciding whether the work should be accepted, considered acceptable with revisions, or rejected.

Where management approval is required as part of the new knowledge evaluation processes it is advisable to institute formal approval processes involving systematic (and preferably electronic) routing procedures.

5.2 Optimisation of knowledge dissemination to stakeholders and the enablement of a knowledge sharing culture

Knowledge transfer is one of the key focus areas of LoGITReC. The main purpose of its knowledge dissemination initiatives should be to facilitate the link between producing research evidence and influencing policy (decision making) and practice (application). Research output should be made accessible through systems for dissemination whereby research uptake and lobbying on policy can be supported. Knowledge dissemination systems should help to ensure the long term sustainability of access to transport information and the continuing exchange of knowledge.

Satisfying external stakeholders is a pre-requisite for attracting support to fulfil the mandate of LoGITReC and knowledge dissemination efforts undertaken should deliberately seek to improve the outreach to all stakeholders. Strategic relationships should be established with dissemination partners, also those involved in labour-based technologies\(^\text{12}\). The generated evidence base should be widely disseminated to, and easily accessible by, policy makers and practitioners.

Research influence on policy could be strengthened by:

- translating and synthesising research evidence into policy implications and impacts
- facilitating policy dialogues with key policy makers and other stakeholders

Research uptake by practitioners could be enhanced by:

- strengthening the interconnectedness of practitioner communities nationally and internationally

• hosting industry workshops (either during a project to gather information and to test ideas; or at the end of the project to report findings) and organising and presenting at national and regional conferences (e.g. the Annual Roads Convention\(^{13}\)) for feedback on latest best practice
• embedding research knowledge into national norms and standards, best practice manuals and industry guidelines and specifications (and compiling simple manuals and guidelines that could also be used at district and village level)
• undertaking demonstration projects for periodic site visits and workshop discussions
• compiling short digests and policy briefings as few practitioners will read lengthy research publications
• providing input and contribute to the development of academic and training curricula
• making accessible research publications through effective Information Centre services
• publication of newsletters and press releases
• establishing an informative organisational website

The proposed knowledge spaces discussed in Section 6.1.1 could assist with the transfer of knowledge to practitioners and industry. A regular programme of events during which new documents (manuals, guidelines and standards) and research findings are presented should be established. All new manuals and research findings can be introduced at such events as it could be useful to hold workshops or feedback sessions prior to release of the final documents so that stakeholders can contribute to the content before finalisation of the documents. Such events are essential to ensure dissemination of the research findings, to increase awareness of LoGITReC and to establish its credibility and status among practitioners.

Optimisation of internal knowledge dissemination within LoGITReC should also receive attention. The proposed knowledge spaces should be utilised to optimise knowledge transfer and organisational learning within LoGITReC, both on a formal and informal basis. This will ensure that staff do not work in silos and could encourage interaction and knowledge exchange between the materials laboratories and research disciplines. The proposed internal knowledge portal/intraweb (Section 6.3) in addition to activities covered under the section on Communities of Practice (Section 6.4) will similarly enhance knowledge dissemination efforts within the Research Centre.

5.3 Enabling the core functions of the organisation through the effective management of the organisational knowledge base

It is important to enable the core services associated with research and development, materials testing, quality assurance and capacity building through improved data and information management procedures as well as effective management of the organisational knowledge base. In this regard LoGITReC would gain from implementing a comprehensive and integrated content management solution aimed at the integration of all organisational systems, databases and procedures.

A comprehensive content management solution enables the core services of an enterprise through good governance as it supports a formalised and structured environment for the management of documents and other records related to its core business and processes. It encompasses auditable procedures throughout the lifecycle of the content and is applicable to information created by the

organisation and as well as information obtained from other sources. Comprehensive content management is required both for content created, used and disseminated internally in the organisation as well as content made available externally, for instance in the form of web content.

The content management solution should consider both the immediate as well as the future needs of LoGITReC. As a minimum requirement the content solution should provide:

- the effective integration of all organisational systems, databases and procedures to reduce duplication of effort and information
- governance structures, e.g. roles and responsibilities, supported by policies, procedures and guidelines
- standard frameworks, e.g. an approval/routing framework
- standardised and controlled vocabulary for the assignment of metadata to ensure ease of retrieval, e.g. a taxonomy/thesaurus/glossary used for descriptive indexing

It is recommended that a **Systems Architect** is appointed on a contractual basis as an addition to the planned long term assistance to be provided under the AfCAP support. The Systems Architect will be responsible for the conceptualisation and implementation of an appropriate and integrated electronic content management solution suitable for LoGITReC. This will include the determination of immediate and future needs of LoGITReC through interaction with stakeholders in PO-RALG, the DICT unit and the management structures in DID. The content solution should consider the required ICT capacity within the organisation in terms of skills levels and capacity as well as adequacy of infrastructure and viability of technologies. Constraints such as cost, implementation schedules and support staff computer literacy levels should be taken into account.

LoGITReC’s content management solution should contribute to the successful implementation of its knowledge management initiatives. From an information and data management perspective, the content management solution should make provision for the functionality required by the Information Centre systems and databases; the dissemination platforms as well as the management of the research, consultancy and governance records of the organisation.
6 Implementation of knowledge management initiatives

**Knowledge management activities** to be considered in support of the abovementioned initiatives (Sections 5.1-3) are summarised in the table below:

<table>
<thead>
<tr>
<th>Enhancement of research capability by strengthening knowledge creation and evaluation</th>
<th>Optimisation of knowledge dissemination to stakeholders and enablement of a knowledge sharing culture</th>
<th>Enabling the core services through effective management of the organisational knowledge base</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual or group learning (addressed outside this study as part of the LoGITReC capacity building activities¹⁴)</td>
<td>Knowledge dissemination to external stakeholders</td>
<td>Comprehensive content management solution to manage:</td>
</tr>
<tr>
<td>Information acquisition through library and information services - User access to reliable information resources - Information specialist services</td>
<td>- Web-based knowledge portal and institutional repository - Communities of Practice - Journals and publications Knowledge dissemination to internal stakeholders - Intraweb/internal website - Provision of physical knowledge spaces - Enhancing the organisational culture to optimise knowledge sharing</td>
<td>- Research and consultancy related publications, project specific records and data sets - Governance related records - Externally acquired information and data - Content disseminated externally</td>
</tr>
<tr>
<td>Supporting collaborative research activities through virtual collaboration platforms New knowledge evaluation through peer review and/or management approval structures</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 7: Knowledge management initiatives**

These knowledge management activities will be discussed in detail in the following sections of the study. It should be noted that the activities proposed will be covered in an integrated manner as certain activities or functions (e.g. the services to be offered by the Information Centre) will contribute to more than one of the framework’s three initiatives. Implementation options will be provided where it makes sense to do so.

The degree to which the proposed knowledge management solutions are put into practice will be determined by organisational priorities as well as enabling factors such as funding, ICT infrastructure and support, along with staff capacity and skill levels. Nonetheless, all of the following solutions should be considered.

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6.1 Information Centre

The research capability of LoGITReC will be enhanced through the library and information services offered by a fully functional Information Centre with skilled staff. Library and information services associated with research centres normally range between the following three options:

- Traditional library services focussed on the library as a structured information and documentation management and storage facility providing “just-in-case” and reactive information services
- A hybrid service where the library not only provides the traditional services but also participates in the information access and retrieval as well as the knowledge management and preservation activities of its users
- A fully digitised platform for innovation, embedded in the activities of the research centre and focussed on pro-active support

Whereas the three options mentioned above should be seen as markers on a sliding scale the final choice of library and information service will be determined by user requirements, the funding available as well as the associated infrastructure. Taking into consideration the planned activities of the Research Centre as well as the infrastructure available the hybrid information service will in all probability be the option that would be most useful. It is therefore this option which is planned for in more detail below.

As the Information Centre will be required to provide thought leadership and services in matters directly linked to its mandate, it is important for the LoGITReC management structures to, as a first step, confirm the mandate of the Information Centre. It is foreseen that the Information Centre will support and enable LoGITReC through the provision of relevant information and knowledge management services that allow access to information, facilitate knowledge creation and sharing, and contribute to the preservation of the organisation’s intellectual assets.

6.1.1 Service streams

In support of the above the activities of the Information Centre should be structured around four core service streams.

Service stream 1: Negotiating and providing access to reliable information resources (both commercial and open access content) through subscription, document ordering and inter library loan services

Researchers typically require access to the primary published literature in their field. To ensure efficiency, simultaneous access and ease of retrieval it is advised that the information resources strategy should focus on the acquisition of electronic products. In general the acquisition policy should consider commercially available information resources (i.e. electronic journal platforms and databases; standalone journals; books, standards; conference proceedings and publications from professional societies) as well as open access resources (i.e. portals and report collections from other research organisations and government agencies; technical specifications; datasets; codes of practice; and publications from aid organisations). Initially information resources will focus on low-volume district roads along with urban roads, however, resources and services will be expanded as the spectrum of LoGITReC research activities is broadened. Annex B provides a list of suggested initial information resources. Ideally, access to the Information Centre’s information resources should be provided through a well-planned and structured library portal or, alternatively, an Online Public Access Catalogue (OPAC).
Standard library technical services to manage these collections, such as acquisitions, inter library loan services, lending and circulation, cataloguing and indexing will be required. These services are generally provided through an online Library Management System (LMS) which makes use of the ICT infrastructure, electronic delivery mechanisms and associated work flow processes. (More details on the LMS are provided under the Infrastructure heading below.)

Price negotiation should consider the most efficient and cost-effective way of delivering commercially available information resources and high quality services. In this regard LoGITReC will benefit from participation in existing national and international library consortia which negotiate access to commercially available information resources on behalf of its members. As a start joining the following consortia should be considered:

- **International Network for the Availability of Scientific Publications (INASP).** INASP is an international development charity working with a global network of partners to improve access, production and use of research information and knowledge. It negotiates with international publishers to secure national licenses on behalf library consortia for free or significantly discounted online access to journals and books. INASP has been working with Tanzania since 2001.

- **Consortium of Tanzania University and Research Libraries (COTUL).** COTUL was established with the main objective of collective subscription to electronic resources to cope with the increasing cost of information resources. It draws its membership from university libraries and research institutions.

- **Electronic Information for Libraries (EIFL).** EIFL works with libraries to enable access to knowledge for education, learning, research and sustainable community development.

In the interim, until the Information Centre is in the position to provide access to the proposed electronic resources, corporate membership of the library of the University of Dodoma should be negotiated. Such membership will allow LoGITReC staff access to the paper and electronic resources (e-books and e-journals) of the University library during staffed service hours. This should not be seen as a long term solution as remote access, e.g. form the LoGITReC offices, to the University’s electronic resources is not permitted due to license agreements with electronic resources vendors.

Given the context of the research focus areas publications, both commercially available and free resources may be sourced in paper format but provision should be made to transfer pertinent items to electronic format so that the items could be made available to multiples users (research staff and clients) simultaneously. This does not negate the need to ensure ethical conduct and adherence to international copyright law.

The Information Centre will be required to maintain a grey literature collection consisting of relevant reports and publications from agencies other than LoGITReC. The grey literature collection will typically include publications form other Government departments (e.g. the Ministry of Works and Ministry of Transport) and PO-RALG agencies, reports on investigations originating from the districts as well as publications from national, regional and international research centres. Particular attention should be paid to publications from those institutes in the field of road engineering with which LoGITReC will enter into cooperation agreements. This will probably include the Central Materials Laboratory (CML) of TANROADS which is well positioned, from a laboratory perspective, to complement and support the activities of LoGITReC and its laboratories, through collaborative research and as a service and training provider.
The collection should be restricted to publications which cannot be found easily either from the websites of these organisations or through conventional channels such as publishers. Agreements with these agencies should be put into place to ensure that publications relevant to LoGITReC staff are received on a regular basis. Aspects to consider include:

- Policy and procedures for the grey literature collection development
- Report categories and report value in terms of retention and disposal schedules
- An electronic database with metadata and indexing standards
- Storage capacity required to manage paper copies in a suitable environment
- Electronic access for users to the grey literature database through the library portal

**Service stream 2: Information specialist intermediary services** focussed on the detailed scientific, business and management information requirements of the staff as well as user enablement through training

The practices of information specialists are far removed from traditional collection management roles as they adopt a much more proactive approach, working in partnership with their user communities. Information specialists are frequently involved in aiding researchers as they navigate information resources. This aid is often at the information seeking stage, when researchers have difficulty tracking down references, or need expert help formulating search strategies\(^\text{15}\). They understand and speak the language of the subject areas they support. They often take up an embedded position where support is required and operate as consultants to identify and solve problems, and trainers to improve skills and understanding. Better links with clients will help the Information Centre to position itself in a changing environment, to take advantage of new opportunities, and to respond to researchers’ evolving needs and behaviours\(^\text{16}\).

Value-added information services should be provided to LoGITReC staff on both a pro-active and reactive basis. The information specialist will be responsible for building and maintaining relationships with the various research groups to ensure continued awareness of researchers’ information related needs as well as to improve service delivery. Supporting services offered should focus on the retrieval of published information, current awareness and alerting services, management of personal information collections through reference management programmes, assistance with the publication of research outputs as well as measuring and monitoring of research impact.

The enablement of researchers through training in the use of electronic information resources as well as the critical evaluation and selection of authoritative information resources should be prioritised. Involving product suppliers as expert trainers as well as capitalising on the available online training material could be considered.

As information specialist services will be provided using the Information Centre infrastructure and information resources, no additional planning is required for this service stream other than ensuring that the incumbent has a working knowledge of the relevant subject areas and experience in a similar environment.

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Service stream 3: Preserving and making accessible (both internally as well as externally to the organisation) the intellectual property created by the LoGITReC through services focused on the management of research records.

Policies and procedures should be established to allow for the systematic and reliable collection and management of internally generated information. Therefore the Information Centre should ensure that all LoGITReC generated research publications are collected, captured, managed, preserved and made accessible based on acceptable meta-data standards and according to LoGITReC policies and procedures. As such it will establish and maintain a Research Outputs Database which will act as a repository for all research and consultancy project outputs and related material such as project proposals, progress reports, research and consultancy reports, learning briefs, safety documents, laboratory reports, technical manuals as well as information published externally by LoGITReC staff, e.g. conferences papers and posters, journal articles, books, chapters in books and training material. A suitable electronic database platform should be deployed and the following aspects should be considered:

- Automated routing/approval procedures in support of electronic document submittal
- Metadata and indexing standards
- IT infrastructure to store electronic copies of the research outputs, preferably in the form of an electronic document management system (EDMS)
- Storage of archival paper copies in a suitable environment with climate and access control
- Electronic user access to the database through the library portal

Metadata of selected publications captured in the Research Outputs Database should be exported to a web-based institutional repository through which LoGITReC publications can be made accessible to external stakeholders. (An institutional repository is a web-based database of scholarly material which is institutionally defined; cumulative and perpetual; and open and interoperable17.) Through routing processes newly produced research output can be added to the repository on a continuous basis. The repository should categorise research publications into logical collections and topics of interest and should include (but not be limited to):

- selected non-confidential LoGITReC research reports and research data
- publisher approved versions of external publications (journal articles, book and book chapters, conference papers) authored by LoGITReC staff
- manuals, guidelines, standards and/or specifications as well as amendments thereto
- research outputs transformed into targeted information products such as technical and policy briefs
- annual reports and other stakeholder reports

The primary aim of the repository will be to make the research outputs of the organisation as widely available as possible. The Information Centre will be responsible for the establishment and maintenance of the institutional repository. The following is required to establish an institutional repository:

- Identify suitable institutional repository software based on desired functionality that will be compatible with the ICT infrastructure. Consultation with similar established services is

advocated. (INASP provides support to libraries wishing to develop their own institutional repositories in line with international standards. The University of Dodoma is in the process of establishing an institutional repository and should therefore also be able to provide guidance in this regard.)

- Installation of software and a trial project to identify problem areas especially in terms of the routing, editing and deletion as well as statistical records.
- Establish work flows, policies and procedures and assign roles and responsibilities in terms of submissions and final approval, mapping to collections, embargo periods and version control.
- Branding options in terms of a collaborative repository is essential.

**Service stream 4: Facilitation of knowledge exchange, scientific interaction and networking** within the organisation through dedicated spaces where staff and external stakeholders can interact on both a formal and informal basis.

The use of knowledge spaces should form an important part of the Research Centre’s knowledge management strategy as the physical work environment can encourage knowledge sharing practices, internal dialogue, networking and science communication. Dedicated spaces should therefore be provided as part of the Information Centre where LoGITReC staff (and external stakeholders) can meet, think together, have conversations and dialogues, collaborate and promote science and research on both a formal and informal basis. The type of venues recommended is based on the typical space requirements of knowledge workers:

- **Personal space** for knowledge workers requiring a different environment to stimulate creativity or individual time for concentration, reflection and learning away from continuous office interruptions.
- **Team space** for collaborative learning by teams of knowledge workers. During certain phases of collaborative teamwork, such as the starting or creation stage, teams need protection from intrusion. Team spaces should be removed from the immediate work areas of staff to minimise interruptions. As team needs vary from time to time, these areas should ensure flexibility through the use of modular furniture.
- **Social space** for informal learning through interactions with co-workers as innovation is fundamentally social. Ideas arise as much out of casual conversations as they do out of formal meetings. More precisely, as one study after another has demonstrated, the best ideas in any workplace arise out of casual contacts among different groups within the same company. Casual conversations provide an opportunity for tacit knowledge transfer as they have the advantage of opening the door to serendipity. They are opportunities for spontaneous meetings of the mind that have the potential to generate new ideas and solve old problems in unexpected ways.

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Details of the physical spaces proposed are provided under the Infrastructure heading below. Depending on available floor space, all proposed venues should be considered as each type supports different knowledge transactions. To ensure optimum utilisation of these spaces the Information Centre staff will be responsible for the conceptualisation, planning, and implementation of an events plan and the scheduling of talks, lectures and presentations by LoGITReC staff and external speakers on a regular basis. Topics of events can typically vary between those with a strictly work related focus and those with a more general or actuality theme.

6.1.2 Human resources

An Information Centre Manager should be appointed in Year 1 to establish, manage and operate the Information Centre. Responsibilities will include:

- Conceptualise and establish the service and necessary infrastructure, systems, policies and procedures
- Provide specialist guidance to the Research Centre in terms of the availability of commercial and open access information products and their content and negotiate access to electronic information resources, preferably through consortium participation
- Recruit and manage the staff compliment (see below)
- Strategically direct the operational aspects of archival activities at organisational level and oversee record management activities
- Develop and lead knowledge management programmes that encourage innovation and the promotion of a culture of knowledge sharing, dialogue and science communication
- Manage relationships with several key stakeholders and suppliers
- Maintain the library portal and catalogue/make accessible commercial monographs (books), journals and multi-media library material according to international standards

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• Provide routine library technical services such as document delivery, inter library loans, and circulation services
• Index and manage the grey literature collection

This person should have the following skills and competencies:

• Self-starter able to work within broadly defined parameters
• Highly systematic and well organised
• Team player and well-developed networking abilities
• Advanced computer user skills
• Technical competence in electronic information management and gaining access to information
• Well versed in the principles of knowledge management

Due to the complexity of the systems to be implemented it is recommended that the incumbent should hold at least a Master’s degree in Library and Information Science. As similar systems are in place in most university libraries and comparable services are provided to academic staff it is advisable to recruit an experienced person coming from an academic environment.

As the demand for information increases, both from the perspective of PO-RALG and LoGITReC researchers, an Information Specialist should be appointed with the following key tasks:

• Empower line staff through training in the use of electronic information resources as well as the critical evaluation and selection of authoritative information resources
• Advise research staff on the international requirements linked to research data management
• Liaise with clients regarding their information requirements and translating this into suitable search strategies that allow for accurate retrieval of relevant information on the subjects. Search results are evaluated before compilation into literature review reports.
• Provide selective alerting services to enable researchers to stay abreast of the latest developments in their areas of specialisation
• Build and maintain relationships with the research units to ensure continued awareness of researchers’ needs as well as to improve service delivery
• Index the data and documented research output of the Research Centre through analyses and extraction of relevant metadata so that these could be captured reliably in the Research Outputs Database
• Populate the web-based institutional repository with selected internal (as well as external publications) and ensure that copyright requirements are adhered to

Initially the Information Centre Manager will also assume the duties of the Information Specialist described above.

The Information Centre will be highly reliant on the ICT department for both system implementation and support. As the Information Centre strategy would focus on electronic products and systems for both research output created internally and items sourced from outside the organisation, cloud based solutions could be considered. Cloud services will, in the longer term, require a lower ICT skills set within the organisation. It might also be advisable to contract-in the services of an experienced systems librarian during the inception phase to assist the Information Centre Manager with the design and implementation of the required library systems.

To ease the burden on the Information Centre Manager during the inception phase the appointment of a newly qualified professional as Information Centre intern should be considered.
Continuous skills development of Information Centre staff should be included in the general capacity building initiatives of LoGITReC. Should the required skills not be available at the start of the implementation phase a fast-track staff development programme should be prioritised. Training offered by professional associations such as the Tanzania Library Association, the Tanzania Library Services Board and INASP should be considered as well as external attachment/secondment programmes to libraries from local universities such as the University of Dodoma and international research organisations.

The organisational structure of LoGITReC will evolve over time. Initially, while it has a fairly small staff complement, it is proposed that the Information Centre Manager reports directly to the Head of LoGITReC. The organogram below indicates the human resource requirements of the Information Centre and how that fits into the overall PO-RALG and LoGITReC structures.

![Information Centre organogram]

6.1.3 Infrastructure

There is a bare minimum infrastructure essential to ensure that a library and information service is possible no matter what the size of the client grouping is. Access to the internet with sufficient bandwidth and a reliable supply of electricity is an essential prerequisite for a sustainable service. To support the proposed Information Centre service streams the infrastructure needs to make provision for the following:

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PO-RALG. 2015. *The functions and organisation structure of the Prime Minister’s Office, Regional Administration and Local Government: Approved by the President on 12th February 2015*, p.10
Systems

Library Management System: To operate effectively the Information Centre will require an integrated library management system (LMS) which comprises a relational database, software to interact with that database, and graphical user interfaces for patrons and library staff. Functionality offered by an LMS includes as a minimum acquisitions (ordering and receiving materials), library network services (borrowing from and supplying material to peer institutions nationally and internationally), cataloguing (classifying and indexing materials), circulation (lending materials to patrons), serials management (tracking journal holdings) and access functionality (library portal/user interface).

Both proprietary and open source systems are available, ranging from standalone library systems (e.g. InMagic Presto or STAR) to internationally shared library management applications (e.g. Polaris or Apollo) and services built on cloud-based platforms (e.g. WorldShare, Alma or Sierra). A cloud-based platform will be the preferred option especially if experienced ICT staff is not readily available to provide support to the Information Centre staff. These platforms could however be expensive. A cheaper option will be the implementation of an open source integrated LMS like LibLime Koha\textsuperscript{22} or ABCD\textsuperscript{23}.

LibLime Koha is used by hundreds of libraries worldwide. It is web based, so there is no software to install on desktop computers and LibLime hosting services means that no servers are required in the library. Upgrades, backups and general system maintenance are managed by LibLime Koha. The development of LibLime Koha is steered by a growing number of libraries throughout the world. These libraries, either on their own, or collaborating in groups, sponsor the development of new features to support their workflows. In keeping with open source tradition, library-sponsored enhancements to LibLime Koha are available for others to use, modify, and re-distribute.

ABCD is web-based integrated library management software comprising the main basic library functions. It was developed by BIREME (the Latin American and Caribbean Centre on Health Sciences) and VLIR (the Flemish Interuniversity Council, Belgium). The main characteristics of ABCD are the coverage of the main library functions, its web centrality and its development and maintenance under the methodology of free and open source software.

It should be noted that open source LMS like LibLime Koha or ABCD still require annual licensing fees. These are however substantially less than purchasing proprietary systems.

Should an integrated LMS not be implemented, individual manual systems will have to be put in place to address the standard technical services required. This is not the ideal but as an interim measure the following systems can be implemented at very little cost:

- Ordering and receiving materials: a Microsoft Excel spreadsheet used in conjunction with the LoGITReC/PO-RALG financial system
- Library network services: negotiate external service provision, e.g. through the University of Dodoma
- Cataloguing: use a relational database, e.g. Microsoft Access or Q&A
- Circulation: a Microsoft Access database could be used

\textsuperscript{22} \url{http://www.koha.org/about}
\textsuperscript{23} \url{http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/free-and-open-source-software-foss/abcd/}
• Serials management: a Microsoft Excel spreadsheet will provide the minimum functionality required
• Information Centre resources and services user interface/library portal through which the user experience of discovering and accessing information can be unified: free versions of blog software, e.g. WordPress or Drupal

**Database software:** Database functionality will be required to manage the grey literature collection consisting of relevant reports and publications from other PO-RALG agencies, government departments as well as national, regional and international research centres. It will also be required for the management of the LoGITReC Research Outputs Database.

It should be noted that many LMS now offer single platforms for the integrated management of different information collections, including closed/confidential collections such as the research outputs collection. The implementation of such a LMS will allow the Information Centre to manage its library collections, the grey literature collection as well as the confidential Research Outputs Database within a single application. If an integrated LMS will not be implemented a standalone library system like InMagic Presto will also provide the required database functionality. Alternatively a relational database such as Microsoft Access or Q&A could be used.

**Institutional repository software**: As previously noted an institutional repository is a web-based database intended to provide access to scholarly material which is institutionally defined; cumulative and perpetual; and open and interoperable. Software (e.g. DSpace, EPrint, Fedora, Islandora) providing the following functionality should be considered:

• Technical/ICT infrastructure, including hardware and software
• Front-end design for ease of use
• Content organisation, control and discovery tools
• Publication tools and reporting options
• Multimedia support
• Social features and notifications
• Interoperability
• Authentication
• Metadata (e.g. Dublin core) standards support
• Preservation

Although the institutional software mentioned above is Open Source, implementation will require substantial support from the ICT unit. Implementation of institutional repository software, however, allows the content of the repository to be harvested by other electronic repositories such as the ReCAP Rural Access Library\(^{25}\). (ReCAP’s knowledge management strategy\(^{26}\) focuses, among others, on the improvement of access to and dissemination of rural road and transport services research evidence. It is for this purpose that the freely accessible ReCAP Rural Access Library has been put in place.) Inclusion of LoGITReC research output on other subject related repositories, such as the

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\(^{25}\) www.research4cap.org

ReCAP repository and the planned African Road & Transport Research Forum (ARTReF) database\(^{27}\), will increase the visibility of LoGITReC publications.

![Proposed LoGITReC database & repository work flow](image)

**Figure 10: Proposed LoGITReC database & repository work flow**

A less ideal option would be to use searchable internet website/blog software, e.g. WordPress, to create subject categories with alphabetical research publication lists and additional metadata. This option, however, does not allow harvesting by other repositories.

**Physical spaces**

The planned LoGITReC building should make provision for the various physical spaces required by knowledge workers and Information Centre staff, including:

- Office space for the Information Centre staff
- Storage facilities with appropriate shelving for the library, research outputs and grey literature collections. As the collections grow standard shelves could be replaced with a compact shelving solution. To ensure long term preservation of the paper records climate and access control will be necessary
- A library reading area with work stations and study cubicles
- A small social area to encourage staff interaction and informal knowledge exchange. If possible the social area should include a small coffee shop/restaurant/staff canteen
- An auditorium, a conference room as well as a smaller meeting room. If a fully functional auditorium is not feasible it is proposed that a less formal staff meeting area is provided instead. This could be combined with the proposed canteen to also function as a social area. Any remaining space could be utilised for conference and/or meeting rooms

The facility should be well equipped and have a welcoming ambiance to encourage usage and to facilitate knowledge exchange, scientific interaction and networking. As staff needs will vary from time to time, these areas should ensure flexibility through the use of modular furniture. Spaces should also be equipped with appropriate audio visual and video conferencing equipment to allow the venues to be multifunctional.

It is recommended that the **services of an architect** are obtained to ensure optimal usage of the various physical spaces.

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\(^{27}\) *The establishment of the African Road and Transport Research Forum (ARTReF)*

Computers, office and audio visual equipment

Standard equipment required will include furniture and computers for staff offices and reading areas; a printer/scanner/photocopier; and audio visual equipment for the conference/meeting areas.

6.1.4 Finances

Sustainable funding will in all probability be the most important resource to negotiate. Access to reliable information resources is expensive and ongoing (although Tanzania is eligible to several very good discounts through initiatives from organisations such as EIFL and INASP as well as active library consortia) and access has to be dependable. In larger institutions the usual library maintenance formula for funding is 50% for resources and 50% for HR costs. In this case the above will in all probability not provide sufficient sustainable funding. It will be of little use if single year electronic subscriptions are purchased and hence both archives and access licences need to be taken into consideration as a continuous cost/investment. Similarly the itemised annual budget would need to make provision for a LMS licence as well as a maintenance agreement.

As mentioned above, there is a bare minimum infrastructure essential to ensure that a library service is possible no matter what the size of the client grouping is. Once the infrastructure has been put in place there usually are no (or very little) additional costs to further expand the client grouping. It is essential to decide up front whether the clients to be served will be employed from a number of different, independent institutions (e.g. from other PO-RALG divisions, other government departments) or affiliated with only one institution as this aspect has serious implications on the access licences to be negotiated with publishers/vendors.

6.2 Virtual collaboration platforms

Research is no longer conducted in isolation. It is increasingly done collaboratively in teams, both within the organisation and between organisations, and is often interdisciplinary of nature. In the proposed Research Centre it is foreseen that research projects will be achieved through a combination of delivery mechanisms involving external stakeholders such as academic institutions, consultants and other national and international research centres. While the final research outputs of these collaborative research projects will be captured in the formal organisational knowledge base, access to web based collaboration platforms (e.g. DropBox, Google-Drive) will be required to allow file sharing and collaborative report writing between team members during project duration.

Free, open source web applications such as the Open Science Framework28 (OSF) are available to assist researchers manage their workflows. (The OSF is part collaboration tool, part version control software, and part data archive. It also connects to popular tools researchers already use, like Dropbox, Box, Github and Mendeley, to streamline workflows and increase efficiency.)

In most organisations the formal organisational knowledge base also does not make provision for the management of day-to-day information required and created by these distributed project teams. (Project managers generally require this type of information for decision making, problem identification and solving as well as writing of progress reports. Team members on the other hand require this information to enable collaborative research efforts). As team members are often not working in close proximity to each other virtual information sharing platforms are required. Mobile centred discussion platforms such as WhatsApp, can be used effectively during project execution. In

28 https://osf.io/
addition content analysis on the data generated from these platforms can provide valuable information for project leaders, for instance to determine how the conversations changed and evolved over time and what was learnt at what point.

Social networking tools can effectively be used for interaction with the project target community to gather input and ensure community participation.

**Virtual collaboration platforms**

<table>
<thead>
<tr>
<th>Social network, e.g. Twitter, Facebook</th>
<th>Project hashtag for Interaction with project target community</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Community participation, gathering input from target community</td>
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<tr>
<td></td>
<td>Citizen science (data collection)</td>
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<tr>
<td></td>
<td>Content analysis (emotional evaluation, topic spotting)</td>
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<tr>
<td>Information sharing platform, e.g. WhatsApp</td>
<td>Closed WhatsApp groups (for each aspect of the project)</td>
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<tr>
<td></td>
<td>Sharing platform for project execution (text, photos, videos)</td>
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<td></td>
<td>Management &amp; coordination tool (high speed &amp; reduced effort)</td>
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<tr>
<td></td>
<td>Content analysis and curation</td>
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<tr>
<td>File sharing, e.g. Dropbox, Google-Drive, Open Science Framework</td>
<td>Working documents</td>
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<tr>
<td></td>
<td>User create single folder on computer, synchronise with Dropbox</td>
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<tr>
<td>Content management system, e.g. OpenCMS, Vibe, WordPress (Blog), Wiki</td>
<td>Shared organisational knowledge base</td>
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<td></td>
<td>Include progress &amp; final project reports</td>
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<tr>
<td></td>
<td>Project evaluation and lessons learnt</td>
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</tbody>
</table>

**Figure 11: Virtual platforms available to collaborative research teams**

### 6.3 Web-based knowledge portals

LoGITReC will require both an internal website (intraweb) as well as an external website.

The **intraweb** will serve as a portal for staff to find organisational information and to learn about developments and news about the organisation. It will afford staff quick and efficient access to the information and operational systems.

The **external website** will provide a snapshot of the organisation to the outside world and will contribute to its knowledge dissemination efforts. A sustainable, easily accessible knowledge portal providing a clear description of the Research Centre’s purpose and services will assist it in building a strong reputation in the transport sector. It will also make research output accessible to external stakeholders through the [institutional repository](#) (Section 6.1.1) and thereby support research uptake. As such it is an important marketing and communication tool for the organisation.

Holistic website design needs to consider both the technical solution and knowledge dissemination perspectives. From a knowledge management perspective a website should be a sustainable, easily accessible knowledge portal providing a clear description of an organisation’s purpose and services and, in the case of the LoGITReC, access to its research and consultancy outputs.

Guidelines and standards for uploading information and links to the websites are required to ensure that pertinent information is given preference; that the quality of information is assured (in terms of completeness, accuracy and quality of language); and that a proliferation of links is avoided and the
sites remain simple and easy to use. The use of standardised branding and navigation items will create a consistent user interface. The visual elements of the websites should assist users to understand the content, structure and navigation. Design should not be used to entertain, but to make the websites informative.

In general the portals should be searchable and have a professional look and feel while affording simple navigation. The external website should allow search engines to harvest content. Push technology such as RSS feeds could be used to automatically inform users of updates to the website. (LoGITReC might also opt to keep high level stakeholders and industry practitioners updated through other means. As Starkey\(^\text{29}\) pointed out, many organisations feel it is necessary to engage in more active diffusion processes by informing people of the existence of new knowledge products through electronic newsletters, printed publications and/or the dissemination of policy briefs.)

Enough time must be allowed to plan and conceptualise the intraweb as well as the external website, as this is the most important step in the development of a website. The conceptualisation of a website is a creative and consultative process and it is crucial to involve managers of all units in the organisation to ensure that their requirements are considered from the start of the project. The following broad steps normally form part of a website development project:

- **Determine the purpose and aim of the website**: The organisation should have a clear purpose for its online initiative to ensure it is a success. The expected benefits of the website should be determined, for example why the organisation should have an intranet/website, what will be its objectives, and what value will it add for the organisation.

- **Identify the website’s target audiences**: An understanding of the audience may influence how the website will be designed and developed, for example what should be available on the website, what functionalities will be included, and how information will be structured.

- **Develop a content plan**: A crucial element of an effective website is good content and it is advisable to identify and/or create suitable content before the website is developed. An information audit/inventory within all units in the organisation can be done to determine what information and communication products meant for public consumption are available in the organisation and where the main content sources are.

- **Decide on a static or dynamic website**: Until recently, most websites comprised “static” pages with an HTML structure. This type of website allows for little interactivity and can be time-consuming and expensive to update or revamp. A more flexible approach is the “dynamic” website where part or all of the content resides in a database. The website itself consists of one or more design templates that define the website’s look, along with some programming that describes what information from the database is to be included and where it will appear. When users browse the website, the pages that appear in their browsers are assembled “on the fly” from the templates and relevant information from the database.

- **Structure information**: The first step after identifying information that should be published on the website is to break the information down into logical and digestible units. Prioritise the potential content by identifying what information the target audience will request most often and what information supports the organisation’s programmes.

The final portal design, both in terms of software and content, should take into account the limitations of local and regional internet access.

It is recommended that the service of a Communications Practitioner is obtained to assist with portal content and branding aspects. (See Section 6.5.)

6.4 Communities of practice

A Community of Practice (COP) is a group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an on-going basis. Group members share a common interest and a desire to learn from and contribute to the community with their variety of experiences. COPs are useful for building relationships and networks across service and disciplinary boundaries, increasing knowledge through case-based learning and inter-professional knowledge exchange and providing space for reflective practice. COPs differ from project teams which are driven by deliverables and which have a team membership defined by task.

LoGITReC would benefit from the establishment and fostering of COPs as these networks of research peers and stakeholders facilitate low-threshold ways of exchanging experience and of lessons learnt between the key target groups. In addition networks can enrich research through discussion and interaction between peers. They also serve the purpose of getting more research evidence exposed in order to promote research uptake through transferring, replicating and identifying policy impacts of research. A number of toolkits for developing, implementing and maintaining COPs are freely available on the internet and it is recommended that these are customised with the help of the Information Centre for LoGITReC’s purposes.

Access to knowledge also concerns the declining pool of experienced experts in the transport sector in general. Much of the sector’s knowledge exists among consultants and older experts. This knowledge is not sufficiently shared and risks being lost if there are not good systems put in place to transfer this expertise to the younger generations. COPs should involve these experts in their interactions. Mentorship programmes should also be established in which younger researchers can work under the guidance of these experts.

Learning briefs and reflection workshops are further tools which could be used to improve research performance, share experiences and convey lessons learnt:

- Learning briefs are short documents which summarise learning from failure; learning from implementation success; or learning from review of previous research and practice. These briefs typically provide the context of the learning/project, an indication of why the learning is important, the evidence base for the learning and recommendations for future similar projects.
- Reflection workshops through project team interaction consider questions such as ‘what worked/didn’t work?’ and ‘what should be done differently in future?’ Where appropriate the reflection workshops should also include representation from the target community who are/were affected by the project activities and outcomes.

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Learning briefs and the outcomes of reflection workshops should be captured in the formal Research Outputs Database and should be consulted (with clear evidence given in project proposals) before new projects are started. Outcomes should also be shared wider than the project team with the remainder of the organisation. The knowledge spaces previous proposed (Section 6.1.1) would be ideal to host these discussions.

### 6.5 Journals and publications

To establish LoGITReC as a reputable research organisation and to promote knowledge dissemination and uptake its researchers should be supported to publish their research in high standing, peer-reviewed journals where the standard of objective reporting is strictly controlled. Publishing is one of the necessary steps embedded in the scientific research process and is necessary for career progression. It further provides the opportunity to influence policy and practice through academic channels. To build researcher capability in this regard the following is recommended:

- A mentoring programme should be put in place whereby first-time authors could be taught the complexities of academic writing.
- The Information Centre staff should be in the position to provide advice on journal selection, the management of copyright, citations and the compilation of bibliographies as well as how to avoid the pitfalls of plagiarism.
- Scientific publishers, such as Elsevier, Springer and Wiley, should be approached to present workshops and provide guidelines which will allow potential authors to obtain the basic methodologies necessary to develop good research articles. These workshops normally cover criteria required by the majority of national and international academic journals, including aspects to consider before starting a manuscript; choosing the most appropriate type of manuscript; language and manuscript writing; the article structure; peer review and editorial processes; and author ethics. (To justify the travel expenses of publisher representatives these workshops could be arranged in conjunction with local universities and academic institutions.)
- Researchers should make use of the opportunities offered through INASP’s AuthorAid\(^{33}\) project. AuthorAid offers research writing courses, an active discussion list and a mentoring platform that matches early career researchers to more experienced researchers.

LoGITReC should however ensure a balance between academic publication and information intended for decision makers. It should be kept in mind that journal articles can take up to 18 months to be published. As Starkey\(^ {34}\) cautioned, many international peer reviewed journals will not take information that has already been published elsewhere, for instance on the organisation’s website. A further aspect to consider is that most peer-reviewed journals are subscription based and are read by a limited number of people, mainly academics. (Reputable open access journals are increasing in numbers but so are journals offered by predatory open access publishers. Open access journals should therefore be evaluated carefully before article submission.)

The organisation’s publication strategy should also address mechanisms for individual researchers to present their research at conferences:

\(^{33}\) [www.authoraid.info/](http://www.authoraid.info/)

To develop staff skills in both writing and presenting conference papers a mentoring programme aimed at speaker support should be established. Part of this staff development can begin with internal processes and procedures for knowledge exchange between laboratories and research disciplines. A regular programme of short presentations should be organised internally so that staff within LoGITReC develop their presentation skills within the relatively safe environment of the organisation itself.

- The Information Centre should be able to assist with conference announcements as well as guidance on conference selection.
- As personal contacts are important financial support mechanisms should be put in place for individual researchers to attend relevant international conferences with a view to encourage personal contact between peers.

A survey conducted by Starkey\(^35\) indicated that much of the transport sector, including staff of transport agencies, NGOs, donor agencies and consultancy firms, tend to exchange information through reports, conference papers and newsletters, which tend to be freely available. These publication channels should therefore not be neglected.

It is recommended that the services of a **Communications Practitioner** is obtained to assist with website content and to design a general communications plan for the organisation which would take into consideration other communication channels such as social media, print media, local media (radio, newspapers), and mass media (TV). The Communications Practitioner will also be able to assist with science communication and transforming research outputs into targeted information products such as technical briefs synthesising best practice in key areas; policy briefs targeted at decision makers in which the policy implications of research are documented; and abstracts summarising new knowledge. During the initial embryotic phase of the Research Centre, until demand justifies the appointment of the practitioner, these services might be obtained from the PORALG Government Communication Unit.

### 6.6 Organisational culture

The organisational culture of LoGITReC will play a crucial role in the successful implementation of its knowledge management initiatives as it can either hamper or empower knowledge creation and sharing activities. It will be necessary for the management structure to understand the organisational culture, both on an organisational and smaller unit level, as each unit may have its own norms, perspectives, and collective understandings and their willingness to share knowledge will be influenced by these collective views\(^36\).

A knowledge culture in the organisation should be promoted through management attention, compliance requirements and incentives to share.

**Management attention:**

- The importance of sharing knowledge should be made clear to staff and should be supported by the required resources, policies and recognition. Staff involvement in the design and

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development of knowledge management procedures and platforms will further ensure ownership and participation.

- Encouragement and legitimisation of the use of the proposed knowledge spaces (Section 6.1.1) and the establishment of and participation in internal and external communities of practice (Section 6.4) is essential. Staff efforts should be encouraged and acknowledged.
- Management should ensure that project managers and project coordinators become knowledge integrators by demonstrating the value of knowledge management in terms of decision making and problem identification and solving. For each research project a team member should be appointed as the knowledge management facilitator.
- Knowledge propriety issues (or perceptions thereof) should be managed and internal competition that may interfere with knowledge sharing should be eliminated.
- Adequate training should be provided and it should not be assumed that people have the technical abilities to utilise knowledge platforms.

Compliance requirements:

- To support the strategic goals of the Research Centre knowledge dissemination should form an integral part of research project implementation and it should be addressed from the start in the planning phase of the project. Clear evidence thereof should be required in the project proposal.
- It should be compulsory to capture lessons learnt at the conclusion of each project. Similarly, it should be necessary to show that these learning documents were interrogated during the planning phase of new projects.
- Related knowledge management activities should be included as part of the key performance indicators of LoGITReC staff on all levels.
- A project should not be signed off before the related project outcomes (e.g. project reports) are submitted to and recorded in the Research Outputs Database.

Incentives to share:

- In order to make knowledge management initiatives work, staff should be willing to share their knowledge with others. “One major influence to a culture's knowledge sharing willingness is the issue of reciprocity. This refers to the individual's need to perceive a current or future return on the knowledge he chooses to share. This could be in the form of direct compensation of some kind; it could be something intangible like enhancing the individual's reputation; but it can also be the knowledge that the favour will be returned the next time he requires assistance”.

6.7 Records management

LoGITReC will have a responsibility to efficiently manage, store and retain data, documents and other forms of information (records) for specific periods of time and thus ensuring compliance with applicable legislation; corporate governance; long term access to its own records; and proper project and contractual management. This will require a sustainable records management system.

A record is defined by the International Council on Archives\(^{39}\) as \textit{recorded information produced or received in the initiation, conduct or completion of an institutional or individual activity and that consists of content, context and structure sufficient to provide evidence of the activity}. Therefore, while the definition of a record is often associated strongly with a paper document, a record can also be digital.

Records management is the practice of identifying, classifying, archiving, preserving, accessing, using and destroying records. The records management system, at its base, makes use of a file plan to consolidate instructions regarding the creation, storage, preservation and destruction of records. It should be noted that the Tanzanian National Archivist must approve all file plans before governmental bodies and organisations may implement them. Records may be managed in a centralised location or the control of records may be decentralised across various departments and locations within the organisation.

### 6.7.1 LoGITReC records

Within LoGITReC records relevant to its research and consulting services as well as to its support services will need to be managed.

**Research & consultancy related records management**

**Research documents and publications:** As discussed in Section 6.1.1 the Research Centre will require a Research Outputs Database with linked routing/approval procedures to record research and consultancy project outputs and related material such as project proposals, progress reports, research reports, learning briefs, safety documents, laboratory reports, technical manuals and guidelines as well as information published externally by LoGITReC staff, e.g. conferences papers and posters, journal articles, books, chapters in books and training material.

While file servers are useful for day to day research or laboratory activity, it is not suitable for research document/content management. In that respect file servers have a number of disadvantages:

- Since metadata is not assigned to documents, searching and locating the correct document/file is inefficient. This situation is often worsened by poor server structure.
- Whereas file servers generally do offer some form of security to limit access to files to specific users or groups this also limits collaboration within the organisation, especially between user groups from different units within the organisation.
- Version control of documents is also not easily managed.

To alleviate these problems and to enhance collaboration and version control an Electronic Document Management System (EDMS) is proposed. The EDMS should typically offer configurable security profiles to enforce access control and assign appropriate reading, modification and approval rights; version control; linked workflow and approval processes; and powerful searching and retrieval tools. It is advisable that the EDMS chosen/installed should allow for specified levels of control in accordance with ISO 9001 requirements.

**Other project specific records:** Besides the project reports and publications discussed above other documentation associated with research projects will also form part of LoGITReC's records. These include risk assessments; contracts and proof of delivery of contracts; project management plans;

\(^{39}\) [http://www.ica.org/](http://www.ica.org/)
records of researchers involved in the project; reviews of literature and relevant protocols and standards; research ethics approvals; equipment calibration reports and operating procedures; laboratory workbooks; project finances and records of client interaction. This type of content is as a rule stored in project files (either in paper format, e.g. arch lever files, or electronic on file servers). Project files could be managed by the Registry function of the organisation. Infrastructure project files should be kept for longer periods in line with the design life of the structures. Other project related records, such as financial transactions, are usually managed in a variety of systems across the organisation.

**Research data sets**: Data sets created as part of the research activity form part of the research outputs of the Research Centre and, as such, it is important for on-going research as well as verification of research results that these data sets be preserved along with the context giving documentation, research reports and results. It should be noted that many journal publishers and international funders now also require that associated data sets are made accessible as part of the publication process. It would be essential to develop research data management policy and procedural documentation (that would include naming conventions and long term preservation formats) as well as to provide sufficient digital storage for these records.

A number of online research data management courses are available. The free online course, MANTRA\(^4\), developed by the University of Edinburgh, can be recommended. MANTRA provides guidelines on the management of the digital data collected through research. It has been crafted for the use of post-graduate students, early career researchers, and also information professionals.

**Central Materials Research Laboratory (CMRL) records**: The CMRL in Dodoma will support LoGITReC research activities and conduct quality control testing of materials used in Local Government road works. The Laboratory will also operate as a reference laboratory for the regional materials laboratories.

Records management systems for the Laboratory (as well as for regional laboratories) should make provision for sample tracking and the handling of test results. Standards relevant to laboratory processes, e.g. ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*, might provide guidance on the design of appropriate automated work flows.

In addition, the CMRL’s materials testing, road monitoring and field tests activities will provide a wealth of geo-referenced data on road structural and surface conditions which should be shared with the research departments as well as other Government agencies. The data should also be uploaded to the Road Maintenance Management System used by the road agencies. Data management procedures and infrastructure for the curation and sharing of data sets should therefore be provided.

**Governance related records management**

LoGITReC’s records management file plan and procedures should make provision for records relevant to the its regulatory framework (policies & procedures); organisation and control (executive matters, strategic and operational plans, SHEQ records); as well as records created by support services such as its Legal, HR and Finance departments. The associated infrastructure required

\(^{4}\) [http://datalib.edina.ac.uk/mantra/](http://datalib.edina.ac.uk/mantra/)
includes the individual departmental systems as well as a corporate archive and correspondence registry.

It is recommended that the electronic registry system (see Section 4) currently being developed by DICT for the PO-RALG Registry should be implemented to manage LoGITReC’s Registry function.

**Externally acquired information**

Externally acquired information sources such as books, journals, standards and technical specifications, conference proceedings and publications from professional societies, other research organisations and government agencies, etc. are not regarded as organisational records. These publications will typically be managed by the Information Centre through its Library Management System (LMS) and grey literature collection database. (See Section 6.1.1.)

**6.7.2 Establishment of a records management system**

To establish a sustainable records management system for LoGITReC it is recommended that the design and implementation methodology provided by ISO 15489-1:2001 and ISO 15489-2:2001 is followed. It should be noted that the methodology proposed was not designed to be linear and that tasks may be undertaken in different stages in accordance with organisational needs. Steps in the design methodology are summarised below:

**Figure 12: Steps in the design and implementation of a records management system**

- **Step A: Preliminary investigation.** This initial step is undertaken to identify the organisation’s structure, its legal and regulatory framework, as well as its strengths and weaknesses in managing its records.
- **Step B: Analysis of business activity.** Identify and document each business function within the organisation and its associated activities and transactions. Establish a business hierarchy system
and the flow of business processes and transactions therein. The reason for this step is to provide an understanding of the relationship between the organisation’s business and its records.

- **Step C: Identification of requirements for records.** The purpose of this step is to identify an organisation’s requirements to create, receive and keep records and to document the requirements in a structured form. The requirements can be derived from an analysis of the regulatory environment and the risk of not creating and maintaining the records. Thereafter it should be determined how each requirement may be satisfied through records management processes.

- **Step D: Assessment of existing systems.** Identify and analyse the organisation’s existing records and information systems to measure their performance and capabilities against the requirements determined in Step C.

- **Step E: Identification of strategies for satisfying records requirements.** The purpose of this step is to determine the most appropriate policies, procedures, standards and tools that should be adopted to ensure that that records requirements are met. Strategies may be applied to each records requirement separately or in combination. This step will provide the basis for the design or redesign of the records system.

- **Step F: Design of a records system.** This step involves adapting the strategies and tactics selected in Step E into a plan for a records management system (including a file plan) that meets the requirements identified in Step C and addresses the deficiencies identified during Step D. Step F covers people, processes as well as tools and technologies.

- **Step G: Implementation of a records system.** The plan designed in step F is systematically implemented using appropriate project planning and methodologies.

- **Step H: Post-implementation review.** This step aims to monitor the performance of the records system on an ongoing basis so that deficiencies can be remedied.

From the above it is clear that records may be managed in a centralised location/records management system or the control of records may be decentralised across various departmental locations/systems within the organisation. The costs associated with the implementation of a comprehensive proprietary records management system might not be justified and LoGITReC might benefit from optimising a decentralised system (e.g. implementing an electronic Registry function and an EDMS). Further aspects to take into account include:

- Records management requirements should be considered as part of the comprehensive content management solution proposed (see Section 5.3).

- Records management should form part of the continuous improvement approach which is recommended under quality management systems such as ISO 9001. (ISO 9001:2015, which was recently published, replaces previous editions.) Records management procedures should be documented as part of the LoGITReC quality management system.

- There are many aspects to records management. Whereas ISO 15489-1:2001 and ISO 15489-2:2001 provide general records management guidelines aimed at the records of professional communities, the ISO 30300 series was developed primarily for a management audience. The ISO 30300 series was created to link the management of records to organisational success and accountability. For a complete understanding a full reading of all relevant ISO standards is recommended. The following illustration might be of assistance:

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41 A Xiaomi, Second National Forum on Electronic Records Management, Beijing, China, 12 November 2011,
The design of the records management solution should be done in consultation with the Tanzania National Archives as it has the responsibility to formulate, implement, coordinate and oversee the execution of records management within the public sector.

Comprehensive and consistent records management will require the appointment of a suitably qualified and experienced records manager.

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provided in White paper: Relationship between the ISO 30300 series of standards and other products of ISO/TC 46/SC 11: Records processes and controls, March 2012
7 Implementation schedule and resource requirements

The degree to which the proposed knowledge management initiatives are put into practice will be determined by organisational priorities as well as enabling factors such as funding, ICT infrastructure and support, along with staff capacity and skill levels. The proposed high level schedule for the implementation of recommended knowledge management initiatives is available in graphic format in Annex C. This implementation schedule was created with a fully operational LoGITReC in mind. This is not currently the case. Furthermore, as the new LoGITReC building has not yet been conceptualised or built the knowledge management implementation plan for LoGITReC will have to provide for a phased approach which should take into consideration its temporary location as well as its final, yet to be built, premises.

7.1 Start-up actions

The present building of PO-RALG in Dodoma does not have sufficient space to accommodate more staff. A new building is in the process of being modernised for PO-RALG. Once this process is completed, sufficient space should become available for LoGITReC staff in the present building. A model similar to the one deployed in Mozambique was recommended, namely to form a Working Group of interested/dedicated PO-RALG staff to further the establishment of LoGITReC, with the objective that they would be incorporated in the structures of LoGITReC once current constraints have been resolved. In the meantime, LoGITReC would have to rely on partnerships with TANROADS-CML and universities to execute projects. To support these initial research activities and to ensure preservation of the research project outputs it is necessary to fast-track the establishment of the Information Centre and its service streams.

A temporary location for the Information Centre was allocated adjacent to the CMRL on the premises of the Municipal Council in Dodoma. Whereas the building housing the CMRL and the room earmarked for the Information Centre was recently renovated it does not yet have any ICT infrastructure. The floor area of the room allocated to the Information Centre is 3.15m x 3.45m. It currently has no furniture, equipment or shelving.

Start-up actions for the establishment of the Information Centre and its services will entail the following:

- The installation of ICT infrastructure in the temporary location of the Information Centre and CMRL is of critical importance and DICT should be requested to, as a matter of urgency, determine the required infrastructure architecture in terms of file servers and network connections. A budget will have to be prepared and funding allocated for the installation, support and maintenance of the ICT infrastructure.

- The Information Centre will provide services as determined by its mandate. It is therefore important for the LoGITReC management structures to, as a first step in the establishment of the Information Centre, confirm its mandate. (As indicated in Section 6.1, it is foreseen that the Information Centre will support and enable LoGITReC through the provision of relevant information and knowledge management services that allow access to information, facilitate

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knowledge creation and sharing, and contribute to the preservation of the organisation's intellectual assets. This, however, need to be confirmed.)

- A key recommendation that necessarily precede most of the Information Centre implementation actions is the appointment of the Information Centre Manager (Section 6.1.2) to conceptualise and establish the service, its infrastructure, systems, policies and procedures. Key steps are the preparation of a job description; position evaluation and salary determination; advertisement of the position and recruitment of a suitably experienced incumbent. It is recommended that the appointee should hold at least a Master’s degree in Library and Information Science with significant experience in an academic environment.

- The planned LoGITReC building should make provision for the various physical spaces (Section 6.1.3) required by knowledge workers. The spaces should be well equipped with appropriate audio visual and video conferencing equipment as well as modular furniture to allow the venues to be multifunctional. During the building planning phase the services of an architect should be obtained to ensure optimal usage of the various physical spaces. The Information Centre Manager should be consulted to provide input from a knowledge management perspective (Section 6.1.1).

- The room allocated to the temporary Information Centre was recently painted but it does not yet have any furniture, equipment or shelving. It will require office furniture and a computer for the Information Centre Manager; chairs and a small desk for visitors; a printer/scanner/photocopier; and at least two walls of library shelving. Furniture and equipment specifications will have to be prepared, quotations obtained and funding allocated.

- As the Information Centre will initially have limited information resources the implementation of an integrated Library Management System (LMS) (see Section 6.1.3) may be postponed to a later stage. Individual manual library systems could to be put in place to address the required standard technical library services (acquisitions, cataloguing, lending and circulation, serials management and user access) at very little cost making use of Microsoft Excel and/or Microsoft Access. Attention should be paid to structure, metadata and indexing standards during the planning phase to ensure ease of migration when the LMS is finally implemented.

- Until the Information Centre is in the position to provide access to the required electronic information resources discussed in Section 6.1.1, corporate membership of the library of the University of Dodoma should be negotiated. Such membership will allow LoGITReC staff access to the paper and electronic resources (e-books and e-journals) of the University library during staffed service hours. In addition Open Access resources indicated in Annex B could be made accessible to LoGITReC staff through the Information Centre portal at no additional costs. (The Information Centre portal could be designed using free versions of blog software, e.g. WordPress or Drupal. The portal should be made accessible through the LoGITReC Intranet currently being developed by DICT.)

- Database functionality will be required to manage the grey literature collection, the LoGITReC Research Outputs Database and institutional repository (Section 6.1.3). Until an LMS is implemented a relational database such as Microsoft Access or Q&A could be used. As is the case with the library systems, substantial attention should again be paid to metadata and indexing standards during the planning phase of the databases to ensure ease of migration when the LMS is implemented. Pending the implementation of institutional repository software non-confidential research publications could be listed on the PO-RALG internet website.
• PO-RALG does not currently have the electronic document management system (EDMS) required to manage and store full text documents. DICT staff is however working on an OS version of Microsoft SharePoint which will provide an EDMS with a document library, task assignments and workflows. Until this solution becomes available it is advisable that a separate, access controlled folder is created for the Information Centre on the PO-RALG or LoGITReC server (depending on the infrastructure architecture determined and implemented by DICT) where full text research publications can be archived. The server will also host the library systems and databases to allow access to and searching by LoGITReC and PO-RALG staff.

• Provision should be made for the preservation and secure storage of research data sets with archival value (Section 6.7.1). These data sets could be stored, along with the context giving documentation, in a similar access controlled folder on the file server discussed above. The folder will function as a data archive. Attention should be paid to standardised file naming conventions. These datasets should be indexed on metadata level in the Research Outputs Database will links provided to the datasets on the storage server.

LoGITReC records relevant to its research and consulting services as well as to its support services will need to be managed (Section 6.7). In terms of records management, the following interim measures should be considered:

• Support services (HR, Finances, Procurement, etc.) will be provided by PO-RALG and the associated records could be handled in line with the decentralised PO-RALG records management system which allows control of records across various departmental locations/systems.

• The electronic Registry system currently being developed by DICT for the PO-RALG Registry should also be implemented for LoGITReC. Until such time, LoGITReC could rely on current services offered by the Registry section.

• The Information Centre will manage research publications and datasets as discussed above. Research project files (Section 6.7.1) could be managed by the Registry function of the organisation.

• Records management systems for the CMRL (as well as for regional laboratories) should make provision for sample tracking and the handling and storage of test results. To ensure the effective operationalisation of the Laboratory the implementation of these systems should receive urgent attention. As an interim measure the electronic registry system currently being developed by DICT for the PO-RALG Registry should be investigated for sample tracking.

The infrastructure required to establish the interim Information Centre and records management functions is provided in graphical format in Annex D.

7.2 Medium to longer term actions

The proposed high level schedule for the implementation of recommended knowledge management initiatives for a fully operational LoGITReC is provided in Annex C. The expected growth in LoGITReC research activities and staff compliment as well as the planning and occupation of its new building will require the actions listed below:

• A Systems Architect should be appointed to plan and implement a comprehensive content management solution aimed at the integration of all LoGITReC systems, databases and
procedures (Section 5.3). The solution should also consider the requirements of the district and regional laboratories.

- PO-RALG has a basic external website (www.tamisemi.go.tz) but the internal website/intranet is still under development (Section 6.2). Principles of holistic website design need to be considered for both the external website and the intranet to ensure that both websites are sustainable knowledge portals. It is recommended that the services of a Communications Practitioner is obtained to assist with website content, organisational branding and to design a general communications plan for the organisation (Section 6.5).

- Initially the Information Centre’s information resources will focus on low-volume district roads along with urban roads, however, resources and services will be expanded as the spectrum of LoGITReC research activities is broadened. Access to electronic journal platforms and databases should be negotiated through Tanzanian library consortia to ensure the most cost-effective way of delivering commercially available information resources (Section 6.1.1). An information resources budget will have to be prepared and funding allocated accordingly.

- As the collections and databases of the Information Centre will outgrow the initial library systems used, an online Library Management System (LMS) will have to be implemented to ensure efficient management of collections and library functions. Selection of a suitable LMS will be determined by user requirements; the existing ICT infrastructure, architecture and support; as well as affordability. Optimally the LMS should incorporate LoGITReC databases (e.g. the Research Outputs Database and the Grey Literature collection) and provide portal functionality to make the Information Centre collections accessible to the end users. A comprehensive list of the available library management systems (both proprietary and open source) is published annually in the Library Technology Guides.

- As the LoGITReC research publications grow institutional repository software should be implemented (Section 6.1.3). As repository software (e.g. DSpace, EPrint, Fedora, Islandora) is mainly Open Source, implementation will require substantial support from the ICT unit.

- As the demand for information increases, both from the perspective of PO-RALG and LoGITReC researchers, an Information Specialist should be appointed (Section 6.1.2). This will require the formulation of a job description; position evaluation and salary determination; advertisement of the position and recruitment of a suitable appointee.

- Once the new building is occupied attention should be paid to the establishment of a sustainable records management system for LoGITReC. The design and implementation methodology provided by ISO is discussed in detail in Section 6.7.2. It is recommended that the electronic registry system currently being developed by DICT for the PO-RALG Registry should also be implemented to manage the LoGITReC Registry function.

- The knowledge management initiatives aimed at stakeholder interaction and communication (communities of practice; journals and scientific/technology communication; utilisation of collaboration platforms) as well as the optimisation of a knowledge sharing organisational culture do not require additional investment in terms of infrastructure. These initiatives are

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nones the less important and should receive equal management attention as LoGITReC starts functioning as a fully-fledged research centre.

Institutional setup will significantly influence the implementation plan, i.e. should LoGITReC become a semi-autonomous agency it will no longer be fully integrated in DID and it will therefore not be able to rely on the support services and infrastructure provided by PO-RALG. The knowledge management implementation plan will then have to be revised accordingly.
Annex A: Stakeholders consulted

PO-RALG Division of Infrastructure Development (DID)
- Eng Gilbert Mwoga, Acting Director
- Eng Vincent Lwanda, Laboratory Manager, Central Materials Research Laboratory, Planning & Research Section

PO-RALG Division of Information and Communication Technology (DICT)
- Mr Robert Dudu, ICT Officer
- Mr Haji Idd Bamsi, ICT Officer

PO-RALG Division of Administration & Human Resources Management (DAHRM)
- Mr George Mwinyikombo, Director
- Mr Mossa Lujani, Records Officer, PO-RALG Registry
- Mr RS Iboni, Records Officer, PO-RALG Registry

PO-RALG Government Communication Unit
- Mr Seraphini Kamilly, Librarian, PO-RALG Library
- Mr Rocky Malecela, Assistant Librarian, PO-RALG Library

PO-RALG Local Government Training Institute, Hombolo
- Dr Mpamila Madale, Acting Rector
- Dr Peter Mateso, Deputy Director: Planning, Finance & Administration
- Mr John Kulwa, Acting Librarian

Dodoma Municipal Council
- Eng John Nchilla
- Eng Lusako Kilembe
- Eng MC Eliufoo
- Eng Kedmon Malima
- Mr Sasoche Matenya, Architectural Technologist

University of Dodoma
- Dr Grace Msolle, Librarian, College of Informatics
- Mr Seif Kachemela, Library System Administrator
## Annex B: Information resources

### Commercially available information resources

#### Electronic journal platforms and databases
- ScienceDirect
- IEEE
- EBSCOHost
- Scopus
- Web of Science

#### Relevant journals
- Asphalt Paving Technology [http://www.asphalttechnology.org/annual-journal.html](http://www.asphalttechnology.org/annual-journal.html)
- Road Materials and Pavement Design [http://www.tandfonline.com/toc/trmp20/current](http://www.tandfonline.com/toc/trmp20/current)
- Technical journals and publications from Tanzanian institutions, e.g.: the National Construction Council, Public Procurement Regulatory Authority, Contractors Registration Board

#### Standards
- Tanzania Bureau of Standards (TBS) [www.tbs.go.tz/](http://www.tbs.go.tz/)
- British Standards (BS) [http://shop.bsigroup.com/](http://shop.bsigroup.com/)
- American Association of State Highway and Transportation Officials (AASHTO) [www.transportation.org](http://www.transportation.org)
- East African Standards (EAS)

#### Conference proceedings
- Transportation Research Board Annual Meeting [http://www.trb.org/Main/Home.aspx](http://www.trb.org/Main/Home.aspx)
- Conference on Asphalt Pavements for Southern Africa (CAPSA) [http://www.capsa11.co.za/](http://www.capsa11.co.za/)

#### Professional societies
- Institute of Engineers Tanzania (IET) [www.iet.co.tz/](http://www.iet.co.tz/)
- Association of Local Government Engineers Tanzania (ALGETA)
- Engineers Registration Board (ERB), Tanzania [www.erb.go.tz/](http://www.erb.go.tz/)
- Association of Consulting Engineers of Tanzania (ACET) [www.acet.or.tz/](http://www.acet.or.tz/)
- Tanzania Civil Engineering Contractor Association (TACECA)
- Contractors Registration Board [www.crb.go.tz/](http://www.crb.go.tz/)
- American Society of Civil Engineers (ASCE) [http://www.asce.org/](http://www.asce.org/)
- Institution of Civil Engineers [https://www.ice.org.uk/](https://www.ice.org.uk/)
**Other databases**

- Transportation Research Board (TRB) collection: Transportation Research Record including Research Results Digests, Transit Cooperative Research Program and National Cooperative Highway Research Program [http://www.trb.org/Main/Home.aspx](http://www.trb.org/Main/Home.aspx)
- Transport Research and Innovation Portal (TRIP) [http://www.transport-research.info/](http://www.transport-research.info/)
- Transport Research International Documentation (TRID) [https://trid.trb.org/](https://trid.trb.org/)
- Federation of European Highway Research Laboratories (FEHRL) [www.fehrl.org](http://www.fehrl.org)

**Open / Free access:**

- ReCAP Rural Access Library [www.research4cap.org](http://www.research4cap.org)
- African Road and Transport Research Forum (ARTReF)
- Directory of Open Access Repositories (OpenDOAR) [http://www.opendoar.org/](http://www.opendoar.org/)
- Directory of Open Access Journals (DOAJ) [https://doaj.org/](https://doaj.org/)
- Publications from similar research organisations:
  - Transport Research Laboratory (TRL), selected publications only [www.trl.co.uk/reports-publications/](http://www.trl.co.uk/reports-publications/)
  - CSIR, South Africa, report collection
  - Building and Road Research Centre (BRRC), CSIR, Ghana
  - Ethiopia Road Authority Road Research Centre (ERA RRC) [www.rta.gov.et](http://www.rta.gov.et)
  - Materials, Testing and Research Department (MTRD), Kenya
  - Kenya Rural Roads Authority (KeRRA) [http://www.kerra.go.ke/](http://www.kerra.go.ke/)
  - The Road Research Centre based at ANE, Mozambique (ANE RRC)
- Publications from Tanzanian academic institutions (e.g. University of Dar es Salaam; the Mbeya University of Science and Technology, St-Joseph University of Technology; the Dar es Salaam Institute of Science and Technology) and regional universities, e.g. Universities of Pretoria and Stellenbosch
- International Road Federation (IRF) [www.irfnews.org](http://www.irfnews.org)
- Federal Highway Administration of the USA (FHWA) [www.fhwa.dot.gov](http://www.fhwa.dot.gov)
- The global Transport Knowledge Practice (gTKP) [www.gtkp.com](http://www.gtkp.com)
- UK Roads [www.highways.gov.uk](http://www.highways.gov.uk)
- Association of Southern African National Road Agencies (ASANRA) [www.asanra.int.mw/](http://www.asanra.int.mw/)
- SATCC - Southern Africa Transport and Communications Commission (Available through CSIR Information Services)
  - Standard Specifications for Road and Bridge Works
  - Code of Practice for the Rehabilitation of Road Pavements
  - Code of Practice for the Geometric Design of Trunk Roads
  - Code of Practice for the Design of Road Pavements
  - Code of Practice for the Design of Road Bridges and Culverts

**Technical specifications**

- Specific to Tanzania / East Africa / Africa (add to collection as published)
- Urban Transport Guidelines (UTG) (Available on the SANRAL web site)
- Technical Recommendations for Highways (TRH) (Available on the SANRAL web site)  
  [http://www.nra.co.za/](http://www.nra.co.za/)

**Conference proceedings:**

- Regional Roads Board (Tanzania) meetings
- AfCAP and ReCAP conference papers
- South African Transport Conference (SATC)  
  [http://repository.up.ac.za/handle/2263/5201](http://repository.up.ac.za/handle/2263/5201)

**Tanzania Government publications**

- Reports from the Central Materials Laboratory of TANROADS
- TANROADS documents (e.g. tender documents, specifications, ‘as built’ files, etc.)
- Tanzania Ministry of Works technical and design manuals, guidelines and standards
- Relevant Ministry of Transport publications
- Tanzania Transportation Technology Transfer Centre (TanT²)
- PO-RALG Division of Infrastructure reports

**Design programs**

- WinDCP 5.0 (Dynamic Cone Penetrometer) More info [http://asphalt.csir.co.za/DCP/](http://asphalt.csir.co.za/DCP/)
### Annex C: Schedule of development for knowledge management activities

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<th>Implementation schedule: Knowledge Management initiatives</th>
<th>Year 1</th>
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<th>Year 3</th>
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<td>Q3</td>
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<tr>
<td>Content management solution including ICT capacity</td>
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<td>Appoint Systems Architect &amp; LoGITReC review team</td>
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<td>Stakeholder interaction to determine current &amp; future needs</td>
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<td>Review existing and required ICT capacity</td>
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<td>Submit recommendation</td>
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<td>Phased implementation</td>
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<td>Information Centre</td>
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<td>Appoint Information Centre Manager</td>
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<td>Design strategy and plan services</td>
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<td>Furnish temporary location allocated to Information Centre</td>
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<td>Plan spaces of future Information Centre in LoGITReC building</td>
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<td>Implement standard library services</td>
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<td>Implement databases &amp; organise collection storage</td>
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<td>ICT infrastructure installed in temporary location</td>
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<td>Web based knowledge portals</td>
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<td>Appoint Communications Practitioner &amp; LoGITReC web team</td>
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<td>Determine the organisational requirements</td>
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<td>Establish and maintain intraweb</td>
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<td>Establish and maintain internet website</td>
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<td>Appoint Records Manager</td>
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<td>Design strategy, service and implementation plan</td>
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<td>Framework for approval, workflow and routing</td>
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<td>File plan: development, approval and maintenance</td>
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<td>Data sets: storage, preservation and accessibility</td>
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<td>Registry and Corporate Archive</td>
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<td>Define URS for RM portal</td>
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<td>Stakeholder interaction and communication</td>
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<td>Communities of Practice</td>
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<td>Building staff capacity</td>
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<td>Scientific publishing (how to)</td>
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<td>Reflection workshops</td>
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<td>Management attention to organisational culture</td>
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**Legend**
- Implementation activities
- Ongoing / routine activities after implementation
- Comprehensive content management solution, input required
Annex D: Interim Information Centre and records management infrastructure

- **PO-RALG Registry**
  - Governance records
    - Policies and procedures
    - Organisation and control
    - etc.
  - Support Services records
    - Legal
    - HR
    - Finance
    - Procurement
    - etc.
  - Research project files
    - Risk assessments
    - Project management plans
    - Contracts
    - Protocols, standards and equipment calibration records
    - etc.

- **Server (PO-RALG/LoGITReC)**
  - CMRL
    - Routine material testing results
    - Research datasets
    - Sample tracking system
  - Standard Library Systems
    - Acquisitions
    - Catalogue
    - Lending and circulation
    - Serials management
  - Grey Literature Database
    - Publications from other Government Departments
    - National, regional, international research centres
  - Research Outputs Database
    - Research publications
    - External publications, e.g. articles, conference papers
    - Datasets and context giving documentation
  - Information Centre Server/Folder
    - Full text research publications
    - Research datasets
    - Full text grey literature/publications

- **Web based portals**
  - PO-RALG Intranet
    - Information Centre portal
      - Information resources
      - Grey Literature Database
      - Research Outputs Database
    - CMRL portal
  - Firewalls
  - Institutional Repository
    - Selected research publications, e.g. articles, conference papers, book chapters, policy briefs, best practices, guidelines, etc.
  - Internet
    - Open access information resources
    - Electronic journals and databases
    - LoGITReC Institutional Repository