Towards a sustainable knowledge management and development perspective approach: The sustainable rural community development portal

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Abstract

This paper presents the rural community planning portal initiative – a collaborative project between the CSIR Built Environment and Walter Sisulu University, Centre of Rural Development together with development partners with interest in rural development. The philosophy and thinking behind the rural community planning portal is that it will act as a seed for the generation of an inclusive and dynamic rural development agenda that is sensitive and relevant to contemporary issues and challenges in rural development.

The portal was conceived as an interactive tool that acts as a fountain of knowledge aimed at seamlessly sharing, disseminating and transferring such knowledge with a view to catalyse rural development. Being mindful of the pitfalls of merely developing a portal as a receptacle of existing rural development information, the rural community portal was designed to appeal to and meet the rural growth and development needs of a cross-section of rural development stakeholders i.e. children, women, youths, adults and the aged from all walks of life. Consequently, attributes such as a discussion forum, document information system, e-journal, training and capacity building section and project management sections (which have provision for adding project site information, such as tracking progress and complaints with the aid of pictures) to make sure the site is vibrant and kept as responsive to user needs as possible, have been built into its architecture. The idea is to have a relevant portal that reflects and captures the dynamic needs of rural communities and the rural planning fraternity. The portal website's design is underpinned by a developmental approach – with improvements and further add-ons being grafted as the project matures.

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Ultimately, the idea is to use the platform to encourage dialogue, innovative and creative thinking aimed at tackling rural growth and development challenges more resolutely. Rural growth and development technology application and intervention areas covered include, but are not limited to, rural access and mobility, rural housing and efficient settlement, sustainable development, energy and economic development, water and sanitation, agriculture and land reform, climate change and adaptation strategies, micro-enterprise and local livelihood systems development.

Keywords:

Rural development, portal, dialogue, community, innovation, interventions, Africa

1. General introduction

Between the years 2008 – 2010, CSIR, Built Environment through the then Rural Infrastructure and Services Competency Area embarked on a joint project with Walter Sisulu University (WSU) to develop a sustainable rural community development portal. The vision of the rural development portal is to provide leadership in rural development matters in developing countries. The portal thus provides a point for interaction, dialogue and exchange of experiences, practices and success stories in rural areas of developing countries. The portal aims to be a prime rural and development knowledge and solutions resource site for Africa and the developing world. This should ultimately facilitate the development of projects and programmes that transform rural spaces, cultures and people from poverty to prosperity through championing and fostering inclusive rural development agendas.

The implementation of the National Land Transport Bill (2009), Municipal Systems Act (No. 32 of 2000) including the developmental local government approach introduced by the White Paper on Local Government, allocates responsibility for planning, implementation and service delivery to municipalities in their area of jurisdiction. These responsibilities manifest themselves in terms of the generation of responsive integrated development plans (IDPs), integrated transport plans (ITPs) and spatial development frameworks (SDFs), to name a few. This necessarily requires capacity at the local level which, for many local authorities, does not exist or is completely insufficient.

For most rural municipalities, an apparent lack of depth exists in both content and analysis covering various rural development components of the IDP, ITP, SDF and various initiatives generated to resolve rural development constraints and challenges. This observation is confirmed by the many critical posts that remain vacant [e.g. it is estimated that there is upwards of a 35% vacancy rate in civil engineering in local government] (COGTA, 2009). Individuals in the posts that are filled are mostly likely overworked – and added to that, the private sector is also severely constrained with close to 90% staff utilisation in consulting practices (SAICE, 2007). In many cases, these technical [engineering] and professional positions are occupied by young inexperienced personnel. In the infrastructure sector, these shortcomings manifest themselves by way of massive infrastructure provision and maintenance backlogs (COGTA, 2009). Given that the dire shortage of technically competent personnel is a deep-rooted structural problem whose ultimate solution is long-term, the need to develop and deploy innovative tools to enable particularly the beleaguered technical arms of municipalities to function relatively efficiently [given their current situation] cannot be over-emphasised.

Because of the wide-ranging circumstances and workings of rural communities, content from almost all of the disciplinary theories is relevant in community development (Todaro & Smith, 2009). Therefore, rural and community development theory has used and will continue to borrow from the theories of the standard disciplines. In a very real sense, most theoretical developments of the disciplines form a reservoir for community development theory (Fourier, 2007). This rich diversity and truth is captured in the design features and capabilities of the sustainable rural development portal website.

The demands of practice are such that thinking about theory in terms of its content within the separate disciplines is not a practical approach (Conteras, 2010). The objective of rural and community development practice is improvement in operating communities. Fundamentally, it is an activity that is normative in nature. That is, it deals with what ought to be, or what is better. The practitioner needs theory that will provide a guide for behaviour in very specific circumstances. The rural community sustainable development portal therefore includes a catalogue of best practices, case studies as well as an expertise database that allows experts/stakeholders to register on site and be more visible to rural communities..

1.1 Rationale for Reviving the Rural Accessibility Planning Portal and Upgrading it into a Rural Community Portal

With time at a premium, officials occupying technical positions and decision makers need tools that enable them to access the right information to effectively discharge their mandates. Such a tool could, for example, also enhance sharing of experiences, minimise duplication as well as assist in building capacity. Capacity building is understood here as a process that improves the ability of a person, group, community, state, organisation or system to meet objectives or perform better by doing things smarter and using the shortest delivery loop (Chakwizira *et al*, 2010). It is an intermediate step towards performance improvement which represents the potential for using resources efficiently and effectively (Chakwizira, 2008). CSIR Built Environment has developed such a knowledge management tool in the form of a portal – the Rural Accessibility Planning Portal [RAPP] geared for the rural transport sector (i.e. from 1996).

As previously configured (refer to figure 1), RAPP contained the following offerings:

- An overview section, providing general information on rural areas in South Africa and transport strategies.
- A legislative and policy section, which outlines significant rural development and transport strategies, as well as existing and pending legislation.
- A local realities and practices section, which facilitates sharing of information on municipal transport planning and service delivery, and good practice examples from some local municipalities.
- An integrated rural transport and access section, dealing extensively with integrated planning, rural transport infrastructure and services, rural LED and enterprise development, and ICT for development to facilitate the formulation of integrated interventions by district municipalities.

Figure 1: RURAL Access Planning Portal

- A discussion forum, allowing district municipalities to share transport and development information, good practices and strategies, enabling them to plan and strengthen their Integrated Transport and Development Plans; and
- A capacity development section, dealing with available decision-support systems and training courses (Moeketsi et al, 2005).

On the balance of evidence, the foregoing was considered to constitute a good value-for-money resource that needed to be revisited, dusted, revived and revitalised for use by a cross-section of stakeholders

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including CSIR Built Environment. However, given the current technical staff turnover rates in local authorities as well as lack of organisational readiness across all spheres of government to effectively administer such a tool, it is envisaged that a permanent team at CSIR Built Environment or WSU would be set up to maintain, manage and update the product and actively source and upload additional rural community development information.

1.2 Purpose of the paper

The main aim of this paper is to present the upgraded RAPP (i.e. the Sustainable Rural Community Development Portal [SURUCODEP]. A number of objectives motivated the need to revisit and revive RAPP and upgrade it into SURUCODEP. Firstly, the need to establish an authoritative source [portal] of rural infrastructure and services covering transportation, water and sanitation, rural energy and supply, geo-ICT information for rural planning and development stakeholders was critical. Secondly, there was a need to create an interactive information-sharing platform for all spheres of Government [and perhaps intermediate means of transport (IMTs), water and sanitation, rural energy and supply, geo-information communication technology (ICT) consulting enterprises]. Thirdly, it was thought necessary to enhance the accessibility of rural development information by a cross-section of stakeholders. Fourthly, it was envisaged that such an initiative would facilitate networking, and by extension, access to knowledge of what works through easy access to fellow practitioners and communities of practice. Lastly, it was deemed vital to create awareness and appreciation of the rural transportation sector in South Africa and other developing countries.

It is intended that SURUCODEP will contain a unique mix of information products and solutions grounded and anchored on thorough research undertaken in the transportation, water and sanitation, rural energy and supply, geo-ICT field locally and internationally. It will thus provide its target audience with focused information in an ordered environment. This edition of SURUCODEP will also entail significantly enhanced usability by ensuring that the required tools and knowledge nuggets are packaged and organised into one cohesive package. In its completed form, SURUCODEP will be easy to use and fun to explore for research, learning and practical purposes.

2.0 Methodology

2.1 Rural and Community Development Systems Conceptual Framework

The process of working towards practical prescriptions for behaviour supporting rural and community improvement is no easy task (Chakwizira *et al*, 2010). Even in the best of circumstances the process will always be complex, imperfect, incomplete and on-going (Mashiri *et al*, 2009). Rural and community development theory heavily depends on general systems and on social systems' conceptual frameworks to organise and relate the ideas, intelligence and information uncovered and created in the processes of engagement (Maritz, 2009; Muniafu, 2007). In addition, the systems framework has the advantage of being compatible with a holistic approach (Bertalanffy, 1968). The above considerations led to the adoption of the sustainable rural community development initiative portal developmental approach which provides flexibility as various add-ons are provided to the website in light of evolving experience and feedback from users/stakeholders. The website is therefore not an end in itself but a means to various ends. The sustainable rural community development portal initiative has provided space for linking the site to other stakeholder sites. In addition, stakeholders can buy space and advertise activities such as green farming, organic farming, micro-credit for small farmers, training and capacity-building events, etc. – describing a much more robust business model.

2.2 Study Approach and Methodology

In order to create appropriate sustainable rural development community portal service systems the ***design science paradigm*** was followed, which is used to conduct research in information systems and organisational settings. Design science strives to create innovative and valuable artefacts, whereby the researcher attempts to create products that serve human purpose, and the outputs are assessed against criteria of value or utility (Stefik, 1984).

Design science guidelines were used to design the systems to fulfil the user requirements identified, and to determine the real business issues (problem relevance) to be solved by the systems. Consequently, interviews, questionnaires, and observations were used to obtain both qualitative and quantitative data from the stakeholders. It is however not only design science which is important when developing information systems; behavioural science also plays an important role as it deals with the human element. It seeks to explain or predict human phenomena surrounding the design, implementation and use of information systems (Hevner et al., 2004). Both paradigms are needed to inform researchers and developers of the interactions among people, technology and organisations to be managed if the information system is to achieve its planned/intended purpose.

"Rural living labs" are user-centric, real-life research and development contexts, involving people, businesses and public players in the co-creation of services to enhance rural development. It also seeks to overcome sustainability challenges normally associated with systems in rural areas. According to Mulder (2008) the main advantage of a "living lab" approach over more traditional user-centric methodologies, is its multi-contextual sphere in which the co-creation of ICT product and service development takes place. It is also about research and technology (R&D) development institutions setting up long-term relationships with the inhabitants of the real-world context in a way that will ensure active participation by the latter in the R&D process (Maritz et al., 2007). The ability to interact with the users is what differentiates the living lab approach from other cross-disciplinary approaches. Living lab research is viewed as the place where both fundamental research and pure applied research meet; it embraces inspired innovation research.

It can be argued that it is not the development of systems that is a concern, rather the sustainability of service systems (Maritz et al, 2007). Past experience has indicated that systems often fail due to incomplete design – or simply not taking local realities fully into account (Muniafu, 2007). According to Kotler (1997) service systems are 'any activity or benefit that one party can offer to another that is essentially intangible and does not result in the ownership of anything'. The design object (the service system – Figure 1) is a combination of the service concept itself, the organisational structure, and the information technology architecture (Van de Kar & Verbraeck, 2007). Focusing on only one of these is ineffective and the boundaries between these are also not clear (yet mutually interdependent).
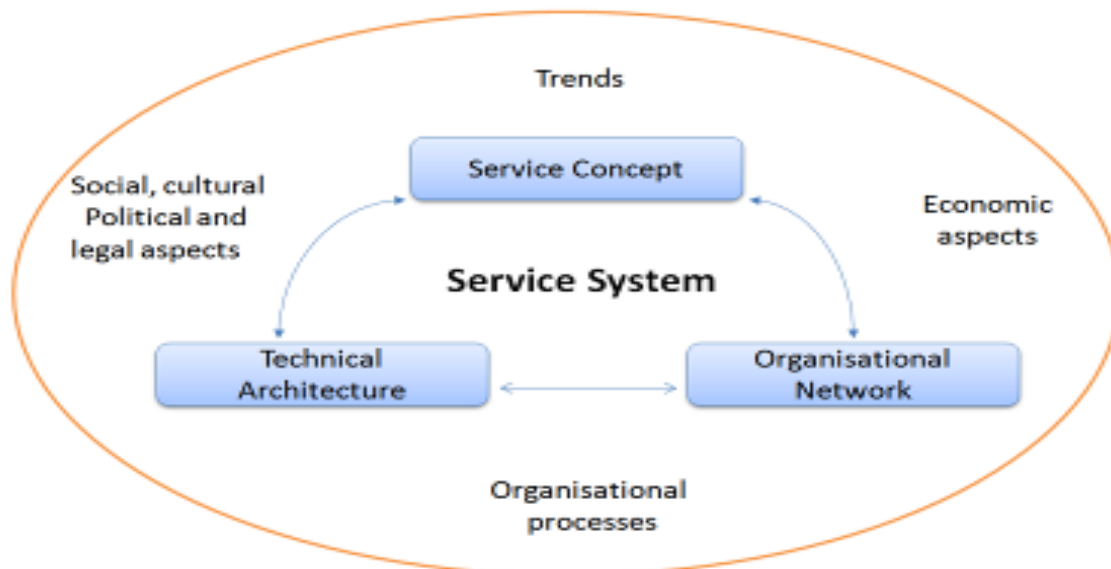
Figure 1: Elements of the service system (Van de Kar & Verbraeck, 2007)

The service system framework as described by Van Der Kar and Verbraeck (2007) was applied to develop the rural community sustainable development portal system. A service system distinguishes between different aspects needing attention in the design of a new (service) system where trade-offs are made between the service system elements. Firstly, a service concept is needed – this determines the strategy used to create value for the users. Secondly, an organisational network must be in place (or established) that supports the service. Thirdly, when looking at services supported by ICT, a technical architecture should be provided. The organisational network and technical architecture are determinants of the actual service delivery. It is also important to note that the system operates within a wider environment that is dominated by issues such as local politics, operational issues and ethical considerations. These need to be taken into account in the design of the rural portal system (Maritz, 2009). This became especially evident during the initial interactions with stakeholders in the Eastern Cape, Annual Rural Development Conference, Department of Local Government (DPLG), Blue Technology Solution service providers as well as internal CSIR Built Environment workshops: the extent of such 'environmental issues' had to be limited – boundaries had to be set for the system in order to proceed with its development. Where possible, the current organisational networks were used in the design of the system.

2.3   Strategic Development Research Phases

In order to realise the aims and objectives of the RAPP revival and upgrading into SURUCODEP project, the approach was informed by building upon the current system and improving it in line with feedback from stakeholders. Integral to executing such an approach were a number of considerations, namely:

- Audit and analyse the existing RAPP system with a view to generating a new vision, mission, aims and objectives.
- Audit and analyse the existing RAPP product with a view to determining the strengths and weaknesses of the information currently available.
- Generate a detailed project plan including the system design, implementation tasks, deployment and testing plan as well as the associated budget.
- Enrich the product by sourcing, synthesising and uploading more meta-data related to each document or publication that is published on the portal.
- Enrich the product by uploading exhaustive information regarding document or publication authors and the relevant publication dates.
- Enrich the product by incorporating opportunities provided by a web-based spatial database

system into SURUCODEP, such as project tracking / progress application to socio-economic infrastructure projects e.g. taxi routes, bus stations, etc.

- Improve the system's functionality and user-friendliness by increasing the speed with which the user interacts with the system through, for example, the provision of staggered levels of information depth to the user. This was done by expanding the information related to a document or publication, which is particularly crucial in low bandwidth conditions experienced in developing countries, including South Africa.

- Improve the system's functionality and user-friendliness by investigating the possibility of providing for richer ways of searching for information which could involve adding to the search function to include more search options.

- Improve the system's functionality and user-friendliness by adding a spatial dimension to the research information currently available and future additions, for example, through a new spatial platform developed for the Internet using open source software. This should enable the development of spatial analysis; assist in the visualisation of key indicators by clients, development of a statistical analysis application that produces reports in various forms such as tabular information, graphs, meta-data and photo libraries.

- Develop a sustainable funding model to enable CSIR Built Environment to recover its development costs, maintain the product on a daily basis, do technical value addition and market-driven research.

2.4   Structure of the Paper

This paper is structured into *five sections. Section one* has provided the general background and introduction to the sustainable rural development portal. The rationale and purpose of the project has been outlined. *Section two* is dedicated to outlining the research methodology. *Section three* discusses the project results and findings. *Section four* presents the main recommendations of the project, while *section five* provides concluding remarks.

3.0   Study Findings & Results

3.1   Background to the Establishment of the Rural Development Portal

A number of strategic steps and decisions explain the birth and development trajectory of the portal. The idea was conceived after 1994 by the then CSIR Transportek Rural Accessibility Research Group. The thinking then was that firstly, a data warehouse would provide easy storage and retrieval of rural transport issues in South Africa. Secondly, a website would act as a gateway to other relevant site links in rural development such as the Development Bank of Southern Africa, the African Development Bank, the World Bank, the Food and Agriculture Organisation, the International Fund for Agricultural Development, and the International Labour Organisation.

Subsequently, the then Department of Provincial and Local Government [DPLG] contributed financially towards the development of the portal. In 2008, the CSIR signed a Memorandum of Understanding (MoU) with WSU. One identified area of cooperation was the development of a rural development portal that would respond to community needs. Since the signing of the MoU between CSIR and WSU, the concept of the portal has undergone a series of iterations. During the 4th Annual Rural Development Conference (organised by WSU), a resolution was made to implement the rural development portal project, taking into account the need to balance academic demands with community rural development needs. In 2009, during the 5th Annual Rural Development Conference, the portal project was successfully launched together with the Digital Doorway facility in WSU, Mthatha, in front of over 500 conference delegates, to allow access and use by the largest possible number of users (a Digital Doorway is a robust multimedia terminal that houses a computer. This is important in eradicating the digital divide and providing access to computer-illiterate communities. Digital doorway website: www.digitaldoorway.co.za). The portal is

therefore a project that represents work in progress. The adopted approach is to perfect the portal with continuous improvements into the future.

3.2 Characteristics of the Sustainable Rural Community Development Portal

The sustainable rural community development initiative is an attempt to normatively intervene in community affairs. Key characteristics that differentiate sustainable rural community development initiatives from other forms of community-related activities include firstly, the primary and undivided focus on a unit called "rural community." Secondly, a conscious attempt to induce non-reversible structural change through an information and technology intervention co-created change system (i.e. the development of the sustainable rural community development initiative). Thirdly, the use of paid professionals to develop and design the portal website. Fourthly, the project initiation by groups, agencies or institutions external to the community unit (the collaborative partnership between the former DPLG, former Transportek, Built Environment, Walter Sisulu University and Blue Gate Technologies) is a distinguishing feature. Fifthly, emphasis is placed on public participation (through grassroots participation of communities from the Eastern Cape Province, student participation as represented by the Walter Sisulu University Students Forum, discussion and presentation of the sustainable rural community development initiative to the 4th and 5th Annual Rural Development Conference at Walter Sisulu University). Sixthly, participation by stakeholders for the purpose of deepening self-help runs throughout all facets of the project. Lastly, the use of a holistic approach is meant to guarantee that the sustainable rural development portal is sensitive to and representative of rural development matters.

Figure 2: Rural Community Sustainable Development Portal

3.3 Sustainable Rural Development Portal Strands and Trends

The sustainable rural community development portal project has assumed the mantle of a flagship project within the purview of the WSU/CSIR MOU. This section discusses the output of the interactive and collaborative outputs of both the CSIR and WSU team members who worked on the project.

3.3.1 Current Architecture and Design of the Rural Development Portal

The portal has been developed and runs on an open source software platform. The portal is user-friendly and compatible with most computer operating systems. The portal has a number of features meant to encourage users to provide input and feedback regarding performance. Figure 2 presents a glimpse of the front-end interface portal webpage. The portal is accessible on the following webpage: www.ruralportal.co.za. This webpage will be changed to www.ruralportal.org.

3.3.2 Existing challenges of the current Rural Development Portal System

The first phase for the Rural Portal was developed in a practical sense to get the website online and thus provide a basis to work on in future. The technology used was for web browsing and has the necessary administrative tools to be edited as and when required. This means that all the information and images can be edited in the form of adding, deleting and changing as required by the administrator. However, the

site has a number of shortcomings as identified by feedback from site users, WSU and CSIR. Currently the site is hosted by Digital Interactive service providers, which enables faster browsing for external users, unlike past experience where such sites ran slower when hosted from within the CSIR, owing partly to the organisation's strict firewall rules. Add-ons are essential to make the site competitive and the system more sustainable e.g. the inclusion of a WIKI system, banner management, other languages and project manager.

3.3.3   Proposed way forward

As a result of the base site being developed, capability to add applications to the site exists as requested by users, WSU and the CSIR. To implement these applications does however mean new developments, which can be catered for in proposed later phases of this project.

4.0 Recommendations

In taking the sustainable rural community development portal forward, a number of strategic decisions need to be made. Options that can be explored include:
- Marketing the Sustainable Rural Development Portal to the new departments of Rural Development and Land Reform, and the Department of Cooperative Governance and Traditional Affairs
- Organising funding outreach programmes with such institutions as the Development Bank of Southern Africa and the World Bank (Pretoria Office) to seek funding to implement subsequent phases of the project. This should also include exploring partnerships and alliances with rural development agencies, NGOs and international development agencies interested in rural development in developing countries.
- Transferring skills and establishing a server at Walter Sisulu University to ensure sustainability of the rural community development portal. This point is relatively significant given that the institution hosts the centre for rural development in the Eastern Cape.
- Exploring the possibility of implementing Digital Doorway pilot projects in the Eastern Cape with space for the rural community portal..This can be explored in conjunction with the Meraka Institute.
- Exploring phase two development funding and logistics requirements. The additional development of phase two components is estimated to require 4-6 months to finalise. This would make the site one of the most comprehensive rural community development and sustainability driven sites worldwide.
- Maintaining and entrenching a user-orientated and design-input developmental approach to the portal website and offerings. Users are the envisaged backbone of the site as they interact with each other via the site and use the site for information exchange and dissemination pertaining to project activities and events in their areas.

4.1   Conclusion

When mature, the site is expected to be recognised as a source of information for rural and development solutions customised to the African market. Currently the website [www.ruralportal.co.za] is active and operational. This base site has the capability to add applications to the site as requested by users, WSU and the CSIR. Implementation of further applications means new developments, which can be catered for under the proposed phase two of this project. The portal has been developed and runs on an open source software platform. In addition the portal is user-friendly and compatible with most computer operating systems. The robustness of the portal derives from the fact that it has a number of features meant to encourage users to provide input and feedback regarding performance. Taking the developmental approach, the next phases - such as funding for portal sustainability - require the establishment of strategic partnerships with institutions and departments such as the Development Bank of Southern

Africa, Department of Rural Development and Land Reform, the Department of Cooperative Governance and Traditional Affairs, and the World Bank, amongst others.

This project is expected to assist decision makers and potential donors and/or project sponsors to make informed choices with regard to the fulfillment of dreams so many people harbour aimed at alleviating some of the critical problems and issues facing people living in rural communities, particularly in developing countries.

5.0References

ACADEMY OF EDUCATIONAL DEVELOPMENT 2008. *Small technology – big impact: Practical options for development.* Washington: AED.

ANAND, S. & SEN, A., 2000. *Human Development and Economic Sustainability.* World Development, 28(12), 2029-2049.

BOTKINS, JAMES W., ELMANDJRA, MAHDI AND MALITZA, MIRCEA.1979. *No Limits to Learning.* New York: Pergamon Press.

BRIGGS, XAVIER DE SOUZA, AND ELIZABETH MUELLER AND MERCER SULLIVAN 1997. *From Neighborhood to Community: Evidence on the Social Effects of Community Development Corporations.* Community Development Research Center.

CHAKWIZIRA J.,2008. *"Technology & Knowledge Transfer for Development"* Knowledge to remobilize Africa: 2nd Biennial Knowledge Management Africa Conference, Nairobi, Kenya, 17-19 July pp 44 ISBN 978192027029

CHAKWIZIRA J, NHEMACHENA C, MAPONYA G & DUBE S.,2010. Sustainable Rural Community Development Portal, CSIR Parliamentary Grant Report, Pretoria

FOURIE, L., 2007. *Enhancing the livelihoods of the rural poor: The role of information and communication technologies.* Pretoria: Global Image.

HEVNER, A., MARCH, S., PARK, J. AND RAM, S., 2004. Design science in Information System Research. MIS Quarterly, 28(1), pp. 75-105.

HLA MYINT AND ANNE O. KRUEGER 2009. "Economic development," *Encyclopædia Britannica.*

LEE, A., 2000. *Systems thinking, design science, and paradigms: heeding three lessons from the past to resolve three dilemmas* [Homepage of Virginia Commonwealth University], [Online]. Available: http://www.people.vcu.edu/~aslee/ ICIM-keynote-2000 [Dec 2, 2009].

LEWIS, MICHAEL.,2009. *The Culture of Inequality.* Meridian edition. New York: New American Library.

LEWIS F. ABBOTT.,2003. *Theories Of Industrial Modernization & Enterprise Development: A Review*, ISR/Google Books, revised 2nd edition 2003, pages 1–2. ISBN 978-0-906321-26-3.[2]

LYNNE MARKUS, M., MAJCHRZAK, A. And GASSER, L.,2002. A Design Theory for Systems That Support Emergent Knowledge Processes. MIS Quarterly, 26(3), pp. 197-212.

MARITZ J, VELDSMAN A & R DE LOW.,2007. *Breaking the Barriers of rural development*, CSIR Media Release, 2007

MARITZ J, NAUDE A H, & BADENHORST W.,2008. *Developing a meso-scale geo-frame ,* Geoinformation challenges, pp 119-130

MARITZ J.,2009. *Development of a logistics brokering system for South Africa's displaced rural residents*, International Conference on Rural Information and communication Technology 2009, bandung, Indonesia, 17-18 June 2009, p 11 ISBN 978-979-15509-4-9

MOEKETSI P N, NAUDE A H, FERREIRA M, MARITZ J, MASHIRI M, MOREJELE NJE, GREEN CA, MARRIAN B & GAIGULO E.,2005. Towards the enhancement of the rural access planning portal (RAPP), CSIR Parliamentary Grant Report, Pretoria

MERZ, C., 2007. The added value of Living Labs – a software industry perspective. Input for the living labs roadmap. Germeny: SAP.

TODARO M P AND SMITH C S.,2009. *Economic Development.* Addison–Wesley, 10th ed.

MULDER, I.,2008. Meraka Living Labs research group research agenda. Pretoria: Meraka Institute.

MUNIAFU, S.M.,2007. Developing ICT-enabled services in transition countries - a studio-based approach for logistics brokering, Delft University of Technology, The Netterlands.

CONTERAS R.,2010., *"How the Concept of Development Got Started"* University of Iowa Center for International Finance and Development E-Book[1]

SAICE.,2007. *"Numbers & Needs",* Midrand, South Africa

SMRČA, K.,2007. *Technology adopts a human face* [Homepage of Engineering News], [Online]. Available: http://www.engineeringnews.co.za/article/technology-adopts-a-human-face-2007-07-27 [July 2007, 2009].

TSICHRITZIS, D.1997. The dynamics of innovation. In: P.J. DENNING and R.M. METCALFE, eds, Beyond Calculation: the next fifty years of computing. First edn. New York: Copernicus, pp. 259-265.

VOTH, DONALD E.; JACKSON, VIRGINIA; AND COOK, JAMES B.,1979 "Citizen Participation in Rural Development." In *Citizen Participation Perspectives.* Stuart Langton, editor, Medford, Mass.: Lincoln Tilene Center for Citizenship and Public Affairs, 1979.

6.0 Endnote