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"Virtuous Cycles" for Rural Innovation and Agri-Entrepreneurship Development

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Abstract: This case study attempts to share an enhanced, systemic and holistic paradigm for both planners and practitioners in the African rural innovation and broader technology-enhanced, socio-economic and entrepreneurial development space. It demonstrates the challenges, but also the value, of a “cyclical” approach through categories of sustainability to ensure scalable (technology enhanced) community-level, social-enterprise, service interventions. These interventions focus on the delivery of “boxes, business and behaviour”-based cyclical dimensions of sustainability categories (and details) as enablers of systemic rural innovation and entrepreneurial behavioural changes in Southern African – and other similar “centre-periphery economy” contexts. It evaluates this learning against the international Choice Framework as well as against own “African learning”.

Keywords: Cycles of sustainability categories; holistic and systemic development design.

1. Introduction

In 2011 the South Africa Departments of Science and Technology (DST) and Basic Education (DBE) jointly identified a need for a “technology-intensive, holistic, systemic and multi-layered intervention that could be tested in a limited rural educational and economic development space.” The Nciba School Circuit near the town of Cofimvaba in the Chris Hani District of the Eastern Cape province of South Africa (classified as one of the rural “priority districts”) was then selected for a range of interventions since August 2011 until June 2016.

The initiative team used a systemic approach that led to the development of a holistic model for rural innovation to address rural enterprise creation and unemployment. A Living Lab methodology was used during implementation to ensure a participatory approach that catered for user-driven, open innovation within complex real-life settings. It was strengthened by the adapted Outcome Mapping Monitoring and Evaluation approach that informed both the intentional design and the adjustments made during in the project.

This paper endeavours to share the experience of the project team in developing a more holistic and systemic approach to rural development and a “virtuous cycle” approach to implementation (and monitoring and evaluation). The shared experience and abstractions are meant for use at both the strategic and practical levels of similar interventions.

2. Objectives

The complexities of the local African context as well as current international development experience (and thinking) motivated the design and implementation of this Technology for Rural Innovation and Economic Development (Tech4RIED) initiative. The research and learning focused on a range of interventions for socio-economic development that had overlapping, yet distinctive, objectives which will be shared and which included:

- Socio-economic development impact - measured as both systemic output and outcomes defined in terms of behavioural changes;
- Technology application approach clarity and impact – measured in terms of both efficiency as well as effectiveness;
- Building the necessary capacity - measured by the ability of the local stakeholders to drive and take ownership of the initiative; and
- Understanding the contribution of technology application towards effective policies for innovation success in the “base-of-the-pyramid (BoP)” development sphere.

3. Methodology

3.1 Design with a Holistic and Systemic Orientation

Against the complex backdrop of the implicit systemic approach of the South Africa National Development Plan (NDP), the initiative cross-examined technology intensive systemic (and holistic) interventions and its influence on human behaviour.

The initial work in the Cofimvaba region led the initiative team to use a holistic, systemic design approach towards the development of a rural innovation model to address education challenges, rural poverty and unemployment. The model then developed and tested, is portrayed in Figure 1 and explained in the paragraphs that follow.

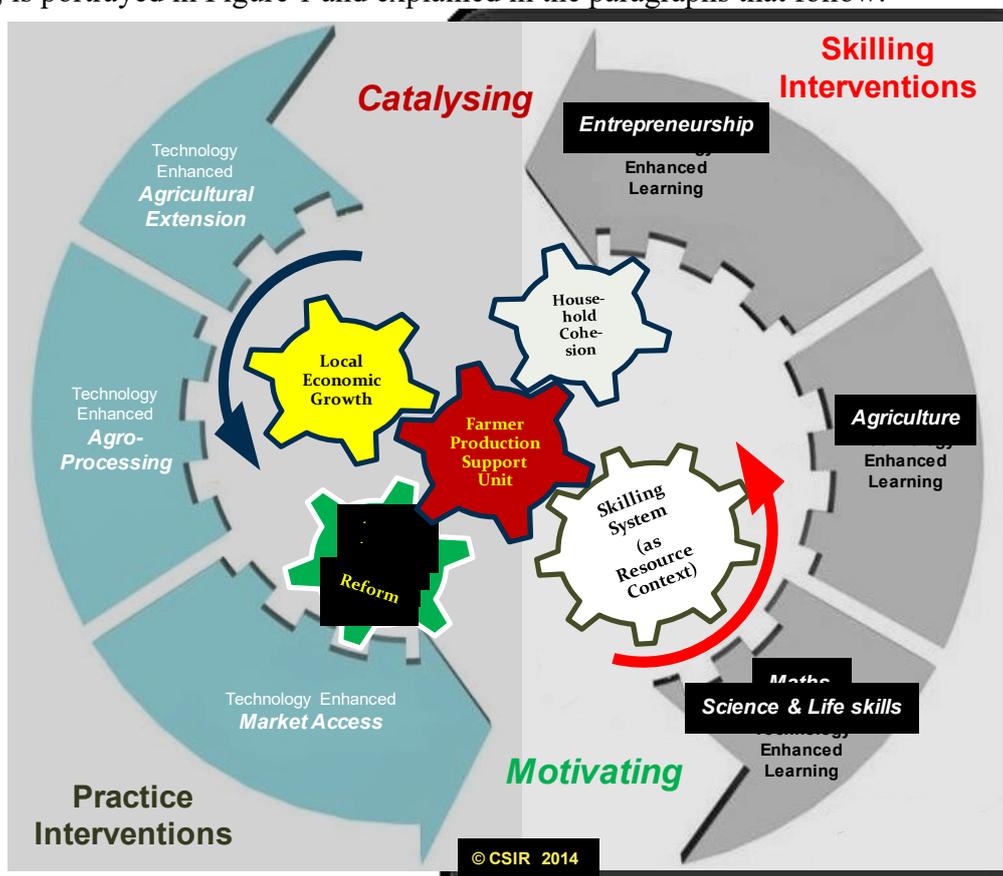


Figure 1: Holistic, systemic Design

All technology-enhanced, basic and agricultural education efforts in-school were therefore geared to:

- Enhance the learning of mathematics, science and agriculture using ICT tools;
- Make agriculture attractive and interesting by using real-world experimental farms, agro-processing equipment and Agri-ICT platforms to enhance interaction and team-work; and

- Develop entrepreneurship - culminating in the development of an Agri-Business for Learners (ABL) programme.

The above in-school elements were designed to catalyse out-of-school agricultural processing and extension activities aimed at enhanced local economic development capacity to persuade jobseekers (fathers and mothers in the cities) to return to the area. Success in the out-of-school realm was in turn aimed at motivating learners to put more effort into learning and to stay in the area – a systemic effect within the holistic design.

3.2 Use a Living Lab Approach to Implementation

The National System of Innovation (NSI) partners proposed the establishment of a rural Living Lab in Cofimvaba in the Eastern Cape to provide the opportunity for *user-led, integrated research* on the application of technology for rural educational and economic development challenges. The Living Lab approach has several characteristics that made it the preferred vehicle for innovative, technology-intensive-interventions to address some of the education and development challenges in rural contexts.

The relevant features of the Southern Africa living lab [1] approach for this project was:

- **User-driven innovation:** It was important to identify, mobilise and commit “users” from all the stakeholder contexts to actively participate and take ownership of this “rural living lab”-initiative; and
- **Ongoing learning in real life rural settings.** The complex, long-term and systemic orientation of a living lab environment, necessitated a phased approach with three phases in mind: Design and scoping; Establishment and Incubation; and Growth and Maturation of the initiative.

3.3 Compile a “Cyclical” Monitoring and Evaluation (M&E) Framework

Previous research has convinced the project team that a combination of monitoring and evaluation methodologies is needed to effectively collect and substantiate evidence of change across all the levels of the strategic plan [2]. A useful combination of logframe and outcome mapping enabled us to deal with the monitoring and evaluation of the following implementation (and sustainability) categories: “**Boxes**” (the technology deployed), “**Business**” (the economic viability) and “**Behaviour**” (as an indicator of behavioural outcomes). A brief view is presented in Figure 2 and will again be referred to under the discussion of the “Lessons Learned” and the “virtuous cycles” of Figure 4.

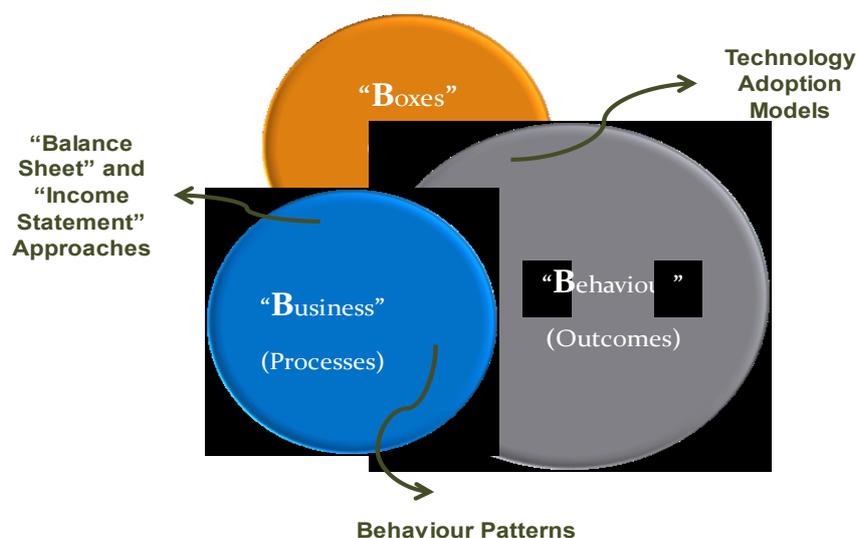


Figure 2: “Business, Boxes and Behaviour”

4. Implementation Process

4.1 Phased Approach

It was realised up-front that the long-term, real-world orientation of a Living Lab environment necessitated a phased approach. The detailed activities during the various phases, portrayed in Figure 3, explains the progression of the initiative from a focus on curriculum content to a compilation of best practice and eventual tested business cases.

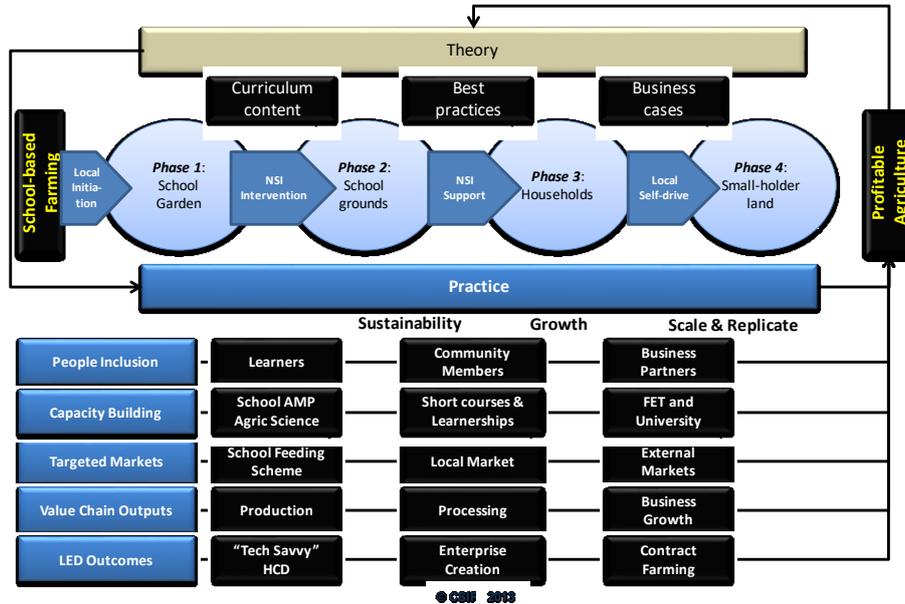
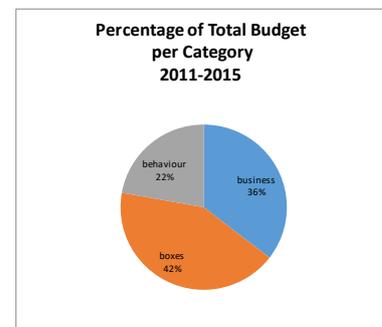


Figure 3: Phased Implementation Approach

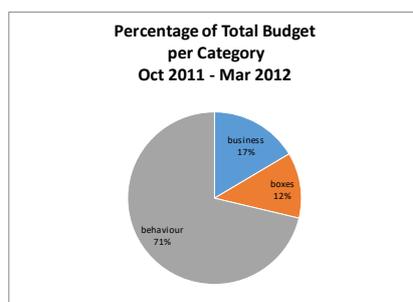
4.2 Investments, Interventions and Results

The percentage of total budget spent per M&E categories of “Boxes” (42%), “Business” (36%) and “Behaviour” (22%) during the life of the initiative is portrayed in the adjacent pie-chart.

Note: The pie-charts following show how the emphasis in the three categories of Boxes, Business and Behaviour varied during the unfolding of the initiative over the years 2011 to 2015. This variation had definite implications on the achievements and progress – as will be discussed at the end of this section.



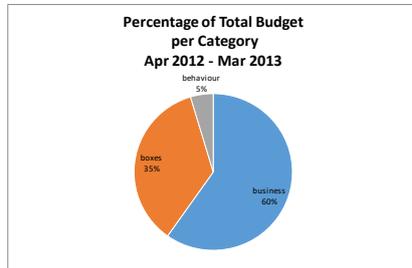
- **From Aug 2011 - Mar 2012 – Scoping and Design phase**



In a visioning workshop, we asked a comprehensive group this fundamental question: “What does the community look like when it is functioning well?” This was followed by various surveys dealing with the analysis of capitals/resources and the opinions of stakeholders. The focus was first on one individual school’s eco-system: to develop the school as the “centre of opportunity”, to take the local context and ambitions of the school into account and to establish a “virtuous cycle”

of development as shown earlier in the document. *It is evident that the bulk of the investment was in people mobilisation and collaborative design (71% “Behaviour”) during this stage.*

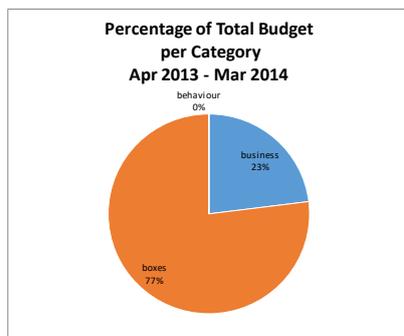
- ***From Apr 2012 to Mar 2013 - Experimental farm development***



The infrastructure preparation for the experimental farm involved the installation of drip-irrigation infrastructure, fencing and security by Tech4RIED. The building of chicken coops, a piggery and a nursery was done through the Education budget. Chicken production started at the end of 2012 followed by crop planting early in 2013 and the introduction of pigs in the same year. These activities were managed by the teachers under the guidance of the

School Management Team (SMT), with mentoring and business support provided. *It is evident that the largest investment was in business development and entrepreneurship training (60% “Business”) during this stage.*

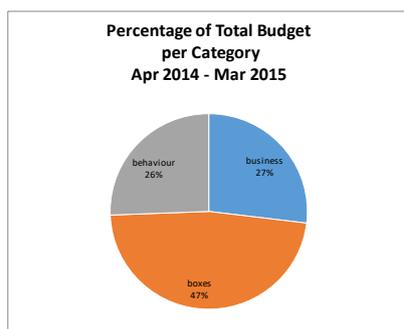
- ***From Apr 2013 to Mar 2014 - Agri-teaching activities and experimental farm development***



A full annual cycle of production was completed during 2013 with eight cycles of chickens, two cycles of crops and the sale of the piglets produced. Egg layers were introduced at the end of 2013. Even though a Project Steering Committee (PSC) of internal and external stakeholders was established in 2013, it had not become involved in operational issues but served more as a strategic forum for activities in the project. The farming operations were still managed by the School Management Team (SMT), supervised by the principal and teachers. *It*

is evident that the largest investment was in the deployment of technology (77% “boxes”) during this stage.

- ***From Apr 2014 to Mar 2015 - Focus on Tech4RIED extension at Cofimvaba***



During this period the farming operation was re-focused to include the incubation of mini-farm agri-businesses. The Agri-Business for Learners (ABL) approach was developed where teams could learn how to run an agri-business on the school ground under expert technical and business guidance. The operational management was now in the hands of the ABL teams who had the incentive for success through the sharing of the dividends at the end of the production cycle. The PSC now had an overall management and mentoring role. The School Management

Team (SMT) continued to play a role in the management of the two fields the school retained. *Investment during this stage was more balanced again but the bulk of it was again in the deployment and maintenance of technology (47% “boxes”) during this stage.*

Note: It became clear that ‘neglect’ in one or more of the M&E (and implementation) categories had a negative effect in subsequent phases. The omission of investing sufficiently in human behavioural changes during 2013 and 2014 had a definite impact on the sustained participation of local stakeholders towards the end of 2014.

5. Lessons Learnt: International and African

5.1 A reflection on Sen, Kleine and the Choice Framework

In 2015 we invited Dr Dorothea Kleine, then director of the ICT4D Centre at the University of London, to do a rapid assessment of the initiative based on her “Choice Framework” [3] approach. She confirmed some of the lessons the project implementers have learnt and *emphasised the need for a more participatory, human centred, empowerment approach* in service of sustainable development.

Based on our own experience on the dynamics between project-led /driven interventions and local innovation, it might be useful to consider the findings of Lessmann and Rauschmayer [4] who used the Capability Approach (CA) of Sen – the backdrop to Kleine’s Choice Framework - to model sustainable development. In their model, it becomes clear that an *individual’s choices* have very little impact on sustainable development, but do have the full burden of moral responsibility under the Capability Approach. Marais therefore deduces that, ignoring the motivational challenges, just the cognitive burden of making rational decisions (in resource deprived contexts) regarding the consequence of your decisions on the far future is excessive and therefore agreed with Lessmann and Rauschmayer agreement with Grunwald (2010) that implementing sustainable development is *mainly a political task* to be undertaken by collective entities [5] (insertion mine).

5.2 The Local, African Lessons Learnt

The learning from the project is reflected in Figure 4 and discussed in subsequent bullets.

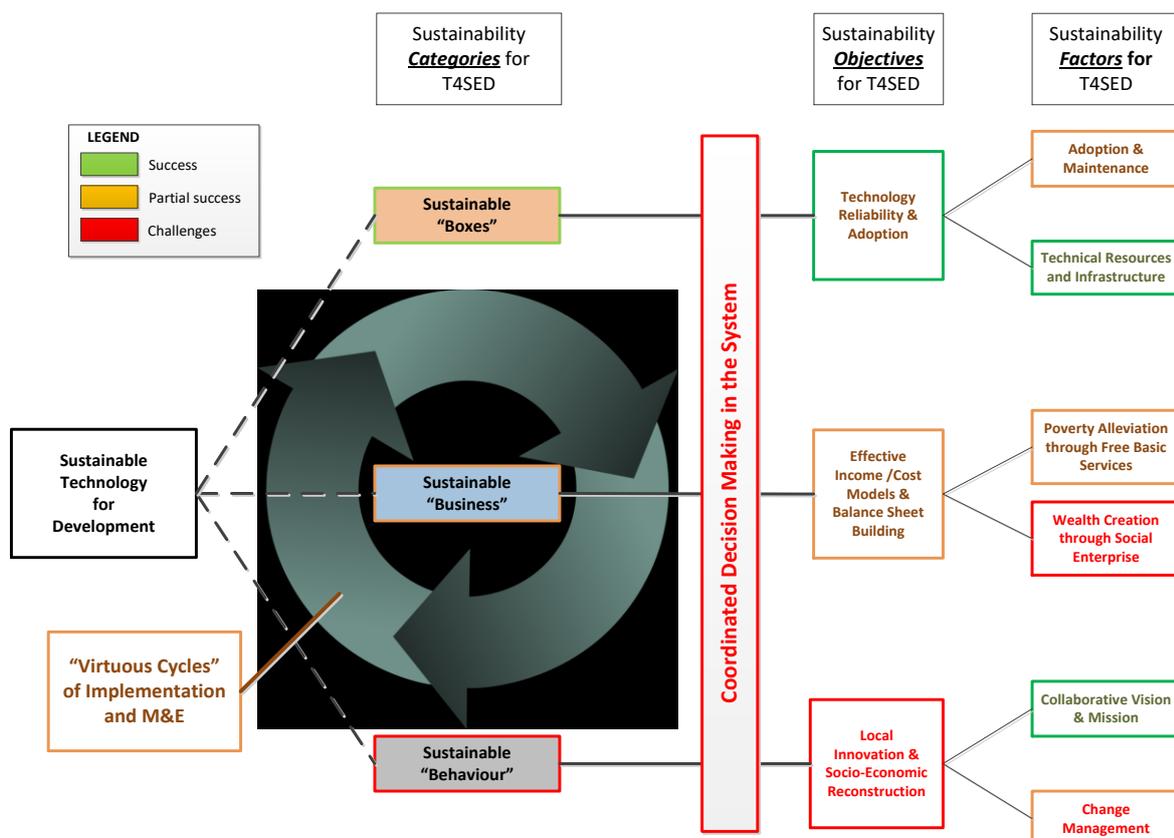


Figure 4: “Virtuous Cycles” of M&E emphasis in Tech4RIED

- At **macro (categories) level**, we confirmed (again) that it is relatively easy to transfer *appropriate* technology (“boxes”) into the rural development domain but *long term adoption* has challenges which often become visible in (lack of) maintenance practices. It is more challenging to do effective income and cost

models (“business”) and extensive “balance sheet building” in terms of extended local “assets /capitals” (human, social, physical, financial and natural) (as per the Sustainable Livelihoods Approach) is very elusive, especially at the human and social levels. It is therefore predictable that the least success can be claimed in the “behaviour” category as social (re)construction and change management are often under-estimated - and funded.

- At the **systemic and process level**, we realized that a balance between short term operational actions and longer term systemic change is important. Smaller and quicker adjustments in project actions seem to create a more conducive environment for adoption. Regular, beneficial outcomes (and success stories!) encourage sustained engagement and provide the impetus and rewards for mind-set and behavioural adaptations.
- We confirmed that **monitoring and evaluation** (M&E) (and learning) should happen both at the micro (activities) and macro (systems) levels. Different approaches are often needed to effectively measure and adjust plans and actions in ‘real’ time.

6. Conclusions

It became quite clear during the “living lab” execution of the project that a lot of “virtuous cycling” needed to happen between the categories of sustainable implementation, i.e. the “boxes”, “business” and “behaviour” elements of Figure 4 both at the level of the individual participants as well as at the institutional /systemic level. The issues of the “what, when and how” of social (re)construction related change management is therefore a critical component of our current validation and refinement of the approach described here.

We have furthermore realized that, whilst Kleine emphasised the importance of a participatory, human centred approach in service of sustainable development, there is a real need to “marry” the *complex dreams* of individuals and entire communities with those of *external development agencies and agendas*. It means that an effective integration approach between *bottom-up aspirations and top-down agendas* needs to be found. It is therefore recommended that ways are investigated that allow top down agendas and bottom-up aspirations to be reconciled in a manner that leads to the *achievement of a dynamic equilibrium*. One possibility for such a ‘marriage’ would be through a process of “Coordinated Decision Making in the System” as indicated in Figure 4 – the focus of our current research in this domain.

Acknowledgement

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