The tuXlab Programme

Evaluation of the tuXlab programme in the Western Cape, as managed by Inkululeko Technologies

FINAL REPORT TO:

The Shuttleworth Foundation

20 November 2008

Contact: Jerushah Rangasami
jerushah@impactconsulting.co.za
082 776 2286

Prepared by

impact

EXTERNAL EVALUATION OF THE TUXLAB PROGRAMME THE WESTERN CAPE

Report commissioned by the Shuttleworth Foundation

By Impact Consulting, 2009.
Written by Jerushah Rangasami, Annie Devenish and Anje Coetzer

ACKNOWLEDGEMENTS

Impact Consulting would like to thank the Director of Inkululeko Technologies and current and former staff of the company for their input and cooperation. In addition, we would like to acknowledge the input and support received from current and former staff at the Shuttleworth Foundation Inkululeko Technologies the Khanya Project Coordinator and Lynette Maart, the overall evaluation project coordinator. This report was also made possible with the cooperation of:

- The principals and staff of the 84 schools in the Western Cape who participated in the tuXlab evaluation survey and site visits, particularly the TuXlab coordinators
- TuXlab learners who participated in our focus groups.

CONTENTS

LIST OF TABLES AND FIGURES

TABLES

FIGURES

GLOSSARY

CAT	Computer Applications Technology
FET	Further Education and Training
ICTs	Information and Communication Technologies
IT	Inkululeko Technologies
NQF	National Qualifications Framework
NEPAD	New Partnership for Africa's Development
OBE	Outcomes-Based Education
OSS	Open Source Software
SF	Shuttleworth Foundation
SLA	Service Level Agreement
UWC	University of the Western Cape
WCED	Western Cape Education Department

FINAL REPORT:

EXTERNAL EVALUATION OF THE TUXLAB PROGRAMME IN THE WESTERN CAPE

EXECUTIVE SUMMARY

The development of Information and Communication Technologies (ICTs) over the past two decades has opened up new vistas of opportunity for the sharing of information and resources in the educational sector and is consequently reshaping the way that teaching and learning takes place. ICTs offer new ways to bridge the digital divide; however, the costs and technical skills involved in accessing and effectively using these new technologies often mean that their current usage and distribution reinforces this divide, which is particularly pronounced in South Africa with its legacy of inequality.

The tuXlab programme, an initiative launched in partnership with the Shuttleworth Foundation in 2002, provides affordable computer labs to mainly disadvantaged schools using refurbished hardware and an open source software platform.

This report presents the findings of an evaluation of the tuXlab programme in the Western Cape conducted in August and September 2008 which was commissioned by the Shuttleworth Foundation.

At the beginning of 2006 the Shuttleworth Foundation took a decision that the tuXlab programme would no longer be managed in-house. TuXlab programme staff decided that they wanted to continue running the programme and subsequently formed Inkululeko Technologies, a service delivery company offering ICT solutions to the education and development sectors. Inkululeko Technologies received start-up funding from the Shuttleworth Foundation to assist with the running of the programme from July 2006 through to February 2007.

In 2008 Impact Consulting was contracted to conduct an evaluation of the tuXlab programme as managed by Inkululeko Technologies. The main aim of the evaluation was to assess the implementation and outcomes of the tuXlab model from July 2006 through to February 2007, according to the service level agreement (SLA) signed between the Foundation and Inkululeko Technologies. According to this SLA Inkululeko was responsible for the overall maintenance and growth of the programme, the general management of the various aspects of the programme, the development of sustainability solutions for schools, and the provision

of training and technical support to schools. The evaluation also aimed to provide a profile of the status quo of the existing labs in the Western Cape.

This study comprised of an in-depth survey that was conducted with tuXlab coordinators and school principals in 84 schools in the Western Cape – a representative sample of the total tuXlabs in the province. From this sample, the three strongest performing and the three weakest performing schools were chosen as case studies to further investigate the outcomes and challenges of the programme, using an adapted version of Robert Brinkerhoff's Success Case Method[1]. Site visits were conducted with schools during which focus groups were held with learners and teachers, and interviews were conducted with tuXlab coordinators and principals.

The school survey revealed that the majority of schools with tuXlabs are primary schools with more than 500 learners. Almost half of tuXlab primary schools in the sample have a learner to teacher ratio of 41:1, which is above the recommended ratio in South Africa. Most schools that completed the question on racial profile identified their schools as being predominately Coloured or Black.

At the time when the tuXlab programme exited from the Shuttleworth Foundation, there were 109 participating schools in the Western Cape, most of whom had operational tuXlabs. Findings indicate that approximately half of the labs surveyed are currently no longer functional, with only 45% indicating that they are still up and running. Most labs reported that a number of computers were out of commission due to technical problems, and almost half of them (45%) said that they had five or more non-working machines. Out of this group, 23% reported that they had no working computers at all. Existing machines tend to be out of date and need to be upgraded or replaced. Nearly half of all tuXlabs schools (47%) have hardware which is four years or older and most lack facilities to accommodate USB devices or multi-media.

Technical problems experienced with hardware, leading to non-functioning and poorly functioning equipment, were the most commonly cited reason (52%) for why tuXlabs are not in operating order. School dissatisfaction levels with the hardware are high, with 73% of schools indicating that they are not satisfied with the hardware. 16% of schools whose tuXlabs are no longer functional noted that it was because they have opted to install a Khanya lab from the Western Cape Education Department (WCED) and the tuXlab is therefore no longer needed.

[1] Davidson, E. Evaluation Methodology Basics, 2005

Other reasons for a lack of use include:

- A lack of organisation at the school (11%)
- Burglary (8%)
- The lab was being moved or fixed at the time of the survey or the lab computers had been returned (5% each).

Despite the fact that, since June 2006, Inkululeko Technologies has been the sole owner and manager of the programme, there remains a strong association between the tuXlabs programme and the Shuttleworth Foundation among learners and staff at schools with tuXlabs. A total of 66% of schools noted that they thought that Shuttleworth managed the labs, 10% reported that both the Foundation and Inkululeko ran the labs, while only 12% of schools knew that Inkululeko was now the sole "sponsor" of the labs.

The tuXlab programme does not provide any internet access to schools. Most surveyed schools that have internet access pay for it out of school funds.

Most learners use the tuXlabs during school hours for educational and recreational purposes or for educational purposes only. The most commonly taught subjects in the tuXlab include Computers and Information Technology (28.5%), Maths (20%), all lessons (10%) and English and Science (8% each). Primary school learners use the labs mainly to play the open source educational games, to conduct research and to type homework assignments. High school learners tend to use the educational software programmes less, preferring to use the lab for research, typing and printing. Just over half of learners have to share a computer with a fellow learner, while 21% reported that they work three or more to one computer.

Teachers generally have their own computer facilities at school but some have used the lab to improve their computer literacy.

Overall levels of community usage of the labs has been much lower than anticipated, with only 18% of schools reporting that community members had been taught in the tuXlabs. In the few instances where communities have used the tuXlabs, it has been on an informal and irregular basis. Safety, especially in the evenings, and a lack of availability of teachers to teach community classes after hours were cited as the main reasons limiting community usage. Low community usage of the labs and almost no income-generating activities for the tuXlabs, both of which are key components of the tuXlab sustainability model, indicate that

the programme needs to seriously reassess the viability of the community component of the tuXlab model.

The fact that only just over half of the tuXlabs in the Western Cape are no longer functional indicates that maintenance and growth of the programme has been a challenge for Inkululeko. Inkululeko has achieved some success in areas such as training and strategic marketing of the programme, but has struggled with areas such as the management of the incentives and volunteers programmes, and with assisting schools to develop sustainability solutions for their tuXlabs.

After the handover of the tuXlab programme from the Foundation, Inkululeko expanded the programme's technical support facilities by employing additional staff to manage the telephonic help desk and by recruiting volunteers to go out and visit schools to fix technical problems. Inkululeko encouraged schools to continue using the facilitated self-help approach for solving technical problems which had been developed under the Foundation. This approach encouraged them to call on a network for assistance first and to only contact Inkululeko to go out to fix technical problems as a last resort. This approach was not successful during the period under investigation and schools remained heavily dependent on Inkululeko for technical support. Inkululeko in-house capacity was not adequate to deal with the number of requests that came in as they had not planned for this level of reliance and, as a result, there was generally a backlog of 30-40 complaints which took up to three weeks to resolve. 41% of the schools who had used the help desk felt that the service was excellent or good, 20% reported that it was average and 14% felt that it was poor or very poor. However, schools did report frustration with the length of time Inkululeko took to respond to calls, with some noting that requests for support were not responded to at all.

A total of 61% of schools received training from Inkululeko during the period of the initial SLA. Coordinators generally felt that the training provided by Inkululeko enabled them to teach some basics to teachers, learners and community members. However, overall, the trained teachers expressed a need for more regular and more advanced training rather than the once-off or ad hoc training that they had received so that they would be enabled to use the tuXlabs to their full potential (for example to use the content to teach the curriculum) and to give them greater confidence to operate in the labs. Teachers also emphasised that they would have liked more regular support from Inkululeko to be able to put their training into practice.

In terms of the incentives programme, Inkululeko spent the first few months of the SLA

period transferring paper files onto an electronic web portal for easier management. Consequently, during this period, the incentives programme was not actively functioning which led to dissatisfaction from the schools as there was confusion about how many points were due to them, long waiting times to receive rewards and, sometimes, a failure to supply rewards that were due.

A pilot project, "The Connectivity Project", was undertaken to test the feasibility of establishing a wifi network between Inkululeko and a cluster of tuXlab schools that would provide these schools with an intranet that they could use for email and to access information through a wiki, which is set up as a content portal that is updated on a regular basis. During the installation of the infrastructure for this project, a number of unexpected challenges led to delays in the project. Partners expressed dissatisfaction with the management of the project, particularly with the management of expectations for the schools. Ultimately, the project proved not to be feasible.

Overall, the majority of schools found communication with Inkululeko to be average, good or excellent but did not perceive that their communication with the Foundation had been of a higher quality. The transfer of ownership and management of the tuXlab programme to Inkululeko of the tuXlabs created a period of uncertainty for schools who had come to expect ongoing and free support from the Foundation and they were unhappy that Inkululeko was now operating on a business model and would start charging fees for services. Distrust and dissatisfaction increased when the company announced that from February 2007 they would actually begin to charge for technical services, when the funding from the Foundation came to an end.

The findings indicate that Inkululeko experienced a number of challenges regarding the management of the tuXlab programme during the SLA period, including:

- The lack of clear lines of authority within the company which led to confusion about responsibilities and roles
- Disagreement amongst shareholders regarding the company strategy
- The lack of clear, practical and measurable implementation plans
- A lack of management of expectations with schools, leading to distrust and dissatisfaction.

In terms of maintenance and growth of the programme, most stakeholders felt that the strategic marketing of the tuXlab programme is one of the areas in which Inkululeko has achieved the most success. The Director of Inkululeko was able to bring the programme into

the public eye through press coverage and to expand the programme in the Education sector and other fields.

Programme volunteer numbers decreased after the transfer of ownership and management, partly due to the shift in focus away from installations, which was the primary activity of the volunteers when the programme was managed under the Foundation. Inkululeko's main mandate was to provide technical support and training, which volunteers were neither trained nor interested in. In addition, volunteers also noted that they felt less inclined to volunteer for a company rather than a non-profit organisation.

When the transfer of ownership and management of the programme was taking place and shortly thereafter, the relationship between the Foundation and Inkululeko was marked by tension and a lack of trust on both sides. This relationship improved with the change of leadership at the Foundation and representatives from both organisations agree that the handover process was rushed and that the terms of the SLA could have been clearer.

The study has shown that a significant majority of schools who used the labs found that there had been some positive outcomes for both learners and teachers. For learners, the primary outcomes have been improved computer literacy, improved language and maths skills and the enhancement of general knowledge and memory. Working in tuXlabs encourages participative and interactive learning – classmates help each other to complete programme exercises and sometimes assist the teacher as well. The labs have also assisted learners to develop their internet research skills (for those who have access to the internet or the wiki) and to become familiar with Linux and OSS programmes. In a few instances, learners have become interested in OSS programming because of their exposure to the tuXlab.

For teachers, the main outcome has been improved computer literacy, and a few teachers have also benefited from the acquisition of skills to install and administer an OSS lab. Almost three quarters (73.8%) of schools noted that the tuXlabs have made a positive contribution to the school curriculum, and 50% of respondents believe that the lab has been helpful with assisting teachers to teach the curriculum.

Although the model aimed that the tuXlabs would include community involvement and some outreach, only just over a quarter of schools (28.5%) feel that the community has benefited from the labs in any way.

One area in which there have been very few outcomes is in the realm of income generation. Only 8.3% of schools have used tuXlabs for any income generation and only 3.5% of teachers and 1% of learners have used the labs for personal income generation.

The tuXlab model has a number of strengths, particularly in a developing country context. The labs are affordable for schools with limited resources and are therefore able to provide disadvantaged learners with access to computers. The open source platform and the tuXlab model itself allow for greater flexibility of the model (for example teachers and learners can change the programme code to suit their needs). The thin client model allows for easy maintenance and upgrading. Community participation and buy-in is a key aspect of the tuXlab model, but this has not taken off very well except for the participatory process of installing labs.

A number of key factors impact upon the sustainability of the tuXlabs. The use of refurbished hardware can be seen as the Achilles' heal of the tuXlab model as it caused many disruptions at schools and, in some cases, has led to a negative perception of computers for learners and teachers. As the lifespan of refurbished hardware is limited, this does not allow for long-term sustainability as additional resources are needed within a minimum of three years, negating the initial benefits of the low cost to set up the labs. The new computers that are used in the Khanya labs, an initiative of the Western Cape Education Department (WCED), are perceived to be better and this has led to a few tuXlabs being closed down, therefore also affecting sustainability. Other factors that challenge the sustainability of the model include a lack of resources and capacity to maintain the tuXlabs, impracticality with the idea of using the labs as income generating sources and the general lack of skills transfer. In some cases, labs have closed when the tuXlab coordinator leaves the school, and, on the whole, labs that have been the most successful have a dedicated and committed lab coordinator or teacher, particuarly with some kind of technical experience or interest in OSS.

The following have been the lessons learned from the tuXlab programme experience:

Implementing the tuXlab programme

1. ***Hardware:***
    - The use of refurbished hardware needs to be re-thought (particularly servers). New hardware automatically increases the lifespan of the machines and reduces the need for technical support which would allow the focus in the first three years of a tuXlab to be concentrated on building capacity and developing strategies for sustainability.
    - It would be useful to increase the number of computers in the labs to accommodate large class sizes (where there is physical space in the school)
    - A machine that is halfway between a fat and thin client would allow for the use of multimedia software.

2. Software

- Many quality software programmes which are curriculum-aligned and grade-appropriate do not run on an open source platform which limits the use of the labs for educational purposes, particularly in high schools.
- Teachers did not receive enough guidance about appropriate software for use in their schools – it might be useful for teachers and tuXlab coordinators to regularly communicate about specific programmes and kinds of material that they would like their class to work on in their lab periods.

3. Security

- Security is a concern for many tuXlab schools and has limited the sustainability of the labs, this report recommends that security set-ups for in-school and after-school activities should be investigated with each school before installation.

4. Training and skills development

- Schools need to have skills transfer and succession plans in place for their tuXlabs
- The feedback from teachers and coordinators in this evaluation suggests that training would have a greater impact if it was regular and ongoing. Training could be redesigned as a programme with a series of modules that build upon one another and should also include post training on site support.
- Training should take place on a regular basis and be held at convenient times and locations for teachers.

5. Technical support

- Volunteers cannot be relied upon to provide technical support if the programme is being operated as a non profit enterprise; rather, formal employees of Inkululeko need to be responsible for technical support.
- Technical support staff could possibly have portfolios of schools so that they are familiar with each schools' set up, this would also allow a relationship to develop between technical staff and schools, enabling Inkululeko to be build up its social capital and peer networks.
- A high level of technical support is necessary for schools initially, especially at schools with low levels of technical skills. Alternative means need to be found to assist disadvantaged schools to finance this support, possibly through corporate sponsorships or strategic partnerships.

6. Communication

- Regular communication needs to be maintained with schools and Inkululeko should look into multiple methods of communication where necessary to contact schools.
- There needs to be careful attention to managing expectations, particularly in terms of promises made to schools.

7. Working with schools to develop plans for use and sustainability

- A number of schools are not using their labs effectively because lab usage has not been scheduled into the timetable. Lab usage plans should be developed with existing and new schools and support should be given to assist with the initial implementation in each school.
- Many tuXlab schools lack the skills and initiative to develop effective income generation or fundraising strategies for their labs and they therefore need to be assisted with this task. One way to do so would be through organising a training course for principals or coordinators, another option would be to assist teachers to become ICDL accredited.

8. Ongoing review and reflection of the tuXlab model

- As the tuXlab model continues to grow and evolve, and as the context in which the project changes, systems must be put in place for ongoing review and revision.

Possible ways forward for the tuXlab programme

9. Organisational structure of Inkululeko

- It seems more viable for the tuXlab programme to be run through a non-profit organisation so that sponsorship and funding may be sourced. Inkululeko might consider the registration of a non profit organisation which could be linked to the company and/or be funded by the profits derived from the company.

10. Possible strategic partnership with Khanya

- This evaluation suggests that there is plenty of scope for the two programmes to work together and to complement each other as they offer different strengths and services to learners and teachers. For example, tuXlabs could establish itself as a service provider offering the provision of general ICT skills and computer literacy (particularly in primary schools), while Khanya focuses specifically on maths and science teaching at a high school level.
- Any partnership with Khanya must be handled in such a way that tuXlabs does not loose its own identity as an open source software lab.
- Communication is almost non-existent between the two entities and these channels would have to be re-opened and relationships built before any possible collaboration can occur.
- The clarification of roles and responsibilities is necessary if any collaboration is to take place between WCED and the tuXlab team.
- There is also a need to challenge the perception amongst schools that Khanya Labs are better – largely because of the new hardware and the use of the better-known Microsoft platforms and programmes.

Lessons learned for the Shuttleworth Foundation

11. Clear exit strategy and terms of reference

- It is important to ensure that projects that leave the Foundation after being housed and branded internally have a proper exit strategy, which is well planned out and carefully monitored. This should include a written agreement in which roles and responsibilities are clearly laid out and clear targets and measurables are established.

12. Clear and consistent communications strategy

- For all programmes exiting the Foundation a clear and consistent communications strategy needs to be developed to inform all programme beneficiaries and other stakeholders about the new institutional arrangements, and how this will affect them, as well as be introduced to the new management.

13. Evaluation of pilots

- Pilot projects should be evaluated at various stages before any roll-out is considered, for example the Social Content Network Project would benefit from an external evaluation after it has been running for a relevant length of time to determine efficiency, effectiveness and outcomes.

14. The development of an advocacy strategy to promote OSS among teachers and learners with the WCED

- An active advocacy strategy or campaign is necessary to promote OSS among teachers and within the WCED (if this is in line with the Foundation's objectives).

15. Design of programmes to reduce dependency and entitlement

- One of the reasons for schools dissatisfaction with Inkululeko was because of the introduction of fees for technical support, after schools had become accustomed to receiving it as a free service. It is recommended that the Shuttleworth Foundation consider building in service fees from the beginning of a project in future so as to encourage a mindset among schools that they are paying for a service rather than receiving a handout.

The findings of this report indicate that, although the programme has made important strides in offering an innovative, flexible and affordable ICT model for schools which has allowed access to computers for many learners who would otherwise not have this opportunity, a lack of resources and capacity (technical skills, human resources, knowledge of OSS etc), problems with the physical infrastructure and inability to use the labs as income-generating resources continue to restrain the sustainability of these labs in a South African school environment. The tuXlab programme will need to find innovative, cost-effective and practical strategies to overcome these challenges going forward.

CHAPTER 1. INTRODUCTION

This report presents the findings of an evaluation of the current status of the tuXlab programme in the Western Cape, as well as the implementation and outcomes of this programme for the period July 2006 to February 2007.

Chapter 2 provides a context section that situates the tuXlab programme within a broader national and global ICT context. This chapter looks at the ways in which ICTs present new opportunities to bridge the digital divide, and offers an outline of the current status of ICT in education in South Africa today. The chapter goes on to provide a description of Open Source Software (OSS) and its current status and use on the African continent.

Chapter 3 contains organisational overviews of the organisations involved in the tuXlab Programme: the Shuttleworth Foundation, Inkululeko Technologies, and the Khanya Project (an initiative of the Western Cape Education Department) and in Chapter 4 we outline the aims and objectives of this evaluation and research methodologies employed.

In Chapter 5, we present a thorough history of the tuXlab programme from its initial pilot phase in 2002, through the growth and evolution of the programme and to the current tuXlab model. This chapter also outlines programme clients, setting and location as well organisational structure, partners and programme funding.

The findings of the evaluation are detailed in Chapter 6. This chapter opens by providing a picture of the demographics of tuXlab schools in the Western Cape. The second section of this chapter offers a review of the current status of the tuXlab programme in the province, looking at the number of functioning and non-functioning labs, levels of functionality of tuXlab hardware, branding and perceptions of ownership of the labs, security and current usage of tuXlabs by schools and communities. The third section of Chapter 6 provides an assessment of Inkululeko Technologies performance in meeting the requirements of the SLA signed between the company and the Foundation in terms of a review of Inkululeko's performance in terms of the provision of technical support, hardware, training and software as well as the company's coordination and management of the incentive and volunteers' programme and the Connectivity Project. Finally, this section reviews Inkululeko's strategic marketing of the programme, its relationship with schools, its relationship with the Shuttleworth Foundation and programme management issues.

Chapter 7 highlights the outcomes of the tuXlab programme that were identified through this evaluation, looking at outcomes for learners, teachers and the community in general. In Chapter 8 the sustainability of the tuXlab programme is analysed and factors that have challenged this sustainability are discussed. In light of the findings, an analysis of the tuXlab model is presented in Chapter 9 where we explore the strengths and weaknesses of the model.

Finally, we outline lessons learned, based on the findings of this evaluation, in Chapter 10 and the conclusion in Chapter 11 offers a brief overview of the significance and value of the programme and a synopsis of recommendations outlined in Chapter 10.

CHAPTER 2. CONTEXT

2.1 GLOBAL INFORMATION AND COMMUNICATION TECHNOLOGIES

Information and communication technologies (ICTs) are at the heart of changes taking place throughout the world. ICTs includes that of any "communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as video conferencing and distance learning. According to the European Commission, the importance of ICTs lies less in the technology itself than in its ability to create greater access to information and communication in underserved populations."[2] Within the South African education context, ICTs (in the form of computer laboratories) are vital in order to bring impoverished schools into 21st century.

2.2 COMMUNICATION TECHNOLOGIES AND EDUCATION

The use of digital media has substantially transformed society and has dramatically changed the learning and teaching process by opening up new learning opportunities and providing access to educational resources well beyond those that were traditionally available[3]. Although technology has provided these new avenues of access to information for learning and education, statistics regarding the use of computers continues to reflect and reinforce the digital divide between the haves and the have nots.

2.3 EDUCATION IN SOUTH AFRICA

South Africa has a unique historical context in which the apartheid education system – 'Bantu Education' – did not allow for subjects like Science and Mathematics to be taught to Black Africans as it was believed that they did not have the skills for these subjects. Government funding for schools was skewed towards historically white schools, leaving historically black schools under-funded and under-resourced. This legacy, even 14 years after South Africa

[2] SearchCIO-Midmarket.com, 2008
[3] E-Education White paper, 2004, p 6

held its first democratic election, means that there still is a substantial discrepancy between historically privileged and historically disadvantaged schools.

Despite the fact that the largest share of the national budget for 2007/08, approximately R105.5 billion, was allocated to education[4], South Africa still faces enormous challenges in overcoming the apartheid legacy. Illiteracy levels are at 24% for adults over 15 years of age, there is a shortage of qualified teachers, there are very low pass and performance rates (particularly for Mathematics and Science subjects), and many schools are seriously under-resourced and over-crowded[5].

2.4 TECHNOLOGY IN SOUTH AFRICAN EDUCATION

In terms of governance, management, teacher professional development and curricular reform, there have been significant changes in the South African education sphere since 1994[6], particularly the National Qualifications Framework (NQF) and the new Outcomes-Based Education (OBE) curriculum. The promotion of ICT capacity forms a central component in the government's economic growth and social development plans. On a pan-African level, the South African government has also indicated its commitment to the New Partnership for Africa's Development (NEPAD) e-schooling programme.

South Africa's current Minister of Education, Naledi Pandor, has referred to ICT as the "future and indeed the key to 21st Century teaching and learning"[7]. The Department's overarching goal is for every South African learner to be ICT capable by 2013, i.e. "to equip every basic and Further Education and Training (FET) learner with the knowledge and skills to use ICT confidently, creatively and responsibly by 2013"[8]. Ultimately, the Department would like to develop schools into e-schools – characterised by teachers and learners with strong ICT skills and a culture of use and support for ICT practices.

In line with this new ICT policy by September 2007, the government had trained more than 22,000 teachers to use ICT in education. This was done through partnerships with Intel, CompTia and Microsoft. A guide for principals on how to implement and use ICT in schools has also been developed and distributed[9]. The Department has also created Thutong, an

[4] InfoDev, 2007
[5] InfoDev, 2007
[6] InfoDev, 2007
[7] Pandor, 2007
[8] Bridges.org, 2004
[9] Pandor, 2007

online educational portal with over 21,000 learning objects for use by both teachers and learners that aims to provide an online educational experience for South African educational communities.

As these initiatives are still fairly new, their impact to date in terms of enabling schools to effectively access and utilise ICT technologies for education is still a matter for debate, and requires a more detailed evaluation. Despite the government's initiatives, research suggests that there remain a number of major challenges in the ICT in education sector that need to be overcome including:

- The need for greater coordination between ICT programmes and projects in schools as at present these projects tend to be dispersed and uncoordinated.
- A shortage of leadership and human resources to manage and support various ICT initiatives.
- The need to demonstrate the value of investment in ICTs through improved performance of learners and teachers and improved employability.
- The lack of a comprehensive policy on ICTs in education that covers all sectors in education[10].

Statistics for 2007 indicate that only 3 in 10 schools (a total of 26,000 schools for 12 million learners) have access to ICT in South Africa, and only 1 in 10 schools have Internet access (mainly through dial-up connections)[11]. In the Western Cape specifically 2005 statistics show that nearly a quarter of schools (23.4%) did not have access to computers for teaching and learning in 2005[12].

In 2001, at the time when the tuXlab programme was first being developed and piloted, access to ICT was even lower – only 26.5% of schools across the country had access to computers for teaching and learning. In the Western Cape, about 56.8% of schools had such access in 2001[13].

South Africa faces the challenge of developing innovative, affordable and sustainable strategies to bring ICT into all schools and to enable schools to integrate ICT into whole-school development. Because of its affordability, Open Source Software offers one such potential strategy.

[10] Isaacs, ICT in Education in South Africa, 2007, pg 2 & 10
[11] Pandor, 2007
[12] Isaacs, ICT in Education in South Africa, 2007, pg 9
[13] E-education White Paper 2004, pg 12

2.5 OPEN SOURCE SOFTWARE

2.5.1 Open Source versus proprietary software

Open Source software (OSS) allows programmers to modify and customise software according to the individual's or organisation's needs[14]. OSS has open copyright licenses that allow users to share software, whilst proprietary software (for example Microsoft Windows) is privately developed and controlled, with copyrights restricting sharing. OSS implies that the sharing of software is legal, and that no royalties or fees should be charged for such sharing[15]. The programmes include the source code so that users can modify programmes easily. Licenses allow such modifications and derived works, as well as the distribution of these under the same terms as the license of the original software.[16]

2.5.2 Use of Open Source software in Africa

In Africa, OSS has been used with some success; however, successful projects have mostly been limited to well-designed, controlled and monitored projects, and use in remote set-ups has been less successful, often due to the very specific technical skills that are required to maintain computers running on Open Source. Supporters of OSS argue that it is more suitable for Africa due to its low cost and adaptability. Supporters of proprietary software argue that this software is more suitable because of its wider use and that Open Source solutions are often not as cost-effective as they seem.

In many instances in Africa, the costs of proprietary licenses do not directly affect computer labs, due to the fact that these labs are funded by outside donors or because unlicensed software copies are used[17]. Software choices may, however, affect hardware expenses, which usually forms the biggest expense in public computer labs.

2.5.3 The philosophy of Open Source software

The principles of collaborative learning, self-sufficiency and the freedom to share information and learn are at the heart of the philosophy that underpins Open Source software. The idea is to create a global culture or community where users have the freedom to customise their software to suit their own needs and to share their customisation and experiences with other users. OSS promote the use of open source in an educational setting for these same reasons[18]. They argue that OSS:

[14] Bridges.org, 2005
[15] Open source Initiative, 2008
[16] Open source initiative, 2008
[17] Bridges.org, 2005
[18] tuXlab Cookbook. 2007. pg 25-26

- Saves money and allows resource-poor schools access to ICT: Because open source software gives users the freedom to copy and distribute the software without any costs attached, a school can make copies of the software for all their computers, thereby providing access and helping to close the digital divide without the school having to find extra resources.

- Enables schools and communities to be more self reliant because it is not dependent on the license agreements of big international corporations. Schools can play an important role in promoting open source software because learners will be encouraged to use this software when they leave school.

- Is empowering and democratic because it allows learners to understand how it works and how to customise it to suit their needs. Learners can look at source code to find out how operations they use were implemented and can experiment with adapting these[19].

2.6 ACCESS TO THE INTERNET IN SOUTH AFRICAN SCHOOLS

Although South Africa has the most modern and best developed telephone system in Africa, coverage is unevenly spread with many areas remaining isolated[20]. Access to the internet is becoming more common in schools in South Africa, but the use of the internet as a teaching and learning tool is still very limited. In 2004, the draft White Paper on e-education noted that only 6.4% of South African schools had access to the Internet[21]. The limited use is mainly due to extremely high connectivity and telecommunication costs which schools with very limited financial and human resources are unable to afford.

[19] tuXlab Cookbook. 2007. pg 25-26
[20] InfoDev, 2008
[21] E-Education White paper, 2004, p 8

CHAPTER 3. ORGANISATIONAL OVERVIEWS

3.1 THE SHUTTLEWORTH FOUNDATION

The Shuttleworth Foundation was launched in 2001 by entrepreneur Mark Shuttleworth, aiming to promote innovation in the fields of science and technology education in South Africa. The Foundation promotes the use of Open Source software in the belief that it benefits local communities by helping them to develop and sustain local capacity and contextually-appropriate resources. Since its inception, the Foundation has designed and sponsored a number of such projects, some of which have evolved over time to become independent.

One such programme was the tuXlab programme which aimed to develop a sustainable ICT model for use in the educational sector in South Africa. The tuXlab programme utilised a technology-based education model that provides South African schools with open source-based computer labs. The model emphasises community involvement and programme sustainability using a seven step collaborative implementation process.

3.2 INKULULEKO TECHNOLOGIES

Inkululeko Technologies is a South African service delivery company offering ICT Solutions in the education and development sectors. The company was formed on 1 July 2006 by former employees of the Shuttleworth Foundation's tuXlab programme, to continue to run the tuXlab programme after the Foundation decided that the programme had reached the end of its lifespan within the Foundation. The Foundation provided start-up funding to Inkululeko Technologies to enable the company to continue and expand the work of the tuXlab programme[22].

When the company was formed in July 2006 the short term aim of the company was to promote the sustainability of the tuXlab programme and expand the entrepreneurship component within this programme[23]. Over the medium and long term the company aimed to expand its services into the education and development sectors as well as the private sector,

[22] Inkululeko Technologies Company Profile, 2007
[23] Inkululeko Technologies Company Profile. 2007, pg 2

and to use the finances generated through services to the private sector to subsidise its support for the education and development sectors.

Inkululeko's mission is "to become the preferred partner to ICT projects in the education and development sector" and to "endeavour to work with their customers to use technology as an enabler rather than a driver". The company aims to contribute to sustainable skills development among communities in the ICT sector through innovative and appropriate solutions[24].

Key components of Inkululeko Technologies approach are the use of open source software solutions and community buy-in and participation in projects. The key objectives of the company are to:

1. build and maintain easily replicable, relevant and sustainable solutions by incorporating best practice methodologies and project cycles
2. follow processes which allow for knowledge sharing and skills transfer to project stakeholders
3. build collaborative projects and partnerships with stakeholders that deliver "value and sustained impact" in communities[25].

Inkululeko Technologies offers the following services to its clients: consultancy, project management, implementation, software customisation, skills training manual development, technical support, hardware distribution and certification solutions[26].

3.3 THE KHANYA PROJECT

Khanya is a project of the Western Cape Education Department (WCED). It was started in 2001 in an attempt to assess the contribution that technology could have on addressing the capacity shortage in the education sector and to bridge the digital divide by providing disadvantaged schools with access to ICT. The focus of the project is on using technology as a teaching aid to facilitate curriculum delivery. By 2008 the project had provided technology to 945 schools in the Western Cape[27]. The Khanya project is open to the use of all technologies and chooses on the basis of "those that are deemed appropriate at the time and for a particular purpose"[28].

[24] Inkululeko Technologies Company Profile, 2007, pp 1-2.
[25] Inkululeko Technologies Company Profile. 2007, pg 1-2.
[26] Inkululeko Technologies Company Profile. 2007, pg 2
[27] Khanya website, 2008, http://www.khanya.co.za/projectinfo/?catid=23
[28] Khanya website, 2008

CHAPTER 4. RESEARCH DESCRIPTION

4.1 EVALUATION AIM

The main aim of the evaluation is to assess the implementation and outcomes of the tuXlab model for the period of July 2006 to February 2007, according to the SLA signed between the Shuttleworth Foundation and Inkululeko Technologies in May 2006.

4.2 EVALUATION OBJECTIVES

The primary objectives of the requested evaluation are to:

1. Provide a clear picture of the current status quo of the tuXlab programme as at September 2008
2. Assess the effectiveness of the tuXlab programme in the Western Cape using a representative sample of the 109 schools participating in the programme
3. Assess the outcomes of the tuXlab programme in the Western Cape
4. Assess the service delivery of Inkululeko Technologies according to the SLA requirements signed with the Foundation in 2006
5. Enable the Western Cape Education Department and the Khanya Project to assess the effectiveness of the tuXlab model
6. Assess the effectiveness of the tuXlab model of intervention, including benefits and risks to the Shuttleworth Foundation
7. Develop findings and recommendations on possible ways forward.

4.3 RESEARCH METHODOLOGY

4.3.1 Research methods and tools

The evaluation used a mixed method approach combining both quantitative and qualitative research methods including:

Schools survey

An in-depth survey with both a quantitative and qualitative components was conducted with tuXlab coordinators and school principals in 84 schools in the Western Cape. These surveys were administered by trained fieldworkers and covered various areas of programme implementation and service delivery including:

- infrastructure and profile
- school capacity (eg for computer literacy)
- satisfaction with service delivery
- levels of collaboration
- perceptions of outcomes for users
- challenges
- suggestions for improvement.

Case studies

From the above sample, six schools were chosen and used as case studies to further investigate outcomes and challenges using an adapted version of Robert Brinkerhoff's Success Case Method[29]. Investigations were conducted with three of the strongest and three of the weakest performing schools; these schools were selected on the basis of the results of the survey. Impact Consulting conducted site visits to these schools where they observed the tuXlabs in use (where applicable), conducted interviews with principals and tuXlabs coordinators and held focus groups with teachers and learners to gain in-depth insights into the strengths and weaknesses of the model.

Focus groups

Focus groups were conducted with learners in a range of grades as part of the case study component of the research.

Key informant interviews

Key stakeholder interviews were conducted with the Inkululeko Technologies staff (current and former), Shuttleworth Foundation staff and WCED Khanya Project representatives.

4.3.2 Sampling

The survey was conducted with 84 out of a total population of 109 schools in the Western Cape. This sample is representative of the whole population with a 95% confidence level and a confidence interval of 6.99. The selection of schools for the survey component of the

[29] E. Davidson, Evaluation Methodology Basics, 2005.

evaluation also took into consideration demographic profiles to ensure that the selected sample was representative of the Western Cape.

The sample group was categorised according to the following variables:

- Urban / rural
- Poverty quintile
- Language
- Educational district
- Ratio of learners to teachers.

4.4 COLLECTION OF INFORMATION

All fieldwork was carefully designed in conjunction with relevant partners and participants, and the research team made every attempt to be unobtrusive and accommodate participants' schedules, whilst delivering according to evaluation timeframes.

4.5 ETHICS

Informed and voluntary consent was gained from each participant. Consent forms were distributed and any participant who refused consent for any reason was not included in the research process. In line with child protection legislation, consent for learners participating in the research was obtained by getting the principal of each school to sign a blanket consent form. In addition, each learner signed a consent form where the purpose of the research and the function of the consent were explained at an appropriate level for learners. The research team treated all participants involved in the evaluation of the project in a professionally acceptable way, with respect, consideration and courtesy. The informed consent form also assured participants of the parameters of confidentiality of the information supplied by them.

4.6 REPORTING RESULTS

The results of this study have been made available with careful attention to the rights of the participants outlined above. Confidentiality is assured and no identifying characteristic of any participant (names, addresses etc) have been or will be disclosed. In addition, no contact

information received from participants was disclosed to anyone who was not employed specifically through Impact Consulting to work on this project. The evaluation team has made every effort to represent all participant voices, while still only reporting valid results. Please note that any errors in this report are not deliberate, and that every effort has been made to counteract any possible mistakes.

4.7 RESEARCH PARTICIPANTS

The table below provides an outline of all research participants who took part in this evaluation. The selection of learners, teachers and administrators for this component of the evaluation took into account demographic profiles to ensure that the selected sample was representative of the Western Cape.

PARTICIPANT GROUP	METHOD				
	Survey	**Focus groups**	**Face to face interviews**	**Telephonic Interviews**	**Subtotal**
School principals			5	1	**6**
TuXlab coordinators	84		5	2	**91**
Coordinators of joint Khanya/tuXlabs				2	**2**
Teachers		7			**7**
Learners		83			**83**
Current Inkululeko staff and Director			1	1	**2**
Former Inkululeko staff			3	3	**6**
Key stakeholders in the Shuttleworth Foundation			1	1	**2**
Key stakeholders in the WCED Khanya Project			1		**1**
				TOTAL	**200**

Table 1: Total number of research participants and method used to elicit information

4.8 DATA AND INFORMATION COLLECTION

The fieldwork was conducted in four phases:

Phase 1: Participatory planning workshop and document analysis (documents provided by Inkululeko Technologies and Shuttleworth Foundation)

Phase 2: Interviews at schools with tuXlab coordinators, principals and teachers using a structured survey

Phase 3: School case studies (selection) based on survey findings that included observations, focus groups with learners and teachers and in-depth interviews with principals and tuXlab coordinators

Phase 4: In-depth interviews with Inkululeko staff, Shuttleworth Foundation staff and Khanya Project staff.

CHAPTER 5. PROGRAMME DESCRIPTION

5.1 PROGRAMME HISTORY

5.1.1 The Open Source Learning Centre pilot and the emergence of tuXlabs

Since its establishment the Shuttleworth Foundation has been interested in the potential of using OSS in education. In 2001 they became aware of the work of the current Director of Inkululeko, who was running open source software computer training at previously disadvantaged schools, and he was invited to present his concept to the Foundation. In partnership, the Shuttleworth Foundation and the current Director of Inkululeko piloted the tuXlab model in one primary school in the Western Cape in 2002 under the name *Open Source Learning Centre*. The first pilot, which showed promise, focused on introducing OSS technology into a South African school for the first time. This pilot introduced an OSS computer lab into a school which had not had not had any computer facilities previously. A second pilot was then requested by the Foundation, in which the computer lab of another primary school was converted from a closed platform to open source platform. This second pilot also proved to be successful. Impressed with the early success of these pilots, the tuXlab programme was moved to become an in-house Shuttleworth Foundation project in May 2003 and in 2004 it was given its current name: *the tuXlab programme*.

While in-house at the Foundation, the tuXlab programme aimed to empower local communities to be able to access and effectively use technology through the development of innovative, appropriate and cost-effective technological solutions. The aim of the tuXlab model at that time was to provide an easily replicable Open Source software ICT facility for schools which could then be expanded into other community development programmes. The tuXlab model drew on the philosophy of open source development, which stresses communal usage and mutual benefit. The programme stressed a hands-on approach where schools needed to buy in to the concept and actively participate in skills sharing, capacity building and community involvement.

5.1.2 Rapid growth of the programme between 2003 and 2005

From the time that it moved in-house to the Foundation in 2003, the project quickly began to build up a list of participating schools. Implementation began before the model had been comprehensively reviewed, which meant that the model evolved and changed over time through a dynamic process of trial and error. Programme staff and stakeholders shared programme experiences and lessons through conferences, websites and mailing lists[30]. As the project expanded, more programme staff were employed, and formal selection criteria and a selection process were established for schools.

The development of the tuXlab strategy was shaped by the annual feedback received from schools and from the WCED[31]. The 2004 South African e-education white paper provided further impetus for the tuXlab programme as it stressed the need "to explore the use of open source software and open content in education…drive capacity among teachers, sustain learners' interest in ICT, to teach basic computer skills to both learners and teachers[32]"

In 2005 the tuXlab programme continued to grow with the rapid installation of new labs. In response to Khanya's roll-out of labs, the founder of the Shuttleworth Foundation pushed for the increased roll-out of tuXlabs, setting the goal of establishing at least 80 Shuttleworth tuXlabs in the Western Cape by the end of the 2004/05 financial year.

In early 2005 the first version of a *Howto* tuXlab manual was completed[33] and later that year the programme won the Community Builder of the year award in 2005[34]. When it became evident that there was a need to provide more technical support to schools, the tuXlab help desk was established.

In the 2004/2005 financial year the focus began to shift from the provision of technology in schools to a focus on technology for the school curriculum.

5.1.3 An independent evaluation in 2006 to test feasibility of programme independence

The general policy of the Shuttleworth Foundation is to pilot and nurture innovative projects over a few years, testing them to determine feasibility. If they prove to be successful, the Foundation encourages them to leave the Foundation and become self-sustainable while it commits its own resources to working with new innovative projects during pilot phases.

[30] TuXlab website, 2008
[31] Interview with the Director of Inkululeko
[32] TuXlab Project Proposal. 2007
[33] TuXlab website, 2008
[34] Inkululeko. Business Plan 2006

In November 2005, when the then CEO of the Shuttleworth Foundation left, the trustees decided that the tuXlab programme had demonstrated that OSS was feasible in a school environment, and that the programme now needed to go out on its own. In 2006, Southern Hemisphere Consultants, an independent monitoring and evaluation consultancy, conducted an external evaluation of the programme while it was still in-house at the Foundation. The evaluation was requested by the Foundation to:

- establish the status quo of the project at that time
- determine the programme's relevance
- assess the achievement of goals
- assess the effectiveness of the team at that time
- identify gaps and understand the requirements for the sustainability of the model.

This evaluation found that the work of the project was relevant, effective and innovative; however, it stressed the need for some changes to the project model and recommended certain further steps be taken to ensure the sustainability of the programme.

Recommended changes to the model included:

- explore developing a half thin or half thick model in order to improve the attractiveness of the labs for schools, the DoE and for curriculum development
- revise the assumptions upon which the community model was based
- revise the volunteer management strategy.

Recommended steps to enhance the sustainability of the programme included:

- involving the government and the Department of Education in the running of the programme in order to ensure adequate access to support and content materials in line with the school syllabus
- extending the life of the programme within the Foundation in order to give the Foundation time to develop a well considered exit strategy for the programme with clear objectives and a plan of action[35].

5.1.4 Inkululeko Technologies as the new owner and manager of tuXlabs

In an attempt to secure the continued existence of the programme, the in-house tuXlab team proposed that they establish themselves as an independent service provider to run the programme with start-up funding from the Foundation. It was initially agreed that an exit strategy spanning six months would be worked out for the programme. During exit

[35] Evaluation of the Shuttleworth Foundation's tuXlab Project, May 2006

discussions, the importance of programme sustainability was emphasised. The then in-house tuXlab team agreed that they would work towards ensuring the programme's financial independence from the Foundation if they received initial funding from the Shuttleworth Foundation.

Consequently, the tuXlab team established themselves as a private company called Inkululeko Technologies. The idea was to establish a pioneering business model that would generate income from open source software, thereby transforming the non-profit tuXlabs programme into a social enterprise. Inkululeko Technologies established itself as a company offering wide scale, cost-effective and sustainable ICT solutions specifically targeted towards the educational, recreational and correctional sectors – private, public or corporate[36].

It was agreed that Inkululeko would take over the current operations of The Shuttleworth Foundation's tuXlab project and continue to focus on providing professional services and solutions to the education sector and its affiliates. It was planned that, as Inkululeko's capacity grew, the tuXlab project would expand and similar products would begin to be offered to the commercial sector[37].

5.2 THE TUXLAB PROGRAMME RUN BY INKULULEKO TECHNOLOGIES

In May 2006, just before its exit, the tuXlab programme had established partnerships with just under 200 primary and high schools in Limpopo, Western and Eastern Cape and was beginning to establish the first tuXlabs in the North West, Gauteng and KwaZulu Natal. In the Western Cape, 109 schools had tuXlabs.

5.2.1 Start-up funding agreement between Inkululeko and the Shuttleworth Foundation

In May 2006 Inkululeko Technologies signed a service level agreement with the Shuttleworth Foundation in which the ownership and management of the tuXlab programme was transferred to Inkululeko. Under this agreement Inkululeko agreed to maintain and manage the tuXlabs in their current form and to undertake new activities within the scope of the tuXlab project. As part of this agreement Inkululeko Technologies agreed to offer the following services and deliverables to the 200 schools associated with the programme:

[36] Inkululeko business plan. 2006. pg 3 and 6
[37] Inkululeko business plan. 2006. pg 3 and 6

- Provision of technical support
- Project management
- Training
- Incentive programme management
- Volunteer programme coordination
- Sustainability solutions and growth
- Internet connectivity set-up in Western and Eastern Cape
- Contribution and maintenance of the *Howto* tuXlab manual
- Monitoring and reporting of the *Geek Freedom League*
- Represent the tuXlab project and its members in any formal communication and manage communication between the project participants.

In addition, Inkululeko Technologies agreed, through this contract, to undertake a number of activities to facilitate the movement towards the financial independence of the project from the Shuttleworth Foundation, including:

- Sourcing potential funders and creating partnerships with such funders
- Strategic marketing of the project to attract more project participants both in terms of schools and corporate funders
- Expanding the number of tuXlabs available by increasing funder support
- Supporting the sustainability of tuXlabs through training and support services (eg having a project to allow selected participants to become ICLD certified with the intention of using these participants as ICDL trainers themselves, and a project to allow selected participants to become LPI Level 1 certified)
- Coordinating volunteers within the community to participate in tuXlabs setups, support and training
- Planning and hosting national events together with tuXlab members to increase awareness and access to open source computer centres.

5.2.2 The tuXlab programme aims and objectives under Inkululeko

Under Inkululeko Technologies no specific tuXlab programme aims and objectives were drawn up; rather the direction of the programme was guided by the terms set down in the SLA signed between Inkululeko and the Foundation.

5.3 THE TUXLAB MODEL

The tuXlab model was originally developed in-house at the Shuttleworth Foundation and Inkululeko continued to refine this model once the ownership and management of the tuXlab programme was transferred to the company in July 2006. The version of the tuXlab model presented below is the version that was used for implementation by Inkululeko after the transfer of the programme to the company. Core components of the model include:

1. Use of open source software designed on open source philosophy

The tuXlab model runs entirely on OSS and is designed around the open source philosophy which stresses the freedom to share, use, replicate and distribute software[38].

2. Relevance and affordability

In terms of design, the model stresses relevance and appropriateness to local context. In the South African situation, where ICT resources in education are often limited, this means that the components of a tuXlab need to be as affordable as possible. To achieve this, one must make use of what is already available and make the parts generic and interchangeable[39]. The tuXlab model achieved this by using refurbished hardware and a thin client system.

3. Emphasis on fostering self reliance and building local expertise

At the core of the model is an emphasis on fostering self-reliance and building local expertise. Community involvement allows for skills transfer and capacity building, not only from the Service Provider, but equally importantly from fellow tuXlab coordinators and users.

4. Sustainable, unbreakable and flexible

Community involvement is an important way to enhance the sustainability of a project, because it ensures the transfer of skills. The tuXlab model emphasises community involvement and programme sustainability using a seven step collaborative implementation/project management process which is discussed further below.

5. A permanent internet connection is not required

A tuXlab should not require a permanent internet connection in order to access and engage in a global network of culture and knowledge. Use of a Wizzy configuration[40] is able to provide cost effective internet access that does not rely on an ASDL connection.

[38] TuXlab website, 2008

[40] A Wizzy configuration acts as a stand in or proxy for the internet. A Wizzy server allows you to set the firewall machine to dial up at certain times of day and download all appropriate content, send queued email and fetch sent email. Data and email is then stored for off line use. The advantage of a Wizzy configuration is that it allows users to benefit from access to the internet but that it is more cost effective and suitable for computer labs in areas where telecommunication systems are not always reliable. TuXlab Cookbook, 2007, pgs 71 and 77.

5.3.1 The tuXlab model

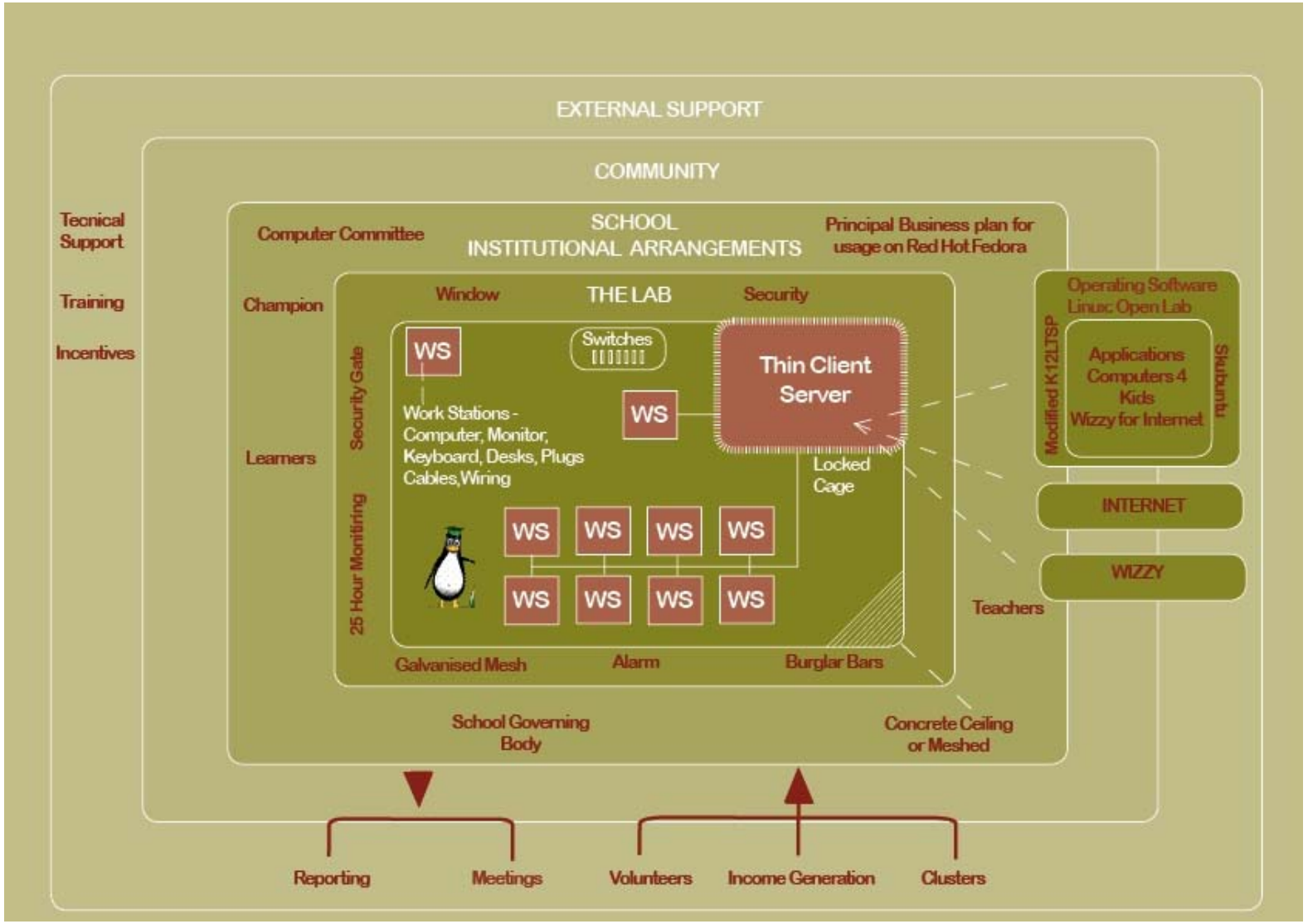

Figure 1: Diagrammatic representation of the tuXlab model, as of 2007

The diagram above illustrates the tuXlab model – the lab itself is set up using a thin-client configuration and open source operating systems, software and applications. Infrastructure and security stipulations are in place for the lab itself. The installation of the lab must be surrounded by certain institutional arrangements that include a business plan for ICT use in the school, a tuXlab champion and a supporting computer committee. Community support is also required as well as external support such as training and technical support. The tuXlabs are required to report and attend meetings and encouraged to participate in the incentives programme, recruit volunteers and use the labs for income generation.

Key success indicators of the model

The key success indicators of the model include:

- sustainability
- capacity
- stakeholder commitment
- community participation
- applicability
- robustness
- cost replicability.[41]

Figure 2: An Inkululeko staff member teaching tuXlab volunteers and coordinators

[41] Tuxlab website, 2008.

5.3.2 Implementation of the model

There are five main phases for a school to undertake in order to implement the tuXlab model. These stages are outlined in Figure 3 below:

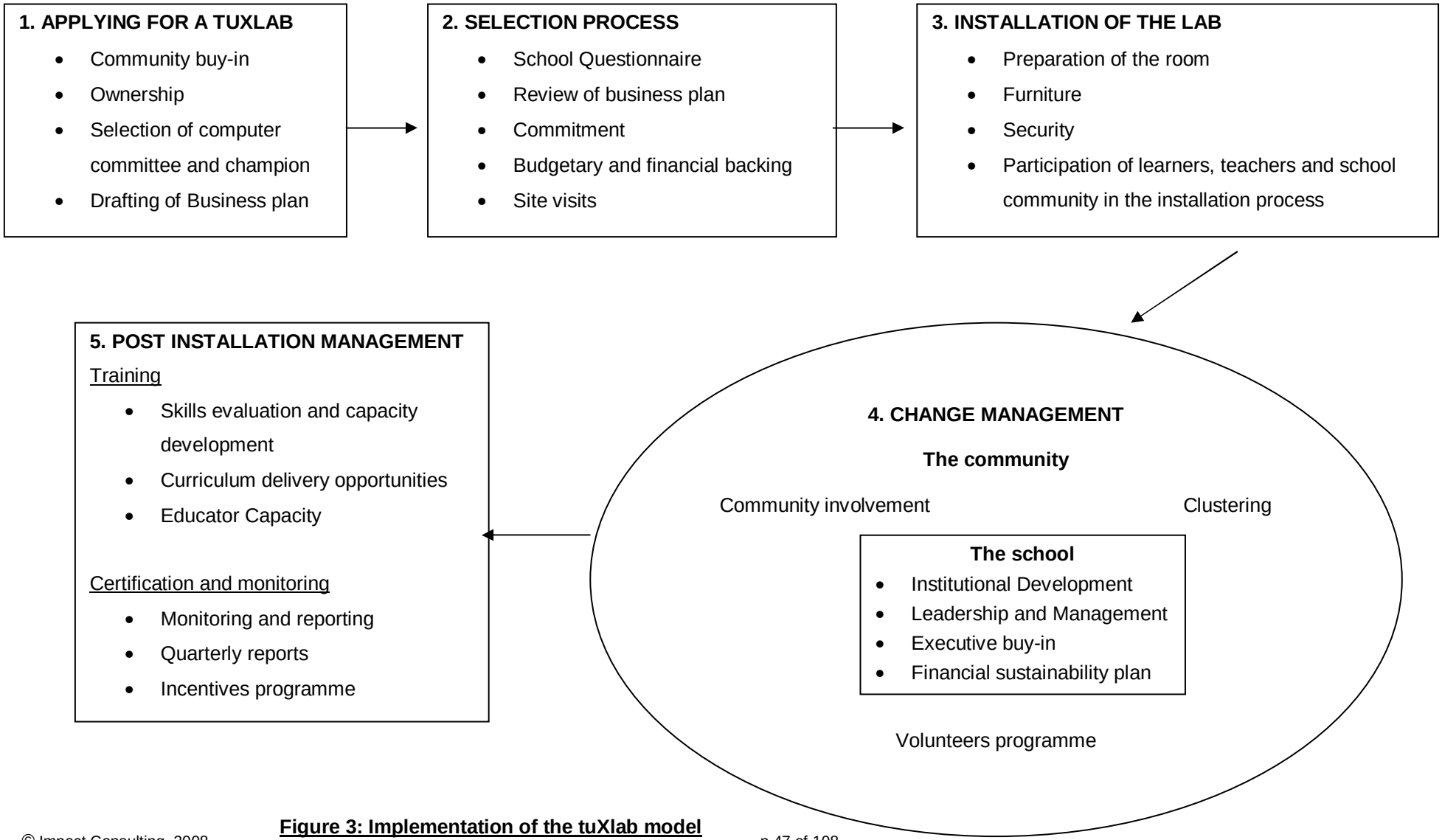

Figure 3: Implementation of the tuXlab model

The process for implementing the tuXlab model is represented in the diagram above and described below[42]:

A) IMPLEMENTATION PHASE

1. Applying for a tuXlab

Community buy-in and ownership

As figure 2 illustrates, according to the tuXlab model schools that are interested in applying for a tuXlab first need to show commitment and a willingness to be actively involved in the programme and to take ownership of the lab. For a school to apply for a tuXlab, they must first ensure that all parties in the school are in agreement with this decision by obtaining a mandate from the governing body (usually in the form of a letter which acts as an informal contract between the school and Inkululeko).

Selection of a computer committee and champion

The school needs to establish a computer committee and select a champion – an individual in the school with an interest/knowledge in computers who is prepared to drive and lead the process of installing and managing the tuXlab. The champion is selected by the school, and is responsible for communicating between the school and Inkululeko.

Development of business plan

During the planning stage, the school must design and draw up a business plan which shows that the school has carefully thought through and planned for the installation and maintenance of the lab. This business plan:

- provides a profile of the school (for example location, number of learners, teachers)
- maps out an ICT strategy for the school
- outlines the need for a computer lab
- describes preparations for the lab's installation in terms of infrastructure and maintenance
- explains the community involvement component – how the school will bring the community into the process and make the lab available for community use
- plans for financial sustainability, indicating how the school intends to maintain the lab financially, usually through using the lab for some income generating activity.

[42] The details of the tuXlab model have been provided through an interview with the Director of Inkululeko and also adapted from the tuXlab Cookbook, 2007

As part of the planning phase the school champion is also expected to attend several installations of labs at other schools in the same cluster or in nearby areas to gain experience in preparation for their own instalment and in order to show commitment.

2. Selection process

During the selection process the school business plan is reviewed, the school is visited and the tuXlab programme team meets with the principal, computer committee, champion and other school stakeholders involved in the process in order to make a decision. The following factors are considered when deciding whether the school is eligible for a tuXlab:

- What has been the success rate of previous projects the school has undertaken?
- Has the lab been mandated by the governing body?
- Is there a unified approach to the tuXlab within the school?
- Is the school well managed?

The eligibility of the school for a tuXlab is determined on the basis of the school business plan and the school site visit.

3. Installation of the lab (infrastructure and technology implementation)

During this stage, the room is prepared for the lab: furniture is organised and the room is secured with a security gate, burglar bars and an alarm. 20 to 24 seats are installed in the tuXlab. Second-hand hardware[43] is used for the workstation computers and new hardware brought in for the server. The tuXlabs are implemented using a thin-client paradigm with GNU/Linux as the primary operating system and open source applications where possible. The installation of the lab is a key aspect of the community buy-in and ownership component of the tuXlab model. Learners, educators, parents and the local community are required to participate in the installation process.

B) PROGRAMME PHASE

The implementation phase of the tuXlab programme is followed by the programme phase, which is concerned with the maintenance and development of the lab and the capacity building of the teachers and school in ICT.

[43] The use of second hand hardware has an influence on the success and operations of the programme. Second hand hardware can be less reliable and needs to be replaced sooner than new equipment. The new equipment provided by Khanya labs has been cited by some of the schools surveyed and interviewed as one of the reasons for the preference of these labs over the tuXlabs.

4. Change management

Leadership and Management

According to the tuXlab model the change management component requires the computer committee and the principal to think about ways to integrate the lab into whole-school development. To facilitate this, interactive workshops are held with principals of tuXlab schools to assist them to develop their ICT leadership skills and to think about ways in which to integrate their lab into whole school development.

Community integration and financial sustainability

Community integration and financial sustainability are meant to be addressed in the schools' business plans in the implementation phase. In this phase schools need to outline how they plan to bring the community into the lab and how they plan to ensure that the lab remains financially sustainable, usually through using the lab in some income-generating activity. Ongoing discussions on ways to achieve community integration and financial sustainability are meant to be held with schools at cluster meetings. At these meetings the idea is also for good schools to share their success stories and ideas to help inspire other schools, to discuss challenges faced, and to share what has worked in their labs and what has not.

5. Post installation management

Skills evaluation and capacity development

In the skills evaluation and capacity development stage the capacity of teachers, and the general levels of computer literacy among teachers and learners, is assessed. This is done to ensure that the introductory training provided to teachers, which is generally a once-off training session of three to five hours, is targeted at the correct skills level.

Educator capacity

Educator capacity involves training teachers to use the labs to their full potential. Training programmes, which have been specifically developed, are used to drive educator capacity, both in terms of computer literacy and in terms of teaching educators how to use content accessed through the tuXlab to teach the curriculum.

Curriculum delivery opportunities

During this phase, teachers are trained on how to use the content gathered from the lab programmes (such as Wikipedia and from the internet) to teach the school curriculum.

Communication and recognition

Regular and open communication between schools and Inkululeko is a key component of the tuXlab model. This model seeks to facilitate such communication through regular meetings, visits and emails with schools. Incentives are provided to encourage regular attendance at school meetings. The tuXlab model also encourages the recognition of schools that have shown commitment or who have managed to get their labs working effectively at such meetings.

Certification and monitoring

The aim of the certification component of the tuXlab model is to get teachers certified to train members of the community in various programmes and computer literacy. The purpose of this is to ensure that computer courses provided to the local community are officially recognised as a formal qualification. This enhances the economic value of such courses and provides a means of income-generation, enabling labs to become financially sustainable.

As part of the monitoring component of the model schools are monitored through quarterly reports and site visits to determine how they are managing to use and maintain their labs.

Hardware and software innovation

Hardware innovation involves assisting schools with restructuring their labs if they obtain new hardware and ensuring that their hardware is compatible with the upgraded software. Software innovation entails the upgrading of software, as well as the introduction and sharing of new and innovative software to assist teachers.

5.3.4 Sustainability of the tuXlabs

Over the first few years of its existence the original aims and objectives of the programme were maintained and expanded. In late 2005 the programme began to consider issues around sustainability and social entrepreneurship – issues which had been highlighted as significant by various stakeholders in the programme and were included as new objectives in the 2006 SLA between Inkululeko Technologies and the Shuttleworth Foundation.

The second edition of the *tuXlab Cookbook*[44] includes a module on sustainability which outlines the factors necessary for the sustainability of the programme. These include seven steps that need to be put in place during the implementation phase of the programme, as well as seven steps or activities which must be achieved during the programme phase[45].

[44] Sustainability Module, tuXlab Cookbook, second edition, 2007
[45] Sustainability Module, tuXlab Cookbook, second edition, 2007

During the implementation phase the following steps/factors were identified by Inkululeko as being necessary for the sustainability of the programme. These included:

- school commitment
- school buy-in and participation
- ownership
- planning
- infrastructure and technology implementation
- skills evaluation and capacity development
- curriculum delivery opportunities[46].

During the programme phase the following steps/activities are identified by Inkululeko as being necessary for the sustainability of the programme. These include:

- leadership and management
- educator capacity
- curriculum delivery
- communication and recognition
- community integration and financial sustainability
- hardware and software innovation
- certification and monitoring[47].

The skills transfer process is a key element of the programme. The tuXlab programme stresses the importance of building capacity with local communities to ensure community ownership and involvement and to ensure that labs remain sustainable. Partnerships with other organisations are also developed in order to ensure sustainability.

Inkululeko also considered and adopted certain aspects of other models in order to enhance sustainability. For example, it looked to the Ubuntu Education Fund[48] for their experience in achieving stakeholder buy-in and commitment, to Computers4kids for curriculum delivery and site visitation processes, the Khanya project for planning and curriculum focus and Schoolnet Namibia for their communication and technology implementation approach[49].

[46] Sustainability Module, tuXlab Cookbook, second edition, 2007
[47] Sustainability Module, tuXlab Cookbook, second edition, 2007
[48] The Ubuntu Education Fund is a nonprofit organisation based in Port Elizabeth which is dedicated to providing vulnerable children and families with access to health and educational resources and services. It is not connected in any way to Ubuntu Linux. http://www.ubuntufund.org/ accessed 04-11-08
[49] Sustainability Module, tuXlab Cookbook, second edition, 2007

5.3.5 A further evaluation of the tuXlab programme in 2007

In 2007 an evaluation of the tuXlab programme, commissioned by Inkululeko Technologies, was carried out by Paradigm Education and Training Solutions. The evaluation aims were:

- to assess the level of school satisfaction with the relationship between Inkululeko and schools, including the product (tuXlabs) and the technical support (maintenance)
- to evaluate whether schools were developing ownership and independence over the lab in order to enable the programme to become sustainable.

The key findings of this evaluation included:

- More computers in tuXlabs and the upgrading of existing computers were identified as pressing needs
- Although schools emphasised that they had a good relationship with Inkululeko, they felt that this relationship could be further strengthened through better communication
- Schools expressed concern about the ongoing sustainability of the programme particularly with the withdrawal of Inkululeko.

The report recommended that Inkululeko develop stronger sustainability strategies or principles with schools.

Responding to these recommendations, Inkululeko attempted to improve its relationship with schools and to enhance the sustainability of tuXlab schools through the Connectivity and Ingots' projects. Schools that had shown commitment and motivation were selected for participation in these initiatives. Inkululeko was not able to upgrade the equipment of the tuXlabs, as it did not have any budget for this, but, wherever possible, they replaced existing equipment with newer second-hand machines. In response to the concerns of schools about the withdrawal of free technical support, Inkululeko made the decision to continue to provide free support to schools.

5.4 PROGRAMME CLIENTS

5.4.1 Direct beneficiaries

- Learners at all functional schools with tuXlabs
- Teachers at functional schools with tuXlabs and those who have received basic or more advanced training
- Schools

5.4.2 Indirect beneficiaries

School Communities including:

- parents and learner's families
- other schools in the same cluster.

5.4.3 Partners

Partners of the programme are also clients. In the case of the tuXlab programme during the SLA period, partners included corporate sponsors, various national and provincial government departments as well as a range of educational and ICT companies and NGOs.

5.5 PROGRAMME SETTING AND LOCATION

The tuXlab programme currently operates in the Western Cape, Limpopo, Free State and KwaZulu-Natal. Schools were originally selected in clusters for participation in the programme to enable them to share labs, resources and community support in order to maximise the impact of the programme.

5.6 PROGRAMME STAFF

The two organograms[50] below outline the staffing structure of Inkululeko in the Western Cape, and the national staffing structure of Inkululeko at the time of the transfer of ownership and management of the tuXlab programme to Inkululeko in 2006.

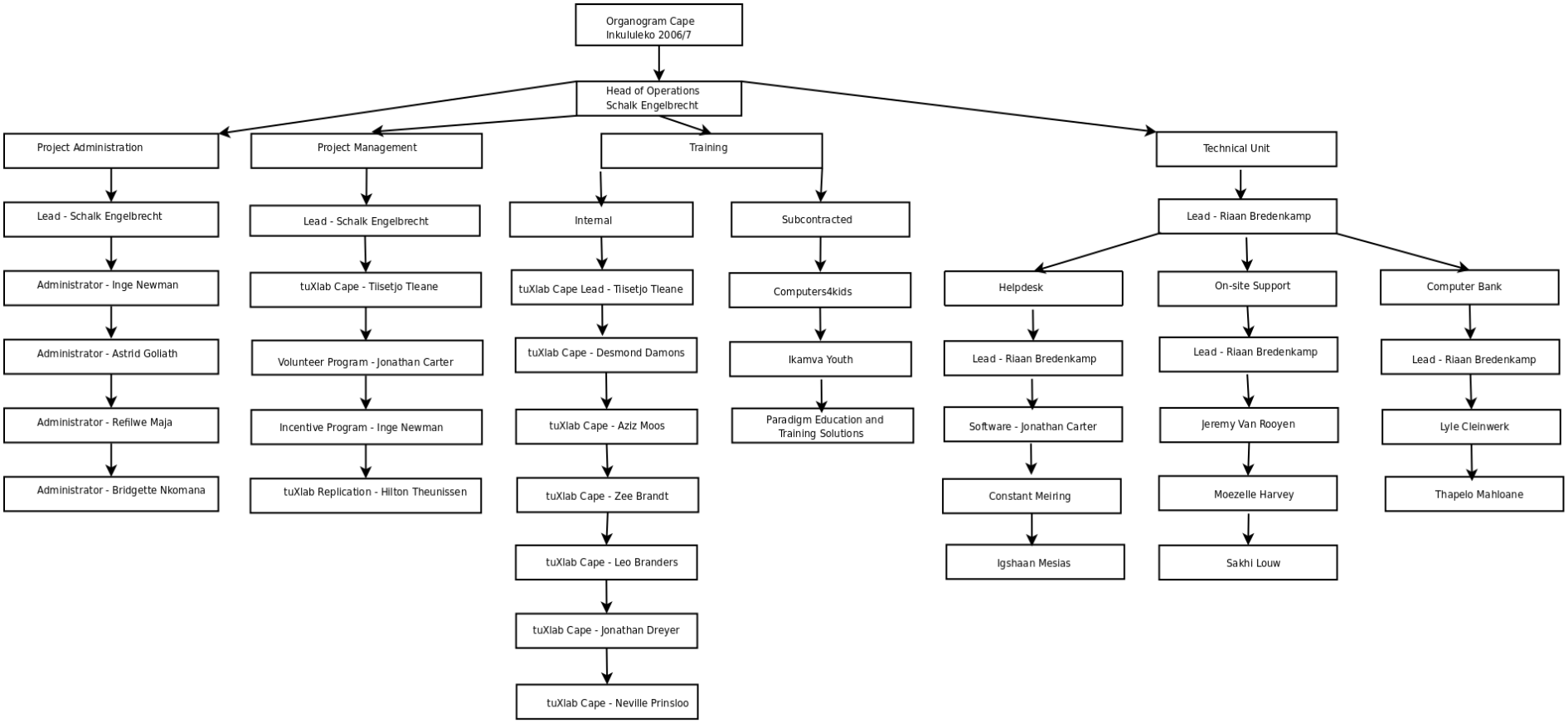

Figure 4: Inkululeko staffing organogram for the Western Cape at the time of the transfer of the tuXlabs programme to Inkululeko

[50] This organogram was supplied by Inkululeko Technologies

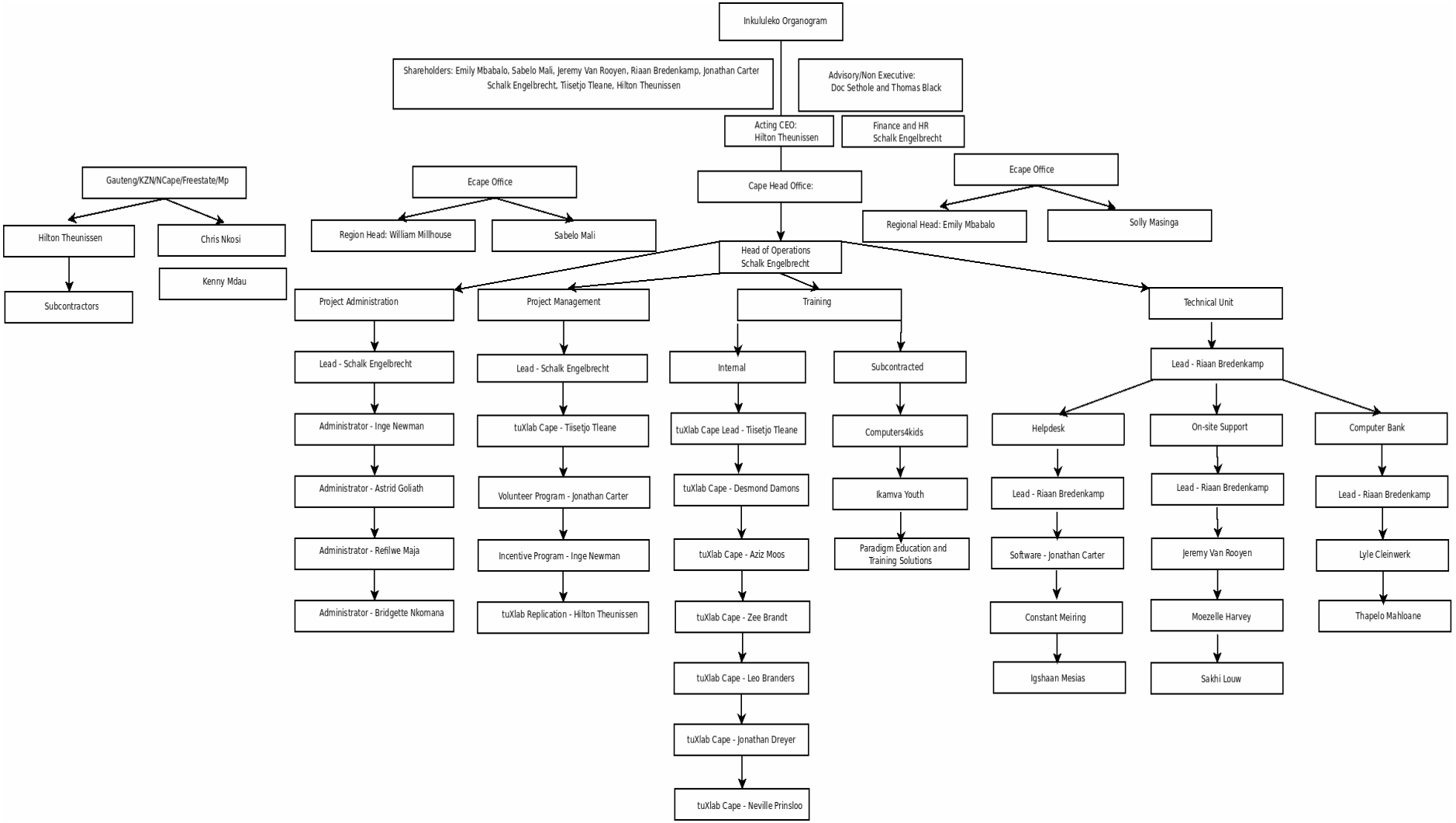

Figure 5: Inkululeko national staffing organogram at the time of the transfer of the tuXlabs programme to Inkululeko

5.7 PROGRAMME STAKEHOLDERS FOR THE WESTERN CAPE

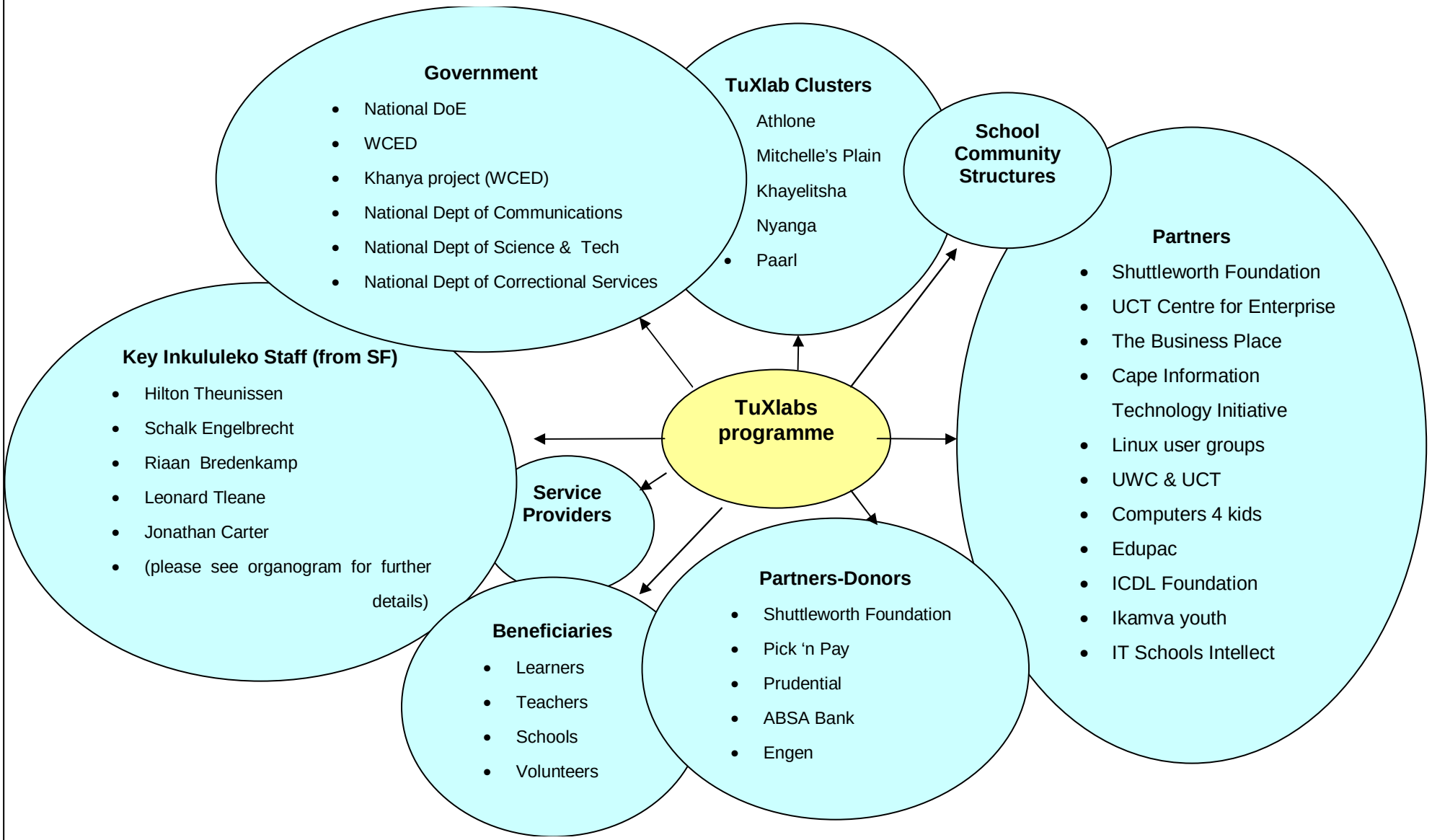

Figure 6: Stakeholders involved in the tuXlab programme

5.8 PROGRAMME FUNDING

The primary funder of the tuXlab programme in the Western Cape was the Shuttleworth Foundation who provided R3,500,000 for the period of July 2006 through to February 2007 in order to carry out the services and deliverables set out in the 2006 SLA between the two parties. In this agreement Inkululeko was tasked with the responsibility of developing relationships and securing financial support with other funders and corporate sponsors. During this same period, Inkululeko was able to secure R1 334 000 in funding from a number of corporate sponsors and government departments, as well as securing the sponsorship of hardware from 3 corporate sponsors for the programme, the details of which are given in the table below.

In addition to this corporate sponsorship Inkululeko was able to raise a further R500 000 for the tuXlab programme through consultancy fees paid to the company for their assistance in helping the CSI divisions of various companies to replicate the tuXlab model.

NAME OF CORPORATE SPONSOR	DETAILS OF SPONSORSHIP	USE OF SPONSORSHIP
Hardware sponsorship		
Metropolitan	Provision of hardware	Hardware for establishment of new tuXlabs
Western Cape Provincial Government (PGWC)	Provision of hardware	Hardware for establishment of new tuXlabs
Engen	Provision of hardware	Hardware for establishment of new tuXlabs
Financial sponsorship		
ABSA	R342,000	TuXlab growth: est of new tuXlabs outside WC
Prudential	R200,000	TuXlab growth: est of new tuXlabs outside WC
Engen	R342,000	TuXlab growth: est of new tuXlabs outside WC
JMC	R50,000	TuXlab growth: est of new tuXlabs outside WC
Pick n Pay	R400,000	Connectivity Project
TOTAL	**R1,334,000**	

Table 2: Sponsorship obtained by Inkululeko for the tuXlab programme during the time period of the first SLA between Inkululeko and the Foundation

In 2007 Shuttleworth provided a further R570,000 in funds for Inkululeko to undertake a separate project, the Social Entrepreneurship for the Sustainability of tuXlabs, from March 2007 to February 2008. This project sought to enable the tuXlabs to become financially self-sustainable by training 10 entrepreneurs to run tuXlabs as social enterprises. These entrepreneurs would run the tuXlabs providing technical support, training and project management to schools in return for a fee and would also provide training and access to the broader community.

During the same period the Foundation also funded Inkululeko R684 000 to run the Ingots programme. The Ingots programme is a Shuttleworth Foundation initiative that was developed to promote the adoption of INGOT certifications in South Africa. The International Grades for Open Technologies (INGOT) are a set of qualifications accredited by UK government regulators which offer a formal yet platform independent end user ICT certification for learners and educators. This certification is designed to provide recognition for skills, knowledge and capability relevant to the use of personal computers and other information and communication technologies, and because of its flexible and open nature is particularly suited to the South Africa education environment[51].

The figure below indicates spending by the Shuttleworth Foundation on the tuXlab programme.

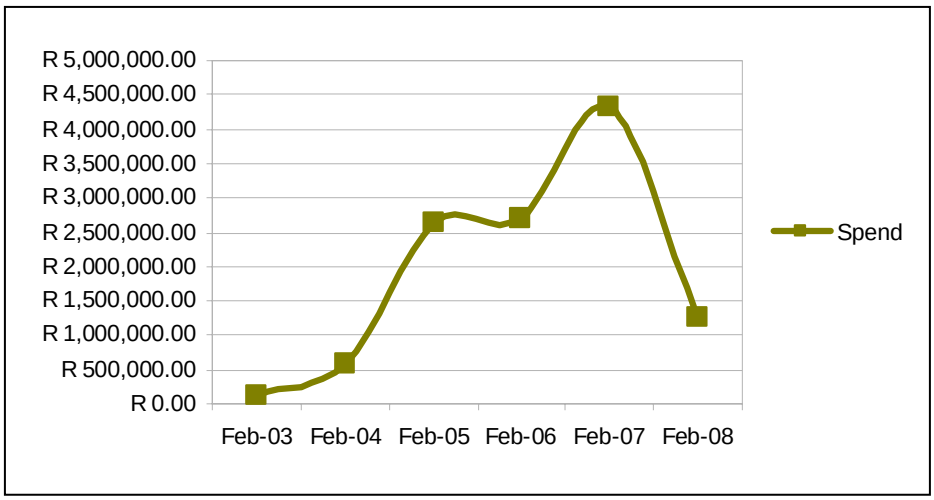

Figure 7: tuXlab financial information from 2003 to 2008

[51] S. Dingle, Qualifying ICT Skills in Local Education, Shuttleworth Foundation Press release, final draft, 22 November /2007

CHAPTER 6. FINDINGS

Case Study 1: *"Linux is actually not that difficult, people just need a mind shift"*

Situated in the scenic Cape Winelands, School A is a primary school with 700 learners and 19 teachers. Most of the learners attending the school come from disadvantaged socio-economic backgrounds, where opportunities to excel in education (and in general) are limited. Only 50% of the school's learners will matriculate and there is a very high level of unemployment within the local community. Much of the work available is limited to seasonal employment on surrounding wine and fruit farms.

As 80% of learners do not have access to computers at home, the general level of computer literacy is low. When their tuXlab was established in 2004 there was much excitement as it was the first time most of the learners had been given access to a computer. On his first visit to the lab, one little boy in Grade 3 who had never seen a computer before reported that he initially thought that it was a television or a piano.

The school has been lucky to have a dedicated tuXlab coordinator who has received strong support from the principal. The coordinator emphasises that the willingness and motivation from the staff and the principal have been important for him to keep the lab running successfully. The school has also worked hard to fundraise and developed some innovative solutions to overcome the barriers to the effective use of their tuXlab.

One of the problems that they faced was that there were only about 16 working thin clients in the lab. With classes of 40 to 50 learners it was very difficult to control the children during classes held in the lab. Discipline was a concern for teachers, and the learners didn't enjoy having to share computers. To solve this difficulty the school used some of the funding that they received from the United States to set up a media centre with a librarian in the classroom next door to the tuXlab. Classes are now split in half and the children spend half their time in the lab and the other half in the media centre.

The same funding was also used to employ a full time lab facilitator who started in March 2008. Prior to this position, each teacher would bring their own classes to the lab and would supervise them. Now the new tuXlab facilitator is responsible for the planning and teaching of all lessons in the lab.

.

All learners at the school use the tuXlab. The younger learners play educational games. Their teacher identifies which areas the children are having problems with and then he, as the lab facilitator, structures his lessons around appropriate games to assist with these specific areas. They have audio-visual exercises, phonetics and typing. The older ones draw graphs and do mathematical exercises in the open source spreadsheets or research on Wikipedia. The school does not have access to the internet, although they do have the satellite dish that was installed as part of the connectivity project

The lab is also open after school for learners to play and do their homework. Each grade is designated a different afternoon on which they are able to come and use the lab after school. Learners enthusiastically noted that they enjoyed their time there – *"the tuXlab is nice for relaxing".*

The community uses the lab occasionally on an informal basis. Former learners come in to write up their CVs and parents sometimes use the lab to draw up a Church programme. The new facilitator is very keen to get the community more involved and mentioned an idea inspired by a neighbouring school with a Khanya lab that was offering a three month community computer course for R300.

The facilitator's chief frustration is caused by the technical problems the lab has been experiencing, mainly with the server, which does not recognise and upload new software. Other technical problems include the fact that the computers often freeze and that he has been unable to work out how to configure the computers.

The weakness of the model at this school is the lack of technical support and the lack of communication. The facilitator said that he just doesn't know where to go for assistance with the problems with the server. He would like to see the server fully repaired and installed with USB ports and the software updated. He also feels that the Service Provider needs to make more frequent visits to the school as this would *"contribute to morale."*

Since the beginning of the year there has been a breakdown in communication between the school and the Service Provider. The lab has remained up and running because of the dedication and hard work of the coordinator and the lab facilitator who, because of his technical background, has been able to repair some of the thin clients. This would not have been the case if he had not been there. As the tuXlab coordinator explained *"teachers lack enough knowledge of working with computers…to fix the problems".*

The facilitator decided to take on this job because of his commitment to the learners and to social development in the community. He receives a very small salary, which would not be enough to sustain a formal lab facilitator position. He is due to leave in June but the principal is hoping to raise additional funds to allow him to stay on.

Although he still uses Microsoft on his own laptop, working in the TuXlab has changed his perception of open source software and encouraged him to do some of his own research in this area. He was forced to learn to fix systems working on Linux and the exposure has made him very pro-Linux and encouraged him to become a speaker for open source technology. In fact, his skills are now in demand as he has had requests for assistance from surrounding Khanya labs. He also noted that the open source programmes allow him to make his lessons more creative.

This change in perception about open source technology has not, however, filtered down to the teachers. They feel that they have not learnt anything about open source software and they prefer Microsoft because it "*is just so much more accessible".* One teacher felt that open source was *"a step back",* because the tuXlabs don't have the curriculum programmes that Microsoft has.

The facilitator faces the challenge of changing the perception of the teachers who *"are quite set in their un-technological ways".* They received training a number of years ago when the lab was first established but do not know much about the labs or open source. He is encouraging the teachers to take more of an active interest in the labs and has noticed that they are starting to play around and experiment more on the computers.

For this champion, the key strength of the tuXlab model is that *"it identifies the poverty-stricken schools"* and is able to provide computer access to children for the first time in their lives. Without the tuXlabs, these children would not have any access at all. The result is computer literacy for learners and an increase in children's sense of self. One teacher noted that *"children are typing faster and with more confidence"*. There has also been an improvement in learners' mental maths skills and they can also now use various maths programmes to make graphs and add up different currencies. Their general knowledge, chess skills and grasp of literature has improved, as learners have access to poetry through the labs. Equally importantly, the lab has prepared learners to work with computers when they reach high school. For teachers the hope is that the labs will help children to learn *"that the world isn't only as big as South Africa".*

Case Study 2: *"At present the computers look like they are about to fall apart…Its like scrap in here…learners don't want to come in here and work on this"*

School B, situated in the Cape Town area, is a junior secondary school that was one of the first schools to have their tuXlab installed in 2004. These were the first computer facilities that were established at the school. The lab was used until 2006 when a series of power cuts in Cape Town *"blew the computers".* Damage to the hardware as a result of these power cuts put the lab out of commission. There are currently only nine computers in the lab that are in working order, but these are not being used because, as both the coordinator and principal stress, with just a few computers still working *"it's impossible to bring a class of 30 or 40 learners in to use the lab".*

The majority of the learners at the school live in Cape Town townships and the school also has some learners from other African countries such as Rwanda. Most of the learners do not have computers at home, although a few do have access to a computer *"at a friend's house".* The principal is aware that the majority of learners are not very competent on a computer. A few who came from primary schools with Khanya labs *"manage much better".*

In 2005 the majority of the teachers at the school received training from the Shuttleworth Foundation. Only three teachers who received this initial training are still at the school and a challenge is that the skills were not adequately shared to enhance the sustainability of the lab.

Access to the tuXlab was scheduled into the school timetable with every learner having a 40 minute period in the lab once a week. Each teacher would come to the lab with their class. Learners played games on the computers and typed and printed assignments. Some teachers used the programmes to do maths and graphs with learners. Learners also used Wikipedia for history assignments but their Wikipedia was not regularly updated as was promised. The coordinator felt that the programmes that were on the computers were not really suitable for teaching the curriculum for the Grades 8 and 9 at the school as they were more geared more towards primary school.

The TuXlab coordinator at this school does not have a particular knowledge or passion for computers – he was designated to the position simply because he happened to know slightly more than the other teachers at the school. He has not had much training nor does he have any administrative or technical skills for running and maintaining the lab. When it comes to solving problems he generally feels disempowered.

The coordinator is also a teacher himself and sighs as he explains that it is very difficult to teach and try to maintain the lab. He feels that it creates problems if there is not a dedicated person for the lab. He said that he would like more training but only if he could be a full time computer teacher and not have other teaching responsibilities in addition. He feels quite isolated and thinks that he lacks the skills and motivation to make the lab a success. When referring to fixing the server, he dejectedly noted "I don't scratch in that box".

The school has not been able to fully participate in the Incentive programme, as meetings were often far away and difficult to access by public transport. Nobody at the school was aware that a volunteers' programme existed.

The main technical problems experienced in this lab included damage to the hardware as a result of the power cuts, problems with passwords not working which prevent access to the system, difficulties with computers "freezing and being slow" and monitors sporadically changing colour. These difficulties demotivated teachers and stopped them from using the lab. The school has done their best to replace some of the broken computers but they just don't have the funds to replace all of them and so they have stopped using them altogether.

The power cuts were not the only reason for broken computers – equipment has also been stolen by learners. The principal explained that some of the learners had tried to steal computer parts from the lab and sell these down the road. He caught one learner who took some parts from the lab computers to fix his own computer at home. The principal confronted the learner and forced him to bring the part back.

The principal felt that, while the lab was working, it had had a positive impact on discipline. Learners were eager to come to use the lab and knew that they had to be well-behaved if they were to be let in. He reported that the learners were interested and enthusiastic about working on the computers and that they frequently knew *"more than teachers".*

In contrast to the principal, the coordinator felt that the lab had not had any significant positive impact on learners and even less on teachers as they are *"so used to Windows and not Linux…Linux is good because it's free but a person needs a lot of training to be able to use it properly."*

To get their tuXlab running again, the school would need to improve its current condition and make it look *"better than it is at the moment".* The tuXlab coordinator felt that the hardware was so old and run-down that the school could not be proud of the lab and that learners could not respect the equipment: *"At present the boxes look like they are about to fall apart…Its like scrap in here…the learners don't want to come in here and work on this…it needs a lot of fixing"*

The principal noted that he would like to get the lab up and running again, but that to do so the school would need new hardware, repairs made to the existing hardware and much more technical support. The server would also need to be upgraded. More involvement on the part of the service provider, such as regular visits would also help. If there are cluster meetings, these meetings *"need to be close to schools. You need a proper network".* The coordinator suggested that it may be useful to get some IT students in to volunteer and help.

6.1 DEMOGRAPHIC PROFILE OF SCHOOLS

The majority of schools (81%) in the sample are primary schools and 18% are high schools. Most schools are located in urban areas (81%), 10% in peri-urban areas and 4% of schools classify themselves as rural.

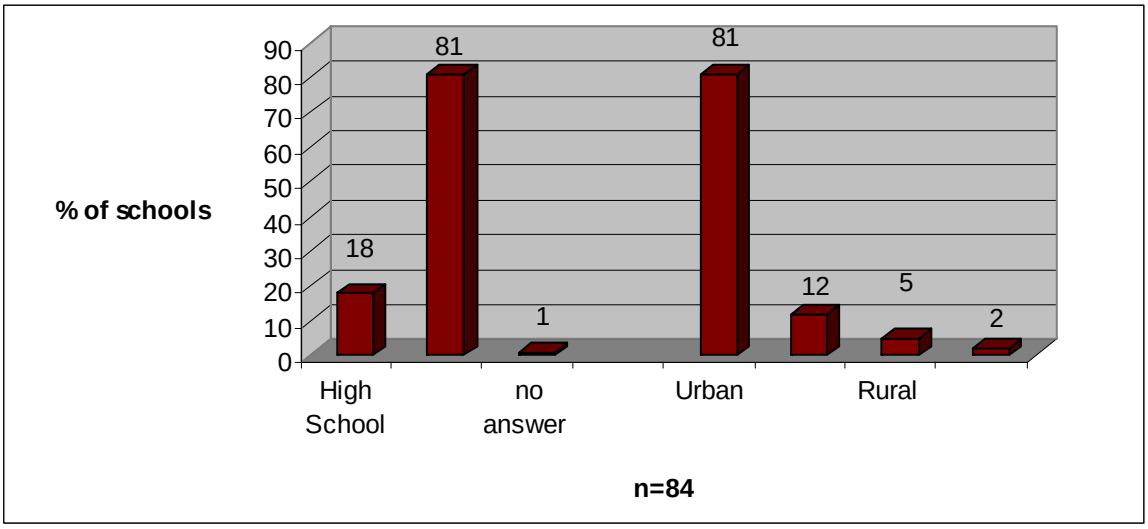

Figure 8: Demographic profile of schools with tuXlabs

6.1.1 School and class size

Most tuXlab schools have more than 500 learners. Almost half of the schools (45%) have between 501 to 1000 learners, with a quarter (26%) of schools having between 1001 to 1500 learners, and the other quarter (24%) of schools having 500 or fewer learners. Only 1% of schools have more than 1500 learners.

As figure 7, below, illustrates the majority of primary schools (78%) have a learner to teacher ratio of 36:1 or more. Almost half of these (37% of the total primary schools) have a ratio of 41:1 or more, which is above the recommended learner to teacher ratio in South Africa. Three-quarters of the sampled high schools (74%) have a teacher to learner ratio of 40:1 or less, but it is still worrying that more than a quarter (26%) are also over the recommended ratio.

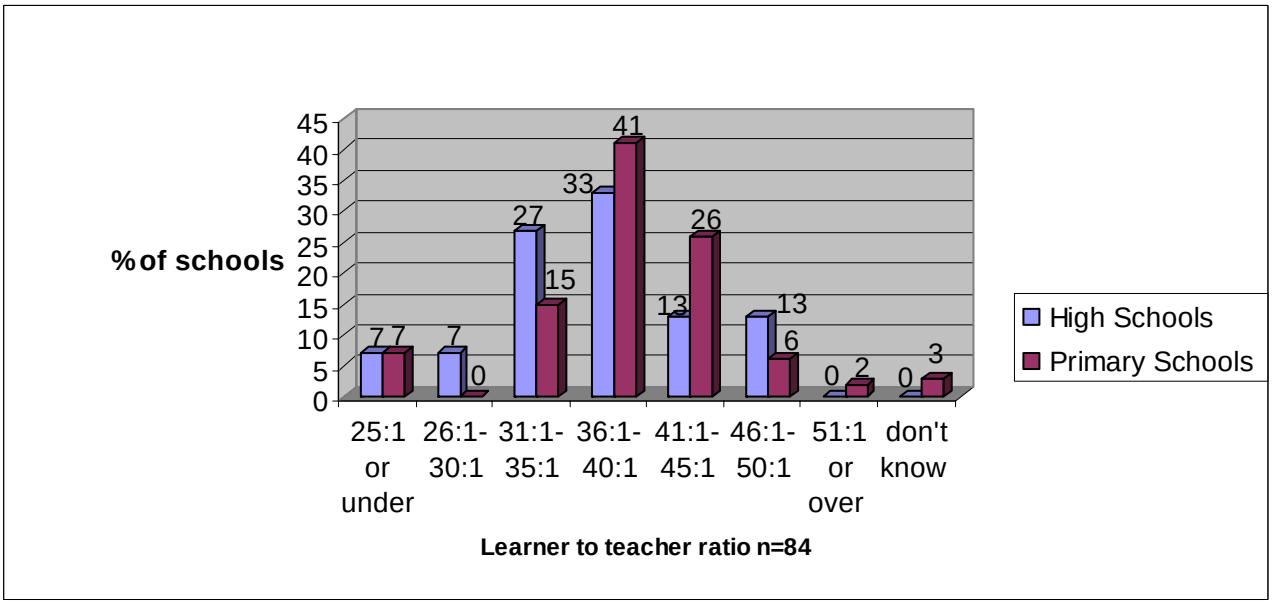

Figure 9: Learner to teacher ratios at schools with tuXlabs

6.1.2 Race and language profile

It was difficult to compile a complete racial profile of tuXlab schools as 29% of schools did not supply accurate information or any information about their racial profile in the survey. Out of the 60 schools that did supply this information, 41% reported that they were predominantly Coloured while 30% indicated that they were predominantly Black.

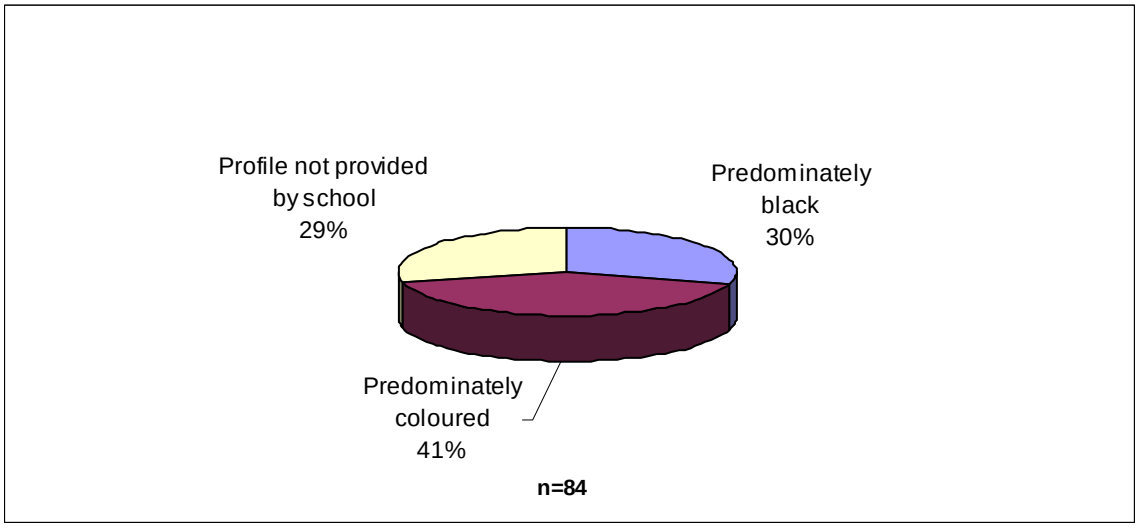

Figure 10: Racial profile of surveyed tuXlab schools

In terms of language at schools, it was reported that 22% speak Afrikaans, 16% speak English, 18% are Xhosa speaking and almost a third (31%) speak a combination of English and Afrikaans.

6.1.3 Poverty quintiles

A total of 54% of surveyed schools said that they did not know what poverty quintile their school fitted into or did not answer this question. For this reason it has not been possible to present a full picture of the socio-economic position of surveyed schools. Out of the 46% of schools that were able to provide this information the majority of these schools are situated in poverty quintiles 3 to 5 (quintile 5 being most advantaged schools on the scale).

6.2 CURRENT STATUS OF TUXLABS IN THE WESTERN CAPE

6.2.1 Number of functional[52] tuXlabs in the Western Cape

In March 2006, immediately before Inkululeko Technologies took over the management of the programme, there were tuXlabs in 109 schools in the Western Cape, most of which were operational.

Of the 84 tuXlabs that were surveyed a total of 88% (74 labs) were functional between June 2006 and Feb 2007, while 12% were not used at all during this period. Less than half (45%) of the sample of 84 schools (which is a representative of all tuXlabs in the Western Cape) currently work.

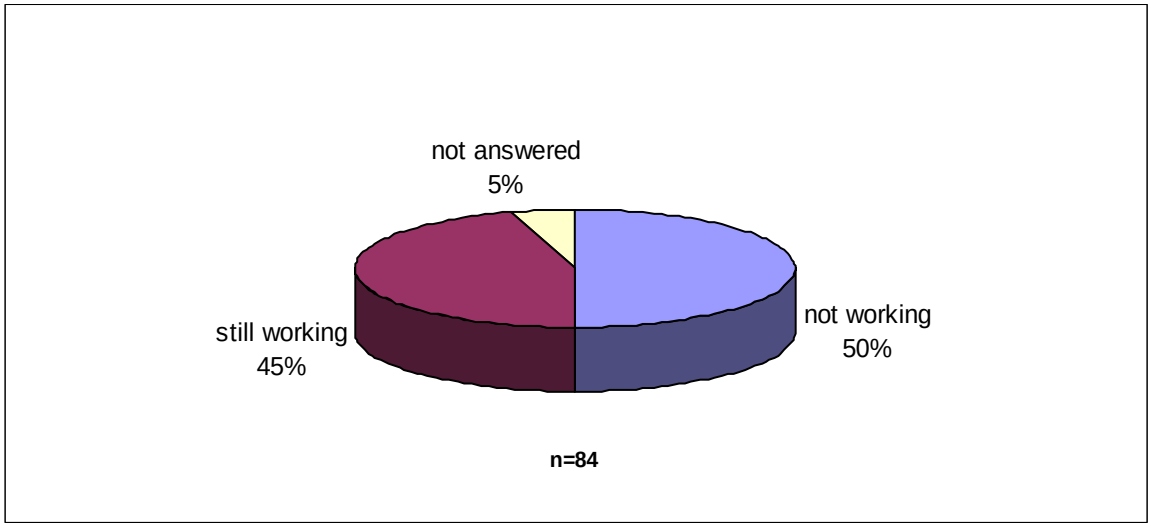

Figure: 11 Total number of tuXlabs currently working and not working out of 84 schools

[52] By functional we mean that the lab was used by learners and teachers for all or some part of the period between June 2006 and February 2007

Out of the 74 labs that were functional at the end of the SLA period, just over a half of these (52%) are still currently working.

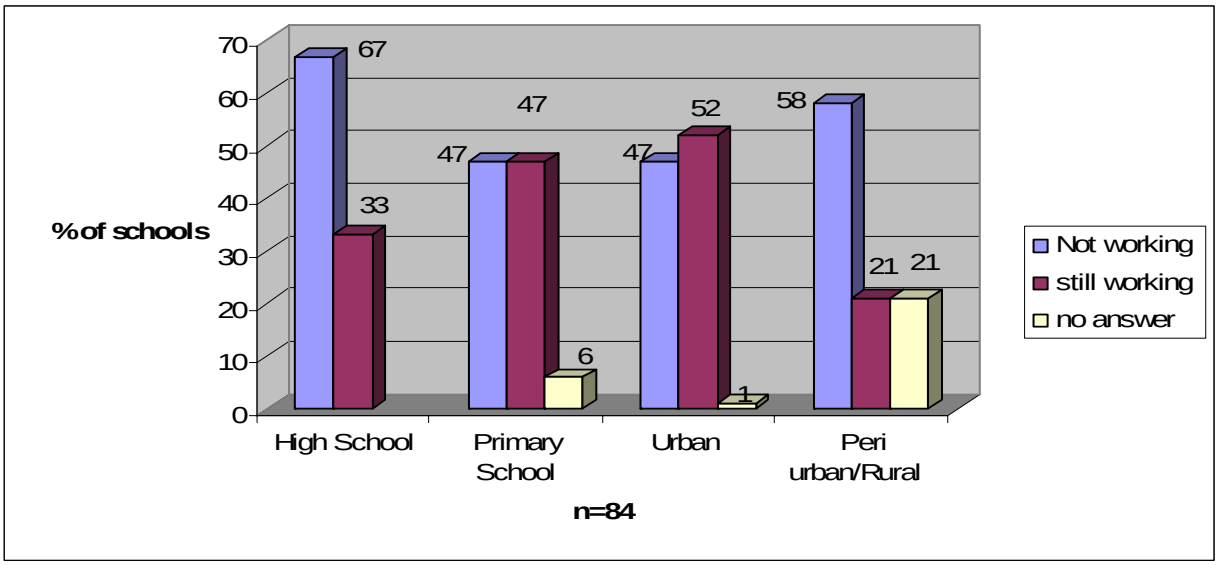

Figure: 12 Percentage of schools with functional tuXlabs according to school type and location

As can be seen above, a higher percentage of tuXlabs have been able to continue functioning in Primary Schools in urban areas (52% in schools in urban areas are still working compared to only 21% in peri-urban and rural areas). Only a third (33%) of tuXlabs in high schools are still working compared to almost half (47%) in primary schools.

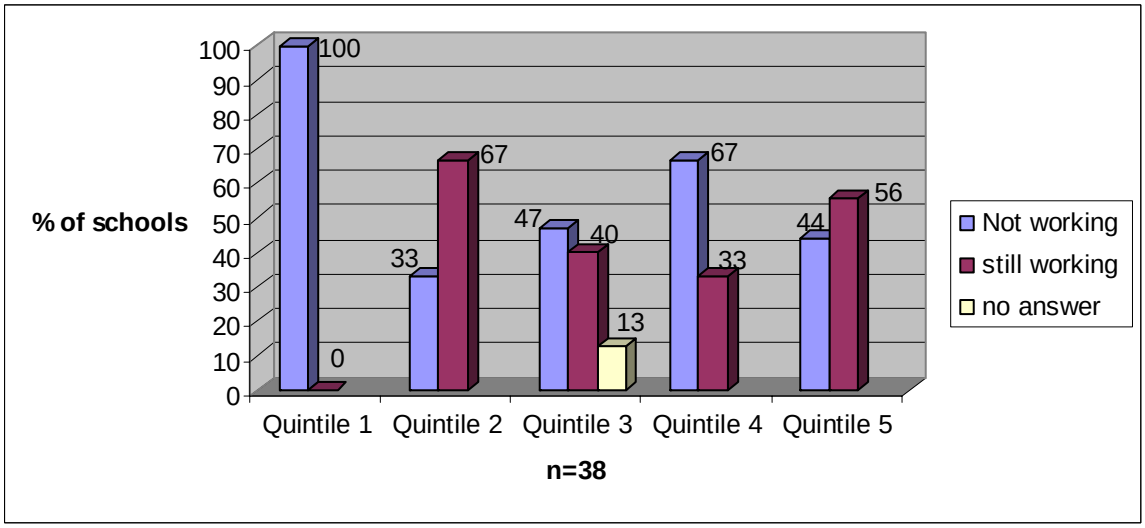

Figure: 13 Proportion of tuXlabs still working according to poverty quintile

Interestingly, none of the poorest schools in our sample (those in Quintile 1) had managed to keep their tuXlabs working while more than half of the "richer" schools (Quintile 5) had.

6.2.2 Reasons why tuXlabs are no longer working

Reasons for no longer using the tuXlabs are portrayed in the figure below:

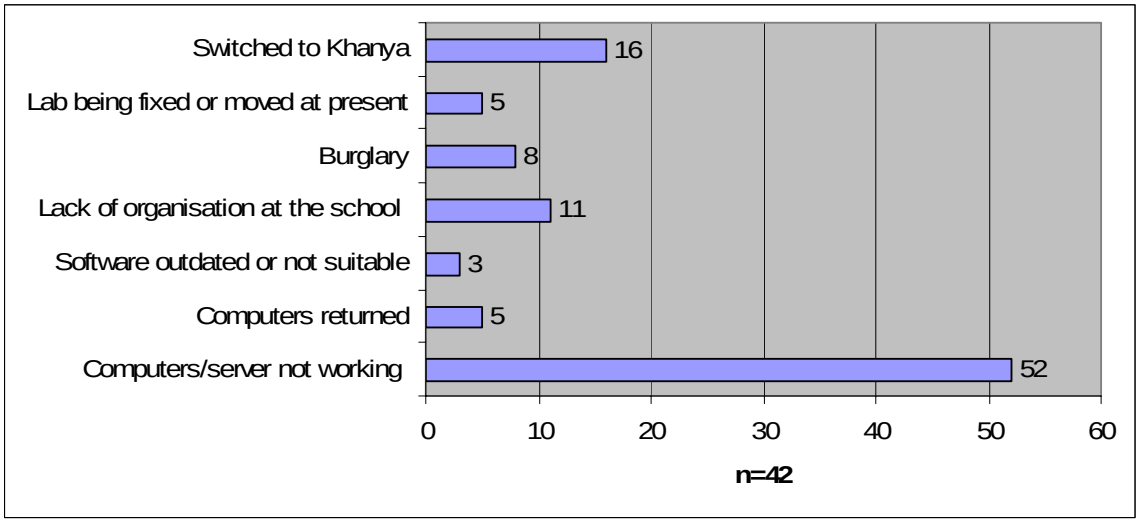

Figure: 14 Reasons given by schools for the closure of their TuXlabs

By far the most common reason for the lack of the tuXlab being in operating order is because of a hardware issue.

Only 16% of the total set of schools indicated that they stopped using the tuXlabs because of Khanya. We did find, however, that schools where the tuXlab is still operating are less likely to have a Khanya lab than schools where the tuXlab is no longer functioning and that a total of 65% of schools where the tuXlab is no longer working have Khanya labs compared to 42% of schools with working tuXlabs who have Khanya labs.

Figure 15: The equipment at a school with a no longer functioning tuXlab lies unused

6.2.3 Technical experience and support

The technical experience of tuXlab coordinators varies considerably. Schools with a coordinator with some technical training have a distinct advantage over schools without such an individual, and are more likely to be functioning. All the schools we visited who have successfully running tuXlabs have dedicated tuXlab coordinators (or other individuals) with technical training who are running the labs. One had received this training through attending Shuttleworth training courses and installations, and the other two through their own programming interest and background. These coordinators have been able to fix many of technical problems rather than having to rely on Inkululeko for technical support.

Schools with these "expertise" in-house are in the minority when looking at the total population. Amongst the coordinators who do not have a technical background we found a lack of capacity to solve even basic technical problems. One coordinator at a school where the lab was no longer functioning expressed his sense of disempowerment when he referred to a question about fixing the server with: *"I don't scratch in that box!"*

Although Inkululeko had planned that schools would begin to pay for technical support after February 2007, when funding from the Foundation came to an end, they continued to provide free support to schools after this period. Since the beginning of 2008, their capacity to provide this free technical support has been greatly reduced, particularly since the help desk was closed in January 2008 and the technical team stopped working at the end of February 2008 (although they carried on informally until the middle of March 2008). Inkululeko continues to provide support to schools wherever possible using volunteers.

Most schools indicated that they are unable to pay for technical support due to a lack of funds. Even the schools that the research team visited that are situated within a higher economic bracket felt that the fees charged for technical support were too high.

6.2.4 Hardware

A large proportion of tuXlab hardware is currently out of commission when it is considered that 50% of labs are no longer functioning. Some of this hardware has been removed from schools; however, most appears to have remained on school premises. Only 19% of schools reported that all their computers are currently still operating, and 32% had less than five non working machines. Almost half (45%) of the sample have more than five computers that are not working, and out of this group, 23% of them report that they have no working machines.

The survey and schools site visits reveal that there is a very high level of dissatisfaction among schools regarding the tuXlabs hardware. Almost three quarters (73%) of the schools surveyed indicated that they were not satisfied or not completely satisfied with the hardware.

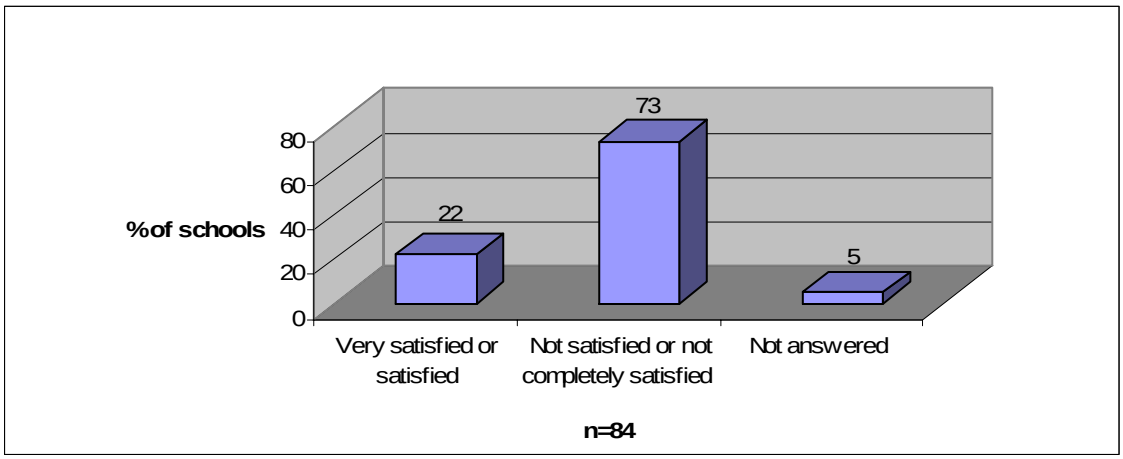

Figure: 16 School levels of satisfaction with tuXlab hardware

Teachers report that hardware has broken on a regular basis, while working computers were often slow and froze at times causing frustration for both tuXlab coordinators and learners using the labs. In some instances, the server would freeze while learners were mid-task which would mean that all the work they had done would be lost.

This dissatisfaction is not a recent issue – it has been an ongoing problem for the programme. For Inkululeko, the hardware problems have been one of the major challenges as they made up the bulk of the technical calls which Inkululeko had to respond to.

Nearly half (47%) of all tuXlab schools have hardware which is four years or older. A total of 73% of this hardware has never been replaced. Because the hardware in tuXlabs is second-hand, it has a shorter lifespan and has required far more maintenance, more repairs and constant upgrading. Technical problems with this hardware, combined with a perceived inability to access technical support has been a major cause for the closure of many tuXlabs.

Another challenge noted regarding the current hardware in tuXlabs is the lack of facilities to accommodate USB devices, CDs or disks. This means that users are limited to using the computers at school and cannot take work home to finish. Learners at some schools complained that there is no shared drive or C-drive for them to save their work on. Although there is certainly a shared drive in every lab, it is worth noting the perception that nothing can be saved.

6.2.5 Software

The majority of all the schools surveyed (67%) said that they used both Linux and Computers4Kids. A total of 10% said that they only used Computers4Kids software, 8% used Linux exclusively and 15% said that they used other software, together with Linux, Computers4Kids or both.

Satisfaction levels with software are much higher in comparison to levels of satisfaction with hardware. Just over half of the 84 schools surveyed (53%) said that this software was either good (40%) or excellent (13%). A total of 27% of schools felt this software was average while only 12% of schools rated it as poor (6%) or very poor (6%).

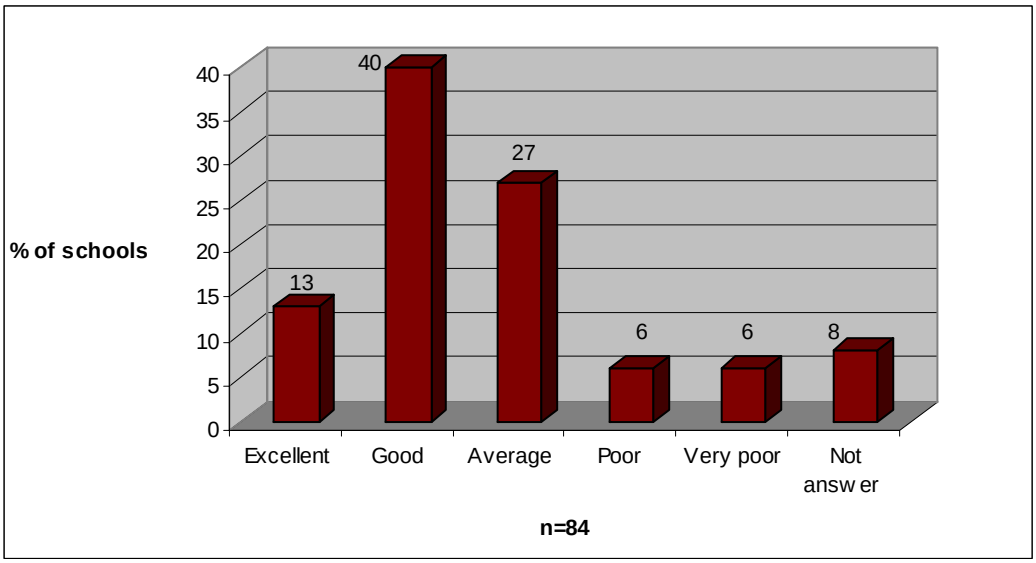

Figure: 17 Schools' satisfaction with software

A total of 77% of these schools felt that that the programmes offered by this software did fit into the curriculum while 18% disagreed. Perceptions of the applicability of the software to curriculum needs vary considerably between high school and primary school respondents. Only 33% of surveyed high schools reported that they felt the software programmes they received fitted into their curriculum compared to 87% of primary schools. This, however, is understandable as the software programmes provided, such as computers4kids, are designed mainly for primary school level rather than a high school.

Schools' dissatisfaction with the software centred on the following concerns:

- The software is more suitable for primary schools rather than high schools
- The software needs to be more curriculum-aligned
- The software needs to be upgraded.

6.2.6 tuXlab manual

In total, 81% of surveyed schools reported that they still have the tuXlab manual provided by the Shuttleworth Foundation. Of those with a manual, just over half (51%) had only a hard copy, 6% had only a soft copy and 23% had both hard and soft copies. The majority (77%) of schools with manuals noted that that they found it to be useful.

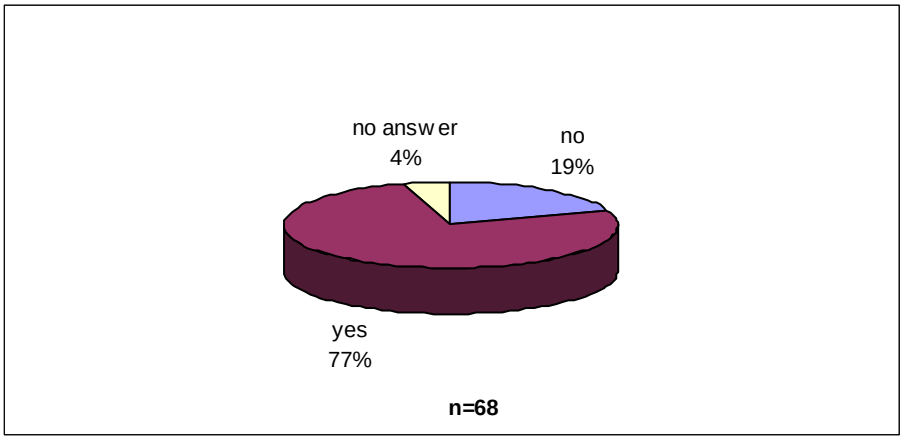

Figure: 18 Schools' perception of whether the tuXlab manual has been useful

6.2.7 Internet access

Only just over a third (36.9%) of surveyed schools (31 schools) have internet access. The majority of these schools (74%) pay for this access themselves.

6.2.8 Community usage of the labs

A total of 18% of the sample reported that they had taught community members in the tuXlab. Community usage of the labs tends to have occurred mainly on an informal and irregular basis, for example former learners and parents coming into the lab to type out their CVs and church programmes. Schools reported several challenges with regards to opening up the tuXlabs to the community, which included:

- Safety issues, i.e. it is dangerous to leave the school (and the tuXlab in particular) open after-hours which is when the community would be available for training
- A lack of availability of teachers to conduct community training after hours.

6.2.9 Income Generation

Only a small percentage of schools surveyed (8%) have used the tuXlabs as an income generator. It was hoped that this would be achieved to assist with paying for the upkeep, upgrade and technical support that the lab will constantly require.

The challenges that schools have faced regarding community participation, and the low level of income generation suggest that there may be a need to seriously reassess the viability of the community involvement component of the tuXlab model.

6.2.10 Branding and perceptions of ownership

There remains a strong association between the tuXlabs programme and the Shuttleworth Foundation among learners and staff at schools with tuXlabs. A total of 66% of surveyed schools said that they thought Shuttleworth sponsored the labs, 10% reported that both the Foundation and Inkululeko sponsored the labs, while only 12% of schools knew that Inkululeko was now the sole "sponsor" of the labs.

6.2.11 Security

Security of the labs is a concern for many tuXlab schools and is one of the reasons why the labs tend to be under utilised after school hours. Although 95% of schools said that their lab was secure, nearly one fifth of all schools reported that equipment had been stolen at some stage from the lab.

6.2.12 Use of the tuXlabs

The way in which the tuXlabs are used varies greatly from school to school. At most schools, the tuXlab periods are built into the timetable. Alternatively some schools have a tuXlab roster, and teachers who wish to use the lab for a particular period, need to book the lab in advance for that period.

In some instances the whole school has access to the lab and in others certain grades are given preference to the lab. The amount of time learners spend in the lab also varies from school to school. In general, learners spend between one to three hours per timetable cycle in the lab during school hours.

The vast majority of respondents said that the lab was used during school hours (87%). A quarter said that the lab was used after hours and only 6% indicated that their lab was used on weekends.

The majority of schools (56%) use the labs for educational as well as recreational purposes, and 30% of schools reported that the labs were used for education only. Just over half of learners (52%) who use the labs have to share a computer with a fellow learner, while 21% of learners work three or more to one computer.

The average number of computers in a lab is about 20. However for many schools the average class size is much larger being up to 40 or 50 learners per teacher. As a few computers or monitors are generally out of use due to technical problems, this has meant that there have sometimes been 15 or 16 computers for over 40 learners in a class. This has meant that labs have sometimes had to accommodate two to three learners per computer.

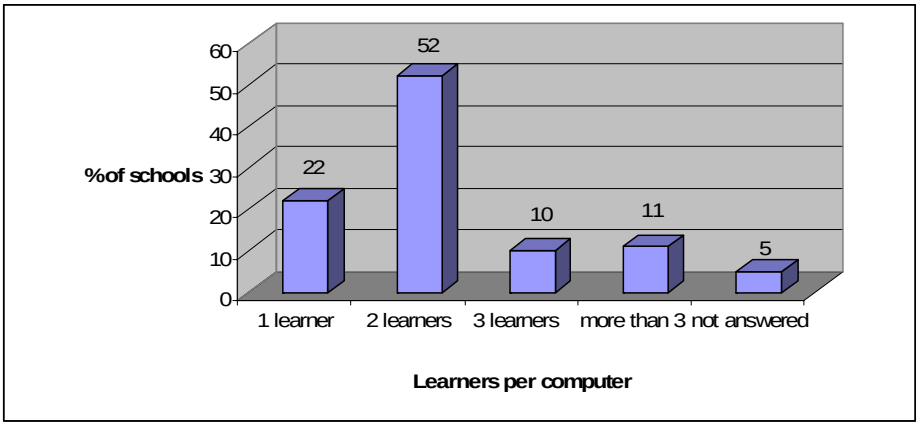

Figure 19: Number of learners per computer in a tuXlab

Teachers have emphasised that, under these conditions, it is difficult to control and keep discipline over classes in the lab and that learners have not been able to use the computers as effectively as they would have if they had one computer per learner.

The subjects most commonly taught in tuXlabs include:

- Computers/IT: 28.5%
- Maths: 20%
- English and all lessons: 12%
- Science: 8%

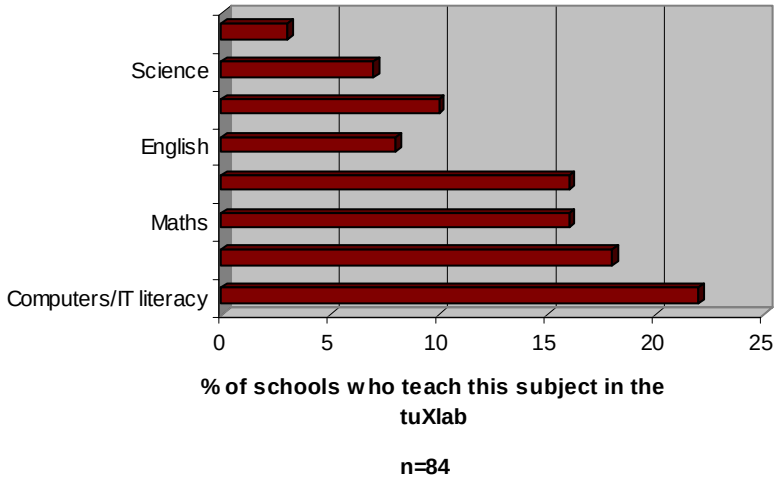

Figure: 20 Subjects taught in the tuXlab

Learners

Primary School Learners use the lab to:

- play games that aim to teach computer literacy (for example, the game "Mr Potato" which helps to improve learners use and coordination of the mouse)
- play educational games aimed at improving maths and language skills
- conduct maths exercises such as drawing graphs in open source spreadsheets
- type school and homework assignments
- conduct research for assignments – learners generally use Wikipedia or the internet if the school has a connection.

Figure 21: A tuXlab during a lesson-the tuXlab is generally a space of energy and activity while in use by learners

High school learners have tended to use the lab mainly for:

- research purposes
- typing essays, homework and assignments
- printing (in labs where there is a printer facility), enabling them print homework and assignments.

Teachers

Teachers generally have their own computer facilities at school, but some have used the lab to improve their basic computer literacy skills. They generally use the lab to teach their learners rather than for personal use.

Community

Community members (for the most part this means parents and former learners) have used the lab mainly on an informal and irregular basis, for example during the Open Days held by schools. Where the local community has used the tuXlab, this has been for:

- Basic computer literacy
- Compiling CVs
- Training courses.

6.3 ASSESSMENT OF MEETING THE SLA REQUIREMENTS

6.3.1 Technical support

According to the SLA signed between Inkululeko and the Shuttleworth Foundation, Inkululeko was responsible for providing technical support to schools during the period of the agreement from July 2006 to February 2007. The system of technical support that Inkululeko inherited from the Shuttleworth Foundation, which was promoted as the approach that Inkululeko should follow during the initial period of their service delivery, was a facilitated self-help approach with Inkululeko only going out to schools to fix technical problems as a last resort.

This approach focused on empowering teachers and tuXlab coordinators through training and planning to solve most of the technical problems that their labs experienced themselves. Schools with tuXlabs were specifically arranged in clusters so that if a teacher could not solve the problem they could call on someone at another school in the same cluster for technical support. This was known as the Cluster approach.

The technical unit manager who led the technical support team for tuXlabs points out that this initial strategy did not work. Teachers, and some of the tuXlab coordinators, did not have the technical background to be able to solve such problems. In addition they were under a lot of pressure in their day to day activities and did not have the time to put their energies into the lab. Teachers and tuXlab coordinators were therefore very dependent on Inkululeko for technical support. This opinion was mirrored by the tuXlab coordinators.

The most common technical complaints schools experienced included:

- The server not working properly, eg not being able to upload new software
- Slow machines
- Machines freezing
- Monitors not working properly and changing colours
- Fans breaking
- Problems with logging in
- Power failures.

Under the direction of an onsite support manager, volunteers were used to assist with technical support. Using volunteers, however, presented its own set of problems as they did not offer the continuity, stability and structure that full-time employed staff would have been

able to provide for Inkululeko. When the tuXlab programme was handed over to Inkululeko, volunteers no longer felt compelled to offer voluntary support to the programme as they felt that this was not necessary if the model was a for-profit one.

Frequency of requested support

As the graph below illustrates, most schools requested support either on a monthly basis or only once or twice during the entire SLA period (from July 2006 to February 2007).

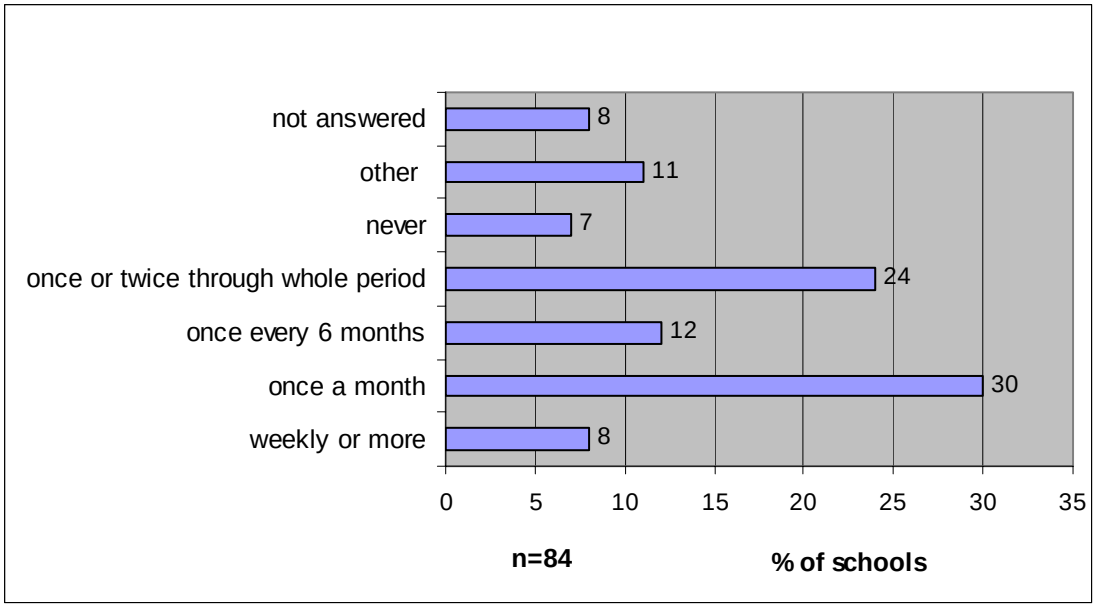

Figure: 22 Frequency of school requests for technical support during the first SLA

tuXlab help desk

The Shuttleworth team that had run the help desk under the Foundation continued to do so once the management and ownership of the programme was transferred to Inkululeko. Towards the end of 2006 Inkululeko acquired additional helpdesk staff/technicians to assist this core team and also purchased a vehicle to assist technical volunteers with transport to schools.

When a school phoned in, the aim was for the technician to first try to assist the teacher or coordinator to solve the technical problem over the telephone. An automated answering device was also installed to provide instant information on how to solve the most common problems experienced. If a problem could not be resolved over the phone then a technician would be called out to the school to assist.

There were three technical assistants who managed the help desk under the supervision of the technical support manager during the SLA period. IT reported that the help desk dealt with six to seven issues per day and that there was constantly a backlog of 30-40 complaints which took two to three weeks to resolve.

A total of 75% of schools surveyed said that they used the help-desk over the period July 2006 to February 2007. As the graph below illustrates, there was a general sense of satisfaction with this particular service – 41% of the schools who used it felt that the service of the help desk was excellent or good, 20% reported that it was average while 14% felt that it was poor or very poor.

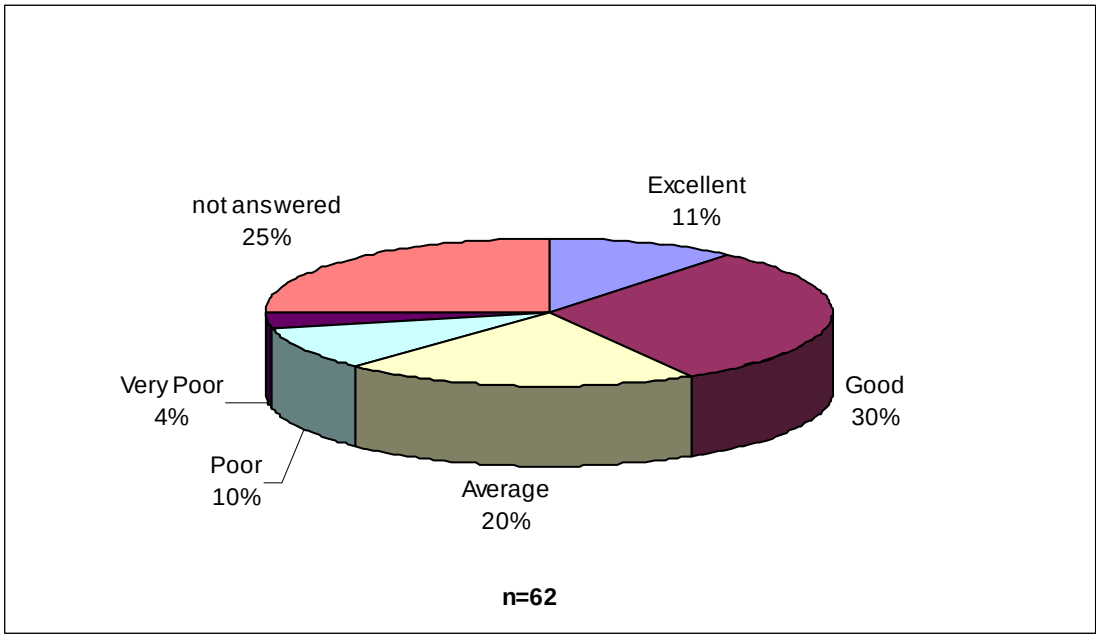

Figure: 23 Schools rating of the quality of service supplied by the help desk between July 2006 and February 2007

While the help desk service was satisfactory, schools reported that they were generally not satisfied with the time that it took for their queries to be dealt with. They felt that having the lab out of service for weeks at a time was de-motivating and challenging. Some even reported that they would log a call and that nobody ever arrived to deal with the query. Some teachers who already had a relationship with the Shuttleworth Foundation continued to call the staff that they knew there and they would help them over the phone.

6.3.2 Hardware

Problems with the hardware appear to have been the cause of much dissatisfaction during the period of the first SLA, as they continue to be for tuXlabs schools at present. Hardware breaking down or not working properly was one of the major causes of lab closure during this period.

6.3.3 Software

Schools used Linux and computers4Kids software during the period of the first SLA. Inkululeko conducted software upgrades with tuXlab schools at the end of 2006.

6.3.4 Training

Provision of training by Inkululeko

Take up and satisfaction of training by schools

A total of 61% of all 84 surveyed schools (51 schools) received training from Inkululeko between July 2006 and February 2007. Out of these 51 schools, almost two thirds (61%) reported being satisfied with this training and a third (33%) said that they were not satisfied.

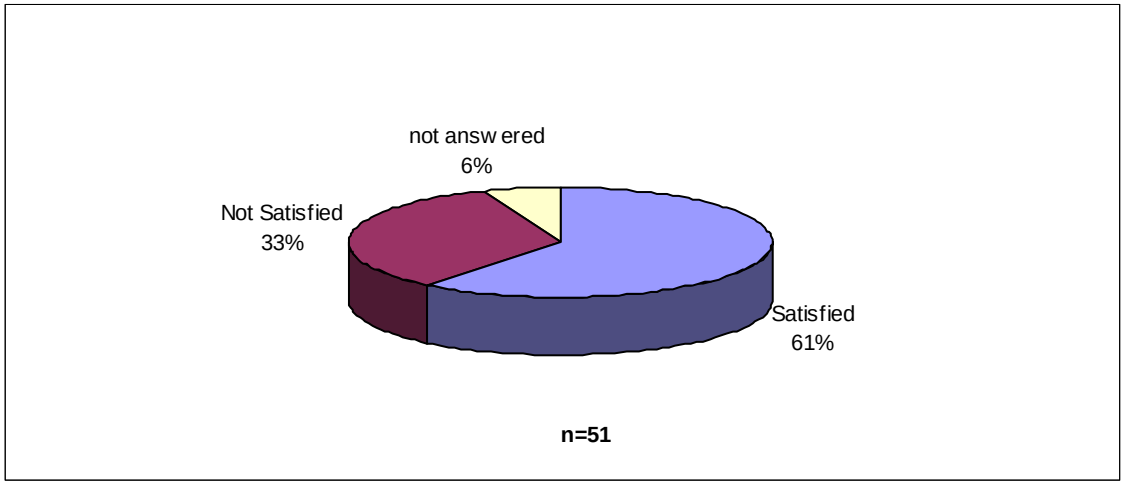

Figure: 24 Satisfaction with training provided by Inkululeko

A total of 57% of teachers surveyed who received training felt that this training adequately prepared them to teach in a tuXlab.

Trained teachers in 59% of schools went on to train other teachers in the school. Out of these schools, teachers in 70% of them felt that this training from Inkululeko was sufficient to train other teachers while 23% disagreed. Despite the trained teachers' confidence, only half of the teachers who were trained by them were prepared to teach in a tuXlab after this training.

A total of 88% of schools (45 schools) where teachers received training from Inkululeko went on to train their learners. Out of these 45 schools, 72% felt that the training teachers received directly from Inkululeko was sufficient to train learners.

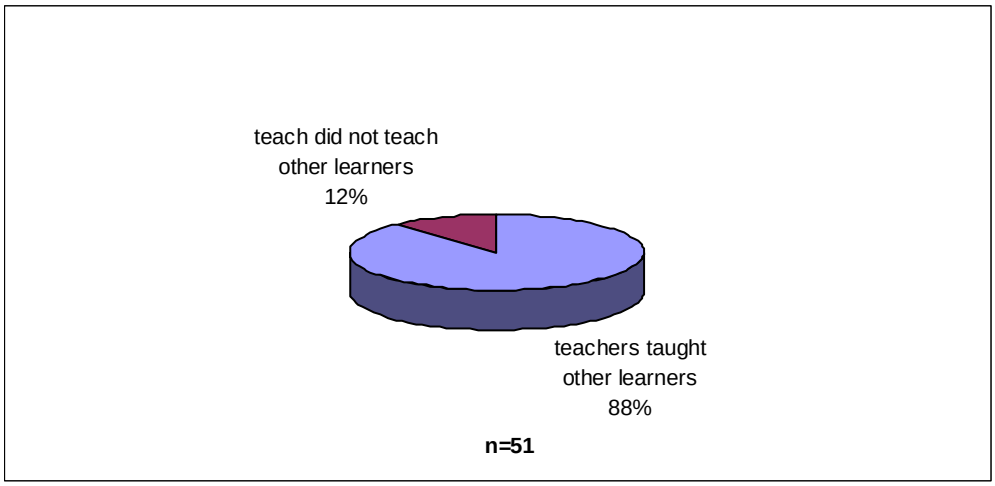

Figure: 25 Percentage of schools who taught their learners

A total of 69% of these schools felt that this training adequately prepared teachers to teach learners in a tuXlab.

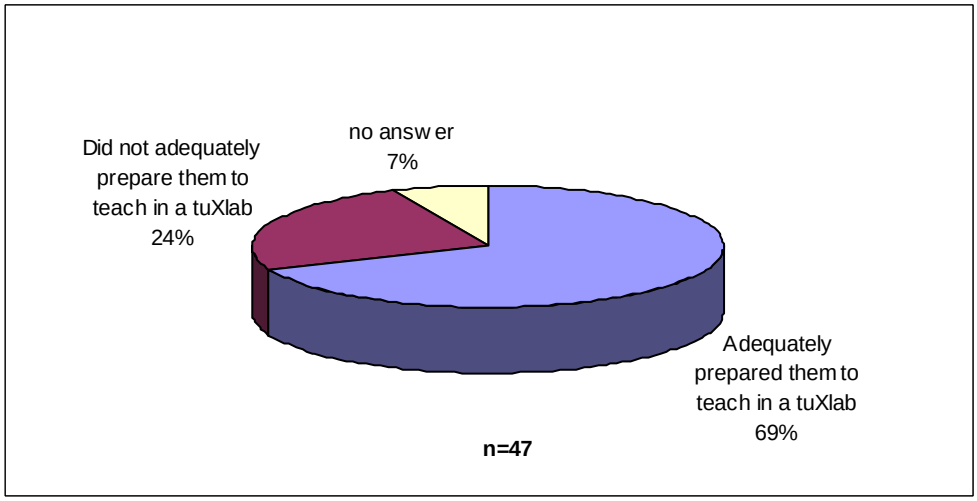

Figure: 26 Percentage of schools who felt the teachers were adequately prepared to teach learners in a tuXlab

Out of the 51 schools that received training from Inkululeko, the majority did not go on to train community members. Only 27% of schools (14 schools) said that they had trained community members. Out of these 14 schools, 72% felt that the training they received from Inkululeko was sufficient to train other community members.

Training challenges

Two of the main issues that emerged as a hindrance to schools in terms of being able to offer community training were:

- the unavailability of teachers to offer training after hours
- concerns around the security of labs after hours.

For Inkululeko challenges around training included logistical issues such as transport and arranging training schedules in schools.

For teachers at schools the main challenges concerning training included the fact that teachers felt the training was too short and too basic to enable them to effectively train other teachers, learners and community members. Teachers also emphasised that they would have liked training to occur on a regular basis rather than being once-off and that they needed further regular support from Inkululeko in order to be able to put into practice what they had learnt in these training sessions.

6.3.5 Incentive Programme

The Incentive Programme encouraged schools to participate fully in the tuXlab programme by offering points for school participation in a range of activities, for example if schools:

- attended or hosted meetings
- participated in new installations and the volunteer programme
- planned and held a tuXlab open day
- submitted quarterly reports
- developed the potential of their lab, eg by ensuring that learners could use email or developing tuXlab lesson plans.

Once schools had earned a certain number of points they were able to claim a reward such as new hardware (eg laser printer, scanner, thin clients, keyboards, computer mouses or monitors) or free acceptance to training courses. Records of these points were kept by the Shuttleworth Foundation and Inkululeko and schools were also required to keep their own incentives file containing the number of points they had collected to date.

The incentives programme was introduced while tuXlabs was still part of the Shuttleworth Foundation. According to the SLA between the Foundation and Inkululeko, Inkululeko was responsible for the coordination of the programme once tuXlabs exited the Foundation. The general perception among schools is that the incentives programme is a good idea and that it motivates teachers and schools to participate actively in the tuXlab programme.

Inkululeko spent the first two to three months (July to September 2006) of the SLA period transferring the paper incentives files onto an electronic web portal for easier management which meant that the Incentives Programme was not actively functioning during this period. This in turn led to a perception among schools that the programme was not being kept up to date and they reported frustrations such as:

1. There was a back-log of incentives, which meant that schools had a long waiting time for their rewards/incentives.
2. Some schools were themselves unclear of the number of points they had earned, or they had kept their own records and applied for their reward only to be told that, according to Inkululeko records, they had not yet earned sufficient points.
3. Some schools said that they were due to get rewards but that these had never been received.

The Incentives Programme began running again in about September/October of 2006 and ended in May 2007.

6.3.6 Connectivity Project

Although the provision of internet connectivity is one of the conditions stipulated in the first SLA signed between Inkululeko and the Foundation; no provision was made in this SLA for the actual implementation of internet connectivity, nor was any dedicated funding made available in the initial grant to support such an initiative.

After the transfer of the ownership and management of the programme to Inkululeko, the company set up a pilot project – "the Connectivity Project" – which aimed to create a wifi network between Inkululeko and a cluster of tuXlab schools through the use of satellite dishes and thus provide these schools with an intranet that they could use to communicate with each other via email and to access information through a regularly updated wiki content portal. This link would not be a live internet connection, which would, in theory, reduce long-term costs.

The Connectivity Project was part of the sustainability component of the tuXlab programme and it was undertaken as a pilot to test the feasibility of establishing such a wifi network Inkululeko chose 50 tuXlab schools that had shown motivation to participate in the Project. No clear timeframes or objectives were established at the outset, although the participating schools did have expectations about the delivery of the project based on the communication they had received.

During the infrastructure installation phase, the Inkululeo team encountered a number of unexpected challenges, such as trees and walls in their way. They had to then halt the installation, send in people to clear the obstacles out of the way and then go back to install the dish. This delayed the installation process, and, in some instances, stopped the process completely. Partners expressed dissatisfaction with the management of expectations as unrealistic promises were made to schools about the delivery of the intranet without taking into consideration Inkululeko's capability to successfully implement these promises.

The connectivity project was considered to be an unfeasible initiative – although the infrastructure for the project was installed in some schools, the project was never actually implemented. It should, however, be noted that the infrastructure installed by this Project has been used for another project - the University of the Western Cape Social Content Networks Project. This project is based on a similar wifi network concept but focuses on the provision of a content portal to encourage teachers to use internet content to teach the curriculum. It is not connected to the tuXlab programme.

6.3.7 Strategic marketing of the tuXlab programme

The strategic marketing of the tuXlab programme is viewed by most stakeholders to be one of the areas in which Inkululeko has achieved the most success. The Director of Inkululeko is perceived to be well positioned to successfully undertake this role.

Inkululeko focused on bringing the tuXlab programme into the public eye through press coverage. The company undertook extensive marketing to get the programme into other fields. For example, Inkululeko negotiated for the use of the tuXlab model in the Digital Doorway project, a project where computer systems were placed in very remote areas within an indestructible material container.

An effort was also made to grow the tuXlab model in the Education sector. Inkululeko was successful in getting an agreement with the provincial government of the North West Province to establish 100 open source computer labs based on the tuXlab model in schools in the province. The pilot component of this project took place while tuXlabs was still in-house at the Shuttleworth Foundation, but the tender and the roll-out has occurred under Inkululeko's management.

Despite the active marketing campaign, we found that schools have continued to associate the tuXlab programme with the Shuttleworth Foundation.

6.3.8 Updating of the tuXlab cookbook

During the period of the first SLA between Inkululeko and the Foundation, Inkululeko undertook work to update the tuXlab manual and produce a second edition, that is based on the initial version. Although the content for the cookbook is complete, the publication has not been finalised.

6.3.9 Volunteer Programme

Volunteers became less active in the tuXlab programme once it was handed over to Inkululeko. One of the reasons given for this was that volunteers had been predominantly used to assist in installing the cables and machines for new tuXlabs at schools. Once the installation of new labs stopped, volunteer numbers and interest also decreased. Respondents also noted that once the tuXlab programme was outsourced to a company rather than to a non-profit organisation, the incentive to volunteer (as a form of "doing good") diminished.

6.4 PROGRAMME MANAGEMENT

6.4.1 Relationships

Relationship between Inkululeko and the Shuttleworth Foundation

The period during which the ownership and management of the tuXlab programme was transferred to Inkululeko was a *"tense and difficult period"*[53]. There was tension between the core tuXlab team and the Foundation and a lack of trust on both sides. All stakeholders agree that this relationship improved when a new leader was appointed at the Foundation in January 2007. Because the Foundation was undergoing significant structural and strategic changes during the hand-over period, the programme's exit was not given much attention. Both parties agree that more time should have been spent on this process and on clearly defining the terms of the SLA.

Relationship between Inkululeko and tuXlab schools

The handover of tuXlabs to Inkululeko Technologies created a period of uncertainty for schools. While they had been partners with the Shuttleworth Foundation, schools had expected and generally received continued support. The hand-over therefore caused some anxiety. The real change in the relationship between Inkululeko and tuXlab schools came when Inkululeko announced, in September 2006, that from the end of their funding period with the Shuttleworth Foundation in February 2007, schools would be expected to pay for

[53] Interview with former Inkululeko staff member

technical support. This caused dissatisfaction and led to some mistrust between schools and Inkululeko. From here onwards, it seems that school disappointment appears to have increased. This disappointment was exacerbated because of schools' perception of a decline in the technical support service that was provided to schools. Because the team had to spend time engaged in activities and projects to bring in additional income, they were less available to deal with schools' technical complaints and this contributed to an increase in their response time to schools queries[54]. The perception among schools was that they didn't receive the same level of personal contact with Inkululeko that they had experienced while the programme was under the Shuttleworth Foundation.

Relationship between the Shuttleworth Foundation and the schools

Although the programme was no longer in-house, the perception among schools was that they could still turn to the Foundation staff for support. If schools reported problems to the Foundation, these were then passed on by the Foundation to Inkululeko to be managed. Even if the schools actually had received the support from Inkululeko, the perception remains that they did not receive help when they asked Inkululeko but did when they contacted the Foundation.

6.4.2 Communication

Communication between Inkululeko and the Shuttleworth Foundation

During the period of the transfer of ownership and management of the project to Inkululeko, and directly after, communication between the Foundation and Inkululeko was not regular and was insufficient to properly support the newly formed company. The contract itself did not include proper targets and measurables and was not adequately monitored by the Foundation. Communication improved with the appointment of the new Principal Advisor to the Foundation who has established a more conducive working relationship with Inkululeko that includes clear communication of expectations and clarification on roles and responsibilities.

Communication between Inkululeko Technologies and tuXlab schools during the period of the SLA

Figure 24, below, shows that the majority of schools (65%) have found communication from Inkululeko to be average, good or excellent. It is clear however that more schools perceive communication from the Shuttleworth Foundation to have been of a higher quality. More than a quarter of the schools surveyed felt that communication from Inkululeko was poor, very poor or non-existent.

[54] Interviews with Inkululeko staff

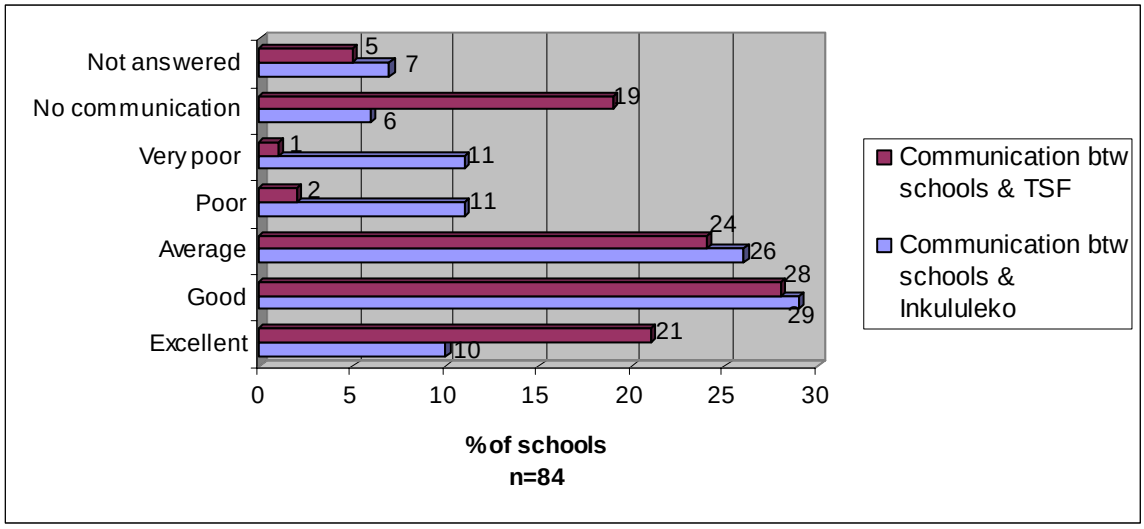

Figure: 27 Schools' rating of communication with the Shuttleworth Foundation versus Inkululeko

Communication between schools and The Shuttleworth Foundation had occurred on a regular basis with monthly meetings, phone calls and site visits with a regular contact person. There is a sense among schools that this communication became less regular when Inkululeko took over. Some schools indicated that they would have liked it if they had still had a central contact person when Inkululeko took over, as they did with the Foundation. Current Shuttleworth Foundation staff also noted that they received mixed communication from schools during the period of the first SLA about school satisfaction with Inkululeko.

6.4.3 Programme management

The management of the tuXlab programme was challenging during the SLA period. As Inkululeko was a new company, there was a set of business skills that were necessary to run the company in addition to the programme management skills to run the tuXlab programme and these were not all in place initially. It was widely agreed that a lengthened hand-over period from the Foundation would have been useful at the outset. The major management challenges that were identified during the evaluation include those listed below:

Lack of formal organisational structure with clear lines of authority

When Inkululeko was first set up, the organisational structure did not clearly outline the different levels of authority in the company. This is partly because all tuXlab staff who had moved from the Shuttleworth Foundation to join Inkululeko were brought in as shareholders. As one interviewee put it, this meant that *"there were eight bulls in one kraal".* In hindsight, there should have been a general manager and a financial manager as well as the CEO. There was also some disagreement amongst the shareholders regarding the company strategy. Without clear roles and responsibilities, this was problematic internally.

Lack of implementation planning

While there was a broad vision for the company and many big ideas, this did not always translate into practical implementation plans. Therefore, some ideas would not be delivered upon.

Lack of management of expectations

All stakeholders identified that unrealistic expectations about the programme were created and, because these were not met, it led to dissatisfaction and mistrust on the part of schools. A key example is the Connectivity Project where unexpected problems encountered during this installation (due to a lack of thorough planning) delayed or halted the process.

6.4.4 Monitoring and Evaluating

Reporting

Just over half of all schools surveyed (52.3%) had submitted reports about the status of the tuXlabs to Inkululeko. Out of those schools, most said that they submitted reports on a monthly basis (57%) or other/quarterly basis (36%). The majority of surveyed schools (78.5%) said that they did attend meetings with Inkululeko, mostly on a monthly basis.

6.4.5 Maintenance and Growth

The fact that currently just over half of tuXlabs in the Western Cape are no longer functional indicates that overall maintenance and growth of the programme in this province has been challenging for Inkululeko. Some of the strengths and challenges are listed below:

- In terms of growth, Inkululeko has been fairly successful with its marketing of the programme.
- In terms of maintenance, the training provided by Inkululeko received the most positive comments.
- The volunteers programme was not able to be maintained as a way to provide technical support to labs.
- Inkululeko was supposed to have provided technical support to schools for a limited period of time after which schools were to have become technically and financially more self-sustainable. This, however, has not generally happened, and some of the reasons are described in Chapter 8: Sustainability.

CHAPTER 7: OUTCOMES

A significant majority of schools who used the tuXlabs reported positive outcomes for learners and teachers.

According to the survey, the area where the labs have had the main outcomes on learners is around assisting in the provision of a better education in general. For teachers, the main outcome is improved computer literacy. Almost three quarters (73.8%) of respondent schools note that the labs have made a positive contribution to the school curriculum, while half (50%) believe that the lab has assisted teachers in teaching the curriculum.

The area where the lab has not had many outcomes is in the realm of income generation. Only 8.3% of schools have been able to use the labs for income generation and only 3.5% of teachers and 1% of learners have been able to use the labs for personal income generation.

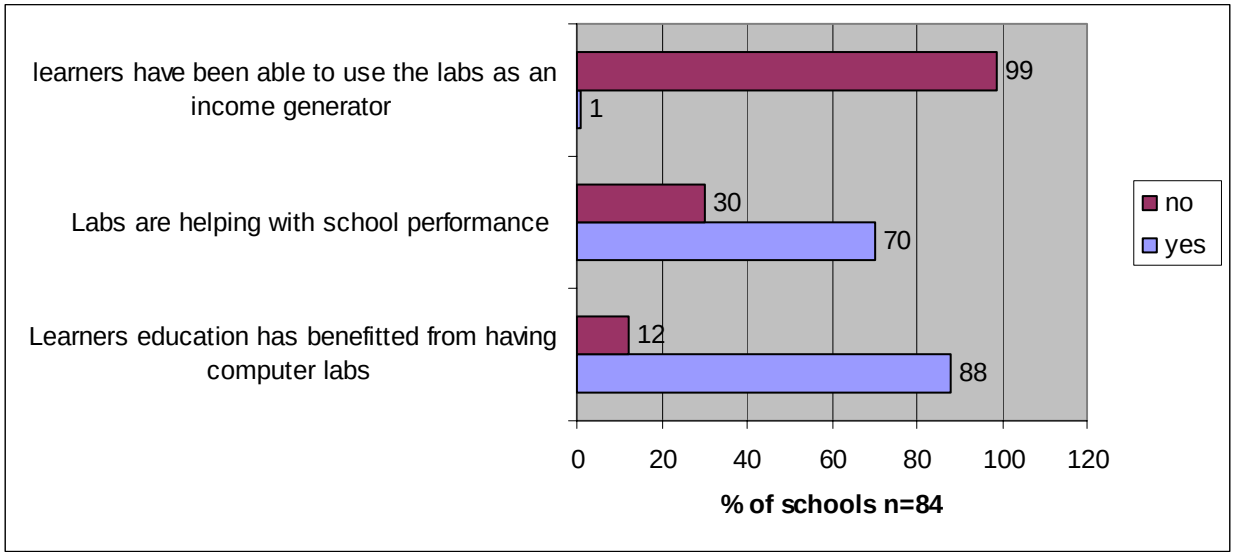

Figure: 28 Benefits of usage of tuXlabs for learners

7.1 TEACHERS

The figure below shows the benefits of using the lab for teachers:

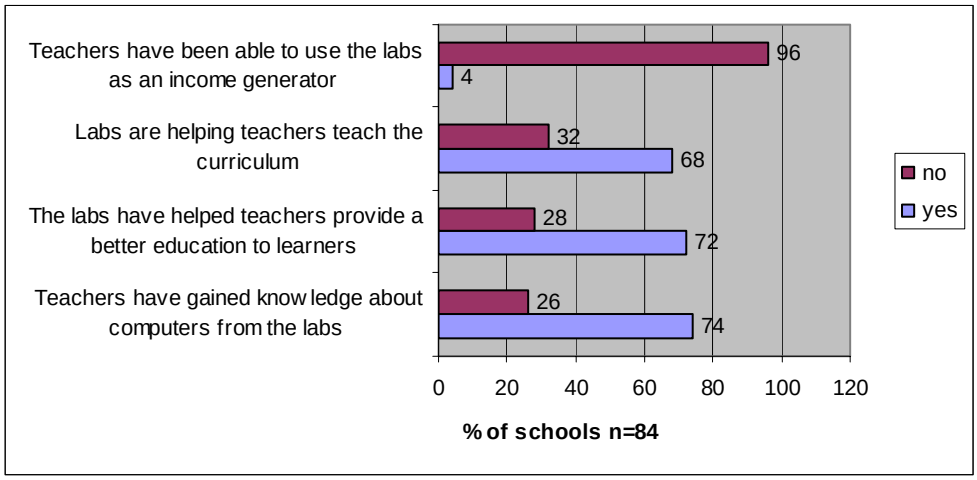

Figure: 29 Benefits of usage of tuXlabs for teachers

7.1.1 Improved computer literacy

For teachers at poorer schools, many have not worked much with computers before the tuXlab and it has provided an opportunity for them to familiarise themselves with using a computer and to improve their computer literacy.

7.1.2 Acquisition of skills to install and administer an open source software lab

The tuXlab has provided an opportunity for teachers with an interest in open source software and a commitment to the lab to learn the skills and knowledge necessary to be able to install and administer an open source software lab through training and installation opportunities. For example, one of the tuXlab coordinators noted that he has attended four training courses including Linux, Networking and Scripting and has assisted with a number of installations at other schools. Through his experience in the tuXlab he is now able to run his own lab and can also do all the cabling that is required for the lab.

7.2 LEARNERS

7.2.1 Improved computer literacy

Through access to the tuXlabs, coordinators and teachers noted that learners' computer literacy has improved significantly. Working in the labs has enabled learners to develop an understanding of how a computer works and the different components of a computer. It has taught learners how to control and use a mouse with ease and how to type assignments and homework. Working in the lab has given learners the skills to be able to find, open and use

various programmes, and, for schools with the internet, learners have learnt how to use the internet for research as well as to send and receive email.

Figure 30: A learner completing a task on one of the tuXlabs programmes

7.2.2 Improved language and maths skills

Learners who have used the language and maths programmes (eg using spreadsheets) have found that this has helped them to hone these skills. Teachers also noted that those learners who have access to the internet or Wikipedia are forced to read more, which improves their English skills.

7.2.3 Participative and interactive learning

Learners help each other when they encounter problems on the computer and share the new things that they discover with each other. We witnessed how, if a learner was struggling to work out how to use a programme, a fellow learner would come and assist them. One coordinator even mentioned that if they as the coordinator got stuck with something they could call on a learner for assistance.

Figure 31: A learner explaining something to a fellow classmate in the tuXlab

7.2.4 Improved general knowledge

All tuXlab coordinators and teachers interviewed agreed that access to Wikipedia and the internet had led to an improvement in learners' general knowledge. One of the teachers at a primary school visited by the research team emphasised that when the class has a discussion about current events occurring in the newspapers that learners can relate to these issues and look them up on the internet, informing the teacher of some of the websites they visited for more information.

7.2.5 Improved memory

Teachers felt that learners remember more from the research that they conducted themselves in the tuXlabs.

7.2.6 Ability to conduct internet research

This is a skill that is essential for success after school and the tuXlabs with internet access have been able to develop this skill for its users.

7.2.7 Familiarity with Linux and other open source software programmes

Education in South Africa, including tertiary education, is likely to move towards to an open source platform. For learners who will enter the tertiary education sector a familiarity with and knowledge of open source will be an advantage.

7.2.8 Fostering an interest in open source programming

For those who are interested in programming or who might be, the tuXlabs have provided an opportunity for them to play around. With proper supervision and guidance from mentors this will hopefully result in more open source programmers and help to address the current shortage of skilled programmers in the country, particularly black ones.

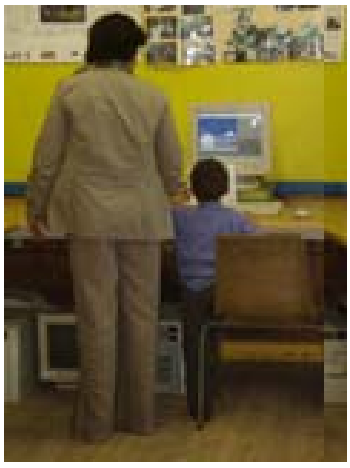

Figure 32: A teacher assisting one of her learners with an exercise on an OSS programme

CHAPTER 8. SUSTAINABILITY

8.1 INTRODUCTION OF THE KHANYA LABS IN THE WESTERN CAPE

One of the key factors currently impacting on the sustainability of the tuXlab programme is the rapid roll-out of the Khanya labs, as initiated by the Western Cape Education Department. Interviews with stakeholders at Inkululeko and at Khanya have indicated that the general perception is that the introduction of Khanya labs by the WCED, which occurred at approximately the same time as the first tuXlabs were being piloted, inadvertently created competition with the tuXlabs. The 2006/2007 evaluation report stressed that the older hardware used by the tuXlab programme put the programme at a disadvantage when compared with the new equipment made available for Khanya labs. The commercial Khanya software was also advantageous as it directly addresses the South African curriculum. In high schools, DoE officials have not allowed the CAT (Computer Applications Technology) learning area to be offered on open source software and this forced schools to replace their tuXlabs with Khanya labs[55].

The perception that Khanya labs are better than tuXlabs appears to be largely associated with the fact that tuXlabs use refurbished hardware while Khanya labs are installed with brand new hardware.

Because of limited space in schools, those who were granted a Khanya lab would often close down their tuXlab to make room for this new lab. Khanya could then take advantage of the secure room and cable layout which had initially been set up for the tuXlab. As a result, tuXlabs have actually paved the way for Khanya, not only in terms of setting up some of the initial infrastructure required but also by preparing teachers and learners with basic computer literacy and knowledge which have made the introduction of the Khanya labs much easier[56].

[55] Shuttleworth Foundation Report 30 March 2007

[56] Interview with former Inkululeko Technical support manager, Cape Town, 26 August 2008 & Telephonic Interview with former Inkululeko tuXlab Western Cape lead, 30 August 2008

Table 3 highlights general differences between tuXlabs and that of Khanya:

	TUXLAB	KHANYA
Hardware	Refurbished Hardware	New Hardware
Software	Open Source	Microsoft
Architecture	Thin Client	Fat Client
Maintenance	Maintenance / upgrading generally focused on server	Maintenance focused each computer and server
Support	Community-orientated support (assistance from Inkululeko to be paid for)	Free support from WCED (if items are still under warranty) or schools must pay for support
Use	All learners have access to labs for all subjects	Only selected grades have access to labs and access limited to a few subjects (maths and science)
Costs	Initial costs low but long term maintenance costs high	Initial costs high but long term maintenance costs low
Administration	Relying primarily on school teachers to run the lab	Relying primarily on school teachers to run the lab
Initial Setup	On average 20 Computers per lab	Between 25 and 30 computers per lab[57]
Cost per lab	R60, 000 per lab (for infrastructure and hardware/software)	R300,000 per lab (for infrastructure and hardware/software)

Table 3: Comparison between tuXlabs and Khanya

As shown in the above table, there are a few marked differences between the two labs.

The refurbished hardware that has been used in the tuXlab model can be seen as the current Achilles' heel of the tuXlab model. The problematic and sometimes temperamental refurbished hardware has caused many disruptions at schools and in some cases has resulted in creating a negative perception of computers for schools and learners. The general perception from schools is that the new hardware and universally accepted software (Microsoft) provided by Khanya is seen as superior to that of refurbished hardware and open source software. The legacy of tuXlabs has also assisted with this perception – while the labs were initially seen in a positive light, hardware problems and other technical issues have forced many schools to make the move to Khanya labs in the hope that the change of hardware and software would make the lab run more efficiently. As the lifespan of refurbished hardware is limited, this does not allow for much sustainability without additional resources.

[57] Khanya Website, 2008 http://www.khanya.co.za

The Khanya lab also provides more computers than Inkululeko and limits access to a core set of learners. This means that there is normally a ratio of 1:1 (one computer to one learner) in a Khanya lab as opposed to Inkululeko where all learners have access but there are less computers so they have to share computers.

Within a South African, developing country context, open source software comes with mixed blessings. Because of its lower start up and maintenance costs, it is accessible for resource-poor schools, but as it is not as widely used as Microsoft it can be problematic. Some of the software programmes offered by Khanya are not available on the open source platform or they need hardware components that are not available on thin clients (eg multi-media facilities) and therefore these cannot be used for the education of learners who have tuXlabs.

8.2. USING THE LABS TO GENERATE INCOME

In terms of sustainability, the idea of using the labs to generate income has been unsuccessful to date. In addition, communities have not been involved in the tuXlabs, as was initially conceptualised.

8.3 SKILLS TRANSFER AND COMMITTED STAFF

Technical and other skills are lost if trained teachers leave the school without any of the teachers being trained in OSS and the use and maintenance of the labs. It was clear from the evaluation that a strong champion who is an advocate for open source technology is hugely advantageous when considering sustainability as those coordinators who do not have a specific interest in open source technology are less likely to work towards tuXlab sustainability. In addition, sustainability of the tuXlabs, in the current model, also requires a dedicated coordinator rather than relying on teachers who have other duties.

CHAPTER 9. ANALYSIS OF THE MODEL

9.1 STRENGTHS OF THE MODEL

9.1.1 Providing learners with access to computers

The tuXlabs are affordable for schools with limited resources and therefore provide affordable access to computers to schools who would otherwise not have them and not be able to afford them. When learners come from very poor backgrounds, the tuXlab is often the first and only computer access that they have.

With the entrance of Khanya into schools in the Western Cape tuXlabs, is no longer the only model that provides labs to schools that did not have previous access to computers. However, Khanya labs are designated for use by specific grades and for specific subjects such as Maths and Science and the computers are not available for all learners to use as opposed to the universal access proposed by the tuXlab model.

9.1.1.1 Empowering learners through the provision of ICT skills

Through access to computers the tuXlabs give learners and teachers the opportunity to acquire a range of skills, including ICT skills, which are vital in enabling learners to perform successfully in the tertiary education environment and in the South African job market.

9.1.1.2 Providing learners and teachers with access to teaching and learning content

Access to computers also offers teachers the skills necessary to use programme and internet content for teaching the curriculum, while it equips learners with the skills necessary to navigate through such content for research and assignments.

9.1.1.3 Providing learners and teachers with exposure to Open Source Software

The tuXlabs provide learners and teachers with exposure to Open Source Software, an exposure which they are unlikely to receive in a school or a Khanya sponsored lab. This exposure will assist learners to cope in a tertiary education environment. Exposure to OSS also offers the potential to foster interest in OSS programming for some learners and teachers.

9.1.2 Flexibility

The Khanya representative noted that they have specifically set up the Khanya labs in a very structured way where they *"hold schools' hands".* Both the open source platform and the tuXlab model itself means that schools have much more flexible use of the tuXlabs.

9.1.3 Community buy-in and ownership of the model

Parents and teachers from other schools were involved in the tuXlab installation at schools and the experience was generally described as an enjoyable one by all stakeholders. When the school and the community do get involved, it can be perceived to be a strength of the model, but there are not many cases where this has actually occurred.

9.1.4 Easy maintenance of the lab

The thin client model means that tuXlabs are very easy to maintain if the hardware is robust, and the lab is properly managed and has access to adequate technical support. Once the tuXlab coordinator has been trained to use the open source platforms, s/he can easily maintain the lab, upgrade the server and upload new software programmes.

9.2 WEAKNESSES OF THE MODEL

9.2.1 Use of second hand hardware

This has been proved to be unsustainable as a business model as schools do not have the capacity to run the labs on their own. Hardware problems mean that they need constant support and they do not have the resources for this. It would be better to provide new and robust hardware that is warrentied and has a longer shelf-life.

9.2.2 The lack of a skills base, or skills transfer within tuXlab schools

Having a dedicated tuXlab coordinator, or other individual, has been identified as one of the key factors that need to be in place in order to ensure the ongoing and successful functioning of the lab. However, if such an individual does not share their skills and experience in running the lab with others at the school, this could also be a potential weakness if this individual leaves the school. It is important that schools have a succession plan in place, this plan will entail the identification and training of another individual, so that if a tuXlab coordinator leaves the school there is someone with the skills and interest to take over from them in order to keep the lab up and running.

9.2.3 Sustainability

The challenge of sustainability is one which relates to the implementation of the tuXlab model rather than the actual design of the model. According to the tuXlab model technical sustainability can be achieved through the facilitated self help approach to technical problems which is meant to empower coordinators to solve the technical skills problems they experience with assistance from the manual and more experienced fellow coordinators in their cluster. While financial sustainability is meant to be achieved through the use of labs for income generating purposes. In reality the limited capacity of teachers and schools has meant that these sustainability strategies have not been viable.

In the cases where sustainability has been achieved the following features have been in place:

- A passionate tuXlab coordinator.
- A full time lab staff member (normally the tuXlab coordinator) whose sole responsibility is to teach and supervise learners in the lab and to manage the lab.
- In resource poor schools a principal or governing body with the initiative to fund raise and go out and seek support and sponsorship for the lab from the surrounding community.

CHAPTER 10. LESSONS LEARNED

A number of important lessons for Inkululeko, the Shuttleworth Foundation and for the tuXlab model itself have emerged from this evaluation. The lessons learned have been incorporated into a set of recommendations below, which offer a way forward for stakeholders.

10.1 IMPLEMENTING THE TUXLAB PROGRAMME

Despite the tuXlab model stating clear guidelines for sustainability, these strategies have not been effective in reality. If the tuXlab programme continues running in schools, we recommend that the following aspects could be revised to maximise effective use of the tuXlabs and to enhance sustainability.

10.1.1 Hardware

- If further tuXlabs are installed, the programme should investigate the use of new hardware. This will increase the lifespan of the hardware, thereby reducing the need for replacement and for technical support to deal with hardware issues. Sponsorship of second-hand hardware is common from corporates – these donations should continue to be sourced, as long as all donated machines are carefully screened, cleaned and are no more than one year old.
- Existing tuXlab hardware would benefit from an upgrade across the board. Such an upgrade should include ensuring that lab servers and all computer components are in good working order and that, as proposed in both previous evaluations, a half-thin/half-thick client model is used so that computers have multi-media capability, as well as USB ports and CD facilities so that individual work can be saved.
- Schools should be made aware that they will need to make financial contributions to keep the lab running and that they must take responsibility for this, along with the service provider.
- Where feasible, tuXlabs should house 30 to 40 computers per lab as this would facilitate effective use of the labs by larger classes – which are the norm in most primary schools.

10.1.2 Software

- To facilitate the use of existing curriculum-aligned software programmes, the open source platform of the tuXlabs must be made compatible with these products, or the software developers must be encouraged to develop open source compatible versions of their products.
- It would be helpful if the tuXlab team could compile (perhaps in conjunction with Khanya labs), and distribute to tuXlab schools, a list of compatible quality software programmes which are aligned to the curriculum and appropriate for the age groups that will be using them.

10.1.3 Security

- Security issues have limited the sustainability of the tuXlabs, particularly theft and security when using the labs after hours. The latter has limited the use of the labs for income generation, homework opportunities and other community activities. Security set-ups for in-school and after-school activities should be investigated with each school before installation.

10.1.4 Training and skills development

- It is vital that tuXlab schools do not have only one staff member who has the skills to manage and maintain the lab. Schools should have skills transfer and succession plans for their tuXlabs.
- The tuXlab training could be redesigned as a programme with a series of modules rather than as a once-off event. Most participating teachers indicated that they would like further training, not just about how to maintain the lab, but also about open source, the kinds of open source software programmes available and about how content from the internet could be used to teach the curriculum.
- A training programme should include modules that build upon one another and should include post-training on-site support.
- Training should take place on a regular basis and be held at convenient times and venues for the relevant teachers.

10.1.5 Technical support

- Volunteers can not be relied on to provide technical support if the programme is being operated as a for-profit enterprise.
- Technical support staff could possibly have portfolios of schools (possibly within clusters) so that they are familiar with each schools' set-up, skills levels, usage etc –

this would not only ensure that technical problems could be more quickly handled, but would also allow Inkululeko to start building social capital and peer networks between these schools.

- It is clear that a high level of technical support is necessary for schools initially, especially at schools where there are low levels of technical skills. Disadvantaged schools cannot currently finance their own technical support so alternative means would need to be found until they are able to become self-sustainable. There are several ways in which this could be achieved:
    - Inkululeko could investigate corporate sponsorship which could be used to finance technical support to schools
    - Inkululeko could explore the possibility of forming strategic partnerships, for example with Khanya, Edunova Schools ICT Academy etc
    - Funding proposals for labs should include a maintenance endowment component for each lab, which would entail a certain amount of money from each grant being invested and the interest used for maintenance (technical support, hardware upgrades etc) in perpetuity.

10.1.6 Communication with tuXlab schools

- Regular communication must be kept with tuXlab schools. A portfolio manager would be useful for this.
- There needs to be careful attention to managing expectations, particularly in terms of promises made to schools.
- Multiple methods of communication are necessary when trying to contact schools, for example using SMSes as well as regular fax and phone communication.

10.1.7 Working with schools to develop plans for use and sustainability

- We found that many schools were not using their labs because the use of them had not been scheduled into the school timetable, despite the requirement of having a business plan in place before a tuXlab was initially installed. These plans should be developed with existing and new schools and support should be provided to assist with initial implementation in each school.
- Many tuXlab schools lack the skills and initiative to develop effective income generation or fundraising strategies for their labs. A training course could be held for principals and/or coordinators, or tuXlab staff could work with willing schools individually. One possibility is to assist with the ICDL accreditation of teachers who would be willing to offer formal accredited computer courses and to recommend that these teachers are remunerated to run these courses in some way.

10.1.8 Ongoing review and reflection of the tuXlab model

As the tuXlab model continues to grow and evolve, and as the context in which the project is situated changes, systems must be put in place for ongoing review and revision.

10.2 POSSIBLE WAYS FORWARD FOR THE TUXLAB PROGRAMME

10.2.1 Organisational structure

It seems more viable for the tuXlab programme to be run through a non-profit organisation so that sponsorship and funding may be sourced. Inkululeko might consider the registration of a non-profit organisation which could be linked to the company and/or be funded by the profits derived from the company.

10.2.2 Possible strategic partnership with Khanya

This evaluation suggests that there is plenty of scope for tuXlabs and Khanya labs to work together in a complementary way. If this possibility is pursued, the lessons learned through this evaluation should be workshopped with the tuXlabs team, Khanya and other key stakeholders in a collaborative workshop. Certain issues need to be taken into consideration:

- There is a need to challenge the perception amongst schools that “Khanya is better”. The use of new hardware would assist in giving the programme a new image.
- Any partnership with Khanya must be handled in such a way that tuXlabs does not lose its own identity as an open source software lab.
- tuXlabs could be used to complement Khanya labs by focusing on teaching computer literacy and basic computer skills in primary schools, while Khanya focuses more maths and science education in high schools. In addition, tuXlabs offer an opportunity to learn and explore for those learners with an interest in computer programming.
- If a partnership is established, clear roles and responsibilities must be established between WCED and the tuXlab programme. These roles and responsibilities will need to be clearly communicated to schools with joint labs so that they are clear about where to obtain any assistance that is needed.

10.3 LESSONS LEARNED FOR THE SHUTTLEWORTH FOUNDATION

10.3.1 Clear exit strategy and terms of reference

One of the key lessons from this evaluation is the need for clear exit strategies when Foundation programmes are handed over in the future. If any start-up funding is given, terms should be carefully set and monitored. A written agreement should always be signed between the Foundation and the new management of the programme in which roles and responsibilities are clearly laid down, and clear targets and measurables are established

10.3.2 Clear and consistent communications strategy

Programme beneficiaries and other stakeholders must be clearly informed about the new institutional project arrangements and how this will affect them, as well as be introduced to new management. Hopefully, this will limit any negative perceptions of the Foundation after projects have "left the nest". In addition, any Foundation branding must be removed and replaced (for example, posters and contact numbers).

10.3.3 Evaluation of pilot projects

It is important that pilot projects are evaluated after an appropriate period of time and that recommendations are set in a participatory matter (as was the case in this evaluation) and then implemented. For example, it is recommended that the Social Content Network Project – an innovative and exciting project that shows potential for positive impact by enabling teachers to access content from the internet to teach the curriculum while controlling web access – is evaluated to determine its efficiency, effectiveness and outcomes, and to learn lessons and incorporate these into project design.

10.3.4 The development of an advocacy strategy to promote OSS among teachers and within the WCED

The tuXlab programme has introduced and educated teachers and learners at tuXlab schools to use open source software for the first time. There is, however, still much work to be done in terms of creating awareness of open source software and its potential, and to encourage support of its use in the education sector in South Africa. This evaluation found that surveyed teachers generally had very limited knowledge of software, which led to resistance to OSS as it was perceived as "different" and "unfamiliar" compared to other software programmes such as Microsoft. There is a need for an advocacy strategy to promote OSS among teachers and within the WCED. Such a strategy could also play an important role in paving the way for a partnership between Khanya and tuXlabs (as schools

would be more informed and receptive to OSS) and would help to raise the profile of OSS and interest in its usage within the education sector in South Africa.

10.3.5 Design of programmes to reduce dependency and entitlement

One of the reasons for school's dissatisfaction with Inkululeko was because of the introduction of fees for technical support. Schools were used to this being a free service and they felt "betrayed" and unhappy about having to pay for it. It is recommended that the Shuttleworth Foundation consider building in service fees from the beginning of the project (even if it is just a token amount) into projects of a similar nature in the future so as to encourage a mindset among schools that they are paying for a service rather than receiving a handout.

10.4 USING THIS EVALUATION

Whatever decision is taken regarding the future of the tuXlab programme, we recommend that the Foundation and Inkululeko jointly produce a press release to ensure that this information is communicated clearly to the general public. An effort should be made, and some resources invested, to ensure that all schools are personally visited and informed about the future trajectory of the programme. The Foundation and Inkululeko need to work together in this regard, as the tuXlab programme is still largely associated with the Foundation.

11. CONCLUSION

The tuXlab programme in the Western Cape fulfills an important need in the education sector by providing learners, who may otherwise not have access to computers, with hands-on experience. The findings of this study reveal that this access has had a number of significant benefits for learners. These benefits include improved computer literacy, language and maths skills, increased opportunities for research, enhanced learner self-esteem and broadened perspective on the world.

Internationally, education is moving towards the use of open source software platforms. The tuXlabs provides learners and teachers with exposure to open source software and therefore plays an important role in preparing learners and teachers to use and engage effectively with open source in the broader world.

Learners, teachers and coordinators all agree that the tuXlab programme is a good concept. The findings of this evaluation, however, suggest that certain elements of the tuXlab model may need to be revisited. The main challenges that the programme faces are around defective hardware that prevent the effective use of the labs, limited capacity for the provision of adequate and affordable technical support, difficulties with capacitating schools to use their labs to become financially self-sustainable and competition with the Khanya Project, which has an advantage in terms of resources and provincial government backing.

To overcome these challenges this report makes the following recommendations:
Implementation of the tuXlab programme

- Investigate the use of new hardware and upgrade existing hardware
- Investigate the use of a machine which is half way between a thin and fat client
- Ensure the provision of quality curriculum aligned software which is grade appropriate
- Investigate security measures for in-school and after-school activities with each school before installation
- Ensure that schools have skills transfer and succession plans in place for their tuXlabs
- Provision of regular training sessions which build upon each other, and that such training occurs at times and locations that are convenient for teachers

- Use of paid staff members rather than volunteers to provide technical support, and the development of school portfolios for technical staff
- Exploring alternative means to assist disadvantaged schools to finance their technical support possibly through corporate sponsorship or partnerships
- Ensuring regular and effective communication with schools
- Ensuring the careful management of expectations with regards to promises made to schools
- Assisting schools to develop plans detailing the usage of the lab in the school timetable and assistance with the implementation of these plans
- Assisting schools to develop effective income generating strategies, for example through training courses for principals or ICDL accreditation for teachers
- Develop systems to allow for the ongoing review and reflection of the model.

Possible ways forward for the tuXlab programme

- If the tuXlab programme is going to be maintained through sponsorship and funding it may be more appropriate for the service provider of the programme to take the form of an NGO rather than a business, at least for the education component of this service
- Developing a partnership between Khanya and tuXlabs and investigating ways for Khanya and tuXlabs to work effectively together in complementary roles, while ensuring that tuXlabs is able to maintain its own unique identity.

Lessons learned for the Shuttleworth Foundation

- The development of an exit strategy for programmes exiting the Foundation which is well planned out and carefully monitored. Such a strategy should include a clear and consistent communications strategy to inform all beneficiaries and stakeholders of a programme exit.
- The evaluation of pilot projects at various stages before they are rolled out for example the Social Content Network Project would benefit from such an evaluation to determine its efficiency, effectiveness and outcomes.
- The development of an advocacy strategy to promote OSS among teachers and learners within the WCED.
- Building in service fees from the beginning of a project to encourage a mindset among schools that they are paying for a service rather than receiving a hand out.

The tuXlab programme also offers something unique to schools, and the education sector in South Africa, in terms of its affordability, flexibility (customisable to suit the needs of individual schools) and thin client design, which offers advantages for administration of the system. Even if the costs of the lab were to be increased through the use of new rather than refurbished second hand hardware, the costs saved by not having to purchase licensing fees for software would still be substantial. If tuXlabs programme were to close and/ or to be subsumed into the Khanya project or transformed into Khanya labs these unique advantages would be lost.

12. REFERENCES

Davidson, E. 2005. Evaluation Methodology Basics. SAGE Publications, California

Dingle, S. “Qualifying ICT Skills in Local Education” , Shuttleworth Foundation Press release, final draft, 22 November /2007

Isaacs, S. 2007. ICT in Education in South Africa. Survey of ICT and education in Africa: south Africa country report - South Africa. InfoDev.
www.infodev.org

Pandor, N. 2007. “E-learning in South Africa”. Department of Education. World Ministerial Seminar on Technology in Education “Moving Young Minds”, Queen Elizabeth II Conference Centre. Westminster, London

Public ICT access and software choices in Africa. Comparison study of free/open source and proprietary software in an African context. 2005. Bridges.org. 24 May, 2005.
http://www.bridges.org/publications/21/exec_summary

2004. Submission to SA Dept of Education on the Draft e-Education White Paper. Bridges.org. 31 January 2004.
http://www.bridges.org/commentaries/116

2005. Bridges.org study identifies realities of using free/open source software and proprietary software in public computer labs. Bridges.org. 24 May 2005.
http://www.bridges.org/publications/21/news_release

Open source Initiative. 2008
http://www.opensource.org/docs/definition.php