Assessing ICT4D Project Design: A Programme Theory Assessment of the Siyakhula Living Lab

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Abstract

The evaluation of rural ICT for development projects is crucial to understanding the impact of such projects in developing countries. A comprehensive evaluation framework called the Rural ICT Comprehensive Evaluation Framework (RICT-CEF) was developed to capture the relevant impact and effectiveness throughout the life of ICT4D projects in marginalised communities. This report presents the evaluation results of one of the seven evaluation domains of the RICT-CEF; Programme Theory Assessment. A Programme Theory Assessment aims to evaluate whether the conception or logical design of the ICT4D initiative is actually designed to support development programmes or address the needs and priorities of the targeted community. A Programme Theory Assessment was conducted for the Siyakhula Living Lab, an ICT4D project in South Africa. Programme theory was elicited and understood in terms of three interrelated components which include the living lab's organisational plan, service utilisation plan, and the impact theory. These components were assessed based on criteria from the 'access to education and knowledge' need identified in a previous needs assessment, research/project practice, and observation. This report discusses each programme theory component of the Siyakhula Living Lab, and presents the assessment results in terms of the suitability, shortcomings, and recommendations to adjust the existing programme theory. A description of the contribution of the programme theory assessment for subsequent or future evaluations of the Siyakhula Living concludes the report.

Keywords

Evaluation, living lab, rural, impact, needs assessment.

1. Introduction

A Programme Theory Assessment aims to evaluate whether the conception or logical design of the ICT intervention is actually designed to support development programmes or address the needs and priorities of the targeted community. Rossi, Lipsey and Freeman (2004: 134) define programme theory as "the conception of what must be done to bring about the intended social benefits". A project that is not designed or planned appropriately can fail or become unsustainable, especially in

relation to meeting the information and communication needs of marginalised communities. A programme theory assessment, therefore, uncovers any problems with the ICT project's design that must be corrected before any meaningful aspect is implemented (Rossi at al. 2004: 134). Programme Theory Assessment is an evaluation domain that originates from the Rural ICT Comprehensive Evaluation Framework developed by Pade-Khene and Sewry (2011). This framework is based on a multi-method analysis of ICT4D and Information Systems evaluation frameworks, and the fundamental concepts of programme evaluation, to determine the multiple components associated with rural ICT evaluation. It is comprehensive in the sense that it embraces evaluation at *all* stages of the ICT project life cycle; attributable to an *interdependence* between various evaluation domains. The domains that make up the evaluation cycle of the RICT-CEF include: 1) The Baseline Study, 2) Needs Assessment, 3) Programme Theory Assessment, 4) Process Assessment, 5) Outcome and Impact Assessment, 6) Efficiency Assessment, and 7) Scalability Assessment (Pade-Khene and Sewry, 2011). All domains of the framework are dependent on Programme Theory Assessment, as programme theory can provide comparison benchmarks for actual ICT project performance and impact.

Programme theory assessment was conducted in the Siyakhula Living Lab, a rural ICT project that exists to provide new technology and skills to the rural community of the Mbashe municipality, specifically in Dwesa on the Transkei wild-coast of South Africa. The primary objective of the SLL is to develop and field-test a distributed, multifunctional community communication platform, to deploy in marginalised and semi-marginalised communities. Since the Siyakhula Living Lab has been operating for a number of years, the programme theory assessment also aimed to correct planned approaches to implementation that the project has applied. Future implementations at other schools or project sites can, therefore, be designed appropriately. Programme theory assessment also plays an important role of guiding subsequent evaluations in the project, such as process assessment, outcome and impact assessment, and efficiency assessment. The subsequent evaluations of the living lab can partly be based on the conceptual design of the project; to measure the extent to which it is being appropriately implemented, hence providing benchmarks with which stakeholders and the evaluator can compare actual programme performance and impact.

Programme theory is elicited and understood in terms of three interrelated components which include the living lab's organisational plan, service utilisation plan, and the impact theory. These components are assessed based on: 1) criteria from the 'access to education and knowledge' needs assessment identified previously in a Needs Assessment of the rural community, 2) research practice, and 3) observation. The paper first presents the evaluation plan used to guide the evaluation process. Subsequently, it discusses each programme theory component of the Siyakhula Living Lab, and presents the assessment results in terms of the suitability, shortcomings, and recommendations to adjust the existing programme theory. A description of the contribution of the programme theory assessment for subsequent or future evaluations of the Siyakhula Living concludes the report.

2. The Evaluation Plan

The evaluation plan describes the plan to guide the evaluation domain process. The plan is tailored around three features, adopted from the evaluation structure of Rossi *et al.* 2004: 33): 1) The Evaluation Questions, 2) The Methods and Procedures, and 3) The Nature of the Evaluator-Stakeholder Relationship. Prior to developing the evaluation plan, the programme theory of the Siyakhula Living Lab had to be elicited. The programme theory of the Siyakhula Living Lab was implicit (not clearly defined); therefore, the evaluator had to elicit the theory through interactive workshops with stakeholders, interviews, and observations of the living lab's practice. The evaluator worked closely with living lab stakeholders (project leaders) to conceptualise and describe the characteristics of the living lab, and hence validate its quality (Owens and Rogers 1999: 192). Once the programme theory components were identified and described, the following plan was used to guide the assessment of the SLL's programme theory.

2.1 The Evaluation Questions

The following evaluation questions were used to guide the assessment:

- Which target groups and/or individuals in the community should be served? How can the ICT intervention identify, recruit, and sustain the intended actors (individuals and groups) in the community?
- What are the best delivery systems for the ICT services?
- How should the ICT intervention programme be organised?
- What are the intended outcomes and how is the ICT programme designed to achieve them?
- What ICT intervention elements need to be modified in order to maximise the intended outcomes?

2.2 The Methods and Procedures

The research approach to assess programme theory was predominantly qualitative. The evaluator conducted an independent assessment using three approaches (Rossi *et al.* 2004):

- *A Needs Assessment comparison:* A comparison is made between the living lab ICT intervention specified in the programme theory, and the social needs (access to education and knowledge) the living lab is expected to address. The needs assessment report informs the evaluation of the challenges and recommendations of local stakeholders, hence providing their perspective on the operation of the living lab in the rural communities. The compatibility of process theory (which comprises of the organisational plan and the service utilisation plan) is assessed by comparing process theory assumptions with information of the target population's opportunities to access essential information for development and barriers to accessing this information. Impact theory is assessed based on whether the intended effects of the living lab intervention correspond to what the required needs are, to improve social conditions in the Dwesa community.
- *Document analysis through a comparison with research and practice:* The programme theory is compared with some existing literature on ICT4D practice, based on lessons learned.
- *Direct observation and participant observation:* The evaluator has participated in the

SLL since inception, and therefore observation accounts are used to assess the programme theory. Observation helps to breakdown an understanding of the programme theory and observes the feasibility and relevance of the design of the living lab.

A future methodology that can be used to assess programme theory and is suited to the living lab context is:

- *An expert review of the logic and plausibility of the programme theory:* A diverse group of entities support the operation of the living lab, which includes academia, government, industry, and the Dwesa/Cwebe and Nkwalini communities (targeted communities). Each entity has expert knowledge in various fields, or in the case of the rural communities, the environment in which they reside. A collaborative panel with these entities to discuss the programme theory and future direction of the SLL supports the assessment and revision of the programme theory, to guide the future direction of the living lab. This promotes the key characteristic of living labs which are: "collaborations of public-private-civic partnerships in which stakeholders co-create new products, services, businesses and technologies in real life environments and virtual networks in multi-contextual spheres" (Schumacher and Niitamo 2008: 2). Currently, the Living Labs in Southern Africa (LLiSA) initiative holds an annual workshop with members of ICT4D living labs in South Africa to discuss the design and future directions of their projects in South Africa. This could potentially be a platform for an expert review process.

2.3 The Nature of the Evaluator-Stakeholder Relationship

- *Independent Evaluation:* The evaluator is solely responsible for developing the evaluation plan, conducting the evaluation, and disseminating results. However, the stakeholders provide input on the selection of evaluation questions to guide the evaluation. Future programme theory reassessment should also rely on obtaining more outside perspectives on the suitability of the programme theory, which can reduce bias from differing and conflicting descriptions of the programme theory from various stakeholders (Rossi *et al.* 2004: 51).

3. Programme Theory Assessment Findings

The programme theory of the Siyakhula Living Lab is described in terms of its Organisational Plan, Service Utilisation Plan, and Impact Theory. This section describes the programme theory elicited. Each theory's description is followed by the assessment results based on the suitability and shortcoming of the theory, and recommendations to change the programme theory.

3.1 The Organisational Plan

The Organisational plan describes the intended functions and activities the Siyakhula Living Lab (SLL) is expected to perform, as well as the human, financial and physical resources essential for that performance (Rossi *et al.* 2004: 142). The SLL organisational plan is depicted in *Figure 1*. The specific activities that indicate the SLL's role in enabling *target population* transactions that lead to social benefits, are central to the organisational plan. In addition, the entities and functions that provide ongoing support for the SLL's operation describe the organisational plan. The SLL's organisational plan is described in terms of three elements and their functions: a) Key entities, b) Supportive units, and c) Living lab networks. These elements are not

necessarily separate, but collaborate and interconnect to support the operation and performance of the SLL.

A. The Key Entities

The key entities include academia, industry, government, and the Dwesa/Cwebe and Nkwalini communities. Their purpose and functions in the SLL are described as follows:

A.1 Academia

Rhodes University and Fort Hare University are the main entities that support the operation of the Siyakhula Living Lab. The SLL operates through a collaborative relationship between the Telkom Centres of Excellence (CoE) at the two Universities. They have been involved since the inception of the project in 2005, and have played a key role in development, technical and research support, and fostering essential relationships and collaboration with the rural communities. Therefore, most of the functions and activities of the SLL are managed by academia, through the CoE. The key functions and activities include:

Technical and Research Support

- Management and collaboration between academic staff, postgraduate students, and CoE personnel.
- Research supervision of postgraduate students.
- Conduct project team meetings weekly to discuss research project progress.
- Maintain field trips to monitor technology, implement prototypes, and support training.

Management of the Multi-functionality and Distribution of the Prototype: Sub-project implementations

- Conduct a feasibility assessment to select a school.
- Hold school/community meetings to introduce and discuss the progress of the living lab.
- Apply an action research approach, to prototype and field-test components.
- Continuously develop a range of ICT solutions to support rural environments (e-government, e-health, e-judiciary, *etc.*), based on field findings and experience over time (action research).
- Develop user manuals for computer literacy training.
- Provide computer literacy training.
- Monitor and maintain Internet access and use, and monitor bandwidth consumption.
- Maintain existing ICT equipment at the project sites.

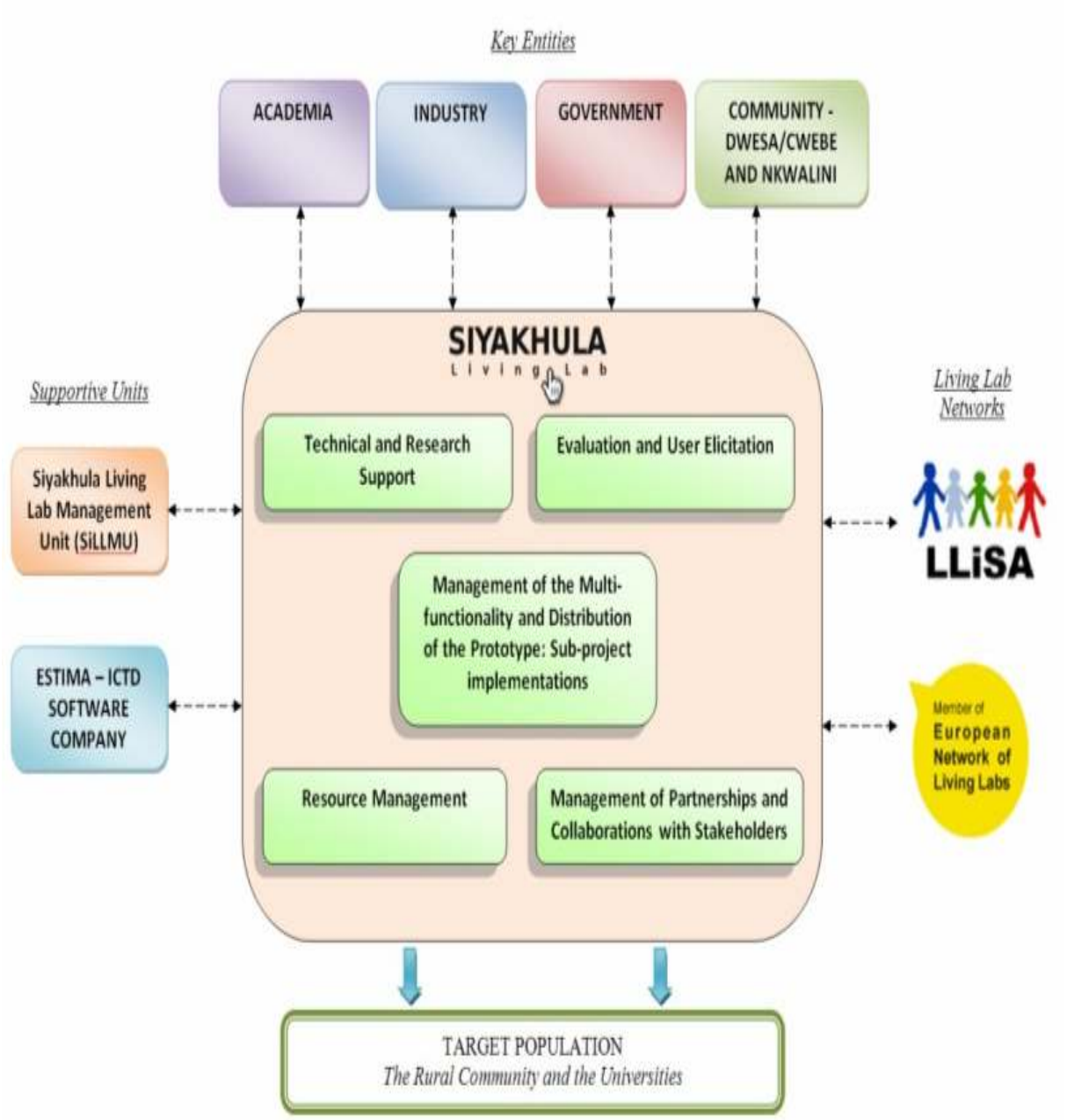

Figure 1. The Organisational Plan

Evaluation and User Elicitation

- Conduct targeted user needs elicitation.
- Conduct a Baseline Study.
- Create explicit mechanisms for the development and deployment of user-driven, context-sensitive services.
- Progress reports and evaluation to track the progress of research and technical skill development (university assessment).
- Conduct an outcome and impact assessment.

Resource Management for

- Technology – Communication and computing equipment, WIMAX, VSAT, *etc.*
- Research equipment - servers, laptops, networking devices, *etc.*
- Technical support and coordination remuneration.
- Local maintenance costs - e.g. hiring local support for data collection, maintaining field accommodation, *etc.*
- Research bursaries and grants (Telkom CoE), and
- Operational costs – running costs, local travel (field trips), local conferences and events, and international engagement.

A. 2 Industry

Industry supports the SLL through providing financial and technical resources. The SLL is partly funded by industry, and technological equipment and advice is at times provided. Industry also evaluates and tracks the progress of research at the two universities. Industry partners include Amatole Telecommunication Services, Mars Technologies, Tellabs, Saab Grintek, Telkom, Stortech, DRISA, Comverse, Bright Ideas Projects, and eKhaya ICT.

A. 3 Government

Government supports the SLL through providing financial resources and enabling partnerships with private and public stakeholders that can support the operation and development of essential services of the living lab. Government partners include the Department of Trade and industry (DTI) through the Technology and Human Resources for Industry Programme (THRIP) who have provided matching funds, to that contributed by industry funding since the inception of the project. Partnerships have also evolved recently to include the South Africa - Finland Knowledge Partnership on ICT Programme (SAFIPA), Cooperation Framework on Innovation Systems between Finland and South Africa (COFISA), Department of Science and Technology, Meraka Institute, and Department of Education. As an example of government participation, COFISA has supported the collaboration of the Siyakhula Living Lab with Nokia Siemens Networks, the Meraka Institute, and Vodacom during the early stages of a Village Connection (VC) Project in 2007. In addition, various evaluations of the SLL were conducted by specialists, for instance, to support the development of a business model for the VC project.

A. 4 Dwesa/Cwebe and Nkwalini Communities

The communities play a key role in the performance and sustainability of the living lab within the community. The project sites in the community are the schools, which were chosen for the following main reasons (Pade, Siebörger, Thinyane, and Dalvit, 2009):

- They have the necessary infrastructure for housing computer labs, such as electricity and appropriate venues to contain computer labs. In the case of Ngwane JSS school, they provided computers that were already available at the school, to support the implementation of the computer lab.
- Schools are educational centres and are thus in a position to be able to train both local learners and local community members, and
- The schools are open to all community members, allowing access to all.

However, local project champions or representatives are not limited to school staff. Some community members also champion the project in the community. The expected or intended functions and activities of the community are:

- To collaborate with the community to select local representatives or project champions.
- To maintain communication with external stakeholders (the universities) about the local operation of the project, hence providing feedback on the local operation of the SLL.
- To provide an appropriate test site to implement the multi-functional, distributed communication system.
- Participation in the co-creation of context sensitive, user-driven ICT support solutions.
- Participation and guidance in collecting project data locally.

B. Supportive Units

The supportive units consist of the Siyakhula Living Lab Management Unit (SiLLMU) and ESTIMA Software Company. They provide support for the continuous development, growth, and effective operation of the SLL. Each unit plays a different role. SiLLMU is a management unit initially structured within Rhodes and Fort Hare Universities. The governing body of SiLLMU will represent Rhodes University, Fort Hare University, the Communities (Dwesa/Cwebe and Nkwalini) and COFISA. It aims to:

i. Support the operation and plan the sustainability of the Siyakhula Living Lab,
ii. Enlarge its network of partners and clients (including the European Network of Living Labs (ENoLL)),
iii. Involve government more deeply at all levels,
iv. Generally promote the Siyakhula Living Lab, in order to increase its innovation potential and sustainability.

Therefore a summary of the key functions and activities of SiLLMU include:

- Establish and maintain networks with key entities (existing and future) that may support the SLL.
- Coordinate activities of the SLL, e.g. facilitating interaction with different entities (internal and external) and organising research field trips for the universities.
- Market and communicate SLL information to key entities, e.g. Living Labs in South Africa (LLISA) and funding partners.
- Conduct fund-raising activities for the SLL.
- Facilitate the formation of a governing body for the SLL.
- Define operational parameters for the operation of the SLL.
- Represent and engage with community representatives in the local operation of the SLL.

The ESTIMA (E-Services and Telecommunications Infrastructure for Marginalised Areas) programme to setup a software company is an initiative that will be run and operated by a steering committee that consists of Rhodes University, Fort Hare University, and eKhaya ICT (industry). SAFIPA is the key government entity that

provides funding for the establishment of the company. The main functions of ESTIMA are:

- To complete the development of ICT4D software from various research projects in the SLL. Research projects' software is usually not appropriate for commercialisation. Traditionally the SLL consisted of various research projects (some complete, some incomplete), and therefore ESTIMA will now support the commercialisation of such software, and the development of quality ICT4D products.
- To obtain orders for the development of ICT4D software. SiLLMU will play the role of linking the software company with other stakeholders or development organisations.

C. Living Lab Networks

The Siyakhula Living Lab is a member of Living Labs in South Africa (LLiSA) and the European Network of Living Labs (ENoLL). The networks provide a platform for Living Labs to share knowledge, practices and ideas to support their operation and sustainability. The LLiSA network specifically caters for innovative ICT for development living labs in Southern Africa. It is run by the Meraka Institute and exists as a collaboration between academia, government, and private companies in Southern Africa. LLiSA was inspired by ENoLL. ENoLL exists as a collaboration of European living labs, the European Union (EU), national and regional governments, academic and leading companies, providing a platform for networking within a global context for its members. The Siyakhula Living Lab aims to actively participate in the network to share knowledge with and learn lessons from other living lab interventions.

3.1.1 Suitability Assessment

The Siyakhula Living Lab is based on a workable organisational theory that is representative of a living lab context. The existing entities and collaborations that support the functions and activities of the living lab underlie the potential sustainability and effectiveness of rural ICT projects. The fact that it is specifically centred on a *Quadruple Helix model*, consisting of collaborations between academia, industry, government, and importantly the Dwesa/Cwebe and Nkwalini community; essentially positions the living lab to address development challenges that occur at micro and macro levels. Each entity has a unique contribution to the living lab operation, and also stands to learn lessons and share diverse views on the operation of the Siyakhula Living Lab. Furthermore, collaborations with other living labs through the LLiSA and ENoLL networks provide a platform nationally and globally for the SLL to share experiences, and learn from other living labs. This provides an external supportive structure for the continuous development and sustainability of the living lab in rural environments.

The existence of collaborations between entities and living lab networks also promotes the *holistic nature of the project*. An ICT project needs to address a variety of interrelated dimensions in rural development in order to secure a more enduring impact (UNDP, Accenture, and Markle Foundation 2001: 18). The SLL Needs Assessment revealed that the needs and priorities in the community are beyond the scope of computer science and information systems, or even academia, therefore, collaborations with the private sector, government, community and other multidisciplinary fields can play complementary roles in addressing development

challenges. The living lab will be more effective if these stakeholders work together as part of a coordinated strategic approach to address key rural ICT and development aspects, such as, building human capacity, creating a favourable environment for enterprise (tax and trade policies), infrastructure development, significant participation of community target groups, building on local needs and indigenous knowledge systems, promoting local ownership, and a transparent, inclusive and open stance on policy (Pade, Mallinson, and Sewry, 2008; Bridge 2006; Talyarkhan 2004: 19; UNDP *et al.* 2001: 30). To support the essential collaborations and relationships between entities, SiLLMU play a key role in managing the operation of the Siyakhula Living Lab, as represented in its key functions and activities.

The Siyakhula Living Lab has been operating as a research project, out of which a number of research sub-projects (masters and PhDs) have emerged from the two universities. Although research has been completed for a masters or PhD, some operational aspects of ICT4D software remain incomplete. The planned introduction of the ESTIMA programme to setup a software company in 2010 supports the completion of ICT4D research software and commercially markets useful software in ICT4D, hence not limiting it to research that may remain idle and unused. This can contribute to growing ICT4D innovation within South Africa and internationally, because as innovations become more explicit and not limited to research, technology is shared and developed to become more and more compatible for diverse development contexts.

3.1.2 Shortcomings and Recommendations

Most of the organisational plan appears sound and appropriately designed. The functions of most entities are clearly stated. However, the expected/intended functions and activities of industry and government partners are less explicit in the organisational plan. Although, the theory explains that these key entities mostly contribute to funding the project, and creating relationships with other organisations or sectors, these are described at a high level. The *specific* functions and activities of industry and government partners are not described, such as how collaborations are created, essential meetings, protocol for external expert evaluations or external research in the Dwesa/Cwebe or Nkwalini communities (for example, business modelling research conducted by Ungana Afrika – a company that was hired by COFISA to conduct a Feasibility analysis for creating a business model for the Village Connection project), *etc.* External participation in the SLL and the rural community can influence or contribute to the performance of the project and the relationships in the communities. Therefore, the SLL needs to define explicitly the expected functions and activities of private and government partners, and hence be in a position to determine an approach to evaluate the participation of these stakeholders, who contribute to the direction and performance of the Siyakhula Living Lab. Whilst the SLL is evaluated by industry and government stakeholders, the SLL also needs to be able to evaluate the stakeholders' functions and activities, so that they can all collaborate to guide and improve the living lab over time. Nevertheless, the stakeholders indicate that the intended function of SiLLMU is to define relationships and roles of different entities, and how they will interact to support the operation of the living lab. This will better formalise the expected functions and activities of the different entities.

3.2 The Service Utilisation Plan: Access to Education and Knowledge

The Service Utilisation Plan depicts *how* and *why* intended recipients will become engaged in the SLL, to the point of receiving services to meet needs (Rossi *et al.* 2004: 142). Each local need the SLL aims to address should have its own service utilisation plan. The service utilisation plan in *Figure 2* is specifically for addressing the need 'access to education and knowledge'. Therefore, it illustrates the various paths the teachers and community members (SLL targets) go through at the school, from the point of no living lab services to the point of receiving supportive services that will eventually initiate impacts in the communities. This service utilisation plan, however, specifically focuses on educators as targets, as the need 'access to education and knowledge' is mostly associated with the local operation of schools and the education system. Nevertheless, it also illustrates that community members receive the same computer literacy training as teachers, and the contribution teachers make to the wider community (for example, through community training and local ICT support). The service utilisation flowchart is depicted in *Figure 2*, and described as follows:

- The service utilisation flowchart begins with the position of the rural school, prior to the introduction of the SLL. Typical of many rural schools in developing countries, they are confronted with education and development challenges, such as, a lack of educational material, ineffective school administration, a lack of teacher training, *etc.*
- Feasible rural schools are then approached and the SLL is presented to the community through community meetings and discussions with potential project champions (for example, the school Headmaster, teachers, or certain community members).
- Once an agreement has been reached between local stakeholders and the SLL project team (external stakeholders), ICT equipment is gradually implemented at the schools. Computers are provided at the schools, which have the Edubuntu Open Source platform, designed and customised for school environments (although not limited to school use). Examples of other applications include the Gutenberg Project, Wikipedia, and SchoolTool. Other research sub-projects are implemented as well, such as, the implementation of WiMax, investigating the use and barriers of ICT use, and developing a context sensitive e-commerce platform for local arts and crafts.
- Teachers and community members receive computer literacy training, once the ICT equipment is available. They are trained on part of Open ICDL (International Computer Driving Licence), with modules such as Open Office (Writer and Calc), the Internet, educational games available on the Edubuntu platform, and basic local management and operation of the ICT equipment in the absence of the project team (for example, setting up computers). The community members communicate with the project team about any equipment failures or faults, as well as factors that affect the operation of the SLL.

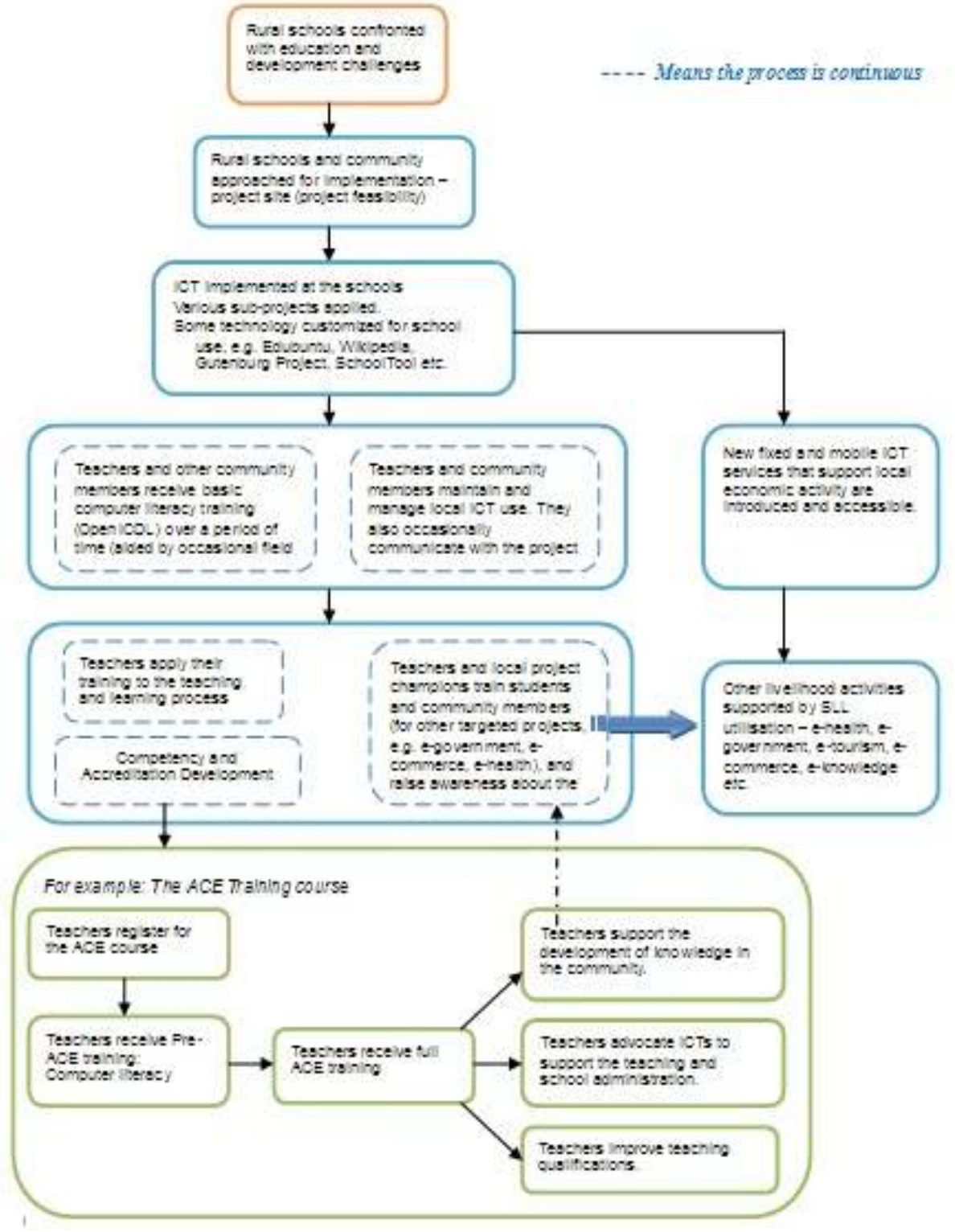

Figure 2. The Service Utilisation Plan – Access to Education and Knowledge

- The services offered by the SLL at the schools, also enable the following:
    - The teachers apply their training to support the teaching and learning process at their schools.

- Teachers and community members are expected to also train other community members in computer literacy; hence a 'train-to-train' approach is applied. The training is expected to support the development of existing and new sub-projects of the SLL that target other rural livelihood activities, such as, e-commerce (local arts and crafts), e-government, e-health, *etc*. Community members need to be computer literate to use these applications.

- The implementation of the SLL at the various school sites also provides opportunities for local competency and accreditation development. An example is the *Advanced Certificate in Education (ACE) in Information Communication Technology* for schools.

- The ACE course aims to: i) develop teachers that can be competent users of ICT and become ICT champions in their schools, and ii) develop teachers' skills to support training and the development of knowledge in the communities (hence building their capacity to train community members). The teachers should first register and pay for the course through Rhodes University, and then initially receive Pre-ACE training. The full ACE course is not a computer literacy course, therefore, the Pre-ACE course (80 hours of contact) is provided to train teachers in computer literacy and ensure they are competent to move on to do a full ACE course. The ACE course occurs over two years, and consists of the following programmes:

  1st Year
  - ICT1 education studies, which is common to all the other ACE specialisations offered at the Rhodes University Department of Education Studies. It includes general psychology education, cognitive theories, Outcome Based Education (OBE), discipline problems, National Curriculum Statement programme, and cross-curricular integration (i.e. using computers to teach).

  2nd Year
  - ICT2 education studies and educational research

  Obtaining an ACE accreditation provides key benefits for the school, the individual teacher, and the wider community, as described in *impact theory*.

3.2.1 Suitability Assessment

The service utilisation plan of the SLL shows that the schools are naturally a target for the project sites within the community, as these places are centrally positioned in the community to support capacity building and skills development, as well as, accommodate community meetings for developing the community. Therefore, choosing the school as a first contact is seen as vital, where the ICT project is developed through enhancing an existing development activity (schools and education), in the community. The ICT project needs to be anchored and integrated into local organisational and rural development activities and processes that aim to serve the wider community (Batchelor and Sugden 2003; Ferguson and Ballantyne 2002; Heeks, 2009; The World Bank 2003). Therefore, targeting and training teachers and certain community members, equips them to train other community members. Local trainers are also assumed to be capable of understanding how best to train the community. This allows the community to access ICT services and computer literacy training, especially in the absence of the project team. The community champions support the on-going operation of the living lab, both socially and technically.

The ICT hardware and software available is also designed to serve school environments and address some of their needs. For example, the Edubuntu Open Source platform, Gutenberg Project, Wikipedia, SchoolTool, and the Internet provide schools with access to educational material, an essential need. Furthermore, computer literacy training in Open Office provides teachers with skills to support the administration of the school. More than one school in the community is a project site, therefore, Internet access and IP phones enable affordable collaborations between the schools in the community.

The ACE training programme for teachers is a key benefit for the community, which addresses most of the needs linked to teacher training in Dwesa. A Centre is established at Ngwane JSS school, which provides teacher training in ICT. The course caters for the needs of the teachers, as it occurs over a period of time to ensure teachers understand the training, teachers do not have to travel long distances to obtain such training, appropriate documentation to aid in the training is developed for teachers, and teachers are given enough time to apply their training and clarify ACE programme aspects. Furthermore, the creation of a centre to provide accreditation and develop competencies, with ICTs as supportive tools, develops the skills of teachers to support the operation of rural schools. Community individuals and target groups also stand to benefit from computer training and competency development courses to apply in their rural livelihood activities. As more courses become available through the centre, surrounding villages or communities that attend training and visiting trainers from around South Africa can contribute to economic development through Bed & Breakfasts, or other services to accommodate them.

3.2.2 Shortcomings and Recommendations

The three key elements of a service utilisation plan are that it should appropriately locate, recruit and serve the intended target population. It is evident in the plan, that the SLL appropriately locates and recruits the intended target population, through targeting schools as project sites, and training teachers as well as community members, not only to gain in skill development, but also train other community members. However, the training approach, both by the project team and then eventually community members (teachers and individuals), appears to have some shortcomings as indicated in the needs assessment. The needs assessment shows that although the ICT equipment has tools to support the schools, the teachers still feel there is a lack of educational material and approaches for school administration. In this case, the teachers are not aware of the potential of using ICTs as supportive tools. Nonetheless, the ACE training programme that has recently been introduced to the community targets teaching and school administration skills development with the support of ICT. This course is likely to build the capacity of teachers to more effectively apply ICTs in the schools. Therefore, key to computer literacy training is simultaneously providing a complementary capacity building course, like the ACE.

Computer literacy training that is targeted at community members and other development activities should essentially be *complemented* with capacity building programmes that are specific to the targeted development area or group (for example, arts and crafts, tourism, health, adult education, and government services). As it becomes more evident how ICTs complement rural livelihood activities and

development, the community members may become more supportive of the project. The needs assessment also indicated that the teachers are challenged by the education levels of community members, and hence also social barriers where some community members refuse to attend training because they assume the living lab is only for educated individuals. Complementary capacity development programmes should be provided together with the computer literacy training (and not necessarily separately), specifically in learning areas that improve the education understanding and qualifications of individuals. For instance, the Adult Basic Education Training (ABET) programme is targeted at adults who would like to complete basic education, and aims to provide basic learning tools, knowledge and skills, in order to attain a nationally recognised qualification (Cape Gateway 2009). All things considered, the computer literacy training either needs to have an agenda for eventually supporting specific development activities, or it should occur simultaneously with other capacity building programmes targeted at development.

The service utilisation plan also needs to show a feedback mechanism from the community, to indicate the living lab's progress. A challenge highlighted in the needs assessment indicates that there are unfulfilled expectations that have emerged in the community over time, as a result of different research projects from the universities. These projects are at times incomplete, and a follow-up is not necessarily conducted in the community. Furthermore, these projects are not evaluated based on the community's perspective of the relevance, implementation, and application of the sub-projects. This may discourage community participation in the future development of the living lab, when they do not see results from their participation in the different research sub-projects. The plan should, therefore, show how community groups and individuals can continuously feedback into the living lab, which aims to be user-driven. Conducting a more *comprehensive* evaluation of the living lab can also support its direction and progress in the community.

3.3 Impact Theory

Impact theory describes a cause-and-effect sequence where certain activities of the SLL are the causes and social benefits are the effects eventually produced (Rossi *et al.* 2004: 141). The impact theory cause-and-effect diagram shows two pillars linked to the goals of the project (*Figure 3*). The first pillar is associated with the expected outcomes and impacts of the operation living lab in the community (Goal 1: To develop a distributed, multifunctional community communication platform, to deploy in marginalised and semi-marginalised communities). The second pillar shows the outcomes and impacts associated with developing technical skill in the ICT4D field (Goal 2: To equip people with technical and research skills in the field of ICT4D). The short-term, medium and long-term outcomes eventually contribute to impacts in the wider society.

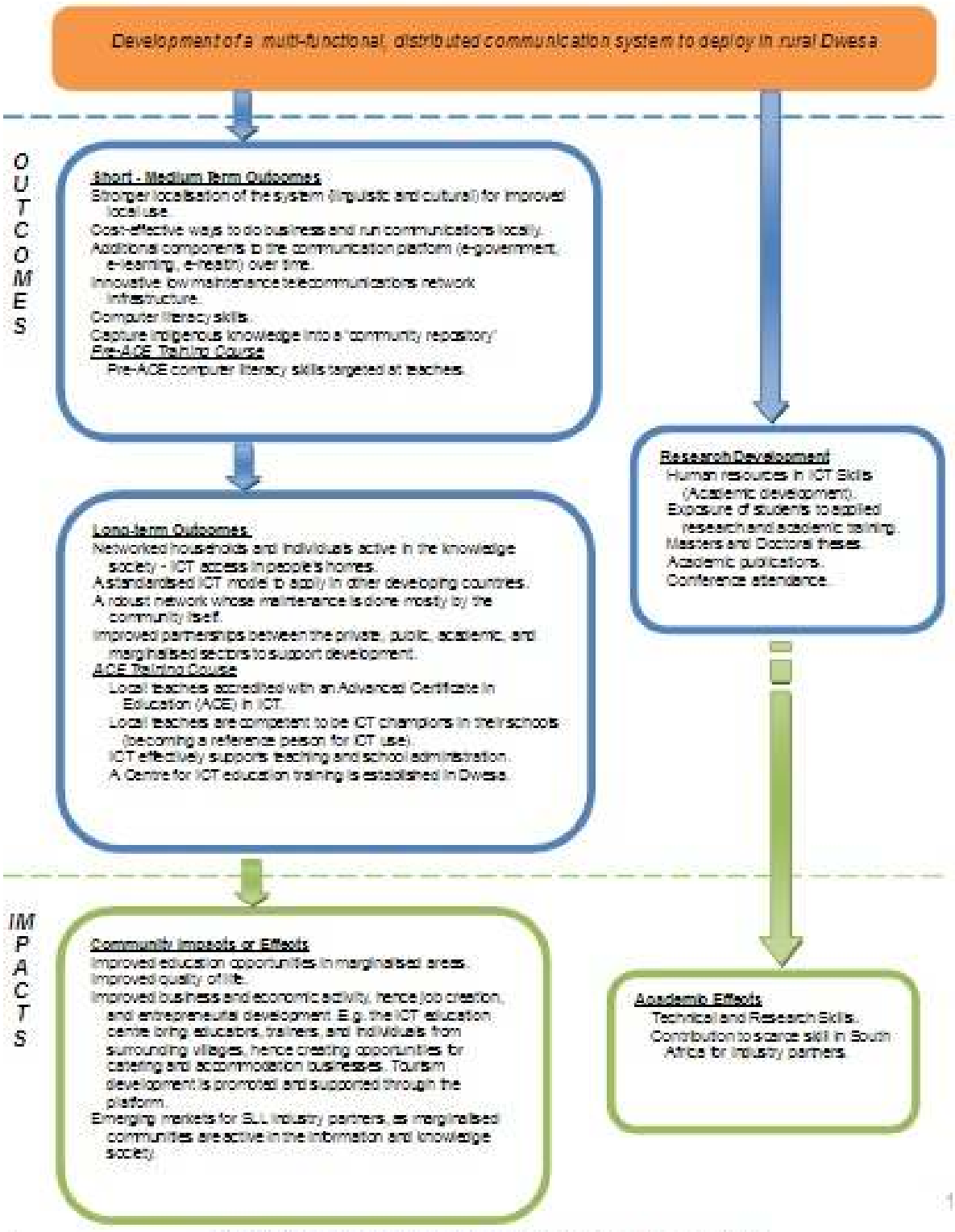

Figure 3. Impact Theory – Access to Education and Knowledge

3.3.1 Suitability Assessment

Impact theory is assessed in terms of the outcomes and effects linked to the two objectives of the living lab. The theory is suitably designed and clearly stated in relation to developing technical skills, which have a beneficial effect in the South African context. The first goal that relates to supporting development in the community is more detailed in terms of its intended outcomes and effects.

Ultimately, the outcomes of the project are targeted at developing an ICT platform that is locally useable and relevant, as well as developing computer literacy and business skills, as additional components (e-government, e-learning, e-health) are added to the platform over time. Therefore, in the short to medium term, the focus of the SLL is to localise the ICT platform. These proximal outcomes support the long-term (distal) outcomes to standardise the platform and make the living lab more sustainable and community driven, in different livelihood activities. Naturally, this should be the aim of ICT4D projects, such that they can become replicated and maintained to influence other areas associated with rural development, and hence contribute to wider society development and impact (Heeks 2005; Jacobs and Herselman 2005; International Development Research Centre (IDRC) 2005; TeleCommons Development Group 2000).

Although the assessment focuses on the need 'access to education and knowledge', all generic outcome and impacts are interrelated in terms of achieving the overall goal of the project. The impact theory appears sound in a number of aspects, but the key supportive component of the SLL, which corresponds to what is required to improve 'access to education and knowledge' conditions, is the ACE programme. The programme is suitably positioned to further develop the teaching and administration skills essential for rural school development. Most of the needs and priorities elicited in the needs assessment for 'access to education and knowledge', are addressed by the supportive ACE programme, and the intended outcomes. Of course, the ACE programme also relies significantly on sub-projects and services generated through the living lab, resulting in outcomes such as computer literacy skills, localisation of the ICT systems, maintenance and development of the ICT platform, *etc.* The ACE programme is only seen as one of the competency development programmes the SLL intends to apply. Over time, more competency programmes will be introduced, that are not only targeted at teachers, but other community members.

The needs assessment also indicated that most challenges faced by rural schools related to the approach and/or lack of government service delivery to improve the education system. Creating partnerships through living lab entity interactions can possibly support the improvement in rural school conditions, as links are created at grassroots level (bottom of the pyramid). Furthermore, development initiatives through the rural schools connect community individuals and groups to entities that would be interested in developing social and economic activities or livelihoods in the community.

3.3.2 Shortcomings and Recommendations

One of the long-term impacts stated is to 'network households and individuals in the communities who are active in the knowledge society - ICT access in people's

homes'. Although this appears to be beneficial for individuals in the community, one needs to question its relevance and its feasibility. The assumption that this long-term outcome is needed to produce wider society impacts may be flawed. The aim of the ICT4D intervention is to *support* development, and not necessarily be the panacea for development. Increasing the availability of computers may not necessarily be an effective approach. It can be difficult to measure the impact of an ICT intervention where there clearly is no direct causal relationship between ICT and poverty alleviation. According to Gigler (2004), the majority of ICT4D evaluations have focused primarily on 'access' and 'usage' hence assuming improved ICT access will have a direct positive influence on community development. However, it is not always that simple. The ICT and poverty relationship is more complex and indirect in nature. ICT initiatives are known to be best implemented when they support an existing rural development project or programme (Batchelor and Sugden 2003; Ferguson and Ballantyne 2002; The World Bank 2003). Rural development programmes are usually group ventures, providing public access facilities (for example, school, clinic, arts and crafts groups, local entrepreneurships, *etc*). Public access facilities encourage collaboration and synergy in development programmes and interventions. Furthermore, complementing ICTs with development programmes is a more sustainable and feasibility strategy. Typically, rural households cannot afford a computer, yet alone afford to maintain one. If such equipment is donated or purchased by the community, it may be more cost-effective and feasible to have it implemented within public access points. Beneficial impacts may be more effective in the community through public access points in the community that accommodate rural development interventions. A recommendation for the SLL would be to target other public access points in the community, rather than individual households in the long-term. This would engage more communities in development interventions and have a wider outreach.

4. Conclusion

A programme theory assessment attempts to determine whether the conceptualisation of the SLL is appropriately designed. The key components of the SLL that are assessed include the organisational plan, service utilisation plan, and impact theory. The organisational plan and impact theory describe the general programme theory of the SLL; however, the service utilisation plan is targeted at the 'access to education and knowledge' need (other local needs the SLL addresses may have different service utilisation plans). The evaluation reveals the suitability and shortcomings of each theory component. Some of the programme theory assessed appears sound, with some flaws in its design that need to be addressed. The evaluator recommends changes to the theory to guide its revision, to more effectively plan the operation of the living lab in marginalised communities. The SLL's programme theory is likely to evolve over time as demand driven needs emerge, new living lab services are introduced, and the project is expanded and taken to scale to support other communities. It is essential that stakeholders (both internal and external) of the living lab collaborate to discuss the further development and revision of programme theory, so as to guide the future direction and operation of the living lab. Continuously developing a sound programme theory supports designing and planning subsequent evaluations (process, outcome and impact, efficiency, and scalability) of the living lab, as a solid benchmark is provided to compare actual project performance and impact. Furthermore, since the SLL is still in a pilot phase,

evaluation domains (process, outcome and impact, efficiency, and scalability assessment) conducted can also contribute to revising the future programme theory of the living lab when it is taken to scale, as the viability of the planned performance and impact of the living lab is assessed.

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