COMPUTER LAB AND INTERNET COMMUNITY CENTRES (CLICC)
&
TABLET FOR SCHOOLS (TFS) PILOTED PROGRAM

EVALUATION REPORT

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Abbreviations

Bislama	A commonly used creole language, one of the official languages of Vanuatu
CLICC	Computer Laboratory and Internet Community Centre
DFAT	Australian Department of Foreign Affairs and Trade
GfG	Governance for Growth Programme, Vanuatu, DFAT
GDD	Gender Digital Divide
GESI	Gender Equality and Social Inclusion
ICS	Internet Community Senta (Centre)
ICT	Information and Communication Technology
MOET	Ministry of Education and Training
Moodle	A well known open source learning management software technology
MOOC	Massively Online Open Course
NICTP	National ICT Policy
NSDP	National Sustainable Development Plan 2016-2030
OGCIO	Office of the Government Chief information Officer
Open VEMIS	Vanuatu's Education Management Information System
OER	Open Educational Resources, often free to use ICT/online resources
RTC	Rural Training Centre
SMAP	Data collection system for mobile phones/tablets
SLA	Sustainable Livelihood Approach, a framework for research on sustainable livelihoods originating from the UK's Department For International Development
TFS	Tables For Schools
TPACK	Technological, Pedagogical and Content Knowledge, a model for ICT integration in teaching
TRR	Telecommunication and Radiocommunication Regulator, of Vanuatu
UAP	Universal Access Programme
VSAT	Very Small Aperture Terminal, a technical name for a satellite Internet terminal.
VITE	Vanuatu Institute of Teachers' Education

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Executive Summary

Background

Under Vanuatu's Universal Access Policy (UAP) two projects were designed under the principle that schools can be hubs for community Internet access. These were the Computer Laboratory and Internet Community Centre (CLICC) and the Tablets for Schools (TFS) projects. A third project was the Internet Community Senta (ICS) project. Nineteen schools across the country were selected for the programme, which invested in broadband links, computer lab and networking equipment, gateway servers with educational resources and for off-grid schools, solar power supplies. The TFS project investments included class sets of tablets preloaded with educational apps and charging trolleys. In addition, the supervising IT teachers were provided with initial and refresher training. Schools and local communities agreed to meet certain requirements to ensure the success of the program. The original project period ran from January 2016 to December 2017. Since then TRR have continued with general oversight and have extended the subsidised Internet to six schools for 2018. An important aspect was that the community had to be engaged and that the site would be open for use by the community during non-school periods.

About this Evaluation

This evaluation is an independent assessment of the CLICC and TFS projects. The field work took place in March and April 2018 and the impact of any subsequent support to the schools is not considered. The evaluation was carried out within the development context of Vanuatu's National ICT Policy and Universal Access Policy and the Ministry of Education and Training (MOET)'s ICT policies. The evaluation is qualitative and quantitative and explores the educational impacts of the programme experienced at the school and system levels, and the socio-economic impacts experienced by the surrounding communities. The analysis brings forward lessons learned about the impacts of the CLICC/TFS programme and the effectiveness and sustainability of the model from the educational and community perspective.

Key Findings

There are specific instances where the model shows it can work very well in most areas of enquiry including educational benefits at the primary and secondary level, and social and economic benefits to the surrounding communities. However, there were also barriers and exclusions that are limiting the potential of the centres. These stem from weaknesses in the model and from contextual factors. As a result, The CLICC and TFS facilities are not being utilised as effectively as they could be and not always in the ways they were intended. This is particularly so in the case of benefits to the community beyond the impacts on their schools.

Educational benefits

The ICTs work differently in primary schools compared to secondary. In primary schools, the most consistent benefit from the CLICCs is that all students come away with hands-on computer skills, advantaging them as they progress. The main benefits for secondary schools are that they allow ICT classes to be taught to the upper years, including scheduled classes and access for students research. The priority should be shifted to support schools without existing labs, and for more inclusive access for all students, as currently the labs are used mostly by senior students.

The educational benefits are currently centred around the computer labs and not so much in the classrooms. To create more optimal conditions for supporting teaching and learning, Internet access should be extended and appropriate technology such as interactive projectors installed that allow teachers to incorporate e-learning resources into their lessons. We find tablets are being used effectively by older students for research, but not as effectively in primary schools. More appropriate content and better guidance for teachers on using them is needed.

Information literacy is an issue, not only for schools. The need for teachers and students to be able to evaluate quality online resources is an educational imperative, and should be made a priority for the UAP because of the wider societal implications. Guidance should be provided for schools and the role of school libraries may be revisited and linked to the ICTs. There is also a critical need for educational content curated especially for Vanuatu and structured around the curriculum. The open resources provided in the CLICCs are a start, but are too general and unsuited for younger ages.

Teachers and administrations are benefiting from improved efficiency and access to OpenVEMIS and online resources although, critically, we found that many teachers do not benefit due to lack of ICT skills.

One of the most critical issues is that that a significant number of teachers remain without basic ICT skills. This is not just a concern for the CLICC/TFS, but more generally for the education reform process. Even in the senior colleges where ICT use is more advanced, we found teachers who were not benefiting or passing on the benefits of the ICTs to their students. Our informants agreed and called overwhelming for more ICT training for teachers.

As ICTs and the Internet are becoming more and more required in many aspects in life, the danger is that some teachers may be being left behind. If we do not carry experienced teachers along with the changes, we risk disempowering or deskilling those who cannot or prefer not to adopt the new ICTs into their practice. Training all teachers with basic skills would make a large impact on the return on investment of ICT in education programmes including any larger scale roll out of the CLICC and TFS programme.

It is not just skills alone that teachers need. Pedagogical beliefs and beliefs about ICTs can be in collision; in other words some teachers can't see the relevance of ICTs for their subject areas. Fears and feelings of inadequacy about ICTs can act as barriers and reduce the incentives for teachers to learn basic ICT skills.

Key Recommendation 1: As a top priority the Ministry of Education should consider introducing a minimum ICT competency standard for teachers. Teachers ICT skills could be made a Ministry Key Performance Indicator (KPI) and tracked with OpenVEMIS, as part of overall professional development. Those in need of training would then be identified and selected for training, and targets for teachers with the ICT competency can be set for schools. A basic ICT skills training course that includes ICT in teaching and relates to all content areas must be incorporated into mandatory teacher education as part of the qualification process. The same course should be made available by distance learning through the CLICCs and other outlets.

Benefits to the community

At the moment, the CLICCs are neither truly embedded in their host communities, nor are they acting unambiguously as outlets for government and other e-services. Community access and use seems not to be happening to the extent that the stakeholders expected and intended by design. Rather than being multi-purpose, open access spaces for learning, research, computing and information for everyone to use, the CLICC facilities often seem to have become more limited in their use as computer labs mainly to support dedicated IT classes.

In our analysis, this is related to a lack of awareness of the benefits and knowledge about ICTs and broadband Internet. The issue is described by our informants: One principal asked, "*What use is marketing (of the CLICC) if people don't know the need*?". Another village Chief put it like this; "*You can grow cassava to eat, you can grow kava for money, but what about the Internet*?". This perception is most commonly heard in remote rural communities, but is still a concern in provincial towns and for some groups in particular, including women.

This shows that simply providing access and awareness talks is insufficient to ensure social viability and sustainable use by the community. Skills training will not be in demand if people don't know why they need ICT skills. What is needed is a more engaged approach to help those communities explore their needs and learn actively about how the broadband, computers and tablets can help them with those needs. This means training people purposefully so that

the access becomes meaningful. With the appropriate programming linkages people's ICT capabilities can be built around their needs. This would lead to more productive and sustainable public Internet access.

Key Recommendation 2: The stakeholders of any renewed programme need to invest more in the communities to identify and prioritise local needs and identify key programming linkages. This must be a participatory process, for instance with community mapping. This would require coordination with the programming partners including NGOs and government departments (e.g. health, agriculture, women's development, business development) and the Provincial Education offices. The aim should be to provide a few leading applications in demand from the community, whilst also supporting open-ended capacity building, digital capabilities and encouraging innovation.

Encouraging youth innovation with technology is another promising way to stimulate the creative use of the broadband and ICTs and promote the CLICCs as incubation centres. Examples for potential collaboration and emulation include Vanuatu's *Smart Sistas* project and New Zealand's *High Tech Youth Network*.

The *social sustainability* of CLICC/TFS centres needs to be balanced by the *management sustainability*. We heard from primary schools (in particular) that they had difficulty in retaining the knowledge and skills to manage the facilities when their local appointed IT teacher or volunteer supervisor left or is transferred. Whilst *financial sustainability* is a concern for some of the primary schools, providing the facilities are operating and the benefits are understood by the school leadership, the broadband and operating costs are perceived as affordable by the schools.

Despite the mostly low utilisation, there were some key examples of benefits including farmers, health workers, business people and community developers that illustrate the possibilities. Those instances need to be nurtured and with lessons learned from them, promoted across the network.

Cross cutting issues

We found all areas of the study were gendered. Women have less say in how the ICTs are accessed and managed, female teachers were often the ones who were not benefiting as much as their male colleagues, and social coding regarding the computer labs more often suited men's preferences. According to informants, women would be the least likely to perceive benefits and relevance of the Internet to their needs. Girl students may use the facilities as much as boys, but there may be opportunities to go further in addressing specific educational challenges faced by both girls and boys.

Resourcing is always a political affair, and the team observed evidence of political interest relating to the CLICCs at some of the research sites. It may be that resources like this may be leveraged by individuals for personal political benefit, and a renewed programme should be alert to this. One way to mitigate against such risks is through an improved monitoring regime.

Regarding the dangers from ICTs, schools and communities generally perceive pornography as the main risk and which needs addressing with a reliable central filtering solution. Issues such as fake news and cyber bullying are not generally understood explicitly and perhaps this points to a need for more community-based awareness raising and links to the general need to promote information literacy.

Finally, the backdrop to all our observations was that many of the CLICC/TFS sites had not been fully functional for technical reasons. This led to expectations being built resulting in a need being unmet when the broadband or computers stopped functioning. This significantly reduced the chance of beneficial impacts during the 2-year pilot project. However, such technical issues should be relatively more straight forwards to fix given the lessons learned and documented here.

1. Purpose of Evaluation and Key Questions

Background

Under Vanuatu's Universal Access Policy (UAP) two projects were designed under the principle that schools can be hubs for community Internet access. These were the Computer Laboratory and Internet Community Centre (CLICC) and the Tablets for Schools (TFS) projects. A third project was the Internet Community Senta (ICS) project. Nineteen schools across the country were selected for the programme, which invested in broadband links, computer lab and networking equipment, gateway servers with educational resources and for off-grid schools, solar power supplies. The TFS project investments included class sets of tablets preloaded with educational apps and charging trolleys. In addition, the supervising IT teachers were provided with initial and refresher training. Schools and local communities agreed to meet certain requirements to ensure the success of the program. An important aspect was that the community had to be engaged and that the site would be open for use by the community during non-school periods.

The original pilot project period commenced in January 2016 and ran for two years, with the Internet subsidy ending in December 2017. Since then TRR have continued with general oversight and have extended the subsidised Internet to six schools for 2018.

About this Evaluation

This evaluation is an independent assessment of the CLICC and TFS pilot projects, and included the original 19 schools in the scope of which 11 were visited for field research. The field work took place in March and April 2018 and the impact of any subsequent support to the schools is not considered. The evaluation is qualitative and quantitative, based on the realistic evaluation approach. It explores the educational impacts of the programme experienced at the school and system levels, and the socio-economic impacts experienced by the surrounding communities. The analysis brings forward lessons learned about the impacts of the CLICC/TFS programme and the barriers and constraints bearing on the effectiveness and sustainability of the model from the educational and community perspective. The Terms of Reference for this evaluation, provided by TRR, are attached in Annex 5.

The primary **purpose of the evaluation** was to:

1. Evaluate and identify the benefits arising from the increased use of ICT by students, teachers and school administrators, including to the support and in the course of the educational process.
2. Evaluate and identify the benefits arising from the use of ICT by the surrounding local communities and businesses, including enhancing their day to day social and business activities.
3. Identify future strategies that can be implemented from an educational and community perspective to increase the use of ICT and improve the sustainability of the identified benefits.
4. Collect, assess and report the findings of the monitoring and evaluation exercise.

From the terms of reference the following **four key questions** were derived:

1. What are the benefits arising from the increased use of ICT by students, teachers and school administrators, including to the support and in the course of the educational process.
2. What are the benefits arising from the use of ICT by the surrounding local communities and businesses, including enhancing their day to day social and business activities.
3. What are the impacts of the UAP, ICTs and Cyber Crime policies as experienced at the school and community level;
4. What future strategies can be identified and implemented from an educational and community perspective to increase the use of ICT and improve the sustainability of the identified benefits?.

The policy context for this evaluation is described in detail in Annex 2. It includes the National ICT Policy (NICTP), Universal Access Policy and Cyber Crime Policy, and Education sector policies relating to ICTs. The National Sustainable Development Plan 2016-2030 (NSDP) also known as the Peoples Plan 2030, is the highest level policy framework to which we can relate the impacts of the programme.

The field work took place between March 22nd and April 27th, 2018. A total of 63 structured interviews were conducted plus 35 off-script interviews. As there were a few group interviews, the final total of persons interviewed was 104. Purposive and convenience sampling was used.

All interviews were carried out in Bislama language by a team of experienced ni-Vanuatu social science researchers with recent Vanuatu rural field work experience. The team provided by Port Vila-based Natora Consulting was made up of three females and one male, joined by the lead evaluator at some of the sites. Each school visit was carried out by at least 2 interviewers who debriefed together after each day and compiled notes on emerging themes. This daily summarising, review and consideration among the team members was an important preliminary in synthesising and analysing the data and information.

A table of the primary questions, enquiry areas from the ToR and the secondary questions developed by the evaluator is given in Annex 3.

The Key Messages relation to the four key questions and the associated recommendations follow in Section 2.

2. Key messages and Recommendations

2.1 Key Messages

KEY QUESTION 1: Benefits arising from the increased use of ICT by students, teachers and school administrators, including to the support and in the course of the educational process.

Students

The main benefits for secondary schools are that they allow ICT classes to be taught to the upper years, including scheduled access for students research. Although there is no firm evidence, schools claimed that improved exam results were linked to an improved interest in learning and improved research capability. An issue is that the heavily used computer labs are often monopolised by senior students for scheduled classes and research. A balance needs to be struck so that junior classes have more access, especially as they are often paying the same levy to the school.

In primary schools, the most consistent benefit is in ensuring all students come away with hands on basic computer skills and this advantages them as they progress to secondary school. The most useful features are the large labs with enough computers for full classes (at least sharing one PC between two) and the provision of basic computer training. Attention is needed to share the benefits with nearby primary schools, as students and parents may feel their students become relatively disadvantaged.

Teachers and school administrations

Providing the Internet and computers are working, and teachers have the basic skills, they are benefiting from the Internet in many ways. These include improving teaching efficiency and saving time, access to up to date resources, improving subject knowledge and templates for administration such as student report cards. Some teachers were studying courses online, mostly with USP. To support study, more information about available official, academic and open courses should be circulated to schools.

Schools emphasised the time savings, reduced travel, that teachers absences are lower, and that MoET can monitor teachers performance. All schools were benefiting from OpenVEMIS and entering the data. The CLICCs had become hubs for OpenVEMIS training and some nearby schools are sharing the benefits. OpenVEMIS was seen as an advantage, for instance prompt updating and improved security of student data compared to paper records.

Teaching and Learning

The educational benefits are currently centred around use of the computer labs and not so much in the classrooms. We found evidence that many teachers were actively downloading resources to help with lesson preparation, and for use as a teaching resource. However, the evidence of teachers routinely using resources from the Internet or the server "live" in the classrooms came mainly from the senior colleges.

To create more optimal conditions for supporting teaching and learning, the first step is to extend the Internet access to the classrooms. Secondly, ICTs should be integrated into the teaching environment in ways that allow teachers to seamlessly embed e-learning resources into their lessons in collusion with existing teaching methods.

Information literacy and the role of school libraries

A common theme with our informants was the need to build the capacity of teachers and students to evaluate quality online resources. This goes hand in hand with the need for more quality-assured, curriculum linked e-learning content. Information literacy should be considered an educational imperative because it has significant implications for the wider societal development.

This raises the issue of school libraries and how they might be reinvented for the digital age to complement the computer labs (and vice versa). Librarians can support teachers and students with "information literacy classes" and providing libraries are secure, school tablets might be usefully relocated there as the library can provide a quality learning space for students accessing and critiquing online information. Librarians can be a person or a role assigned to a subject teacher, or even a member of the community (one informant was a retired curriculum writer).

Educational resources

The CLICC/TFS facilities were equipped with gateway servers with a local cloud of resources provided by the programme in addition to the open Internet access. This provides curated content for the target audience, unlike the completely open Internet, and also acts as a "walled garden" and safe environment for junior students. The gateway servers were regarded as useful by teachers although they judged the content as more suitable for science subjects than other areas.

The local resources were useful for secondary schools during Internet outages and for unlimited fast access to multimedia. However, for primary students the current local content collection is not very suitable. It could be more so if it was selected for relevance, age and language (including more French and Bislama content) and structured for the syllabus, i.e. arranged by content area and year.

Teachers ICT skills

One of the most critical issues is that that a significant number of teachers remain without basic ICT skills. This is not just a concern for the CLICC/TFS, but more generally for the education reform process. Even in the senior colleges where ICT use is more advanced, we found teachers who were not benefiting or passing on the benefits of the ICTs to their students. Our informants agreed and called overwhelming for more ICT training for teachers.

As ICTs and the Internet are becoming more required in many aspects in life, the danger is that some teachers may be being left behind. If we do not carry experienced teachers along with the changes, we risk disempowering or deskilling those who cannot or prefer not to adopt the new ICTs into their practice. Training all teachers with basic skills would make a large impact on the return on investment of ICT in education programmes including any larger scale roll out of the CLICC and TFS programme.

It is not just skills alone that teachers need but a wider set of digital capabilities including how to teach with technology and both digital and information literacy. Pedagogical beliefs can be in collision with their beliefs about ICTs and the relevance of ICTs for their subject areas. Fears and feelings of inadequacy about ICTs can act as barriers and reduce the incentives for teachers to learn basic ICT skills. These issues must be addressed systematically in teacher education and in service training, particularly for older teachers.

KEY QUESTION 2: Benefits arising from the use of ICT by the surrounding local communities and businesses, including enhancing their day to day social and business activities.

Community access

A range of community benefits were identified. A key benefit of the CLICC that applies to both the school and the surrounding community is access to up to date disaster information (cyclone and tsunami warnings). Informants frequently mentioned that the CLICC was used for communicating with family members overseas, for instance those in Australia or NZ as seasonal workers. Secretarial functions of ICT are important in rural areas, and as a lot of information is still circulated in printed form, the schools value the basic functions - including charging of mobile devices. The large screens and keyboards add value as they afford more powerful applications compared to smart phones. Community members learned computing skills that were instrumental in gaining employment. Farmers are using the ICTs in an area with a lot of agribusiness activity.

Despite these good indications, community access seems not to be happening to the extent that the stakeholders expected and intended by design. Rather than being multi-purpose, open access spaces for learning, research, computing and information for everyone to use, the CLICC facilities often seem to have become more limited in their use as computer labs mainly to support dedicated IT classes.

The reasons for this are complex and often relate to the local contexts. Barriers include poor availability when the technology fails and initial needs and expectations are unmet after the functions become unavailable. There may be perceptual barriers where there are unspoken rules and people are unsure who the facility is for, despite awareness talks, due to school internal politics or where there was a perception that it is intended for only one language group.

Despite some schools "marketing" the CLICC/TFS, it was clear that many people do not know about the purpose and potential of the Internet, or the ICT facilities, let alone having the skills to use it. This is especially so in remote rural communities, and is gendered and related to social norms. The sustainability of such facilities depends on the social viability as much as institutional and financial. This becomes very clear when school budgets are controlled by the communities and the benefits of school spending on the Internet may be unclear to them.

Ideally, public Internet facilities based on universal access principles (e.g. democratisation of access to information) and should not be restricted to a small set of applications. However, where there is low demand because of limited awareness, a strategy may be to identify a few appropriate programme linkages that are a good fit with the surrounding community and to build people's digital skills around them. The aim should be to provide a few leading applications responding to demand from the community, whilst also supporting open-ended capacity building, digital capabilities and encouraging innovation.

We did find some good examples of the facilities benefiting people in different sectors. This foundation could be built on by the government leading the way with development partners including NGOs and private companies to "expand the ecosystem for digital services". It is obvious that there are many e-services already available and the CLICCs could become hubs and centre of knowledge for such services.

Another promising strategy would be to partner with initiatives featuring youth innovation with technology.

KEY QUESTION 3: Impacts of the UAP, ICTs and Cyber Crime policies as experienced at the school and community level

Broadband access

One of the outcomes of the CLICC/TFS programme is that it has advanced the nationwide availability of affordable broadband solutions for schools that meets required standards. We have seen that where the overall conditions are supportive, both small primary schools and larger secondary schools are renewing their connections and that both of the solutions provided by Digicel and Telsat are continuing to be available for an affordable price.

However, if the decisions concerning providers and services is to be left with school administrations, they need guidance on the issues around school connectivity, such as the different kinds of broadband (i.e. fixed wireless, VSAT, 3G/LTE, optical fibre, etc) and the need for connectivity within the school.

To provide a clear reference that addresses all of the potential issues highlighted in the main discussion in this report, the Ministry of Education should consider developing a school Internet connectivity policy. This would provide minimum standards and guidance to school Principals of the requirements.

Cyber Security

The main risk perceived by the schools and communities is from pornography. This has been a concern for some parents. Reports of the CLICCs being used to access such material risk losing the support of the community. Schools

can overreact and overly tighten down access to the Internet limiting some of the potential benefits in the process. As the CLICCs are situated in and used by schools, reducing risks to children must be the imperative. There is therefore a strong case for a better filtering solution.

Other issues such as fake news and cyber bullying were not mentioned specifically by informants, and are perhaps not understood or expressed in those terms. This related to information literacy. There should be a role for community leaders and church leaders to provide oversight and inform the community that they should be mindful of unverified and sometimes malicious information on the Internet and to use their discretion.

KEY QUESTION 4: Future strategies that can be identified and implemented from an educational and community perspective to increase the use of ICT and improve the sustainability of the identified benefits.

The CLICCs and TFS centres need to be better adapted to suit both their schools and their communities.

Our finding is that CLICCs need to be made to fit better with their communities and their local contexts. At the moment, the CLICCs are neither truly embedded in their host communities, nor are they acting unambiguously as outlets for government and other e-services.

The functions and resources of the facilities work differently in primary and secondary schools. Likewise, the benefits for the host communities depend greatly on the needs and local contexts. It is clear that "one size does not fit all". Some adaptability needs to be built in to the programme that discriminates between these different contexts.

For *secondary schools* the priority should be those schools with the greatest need that do not have existing computer labs, and in ensuring all students have access. Schools with existing labs easily integrate the new CLICC facilities but the net improvement may not be optimal for Vanuatu's student population. In *primary schools*, the focus should be on providing labs with enough computers for full classes and making the facilities as accessible and useful as possible for the local community.

On the side of *public access and benefits to the community,* the focus should be on supply and demand sustainability. A mechanism such as a scoping study is needed that allows the communities and stakeholders to identify needs and prioritise programming linkages. This should be a participatory process (for instance community mapping). Consultations may not be enough as communities may not have any idea of how broadband can assist them beyond a narrow range of applications.

The concept of capabilities rather than skills alone is important. Capabilities include a measure of empowerment, knowledge and the confidence to apply skills in different contexts. The aim should be to build digital capabilities and create the conditions (advice, trainings, resources, networking) where capabilities may be converted into action.

In addition to this bottom-up approach, an inventory of available e-services should be compiled and the partners should collaborate to make those available through the CLICCs.

The facilities (CLICC and TFS) should function consistently and reliably.

When the equipment for any reason becomes unavailable for a long time, after it has been set up and worked initially, it creates an expectation and a potential need in the school and community, that then goes unmet.

Almost none of the CLICC and TFS facilities studied had been fully operational for all the programme. In many cases the facility was installed and expectations raised but subsequently there were technical issues that caused interruptions sometimes for long periods. The technical issues included outages in the broadband service, unreliable thin client computer systems that were not fixed promptly, poor coordination between several contractors on configuring the facilities and external factors that hindered the prompt recovery after events such as cyclones.

The technical and technological issues should be straight forward to address, although by no means simple. The lessons learned from the pilot programme and the technical issues described in the main discussion in this report should be reviewed before any further roll out. In particular, a single focal point is recommended taking care of provisioning and installations and to coordinate prompt and responsive technical support. This may be the MOET or an intermediary organisation or programme. Sustainable ICT in rural areas is dependent on many factors and circumstances, not just the actual technology, but in particular the nComputing systems were an obvious weak link.

The CLICCs need to retain skilled and knowledge managers

An issue raised by informants and observed by the team is the difficulty in retaining suitably skilled and knowledgeable supervisors to manage the CLICC/TFS and provide training and support. This was an issue when the original trainees left or were transferred and their replacements were not suitably trained.

The main manager of the facility, including a TFS only school, should be a "knowledgeable champion" whose priority is to help everyone to benefit including all teachers in the school, all students and if there is community access, to face the community and actively engage with them to help them benefit. Whomever the person is, whether an ICT teacher, a volunteer or champion from the community, it should be the "right person", as one of the informants put it. There should be equal representation of women managers (and assistants) as they have different approaches and styles. They must have sufficient pre-existing ICT skills before being selected - beginners are not suitable. The school principals must be trained to lead strategically, understand the potential benefits and nurture an inclusive ICT culture, but they may not be the right persons to manage a CLICC.

Provincial Education officers recommended to us that they should be more involved in the oversight of the CLICC/TFS centres as they can ensure suitable IT teachers are appointed. They suggested a CLICC officer be appointed (or the role given to an existing education officer).

A related recommendation is that more women should be trained as CLICC/TFS managers, who currently are predominantly men. Women seem to predominantly teach the lower primary grades with more men at the senior levels, and that they were more at risk of being left behind in learning to use the ICTs. Having "the right woman" as manager of the CLICC/TFS might address such unspoken gendered rules in some schools.

***Gender and social inclusion*.**

Applying a gender lens ensures that the different needs and preferences of men and boys, and women and girls are recognised and addressed. Prioritising women's needs is not just helping women, it can have a generally lifting impact on the social viability and cultural bonding around ICT use.

It was commonly heard that girls were accessing the facilities on an equal basis to the boys. However, this is not the end of the story as there may be opportunities to address gender biases impacting attendance and learning (affecting both girls and boys) that are being overlooked. The programme could be innovative in this regard.

Initiatives that promote youth innovation with technology are known to address gender bias and wider issues of social inclusion. For instance, Vanuatu has the *Smart Sistas* collaboration that helps girls to learn high tech skills, and the New Zealand-based *High Tech Youth Network* which has centres in Fiji and Samoa, is an example of an approach that has helped many school children and unemployed youth to learn creative media skills opening up new vistas.

There was indication of social norms limiting women's access. This is especially noticed in rural areas where there are generally low ICT skills and awareness. For instance, one informant thought men would stop their wives from using the ICTs, and generalised that women don't know "how to go in the Internet". In response to this, attention should be given to linking to women's programmes and providing content of interest to women. In general women's clubs could be helped more actively to use the ICTs.

Access to the ICTs by teachers is also obviously gendered, and as women are often teaching the lower classes predominantly, this sometimes results in female teachers feeling they don't have as much right to the equipment as the men, especially where men are controlling access and possessing most of the knowledge of the ICTs. This should be addressed, for instance by training more women as CLICC managers - not just as assistants.

Financial guidelines

Owing to the UAP programme, the broadband services and pricing plans that were negotiated are now generally available in Vanuatu.

We find that the monthly subscriptions at around 20,000 Vatu for the unlimited 2 Mbps plans rising to 35,000 for the faster 4 Mbps plans used by some colleges is affordable for both primary and secondary schools. Primary schools struggle a little as they also may have to hire a CLICC manager as a locally appointed IT Teacher, whereas secondary schools generally have government salaried ICT teachers.

There is obviously a need for MOET to consider applying some guidelines around levies charged to students. Most schools were charging student levies to raise these funds. The amounts seemed to vary quite widely and in some cases would be in violation of the Ministry's policy. Secondary schools were collecting more from students than the cost of the Internet, and this aspect of fund raising was obviously a factor in how schools viewed the benefits. This was introducing inequalities. Despite being charged such a high levy, junior students were not enjoying the benefits as the CLICCs were monopolised by senior students for scheduled classes.

The charges for community access also varied, but in most cases we were told people regarded them as affordable providing the Internet was working well.

Several schools with CLICC/TFS have not renewed their broadband subscriptions. Some are quoting financial difficulties. It is important that school Principals and Council Chairs are made aware of the difference between uncapped broadband and mobile data accessed by phones, and how each mode may support education and extend the learning environment in different ways.

2.2 Recommendations

Key Recommendation 1: As a top priority the Ministry of Education should consider introducing a minimum ICT competency standard for teachers. Teachers ICT skills could be made a Ministry Key Performance Indicator (KPI) and tracked with OpenVEMIS, as part of overall professional development. Those in need of training would then be identified and selected for training, and targets for teachers with the ICT competency can be set for schools. A basic ICT skills training course that includes ICT in teaching and relates to all content areas must be incorporated into mandatory teacher education as part of the qualification process. The same course should be made available by distance learning through the CLICCs and other outlets.

Key Recommendation 2: The stakeholders of any renewed programme need to invest more in the communities to identify and prioritise local needs and identify key programming linkages. This must be a participatory process, for instance with community mapping. This would require coordination with the programming partners including NGOs and government departments (e.g. health, agriculture, women's development, business development) and the Provincial Education offices. The aim should be to provide a few leading applications in demand from the community, whilst also supporting open-ended capacity building for digital capabilities and encouraging innovation.

Recommendation 1: For *secondary schools* the priority should be to support those schools with the greatest need that do not have existing computer labs. Those with existing labs easily integrate the new CLICC facilities but the net improvement may not be best optimised over Vanuatu's student population.

Recommendation 2: For *primary schools*, computer labs should have sufficient PCs (at least 25) and attention is needed to share benefits more with neighbouring primary schools where students may become relatively disadvantaged.

Recommendation 3: To promote the use of e-learning resources in teaching practice more widely, MOET should consider classroom technology such as smart whiteboards or interactive projectors (as used in Fiji Muslim League primary schools to good effect, and which are popular with teachers). Wi-Fi should be extended to the classrooms.

Recommendation 4: ICT training in teacher education should go beyond mere computer skills and relate to teaching methods and content areas, e.g. with reference to the Technological, Pedagogical and Content Knowledge (TPACK) model.

Recommendation 5: It may be helpful for the Vanuatu government to consider some basic and accessible materials on information literacy and assisting students and people in general with how to evaluate the information they access online.

Recommendation 6: As a longer term goal, Vanuatu should consider how to support and strengthen information literacy capacities in schools, for instance by including the topic in teacher education and linking ICT and school library development.

Recommendation 7: As there is little awareness of information literacy, it is important that the Vanuatu Government provide some leadership to schools and communities. School leaders should also be made aware of this 'educational imperative' and should nurture a culture of information literacy across their schools, using the resources they have available.

Recommendation 8: There is undoubtedly a need for more and better quality e-learning and educational resources for teaching and learning and for student and teacher's research. The focus should be on providing an improved and better targeted collection of resources, and redesigning the gateway servers so it is easy to update and add new

content. This is something for MOET to consider, and they may also look at regional projects such the Kiribati tablet trial and take advice from USP's open education centre.

Recommendation 9: The generic open resources provided with the gateway servers may not be well aligned with local community needs. MOET and TVET stakeholders might consider a focal point to source and curate useful resources relevant for Vanuatu, including materials from all the government departments, NGOs and partners and build up a collection of open resources that could be made available both online and in offline form. OpenVEMIS has the potential to act as a portal for open educational resources.

Recommendation 10: School Principals should ensure the CLICC/TFS managers schedule basic ICT training for those teachers with the least skills, as a special needs group. These are the ones in danger of being left behind. This should also be monitored by Provincial Education Offices.

Recommendation 11: The CLICCs need to link to an official training accreditation scheme so that they can offer officially recognised courses with certificates.

Recommendation 12: The MOET should consider developing a school Internet connectivity policy (suggested policy areas are listed in the main report). School Principals also need guidance on Internet connectivity and the choices open to them.

Recommendation 13: Efforts should focus on maintaining the cooperation with the ISPs so that the existing broadband services and affordable plans remain available for schools across Vanuatu.

Recommendation 14: It is recommended that technical experts consider a centralised solution for filtering pornography. This could be in collaboration with the ISPs, with the use of a government gateway maintained by the Ministry of Education, or otherwise.

Recommendation 15: Awareness programmes for online risks such as cyber bullying, fraud and fake news should be extended to the CLICC schools and community meetings held with the facilitation of local leaders. The CLICC managers could also be trained and updated via the UAP email group and serve as local advisors.

Recommendation 16: The "one size fits all" model for the CLICC should be reviewed and consideration should be given to making the model fit better with communities and local contexts. For instance, in rural villages a more engaged model tailored around key needs and programming linkages may be most appropriate. In others, for instance an urban school, the ICT multimedia functions and the facilitated access to e-services may strike the best balance and innovation with technology can be promoted (targeting youth and urban unemployed).

Recommendation 17: An inventory of available e-services from government, the private sector, NGOs and others should be compiled and the partners should collaborate the make them available through the CLICCs, by providing training and guidance for the CLICC managers.

Recommendation 18: Community champions should be identified locally, who can work with the CLICC managers to help the facilities work better for their communities. Those persons, if properly supervised, can support the programme in other ways such as monitoring and research.

Recommendation 19: In particular, a single focal point is recommended taking care of provisioning, installations, technical support including helpdesk services and proactive monitoring. This may be the MOET or an intermediary organisation or programme.

Recommendation 20: Service level agreements (SLAs) should be made with the ISPs and equipment suppliers including arrangements and expected timings.

Recommendation 21: PCs seem to be the most reliable and suitable for CLICCs. All CLICCs should be provisioned with at least 25 PCs. The nComputing system should be avoided.

Recommendation 22: Schools should have the right to cancel their subscriptions and change their ISP if there are outages in the provision of the broadband as defined in the SLA (including issues such as towers affected by land disputes and platform changes).

Recommendation 23: The gateway servers should be redesigned and updated taking into consideration the lessons learned in this evaluation. In particular they should be easier to login to, simpler to install, should incorporate monitoring (logins, applications and content usage) and a simple means to add/upload new resources. The portal may also be optimised for younger students and tablets.

Recommendation 24: MOET should draw up a terms of reference or job description for the CLICC/TFS managers and provide guidance on minimum competences and qualifications. The role should include community engagement and not just IT teaching.

Recommendation 25: More than one person should be trained at each CLICC. The competency should be tracked with OpenVEMIS.

Recommendation 26: MOET should work with Provincial Education Offices to ensure that a suitable person remains engaged at each CLICC / TFS as supervisor and IT teacher. A focal person for the CLICC/TFS should be appointed at each provincial education office to oversee this.

Recommendation 27: More women should be trained as CLICC/TFS managers, who currently are predominantly men.

Recommendation 28: An updated training module and CLICC/TFS manual should be developed and institutionalised within the Ministry PD system. This should be accessible by distance learning and as a face to face course by a Vanuatu provider. It should go beyond technical operations and include community support.

Recommendation 29: The MOET may consider collaborating with existing programmes that promote youth innovation with technology for both girls and boys and marginalised groups such as unemployed urban youth.

Recommendation 30: The advice given previously on building capabilities of groups based on their needs and linking them to programming (Key recommendation 2) should especially be applied to women. Identifying and working with women's clubs may be a start. CSOs with programmes for women especially those already working with the communities should be invited to collaborate.

Recommendation 31: CLICCs should provide an environment that is more tuned to open learning, which also suits women's preferences. Cyber cafe-style kiosks should be avoided. Women leaders should be invited by the management to evaluate the facilities and give feedback for improvements.

Recommendation 32: MOET should provide guidelines to schools on student levies for the CLICCs and TFS facilities. The guidelines should prevent exploitation of the resources and students but should also allow some incentives or for innovation.

Recommendation 33: As many schools' budgets are controlled by communities, it is essential that community concerns are addressed by management. Support from the community may be removed if communities do not perceive real benefits for students and the community.

3. Methodology

The approach followed is known as "realistic evaluation", designed to identify not only the outcomes but how they were produced and the wider contextual backdrop. Realistic evaluation recognises that theory is important and refers to the policy background but also that programmes deal with real problems rather than social constructions.

From this perspective, the timing of the field work a few months after the end of the initial two-year subsidised phase is favourable to the evaluation, as it would bring any problems with sustainability to the fore.

The methodology was both qualitative and quantitative involving structured interviews of school, committee and community members.

In order that a consistent data set would be produced that could be easily manipulated in the analysis and for consistency between sites, the interviews were rendered for use with the SMAP mobile phone-based field tool. The questions required a mixture of fixed and open-ended text responses, including selection from lists and multiple choice. This allowed for quantitative analysis. The approach was not limited by the structured questions but allowed for drawing out richer information where indications pointed to useful lines of enquiry. For instance, longer note taking and "off script" interviews.

Based on the results of a piloting exercise at Eles Centre School, Nguna, on 22nd March 2018 and the consultations with stakeholders, structured interviews were designed for each of the following mixed groups:

1. School administrators (including the administrating teachers, senior members of the school board or management committee and the IT teacher or primary staff member responsible for the CLICC.
2. Subject teachers.
3. Individual parents and community members.

A fourth "online questionnaire" based on the teachers' interview was also prepared and emails sent to all the other CLICC/TFS schools sharing the link and inviting all teachers to complete it.

All questions were translated and the interviews conducted in Bislama by the ni-Vanuatu field work team.

Comparisons between the responses from these groups would be likely to uncover contextual issues from which useful lessons could be learned. This led to a field work plan including a fairly large number of sites, 11 of the 19 originally participating schools.

The full list of questions for each of the three main interviews is attached in Annex 4.

Informed consent was built in via a prepared statement that was read out at the beginning of the interviews, and the informant's verbal consent was registered before the questions could proceed.

4. Field work summary

4.1 Schools visited (study sites)

A table of the study sites visited by the evaluation team is shown below. Each school is shown with the particular variant of the CLICC/TFS programme installed there (provisioned), the broadband service type and the status of the Internet connection at the time of the field visits. The notes below clarify the equipment installed at each site.

More information and a map of all the CLICC/TFS sites is included in Annex 4.

School name	Provisioned	Service	Status of connection April 2018
Eles Center School	Solar power CLICC (v1)	Fixed wireless	Up, subscription renewed
Loukatai Primary School	High power CLICC (v3)	Fixed wireless	Up, subscription renewed
Tafea College	High power CLICC (v3)	Fixed wireless	Up, subscription renewed
St. Anne Primary School	High power CLICC (v1)	Fixed wireless	Down, cyclone damage 3/2017
Matevulu College	High power CLICC (v3) & TFS	VSAT	Replaced, using TVL 4G modem
Merei Center School	Solar powered TFS	VSAT	Up, subscription renewed
Sarakata Primary School	High power CLICC (v3)	Fixed wireless	Up, subscription renewed
College d'Orap	Solar powered CLICC	Fixed wireless	Down, ISP tower issue
College de Walarano	Solar powered CLICC	Fixed wireless	Down, ISP tower issue
Lambubu Primary School	Solar powered CLICC (v1)	VSAT	Down, intermittent fault with VSAT and financial reasons
Epi High School	Solar powered TFS	Fixed wireless	Up, subscription renewed

Table 1. The schools visited for the field research

Notes:

(1) **CLICC (v1)** is provisioned with 10 nComputing thin client terminals
(2) **CLICC (v2)** is provisioned with 25 laptops
(3) **CLICC (v3)** is provisioned with 25 PCs
(4) **TFS** is provisioned with 50 7-inch tablets preloaded with standard set of educational apps
(5) **All schools** are provisioned with gateway servers with "local cloud" of education resources and applications
(6) **Fixed wireless** is a point to point dedicated broadband solution (2 or 4Mbps each, dedicated)
(7) **VSAT** is a satellite broadband solution (12 Mbps shared between all the schools with VSATs)

4.2 Field Interviews

The field work took place between March 22nd and April 27th, 2018. The schedule with the breakdown of persons interviewed and researchers interviewing is shown in Table 2 below.

A total of 63 structured interviews (each taking up to an hour to complete) were conducted plus 35 off-script interviews. As there were a few group interviews, the final total of persons interviewed was 104. Purposive and convenience sampling was used.

All interviews were carried out in Bislama language by a team of experienced ni-Vanuatu social science researchers with recent Vanuatu rural field work experience who are expert SMAP users. The team provided by Port Vila-based Natora Consulting was made up of three females and one male, and the lead evaluator joined the team at some of the sites. Each school visit was carried out by at least 2 interviewers who debriefed together after each day and compiled notes on emerging themes. This daily summarising, review and consideration among the team members was an important preliminary in synthesising and analysing the data and information.

Date	School	Field Researchers	Structured interviews			Off-script interviews
			Administrators	Teachers	Parents and Community	
27/3	Eles	DL, HT, SO, HB, SV				3 school admin 2 teachers 4 community
10/4	Loukatai	DL, HT, SO, HB, SV	3 (1 interview)	1	5	1 teacher
11/4	Tafea	DL, HT, SO, HB, SV	3	3	2	
13/4	St. Anne	DL, HT, SO, HB, SV	-	2	1	4 community
14-16/4	Matevulu	DL, HT, SO, HB, SV	1	8	-	2 school ancillary staff
15/4	Merei	DL, HT, SO, HB, SV	1	4	4	2 community
16/4	Sarakata	DL, HT, SO, HB, SV	2	6	1	1 teacher
18/4	Orap	SO, HB, SV	2 (1 interview)	-	-	2 teachers
19/4	Walarano	SO, HB, SV	-	5	2	1 school admin 3 community
20/4	Lambubu	SO, HB, SV	2 (1 interview)	1	1	3 community
25-26/4	Epi	SO, HB	3 (1 interview)	5	1	2 senior students 1 primary school teacher
	Other	DL, SO, HB				PEO Sanma Education, 2 School Support officers , Malampa Education
Total			17 (11 interviews)	35	17	35
Total number of persons interviewed in the field = 104						

Table 2. Field Interviews

The administrators group included Principals and Deputies, other admin staff, CLICC supervisors and members of the school council. These people may also have other roles. For instance, teachers can be parents of students at the school and live in the community.

The 3 groups of interviewees given the structured interviews are broken down as follows.

4.3 Administrators Group

17 school administrators were interviewed, comprising 9 Principals, 1 education officer, 4 supervising IT teachers, 1 CLICC assistant, and 2 financial officers. Of these, 13 were male and 4 female with average age of 37 and age ranges between 22 and 51. In the off-script interviews we interviewed a number of school council and committee members.

We also interviewed the Provincial Education Officer, Sanma, and 2 School Support Officers, Malampa Province.

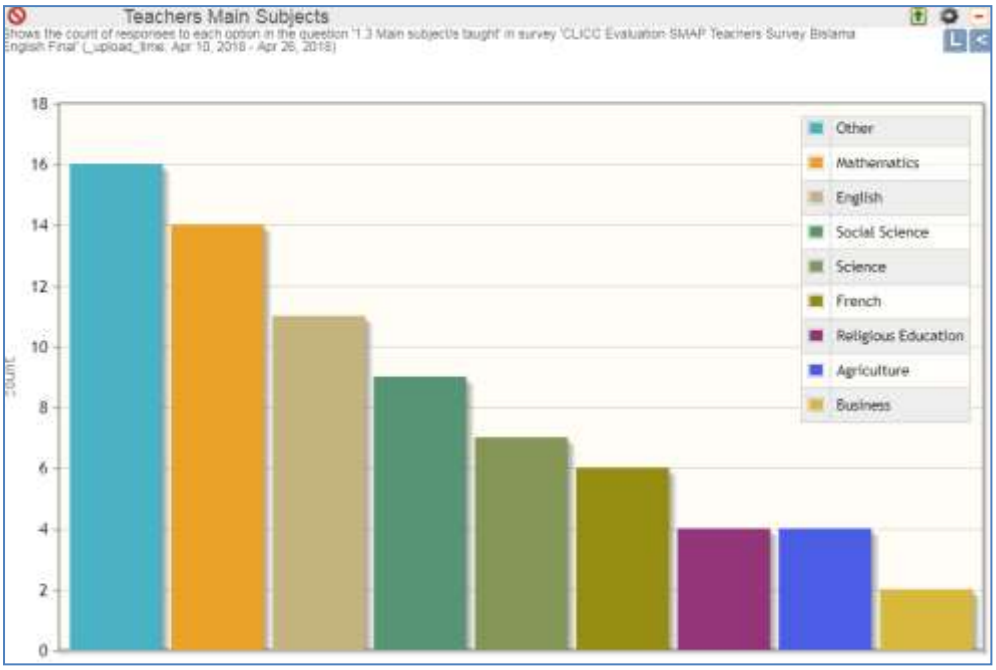
4.4 Teachers group

The teachers interviewed comprise a fair balance of primary and secondary level, teaching subjects and ages. Twice as many male teachers as female were interviewed, due to their availability.

35 teachers were interviewed, of whom 23 were male and 12 female. The average age was 37. Age ranges of interviewees were: 20s (8), 30s (17), 40s (5) and 50+ (5). All but 6 had been teaching at the school during the entire programme and the average years teaching at the school was 5. Average teaching years since qualified was 10. Almost all were resident at or very close to the school.

Of the 25 interviewed in this group, there were 14 primary teachers, 16 secondary teachers, 1 training teacher, 1 acting teacher, 1 kindy teacher, 1 Principal and 1 Deputy Principal.

Teachers main subjects are shown in Fig 1 (bearing in mind teachers teach multiple subjects, especially primary).



Other subjects:

Accounting
Agriculture
Arts
Basic computing
Economics
General Studies
Geography
History
ICT
Technology

Fig 1. Teachers interviewed : main teaching subjects.

4.5 Parents and Community group

17 members of the community were interviewed formally, plus another 13 informally (or "off-script"). Of the 17 interviewed formally, 11 were female and 6 male. Ages ranged between 21 and 74 and average 36.

Such persons can have multiple roles in regard to the school. We asked them their main role, and additional roles or relationships that they held. For instance, an ex-member of a CLICC committee was also a parent of a student at the school.

The roles of community members interviewed in full, including the off script interviews, is shown below.

School community	Type of school	Roles of community members of relevance to the programme
Eles	Community school on a small island	Bungalow owners Chief Ex-Committee member Mamas Computer Club member
Loukatai	Community school situated on main road on Tanna	Young woman doing computer training at CLICC Principal and teacher from Middlebush Senior student Community volunteer - Consumer Champion, child protection, research Church leader A school support officer from Tafea education (interviewed as admin)
Tafea	Secondary school located in central Tanna somewhat isolated	Community member Relative of teacher
St. Anne	Well embedded primary in a large mostly Catholic and Francophone community. Adjacent to secondary school.	Health worker Former Committee Member Parish Council member Bungalow owner

		Staff at National Bank of Vanuatu branch
Matevulu	A secondary school that is isolated from any villages	Boarding master Dresser (Health)
Merei	Rural village school, where there is no reliable mobile Internet access	Chair of Council as of this year and senior elder NTM church Health worker Parents of students at school USP student living in the village
Sarakata	Urban primary school in large town	Parent of student at school
Orap	College situated with surrounding communities	[community not allowed access]
Walarano	Well embedded community based college	Health worker Parent of student at school Member, School Council Chair, community health centre Bungalow owner Community member
Lambubu	Remote rural primary school, somewhat distant from surrounding communities	2 Chiefs Community member
Epi	Community school situated in populated area close to airstrip and facilities	Current community leader and former member of parliament for Epi 2 senior female students 1 primary school teacher

Table 3. Roles of parents and community members whom we interviewed

4.6 Online teachers survey group

Only 5 online interview responses were submitted (Ambaebulu, Eles (2), Tafea and Lamap). It should be noted that some of the schools do not have renewed connections and teachers may not have email access. There was an ongoing crisis on Ambae owing to volcanic eruptions and all three CLICC schools there were affected.

4.7 Physical data

A physical inspection of the CLICC facilities was made at each site with photographs taken, and notes taken on the geographical situation of the CLICC, financial and utilisation data and any systems in place such as timetabling, usage policies, charges and rules. Timelines were established for the CLICC or TFS at each school, with important milestones that could affect the impacts for education and community.

4.8 Consultations with stakeholders

A consultation of stakeholders was undertaken between March 15th and 23rd, 2018. The list of stakeholders consulted is given below.

1. Ministry of Education and Training (MoET)
2. Ministry of Agriculture (MALFFB)
3. Agence Universitaire de la Francophonie (AUF)
4. Presbyterian Church
5. Office of the Registrar of Cooperative & Business Development Services
6. Ministry of Health
7. Pacific Group Ltd
8. Department of Strategic Policy Planning and Aid Coordination (DSPPAC)

9. Ministry of Internal Affairs (MIA)
10. Vanuatu National Statistics Office (VNSO)

Digicel Vanuatu Ltd and Kacific Broadband Satellites were consulted via email.

The Office of the Government Chief Information Officer (OGCIO) was contacted to request a consultation but despite follow up requests this did not eventuate. AUF was consulted but (quoting policy reasons) were unable to give us any specific information for this evaluation concerning their collaboration with the programme and their experiences in providing educational services through the CLICCs.

4.9 Limitations

A risk for the evaluation was in scoping the study too broadly. The ToR contains a significant number of areas for enquiry, each one of which could be the complete subject of an evaluation. For instance, the ICT skills of teachers are obviously a factor in the performance of the CLICC model. However, a survey of this across all the sites and relating it to teacher education and recommendations for future strategies is a major task of its own. This evaluation will therefore focus on the impacts at the school and community level.

There are ethical and technical issues with interviewing children and students under age 18. Firstly, it is essential to obtain fully informed consent from parents. Secondly, specialised technical instruments would be required to avoid biased responses. We felt it would be impracticable to address those given time and resources available. However, we did interview a few senior students informally and they provided useful information.

The initial plan proposed that group discussions (focal group meetings) would be held and significant change stories collected at participating schools. In practice, we anticipated some challenges with such activities following a preliminary survey conducted by TRR officer Mrs Hanson Waki in November 2017. Mrs Waki recommended that prior arrangement should be confirmed with the schools regarding whom to meet and talk to, and that TRR staff should not conduct interviews because of the risk of positive bias in the responses. Her advice was noted in two ways:

> Firstly, detailed requests were send out to the selected schools for the field work. However, only a small number of these requests were promptly responded to, despite follow up attempts by TRR on behalf of the evaluator. We recognised the role of the Provincial Education offices in coordinating, and for example the Malampa PEO was informed in advance of the field work but even so, we encountered poor awareness of the evaluation visit and in one case most of the teachers absent, explained to the field team as due to it being pay day. This mainly affected three schools that had not renewed their Internet connections were in poor mobile coverage, and some of these difficulties can be put down to poor communications. We were therefore prepared to be flexible and to conduct interviews with whomever was available at the time.
>
> Secondly, we noted the forewarning about social desirability bias (the feeling that one should give a rosy picture). It would be inevitable that even though the evaluation team are independent, the team would be seen as associated with TRR and the official Vanuatu Government stakeholders. For this reason, we emphasised the need for triangulation (comparing data from different sources) and the role of the experienced ni-Vanuatu research team to capture a wide range of significant opinion through their sensitivity to context and working in Bislama language.

Other limitations for the evaluations included:

- Time and Resources: we were constrained in the data gathering by the time available.
- As noted in the DFAT evaluation standards, a single interview can only reasonably cover four or five areas. Even with the narrowing of the scope, we still had a very broad subject. The evaluation took this into account

with the methodology as described, relying on structured, specific questions that can be collected methodically with SMAP and by initially working together, with daily debriefs.

- Longitudinal evaluation: There was no on-going M&E framework with regular reporting against agreed indicators of educational and community impacts of ICTs in place. There were also no significant baseline studies against which the evaluation data can be compared. It would have been useful to also conduct a case study component to the evaluation, in which one or two schools could be observed over a period of time. However, time and resources to not allow both for this, and for the detailed surveys of a large number of sites. The latter was regarded as more important in terms of learning what is happening overall, with the collection of change stories to give more longitudinal information.
- During the time of field work Ambae volcano was erupting and it was not possible to visit the three CLICC sites there (which include an RTC). We had planned to visit Arep but the flight schedule was changed at the last moment ruling it out.
- Language is also very important. For honest responses, questions needed to be translated into Bislama. This is a skill and a task that takes time.

5. Detailed Analysis and Discussion

The CLICC and TFS facilities are school-based community Internet access centres. Although evidence shows that the CLICC and TFS facilities can cater for the different needs of their schools and communities, they are not being utilised as effectively as they could be and not always in the ways they were intended. This is particularly so in the case of benefits to the community beyond the impacts on their schools. In addition, technical problems experienced by some of the centres have limited the potential benefits at times.

There are specific instances where the model shows it can work very well, with educational benefits at the primary and secondary level, and social and economic benefits for the surrounding communities. Furthermore, whilst financial sustainability is a concern for some of the primary schools, providing the facilities are operating and providing benefits to the school and that these benefits are understood by the school leadership, the broadband and other operating costs are perceived as affordable by the schools.

However, there were also a wide range of barriers and exclusions that are limiting the potential of the centres. These barriers may stem from weaknesses in the model or from contextual factors. Nevertheless, they are certainly not insurmountable and could all be addressed in a suitably revised programme. This is especially the case given the origins of the programme as a response to the national ICT policy enjoying the backing of all the major stakeholders.

The contextual factors are of great interest to the evaluators as these illuminate the barriers to access. The timing of the review, taking place after the funding support from TRR had ended, allowed us to identify some of the issues around sustainability that consequently came to the fore.

We observed that some of the school administrators seemed to be 'marketing' the benefits more than perhaps is justified. At least, the views of some of these representatives do not seem to be consistent with the rest of the teaching staff. This is why it was important to talk to a cross section of people at each site. Many of the barriers to access were identified from contradictions in the interview data. These are just as important to the evaluation as the stories of success.

NOTE: This chapter is necessarily lengthy due to the wide scope of the evaluation. However, it is hoped that the discussion will be useful for reference purposes, for any renewed programme and for those interested in the regional development of ICT in education.

5.1 Technical issues affecting availability and continuity

In this section the availability and continuity of the CLICC/TFS services are explored. This discussion mainly concerns the technical and operational aspects.

When the equipment for any reason becomes unavailable for a long time, after it has been set up and worked initially, it creates an expectation and a potential need in the school and community, that then goes unmet.

A lack of continuity was found across all the sites we studied. There may not have been a single reason, and in fact it was more common that a number of issues combined to result in the intended functionalities never fully being available.

These reasons included technical and human factors, leadership issues and lack of clarity over ownership. Continuity is also affected by external factors (such as cyclones) and strategies need to be in place to deal with all these risks.

The technical issues included availability (and quality) of broadband. The broadband service was in one case only available for 1 month of the 2 year programme. Other technology related issues included equipment that broke down and was not repaired and returned to the school for long periods, sometimes for months.

Human factors affecting continuity included the problem of retaining suitably trained managers at the CLICC and TFS centres. The facilities require skilled and knowledgeable managers who also act as trainers and IT teachers. The managers should not only have suitable qualifications and ICT knowledge but they must be committed and have the right attitude - they must be the "right persons" for this role.

5.1.1 Reliability and quality of broadband services

The CLICC/TFS programme aims to demonstrate how providing broadband to schools and encouraging their use as hubs for community access can contribute to the Government of Vanuatu's aim to maximise the benefits of ICTs for all citizens. For those benefits to be realised, a number of things need to be in place including provision of broadband, access devices and a meaningful, enabling environment for the purposes of school and community.

The starting point is that the infrastructure and equipment must be functioning and maintained and that there is a reliable broadband service. We first looked at the percentage of the programme period that each CLICC/TFS facility had access to broadband with evidence of it being utilised. This data is readily available from the ISP data provided by TRR and the findings are summarised below.

School	Service type	Average data p.m. (GB)	Number of months available	Comments
Eles	Fixed wireless	92	22 (100 %)	
Loukatai	Fixed wireless	44	18 (82%)	An outage of four months was due to an antenna problem. The IT teacher reported unreliable connection at Loukatai and poor support from the provider..
Tafea	Fixed wireless	240	22 (100 %	
St. Anne	Fixed wireless	105	22 (100 %)	The Digicel antenna was moved from the CLICC to the AUF lab at the High School. Cyclone Cook (April 8 2017) damaged CLICC building and equipment and it was not operational since then. If we take this into consideration, the Internet was only available at the CLICC facility at the primary school for around 12 months (54%).
Sarakata	Fixed wireless	70	21 (95%)	There was a short outage but generally there were no issues with Internet service.
Orap	Fixed wireless	0	1 (5%)	

Walarano	Fixed wireless	50	11 (50%)	A land dispute resulted in the Digicel tower that supports these two centres being turned off. Cyclone Hola in early 2018 caused additional disruption to the network.
Epi	Fixed wireless	132	22 (100 %)	Although data service was recorded for all 22 months, the school reported a short outage of less than a month following Cyclone Cook when the Digicel tower was damaged but quickly repaired.
Matevulu	VSAT	341	15 (68%)	These centres were affected by a planned outage between Nov 2016 and Feb 2017 for a change of VSAT infrastructure required by the ISP. In the case of Merei, the school received less timely support for this changeover, and was consequently offline for two additional months. Lambubu school also suffered due to remoteness and lack of technical support from the provider.
Merei	VSAT	89	11 (50%)	
Lambubu	VSAT	158	16 (73%)	

Table 4. Internet availability at the study sites during the programme 2016-2017
Note: Uptime calculated from each month where data transfer was observed, over the 22 months of the service. .

The subsidised Internet ran for 22 months starting with the installation of the broadband connections in February 2016 and the percentage uptime indicated above is based on records showing data transfer for each month (i.e. the estimate is generous, as outages of less than a month are not considered).

Obviously, reliable broadband is essential for the centres. In general we can rely on the network growth and improvements of the ISPs for improved service reliability. However, there is concern regarding sustainability of rural VSAT infrastructure without timely support or service level agreements (SLA), especially because of the disruption caused by the frequent cyclones affecting Vanuatu.

As the expected benefits of the programme were dependent on the broadband, it is important to point out that only 4 of the 11 study sites enjoyed fully available Internet at the designed capacity throughout the programme, or 3 if we do not include St. Anne, where the connection was moved from the CLICC to the High School. Both fixed wireless and VSAT links were affected by quality issues and outages.

In can be seen that the fixed wireless service was generally more available than the VSAT and any damage to the core infrastructure (i.e. mobile towers) was fixed in a more timely manner. The main reasons for outages were cyclones (especially Cyclone Cook), external factors including a land dispute and a one-off platform change for the VSATs that resulted in a 4-month outage. The data shows that despite VSATs being often touted as more resilient in case of cyclones as they do not rely on terrestrial infrastructure, the downside is that once damaged or in need of maintenance, it may be a long time before support reaches them. In comparison the CPE for fixed wireless is quite simple and if displaced can often be fixed using local resources.

At Loukatai school, the IT teacher advised that they had problems with the reliability of their connection for the whole programme duration, including a four month outage. This is reflected in the usage data - the school has the lowest average for all the schools in the programme despite being online at least some of the time for 18 months of the 22 month-programme. At one stage he resorted to using a TVL modem as an alternative. They also reported "bad network" at St. Anne for the initial months in 2016 (the data shows low data usage for march and April, but by June they were exceeding 150GB/month).

At Lambubu school, the ISP failed to provide essential maintenance for the VSAT promptly resulting in a slower and intermittent connection throughout 2017. The data shows that they maintained an average of 62GB/month during 2017, but the users experience was of a reduced quality and unreliable service.

External issues such as land disputes can also affect coverage, as happened with Orap and Walarano colleges. In the case of Orap there were alternatives, but the school may have felt locked in to that service. Some flexibility with alternative providers as backups may be useful. The Kacific Ka service expected in 2019 may be a significant option as the small terminals are low cost and can be fitted quickly and easily and provide a service anywhere in Vanuatu.

Choices made by the schools can also have impacts on usability. The decision made at Matevulu College to switch from their Telsat VSAT service to a 3/4G solution (that was hardly cheaper than the Telsat service) resulting in drastic reduction in Internet speed and reliability. This was reported by almost all those we interviewed there.

5.1.2 Configuration issues

Even when the broadband was available, incorrect configuration of the technology presented barriers to the users.

The CLICC/TFS system design was quite specific. It was intended that all users whether using CLICC computers or their own devices would access the Internet via a gateway server, accessed through a captive portal where a local e-library of resources was also available. This "local cloud" included open source educational resources and applications such as Owncloud and Wordpress. Even when the Internet was available, many of the facilities were never fully configured in this respect until late in the programme. This was seemingly due to poor coordination between the multiple contractors responsible for various parts of the system.

Firstly, the gateway servers are equipped with a system that controls access to the Internet by requiring users to log in with prescribed usernames and passwords[1]. This system did not work as intended at many of the CLICC/TFS sites for two reasons. The first reason is to do with programme implementation. The servers required a particular matching of configuration with the head-end routers that were provided and installed by another contractor. Confusion over this persisted throughout the programme, resulting in schools being unable to access User Manager to manage user accounts (only the default shared accounts for teachers and students and their original passwords were available). The User Manager training that was included in both the original workshop and the refresher training was therefore to no avail.

In addition, it appears that the contractors who installed some of the CLICC/TFS facilities were not aware of the single gateway design and in several cases the head router's Wi-Fi was set up as an alternative gateway, secured with a wireless password and with an SSID that implied it was the main gateway for the school. This will have misled users to bypass the gateway server and the local cloud resources, unaware of them and their potential benefits.

The end result is that in practice there were unnecessary barriers for users in accessing and benefiting from the educational content and applications in the servers. The issue could be addressed by any future programme by redesigning the server with a simplified authentication system and a good instruction manual written for the CLICC managers and their assistants using uncomplicated language.

5.1.3 Reliability of computing equipment and issues with technical support

Hardware issues were evident at several schools. For instance, by the time the field team visited in April 2018, the Internet and many of the computers were not working at the three Malekula study sites. Table 5 below gives a summary of the hardware issues at the study sites.

We observed that the schools were looking after their computing equipment with great care. However, there is reason to question the suitability of some of the technology selected for the CLICCs.

Whereas the PCs, Tablets and laptops had generally fared well and were in good condition, the sustainability of the more complex nComputing systems without sufficient support raises concern. In all the study sites where nComputing systems were deployed (and some of the other schools such as Ambaebulu), problems with the nComputing servers and the client devices were observed.

[1] The Mikrotik hotspot and User Manager application is built into the gateway servers, which allows the administrator to create individual or shared accounts for users and change passwords easily, plus a range of more advanced features such as user profiling with ability to limit access by time, data and speed

The obvious vulnerability with a thin client system such as nComputing is that when the server goes down, all the terminals become unavailable until it is fixed. With the complicated logistics and costs it can put the facility out of action for weeks for those with no laptop or other device available. On the other hand, we noticed that the PCs and laptops seemed to be all working after two years of use. Modern PCs and laptops are much more efficient than before, and the electrical consumption advantage of a thin client is less clear.

School	**Computing equipment provided by the programme** (in addition to networking)	**Power**	**Description of technical issues**
Eles	10 terminal nComputing system Gateway Server	Solar	nComputing server "broke down" in October 2016 and was not functioning until early 2018 but only 7 of the 10 terminals are working.
Loukatai	25 PCs & Gateway Server	Grid	Gateway server was disconnected by the IT teacher at end 2017, for unknown reasons. Reconnected April 2018.
Matevulu	25 PCs & Gateway Server	Grid	All equipment working and in good condition
Sarakata	25 PCs & Gateway Server	Grid	All equipment working and in good condition
Merei	48 Tablets & Gateway Server	Solar	Tablets in good condition, all are working but 2 can't access the network.
Walarano	25 PCs & Gateway Server	Solar	Poor lab conditions. The solar power developed a fault and was not working from May 2017 until now. Unelco power was connected in mid 2017 until Cyclone Hola shut down the power in early 2018.
Lambubu	10 terminal nComputing system Gateway Server	Solar	nComputing issues started mid 2017 and were repaired by the supplier after approx 2 months. The nComputing system broke down again early in 2018 and is still not returned.
Epi	48 Tablets & Gateway Server	Solar	The equipment was working throughout the TRR programme but the gateway server failed early in 2018 and there are no replacements available.
St. Anne *	20 terminal nComputing system Gateway Server	Grid (local)	Cyclone destroyed all equipment in April 2017. Internet connection moved to the high school to allow AUF services to continue.
Tafea *	20 terminal nComputing system Gateway Server	Grid	All equipment working and in good condition. Gateway server temporarily removed in 2018 for maintenance.
Orap *	18 laptops & Gateway Server	Solar	Computer lab and all equipment in good condition. However, without an Internet connection[2]. Unclear if server was being used but the Deputy Principal reported it was in Sept

Table 5: Provisioning of CLICC/TFS schools and description of technical issues experienced 2016-2017
(* these schools were supported by AUF)

Regardless of the official arrangements made between TRR and the suppliers, at many of the schools there did not seem to be clear information provided regarding who or where they should go to have equipment repaired. There was a clear difference in the level of support available to the three schools supported by AUF and the remaining schools.

Where a good technical support arrangement was in place, there was less disruption. The "AUF" schools had a single point of contact for technical support with AUF's very capable IT engineer, no doubt motivated by AUF's interest in keeping their services going. When Tafea College had minor issues with the nComputing systems they received prompt support and there was no disruption. However, when Lambubu and Eles schools had problems with their nComputing servers, it appears they sent their equipment back to two different sources of technical support and the equipment was not returned for inexplicably long periods of time.

Lack of spares were also an issue. This particularly applied to the gateway servers, which were actually quite low cost in terms of hardware, but the customised equipment was not available off the shelf. It would have been prudent to keep several in stock that could be immediately shipped out should any schools report a fault. The simple wireless access points (Ubiquiti Picostations) also proved somewhat unreliable with a few failing, and difficult to replace with

[2] It was unclear to the field team if the local server resources were available, but in September 2017 the Deputy Principal reported that it was at that time.

suppliers often offering inappropriate types. The server software can run on any hardware with the right architecture and is open source. Improvements should be made so that it is easier to install on locally available hardware by local support companies. These could be combined with general improvements to the features and content, informed by this evaluation.

The importance of schools taking their responsibility to look after the equipment was highlighted by one school support officer and ex-Principal of one of the Santo schools. She said that the facilities must be located in strong cyclone resistant buildings with air conditioning, and explained how she had always made sure the equipment was covered with a tarpaulin as any cyclone approached, for additional protection. This issue was also emphasised by a church education officer, and the consequences of this policy not being followed were all too evident at St. Anne school and another Malekula school where the team found very dirty and untidy conditions and signs of neglect. However, in general, especially where the facilities were active, schools did their very best to look after the computers. The TFS schools generally used sign-out books with the condition of the device noted when checked in.

Power issues were identified as significant. At St. Anne the school was technically on a grid, but in reality the Port Olry community's generator power is only available in the mornings and evenings, leaving the school reliant on a small generator (with possibly unstable output damaging to IT equipment) and with the added fuel costs for providing access in the afternoons when most convenient for students and community.

In general the solar power systems provided appeared substantial and well installed, but a problem did develop at College de Walarano in May 2017 that has not been repaired since. The CLICC at this school was therefore unavailable until Unelco power arrived in July 2017 fortuitously. When Cyclone Hola shut down the Unelco power in early 2018, the faulty solar power system could have been a useful backup if it had been fixed.

5.1.4 Summary of technology issues

If one takes into consideration all of these issues, none of the 11 schools evaluated were installed, configured, provisioned with broadband and maintained fully working over the full programme duration. The closest that we found to fully available operational centres were at large well resourced secondary schools that had government salaried IT teachers closely maintaining their labs and in one case also supported directly by AUF.

Of the smaller schools, Sarakata demonstrated the most consistent approach, although as an urban school it has advantages. The remote rural schools struggled with complex IT equipment. It may be a point to make that tablets seem to be easier to keep going, although other issues need to be addressed as discussed below.

When the equipment stops working for a long time, after it has been set up and worked initially, it creates an expectation and a potential need in the school and community, that then go unmet. For instance, given the fact that the CLICC equipment in Malekula was not working well in most locations, this created a particular set of concerns. For example, one woman interviewed needed to finish a course that she had signed up for, but when the system went down, she then had to travel to Norsup to complete the course or risk losing her money and grade.

We had the sense that more coordination and support is needed for the CLICCs in general. This has likely had an impact on sustainability and maintenance of equipment and skills.

On the other hand, the close working relationship with AUF had a positive impact on technical support, as evidenced at Tafea College and in contrast to the schools without the AUF relationship. This demonstrated the role of AUF as an active service provider in maintaining access to their programmes, in this case educational programmes.

5.1.5 Recommendations on broadband provisioning

The Government of Vanuatu is creating optimal conditions for the growth of the telecommunication sector through the UAP and policies. We can expect the trend of network growth and improvement to continue, including faster and more affordable broadband across the country. We can also expect more sustainable satellite broadband solutions for those areas un-served by terrestrial networks, such as the upcoming Kacific service expected in 2019 that will come with small, low cost and easily installed terminals[3].

Once fully available as intended, the broadband was appreciated and we did not come across any complaints regarding the designed capacity of the broadband services. The data usage records show an impressive capacity enjoyed by all the schools when it was fully functioning, with up to 940GB in one month being downloaded at one school.

From this experience we can draw some information about broadband standards for schools. The bandwidth allocated to each school was effectively 2Mbps for small schools and 4Mbps for some of the larger schools or urban schools where more demand was expected. The six schools in the CLICC programme using VSATs shared 12Mbps dynamically, but in effect if all sites were downloading equally they would be on 2Mbps.

The author has developed broadband targets for schools for a DFAT-funded Access to Quality Education Programme in Fiji, as shown in Table 6 below. The full argument developed from considerations of similar recommendations in the UK, Australia and elsewhere may be accessed from the AQEP report[4]. The targets are delineated with a lower target for 10% of schools in order to realistically allow for very remote schools that may require more expensive satellite broadband.

School		**2017**	**2022**	
Secondary	90% of schools	10 Mbps / 2.5 Mbps	40 Mbps / 10 Mbps	Dedicated/unlimited
Primary	90% of schools	2 Mbps / 512 Kbps	10 Mbps / 2.5 Mbps	Mobile or dedicated
Secondary	Remaining 10%	1 Mbps / 256 Kbps	5 Mbps / 1.5 Mbps	Dedicated/unlimited
Primary	Remaining 10%	256 Kbps / 64 Kbps	1 Mbps / 256 Kbps	Mobile or dedicated

Table 6: Suggested broadband targets for Fiji schools (Leeming, 2017)

The bandwidth allocation for the CLICC/TFS schools compares reasonably well with these suggested targets for Fiji schools, and the users experience was reportedly good at the CLICC sites with highest utilisations and most active computer labs (i.e. Matevulu and Tafea).

We can therefore say that undoubtedly one of the outcomes of the CLICC/TFS programme is that it has advanced the nationwide availability of affordable broadband solutions for schools that meets required standards. We have seen that where the overall conditions are supportive, both small primary schools and larger secondary schools are renewing their connections and that both of the solutions developed for the programme by Digicel and Telsat are continuing to be available for an affordable price, and other providers such as TVL also expanding their networks.

[3] Kacific reported to us that the major difference with the new Ka satellite service will be the volume of bandwidth available to make this possible on a much larger scale. Kacific will have 2Gbps over Vanuatu alone and Ka will allow smaller terminals which will mean it will be cheaper, easier and faster to deploy.

[4] Leeming D., School Internet Connectivity Study, AQEP, Fiji. Published by DFAT, 2017

Efforts should therefore focus on maintaining the cooperation with the ISPs so that those services and affordable plans remain available. Secondly, effort is needed to find ways of providing more sustainable technical support, especially in rural and remote areas where it can be very costly for ISPs to send engineers.

In regards to rural areas out of range of the terrestrial networks, Kacific confirmed that the model currently used by the schools which have renewed is open to any new schools. The local provision is not limited to Telsat, as any ISP can purchase bandwidth from Kacific at the wholesale level and provide the service and associated support to schools. As the Ka terminals will be smaller and cheaper than the currently used 1.2m Ku ones, they could also be used as emergency spares, backups and for diversity.

As 3/4G LTE coverage reaches more and more of the country, "fixed" mobile network connections will become increasingly viable for schools and are easily acquired without needing technical assistance. However, some guidance is needed for schools; for instance a mini "pocket WiFi" modem may be sufficient for 4-5 users and a limited number of uses such as OpenVEMIS, but will not support school-wide connectivity. Schools in weaker coverage areas may also need more robust CPE devices with high gain antenna, and integrated Wi-Fi. We have seen how lack of guidance on this impacted on Matevulu school, which did not renew the unlimited VSAT service but had subscribed to a TVL service using a 3/4G desktop modem. A mobile network can provide high speeds, but it is not dedicated access and service speeds may be slower in rural areas (although this will rapidly improve). The teachers we interviewed experienced a big reduction in the quality of service compared to the dedicated broadband. The variable performance was compounded by the weak signal coverage in that area and outages in poor weather.

As schools take up the costs and responsibility for managing their Internet connections, the issues around access control, user and password management become more important.

To provide a clear reference that addresses all of these issue, the Ministry of Education should consider developing a school Internet connectivity policy or minimum standards, with guidance for school Principals of the requirements. The key policy messages are:

- There are twin challenges in regard to school Internet provisioning. The first is to get connectivity to the school, and the second and equally important challenge is to ensure meaningful use of the connectivity (i.e. for teaching & learning). Therefore, the policy focus should not just be on broadband Internet but also on ICT adoption within schools.
- The connectivity within the school (i.e. local area network) is just as important as the connectivity to the school. Local area networks in small schools are most conveniently achieved using W-Fi and should be extended to all the classrooms.
- Guidance is needed for schools on suitable connectivity solutions and plans (i.e. P2P fixed wireless vs. cellular modem solutions, unlimited plans vs data capped plans and so on).
- Internet connectivity must be available whenever needed by whomever needs it for official purposes. This implies that power supplies (usually solar) must be provided if schools are off grid. Where VSATs are provided, the expensive resource will be wasted if there is no power to charge computers or the access is only available when the generator is turned on.
- The Internet subscription (plan), which is a finite resource, must be manageable - data balances and access to it must be visible to the school administrator and manageable by them.
- ICT adoption in teaching and learning requires appropriate technologies that make it easy to embed online resources into teaching. If the resources are only available in the computer lab, their usefulness for teaching and learning is limited.
- Consider making basic computer skills a minimum standard for teacher competency. This should be supported this in teacher education, and school Principals should encourage computer training for teachers as an option in in-service professional development.

- Teachers and students require new literacies to benefit from school Internet connectivity. These include digital and information literacy (discussed further in this report).
- Good monitoring is essential. OpenVEMIS can be used to track school Internet connection types and plans.

Broadband targets for schools, such as described above, can also be referred to in the policy.

5.1.6 Retention of skills and knowledge

A main concern raised by informants and observed by the team is the difficulty in retaining suitably skilled and knowledgeable supervisors to manage the CLICC/TFS and provide training and support. This was an issue when:

- The original trainees left or were transferred and their replacements were not suitably trained;
- Where those given the appropriate training did not have the prerequisite ICT skills, or
- Those trained were not sharing their skills and knowledge; informants described this issue as the need to select the "right persons" for the training.

Alongside the provision of equipment, resources and broadband, the CLICC and TFS facilities require adequately trained and knowledgeable facilitators on site.

The programme trained at least two persons per site, including IT teachers, head teachers and principals, and other regional/zone based education officers. This initial training consisted of a week-long workshop in Port Vila in September 2015, several months before the first of the schools had their facilities installed. A second round of training based at four hub schools, took place in September 2017, with at least two persons of each school attending a 2 day session.

The original 2015 training was designed as a blended package with the training modules and resources made available via a purposely created Moodle site which could be accessed by trainees as a refresher.

Also key to the programme is an online email community, a community of practice that serves as a main means of announcing news regarding opportunities, sharing experiences between schools and maintaining a sense of continuity and purpose.

Retention of knowledge and operating skills after the trained facilitator is transferred or becomes unavailable otherwise was raised as a concern. When a key person leaves, the knowledge of the CLICC is quickly lost. This seems to be a problem mostly concerning the primary schools, as the secondary schools have the advantage of existing government salaried IT teachers and a prior history of building and maintaining computer facilities and capacities for ICT in education.

This concern was raised by one primary school administration as the main issue affecting sustainability and the team observed the lack of capacity at other schools where the TRR-trained teacher or facilitator had subsequently left the school.

5.1.7 Need for the "right person"

Interview respondents also raised the issue that those trained did not always share what they had learned with others. This was frequently expressed in terms of a need to train the 'right person'. The 'wrong person', in contrast, would not share skills and knowledge with others.

Whilst training school principals and involving them right through the programme is essential given their overall role, it was apparent that they would not always be the best choice as managers of the daily operations. Utilisation appears

to be higher and the benefits more inclusive when that role is given to someone with the right IT skills and attitude, especially a commitment to training others.

Ideally, the role of the principal would be as an enabler, in nurturing an e-learning culture and empowering the dedicated supervising teacher in charge of daily operations. This positive dynamic was evident in the case of Tafea College. The principal said that the school highly values the innovation demonstrated by their IT teachers and wishes to support it. He was quite surprised how much the IT teacher has learned by himself from the Internet, "he really pushes forwards". The principal said that with the right people and resources in place, the school can "do the right thing for the students". The school has already extended the Wi-Fi range and plans to add a second computer lab using their own resources. The principal was also keen to facilitate the IT teachers' ongoing BSc. studies in IT.

At another secondary school, a different dynamic was observed where, as described by several interviewees, the TRR-trained principal did not take on the leadership role so actively. At this school the CLICC was blessed with the presence of a young and well motivated IT teacher and usage driven by the curriculum and high demand from the students and teachers. However, in contrast to the previous example, the principal had not passed on skills to the IT teacher.

One teacher at a school where the facility was supervised by the head teacher said that they lacked 'the right person' to help them to learn how to use the tablets and how to go onto the internet. She said explicitly that the TRR-trained principal was the 'wrong' person to be trained, and several people said he had not shared his knowledge or training with others who needed it. She said she was not sure why, "maybe he is too busy or doesn't want to", and added that whoever was going to teach them would need to be a 'helpful' person. The teachers who were using the equipment at that school were recent graduates and already had computing skills.

TFS schools that had no dedicated lab for using the equipment appear to be more prone to this issue as the resources would be usually under the control of one person, usually the head teacher. Having a dedicated space or lab available as a learning space to pass on skills is important. This is by default with the CLICC programme but not so with the TFS programme. A school library if present and in good condition would be a suitable home for TFS facilities, as this would link to the need for information literacy training.

These examples illustrate the challenge of embedding an ICT for education culture and the continuity of technical skills and knowledge to maintain it.

In contrast to the secondary schools with government-salaried ICT teachers, the smaller primary schools have to appoint their own IT teachers, usually on the minimum rate, to supervise the facilities. In some cases these are sourced from the community, but may not be able to remain in that role for more than a certain time. At Loukatai Primary School, for instance, an energetic and competent volunteer had been appointed IT teacher. As a TRR-trained teacher he had been very active in the UAP community and successful in developing training programmes for students and the public. However, he had resigned late in the programme to embark on study overseas. His replacement is also a good choice, having received formal computer training at CNS, but lacked the orientation and specific knowledge from the TRR training and was not a member in the UAP community.

Effectiveness of training was also raised as a concern. The trained people in several cases did not seem to know how to do basic things with the computer network including setting up passwords, troubleshooting basic information or even seeking technical support. This raised the question whether CLICC/TFS facilitators should be trained together (mixed groups) or segregated into more tailored trainings.

At many sites the researchers noticed gendered aspects of the IT space and the trained individuals. The persons trained to supervise the CLICC and TFS facilities were overwhelmingly male (i.e. only 14% of those attending the 2017 refresher training were female). Some of the CLICCs employed women as assistants, but few are fully engaged in the management of the facilities. There are some excellent senior female teachers who have taken great interest in the

programme and continue to offer guidance at a local level. For instance, the ex-Principal of one primary school who now works as a school improvement officer continues to provide guidance to not only her old school but all those in her zone and was very informative for the evaluation team.

5.1.8 Leadership

During the field work we observed a lot of variability in leadership. For optimal benefit, the support of the school Principal(s) is essential to nurture an ICT in education culture, to encourage uptake by teachers and support the needs and professional development of the ICT staff. This support was not always present. It seemed clear that some administrative positions in some schools may be politicised, and in some of these cases (there seemed to be two examples at least) the computer labs/resources may be leveraged more for personal political benefit than for student and community benefit. This politicisation also seemed to result in a situation where some administrators were saying very different things from the rest of the teaching staff.

5.1.9 Lack of clarity regarding ownership

One issue particularly unique to Vanuatu is the need to for equality of access to education in a bi-lingual system. The UAP programme had addressed this by partnering with AUF, who were given a contract to provision and provide support for six of the programme schools, three of which were study sites in this evaluation.

An unintended impact of this for the bilingual schools and communities can be the emergence of unspoken rules concerning who the facility is for. For instance, in one location where the school was Francophone, an Anglophone community member felt they could not access it "because it was for French students and teachers". The close relationship with AUF at the schools they were given responsibility for may have contributed to a perception that the CLICCs are for Francophone members only. This was evident on Tanna, and in a more limited way in Port Olry. At College d'Orap, the field team were told that community were not allowed access at all.

Politics between Francophone and Anglophone teachers were also evident. Some interviewees in bilingual schools reported that the CLICC was perceived to be for the use of the Francophone (and male) teachers mainly. The involvement of AUF in setting up and 'managing' the CLICC (the language used by a key stakeholder) may reinforce this resulting in the AUF courses being perceived as being higher priority for the CLICC than general community access.

5.2 Educational Benefits

In this section, we first look at the general educational benefits to secondary and primary schools. The evidence of benefits from improved access to e-learning resources is discussed, leading to a discussion of information literacy and the role of libraries and librarians. We then look at the schools experiences and benefits from ICTs for teaching and learning, and describe some alternative approaches from around the region. The benefits for individual teachers and school administrations are then analysed, concluding with a critical look at the issues around teachers ICT skills.

5.2.1 Secondary schools

In general, most of the computer labs in secondary schools where the Internet was available, allowing the labs to be fully utilised, were highly valued by the schools. They appeared well looked after and the qualified IT teachers in charge were able to keep the equipment working and maintained.

It should be noted that compared with primary schools, it may be easier for secondary schools to assimilate and incorporate such ICT facilities as they teach or aspire to teach ICT as a curriculum subject for upper year students. They generally have government-salaried ICT teachers with specific qualifications and training and knowledge of support networks.

Although it is impossible to prove causality, some of the secondary schools administrations claimed that improvements in student results were linked to the CLICC programme. For instance, Tafea College Principal said that results improved after the CLICC was installed, with a record 87 percent pass rate in the 2017 exams. Matevulu's Administrative Principal reported their best ever Year 13 results for 2017, with 64 of 96 qualifying compared to the past year with only 29 passing. In explaining these results, the school administrators point to the improved access to information and ability for students to research assignments.

32 of all the 34 teachers interviewed agreed that students are benefiting from the CLICC and TFS facilities. Of the 2 who didn't, one appeared to have misunderstood the question because he was otherwise supportive, and the other lacked awareness of the programme. As shown in Figure 2 below, teachers point to learning computer skills and research and assignments as the main ways in which students are benefiting. This finding is general to both the secondary and primary.

It is important to temper this finding with the observation that "all the stars need to be lined up" for such consistent benefits. Conditions for success are dependent on many factors. The most obvious of these is that the network and technology has been consistently available and fully operational. Where this has not been the case the initial efforts of TRR and the host communities may come to nothing and the facilities fall into disuse and disrepair.

One weakness of the model is that the computer labs in secondary schools are used predominantly for scheduled and enrolment-based computer classes for Year 11, 12 and 13 students. As a result, in some schools the facilities are not very accessible to others in the school community including younger students, teachers, and others. The demand from the upper school students is high and students complain when teachers use it too much. Junior students don’t really get any access at all as the facilities are busy all the time with classes. In relation to this, the issue of equity was raised, in that all students are required by the schools to pay a "computer levy" every year, but only a few upper year levels (and students who are enrolled in computer classes) are actually getting access to it and benefiting from it.

Many of the secondary schools had previously owned computers and the TRR programme built usefully on that pre-existing infrastructure and experience. The batch of 25 computers provided by the programme is just about workable for full classes, although most of these schools had supplemented or were planning to supplement the facility with additional equipment or even additional computer labs as a means of improving capacity. It was not clear if this was

driven by a desire to improve access for the junior students as it was in one case also seen as a fund raising opportunity for the school.

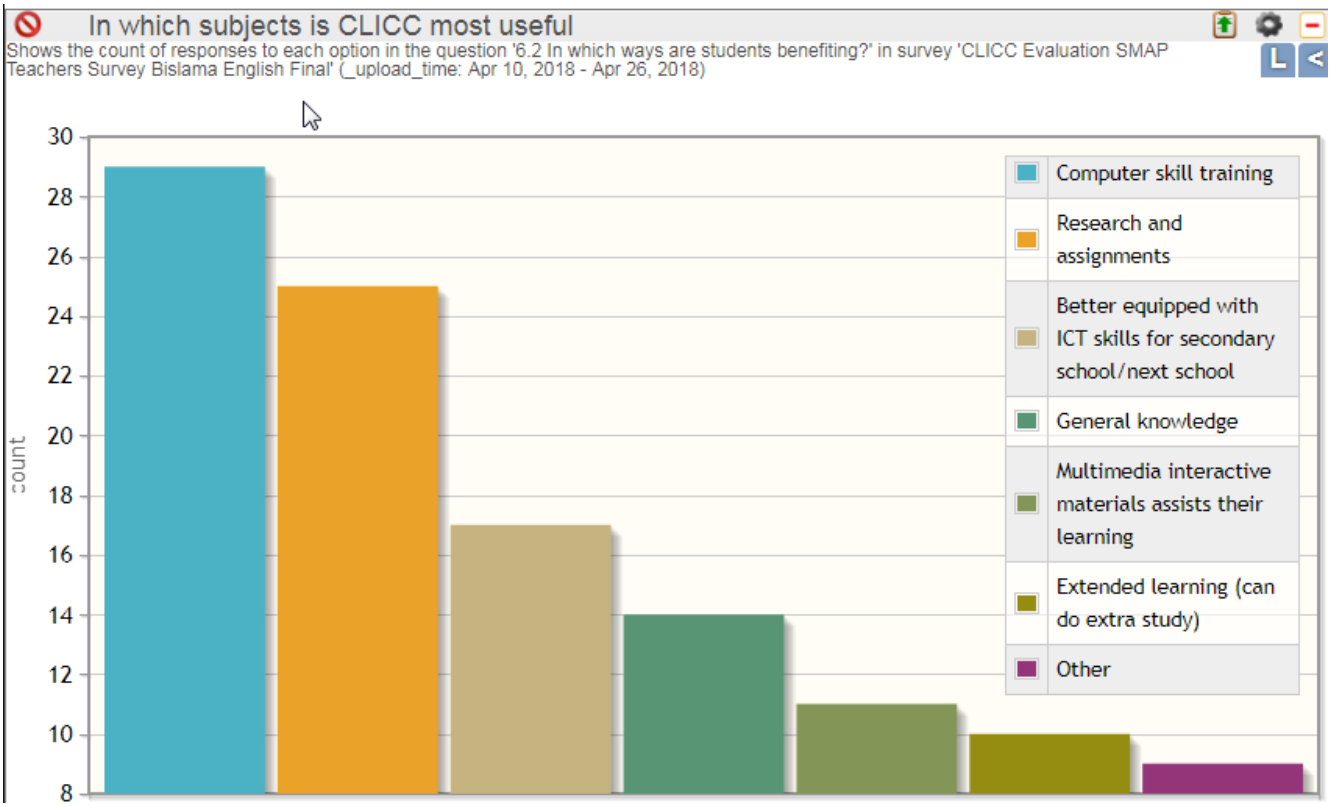


Figure 2: Teachers responses to the question "In which ways are students benefiting? (primary and secondary)

Utilisation of the class sets of tablets provided to some of the secondary schools was more variable. At Epi school, we observed that the tablets were being used (all 5 teachers interviewed stated they sometimes use the tablets in class as a teaching or learning aid) and their value for student research was confirmed by senior students. However, Epi is a TFS only school (only the tablets and no PCs were provided). At Matevulu school, which is both a CLICC and TFS school, we found the tablets were less utilised and less valued by the teachers - only 1 of the eight teachers interviewed stated he uses the tablets in the classroom and 5 don't use them at all or only for private reasons. This is probably because their CLICC computer lab with the larger screens, keyboards and desktop applications is preferred by the ICT teachers and students and the potentials of tablets had not been explored by the school. The tablets are useful for research, and seem to be fairly accessible, but they have clear limitations as well, particularly when students and others need to use them to write out notes and print documents. The lack of a proper keyboard, and the difficulty of writing and being able to print out longer documents was identified as a limitation. The tablets may best be relocated to the school library in such cases, where their main function of enabling access to content would more obviously fit in and complement the library resources, and where students could use them in a quality space dedicated to literacy and learning. This is discussed further below.

Even where the facilities are apparently well utilised, there are obvious inequalities in benefits to teachers. Issues brought up by interviewees include lack of training and awareness, perceptual barriers (such as for whom the facilities are intended for), gender, seniority and other internal power dynamics within the school and the ICT space. We have to look beyond the more optimistic reports of school leaders and focus on the weaknesses, and make sure that all teachers are carried along with the technology upgrades. These issues may be addressed by a more hands on approach by the Ministry of Education, including minimum ICT competency standards for teachers and closer monitoring through the OpenVEMIS system.

Areas for building and improving on educational impacts for secondary schools include making the content on the servers more relevant, extending Wi-Fi access to the classrooms (something that the most forward looking schools have been doing themselves) and considering technology that conveniently brings the online resources into the classrooms allowing teachers to embed them in their teaching.

5.2.2 Primary schools

A consistently identified benefit of the CLICC facilities in primary schools is that they teach basic keyboarding skills, where every child may come away with hands on computer training and advance to secondary school already having mastered basic keyboard and computer skills. An example given to us at Loukatai Primary School concerned a girl student who graduated and went on to the Presbyterian College where she won the end of year prize for computer class. At Eles school, the Principal shared feedback from secondary schools with us, relating that "students from Eles know how to use computers".

Where Internet is also available in the CLICC and beyond, it is also identified fairly unequivocally as a benefit, however it may be more useful for teachers than students. Most schools restrict Internet access to lower grades, and progressively introduce online resources especially year 7 and 8 although it is not clear how openly students are being allowed to "research" online. The Principal at Eles Center School felt that students performances are generally better because of the online assignments, but in fact their nComputing terminals had not been working for most of the 2-year programme and it is unclear how much actual 1:1 computer time the students would have had.

Notwithstanding this, the staff at Eles school presented us with results summaries which they claimed show progressive improvements in national exam results between 2012 and 2017, with all the 2017 results higher than the national average (see Figure 3, below). They felt this was evidence of benefits to student outcomes resulting from the access to ICTs. In fact their average results have been higher than the national averages in all subjects but French since before the UAP programme, with French also being higher in the 2017 results. Although the school staff obviously felt there was a connection with the programme, be it down to improved interest in learning as a result of the school's ICT improvements or other impacts such as on teaching resources and subject knowledge or better quality teaching, we don't have any evidence of any direct linkage. The school results had been improving since well before the programme and the selection of the school for a CLICC (following their successful application) might just as well have been an outcome of the ongoing school improvement, rather than the cause.

The number of computer terminals available in a computer lab has a big impact on the practicality of computer classes. Whereas the 20-25 computer terminals or PCs provided to schools such as Loukatai and Sarakata would just about accommodate a full class of students with two students sharing, those schools with only 10 computer terminals such as Lambubu and Eles would find scheduling of training more complicated, with a reduction in student access and less evidence of regular scheduled computer classes.

As evident in the discussion above, CLICCs appear to be valued and are used differently when they are in primary schools compared to when they are in secondary schools. One view may be that primary schools do not need access to the Internet for computer labs as much as secondary schools do, particularly if the server portals are accessible.

The Internet becomes more useful for students when in the higher levels of education. However, the teachers and school administrations are also beneficiaries of the Internet in primary schools in the current CLICC model, and as measures are taken to promote use of online resources in the classrooms, good Internet access will certainly become just as important for primary schools.

An issue with concentrating resources in only a few primary schools is that other schools and their communities feel a sense of inequality when they see students in the lucky schools with CLICC facilities so obviously advantaged. This was raised as an issue by a primary school Principal in Tanna. Of course, the UAP programme is a pilot, and therefore only some schools were selected. The selection was competitive and all schools should have had the same chances of selection. A competitive aspect to school improvement was seen as a good thing by teachers when questioned about

this aspect. However, in a subsequent expansion of the programme, some attention should be given to strategic location and ways in which access to the facilities can be genuinely shared with neighbouring schools.

2012 Basic Education National Certificate result summary

5021 Eles Centre School

(Vanuatu island)

	Number of Students										Degree of concern
		Grade									
	Total	1	2	3	4	5	6	7	8	9	
001 ENGLISH	35	0	0	1	6	15	10	2	0	1	○ ● ○
003 MATHEMATICS	35	0	0	0	1	1	11	12	6	4	○ ○ ●
009 FRENCH	35	0	0	0	1	4	7	16	5	2	○ ○ ●
015 GENERAL SCIEN	35	0	2	9	9	8	4	2	0	1	○ ● ○
017 APPLIED SCIENC	35	0	0	0	0	3	14	15	2	1	● ○ ○

2014 Basic Education National Certificate result summary

5021 Eles Centre School

(Vanuatu island)

	Number of Students										Degree of concern
		Grade									
	Total	1	2	3	4	5	6	7	8	9	
001 ENGLISH	38	0	1	10	9	9	5	3	1	0	○ ● ○
003 MATHEMATICS	38	0	0	5	3	7	19	2	1	1	● ○ ○
005 SOCIAL SCIENCE	38	0	0	1	5	12	11	7	1	1	○ ● ○
007 BASIC SCIENCE	38	0	0	8	5	16	6	2	1	0	● ○ ○
009 FRENCH	38	0	1	1	7	13	13	3	0	0	○ ● ○
011 AGRICULTURE	38	0	0	0	0	5	9	11	8	5	○ ● ○

2017 Basic Education National Certificate result summary

5021 Eles Centre School

(Vanuatu island)

	Number of Students										Degree of concern
		Grade									
	Total	1	2	3	4	5	6	7	8	9	
001 ENGLISH	42	0	1	4	16	13	8	0	0	0	● ○ ○
003 MATHEMATICS	42	0	4	7	12	10	7	2	0	0	● ○ ○
005 SOCIAL SCIENCE	42	0	1	6	10	17	8	0	0	0	● ○ ○
007 BASIC SCIENCE	42	2	4	8	11	13	4	0	0	0	● ○ ○
009 FRENCH	42	1	3	10	13	10	3	2	0	0	● ○ ○
011 AGRICULTURE	42	0	3	8	10	15	6	0	0	0	● ○ ○
013 RELIGIOUS EDUC	42	2	4	7	12	13	4	0	0	0	● ○ ○

Figure 3: Improvements in Eles Center School National certificate results 2012-2017

5.2.3 E-learning resources

One feature of the UAP programme is the local cloud provided by the gateway server, which includes both a local cache of e-learning content and applications for creating and sharing content. Providing the CLICC/TFS centre is configured correctly, these can be accessed by any device connecting to the wireless or wired network via a captive portal (home page). This provides a secure "walled garden" of multimedia content that students, teachers and community users can access freely and almost without limitation over the local network.

The local cache of resources would ideally include a range of locally relevant, curriculum linked and quality assured multimedia e-learning content. However, Vanuatu as with most countries across the region is in the early stages of developing strategies, policies and frameworks for producing such local contents, either through dedicated programmes producing specific content or by leveraging the universe of open education resources (OERs) . In the meantime, open educational resources that have been identified by organisations such as SPC and USP as generally useful such as the Wikipedia 'slices' and Khan Academy videos are being used in such applications. There are obvious deficiencies, including the predominance of English language and Eurocentric (or non-regional) perspectives in the content. This, however, is also the case with online content too and the issue points to a general need for curation.

The gateway server installed in each CLICC/TFS facility contains a library of OERs from the RACHEL collection as available in mid 2015[5]. In addition there are some collections of e-learning resources from UNESCO, collections of educational PDFs collated by the regional organisation SPC and Vanuatu curriculum resources provided by MoET.

The main finding is that although the programme illustrated the need and potential for quality e-learning resources for teaching, learning and student and teachers' research purposes, there were significant barriers to the use of the server (local cloud) resources resulting in uneven and less than expected benefits for teachers and students. The relevance of the resources supplied on the server is mostly limited to upper classes and mainly science and maths.

Concerning teachers' usage of the OERs, the field data reveals that only 20 of the 34 teachers interviewed (59%) were aware of the local resources, and only 14 (41%) had used them. Only 12 (35%) of the teachers stated that they had ever accessed the Vanuatu curriculum resources.

Despite the relatively small sample size (and unequal number of teachers interviewed in each school), the figure below illustrates the mixed picture we found concerning the access to the local cloud resources by the teachers.

[5] One of many OER collections created by open source projects. The RACHEL project is known also for an offline server. The collection selected for the CLICCs contains collections for schools and more community oriented information.

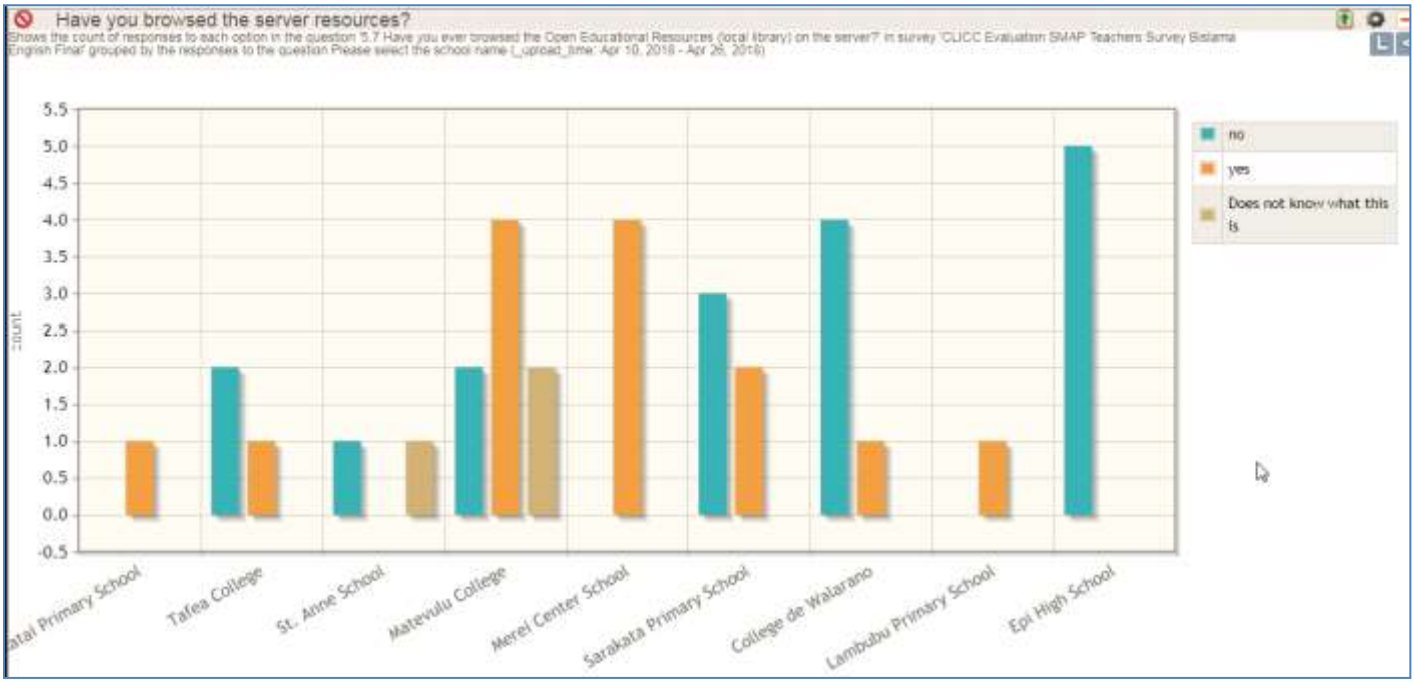


Figure 4: Teachers using the educational resources on the server (OERs) by school (n = 34)

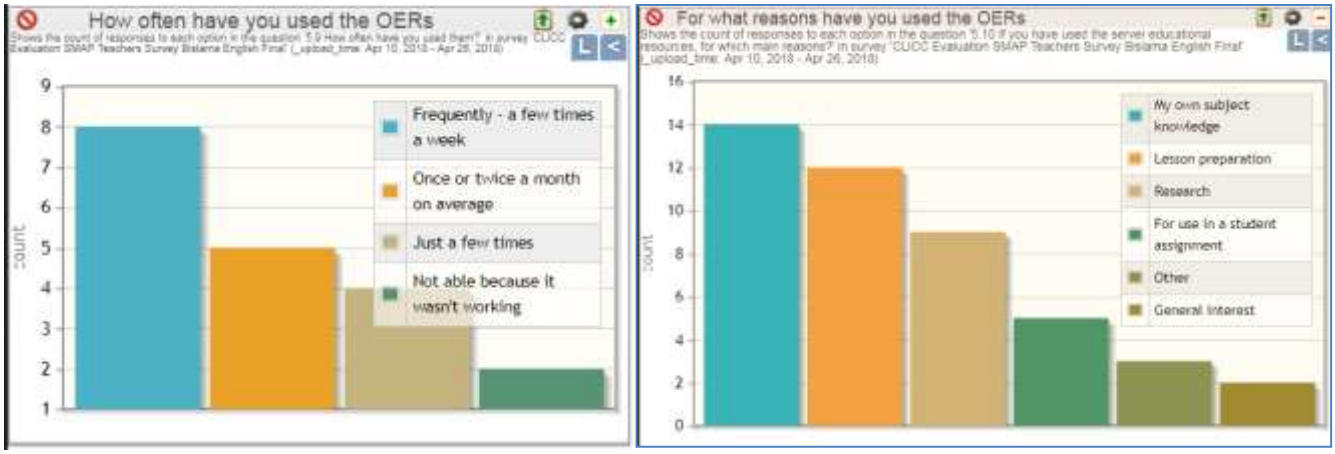


Figure 5: Teachers' frequency of usage and reasons for using the server (n = 34)

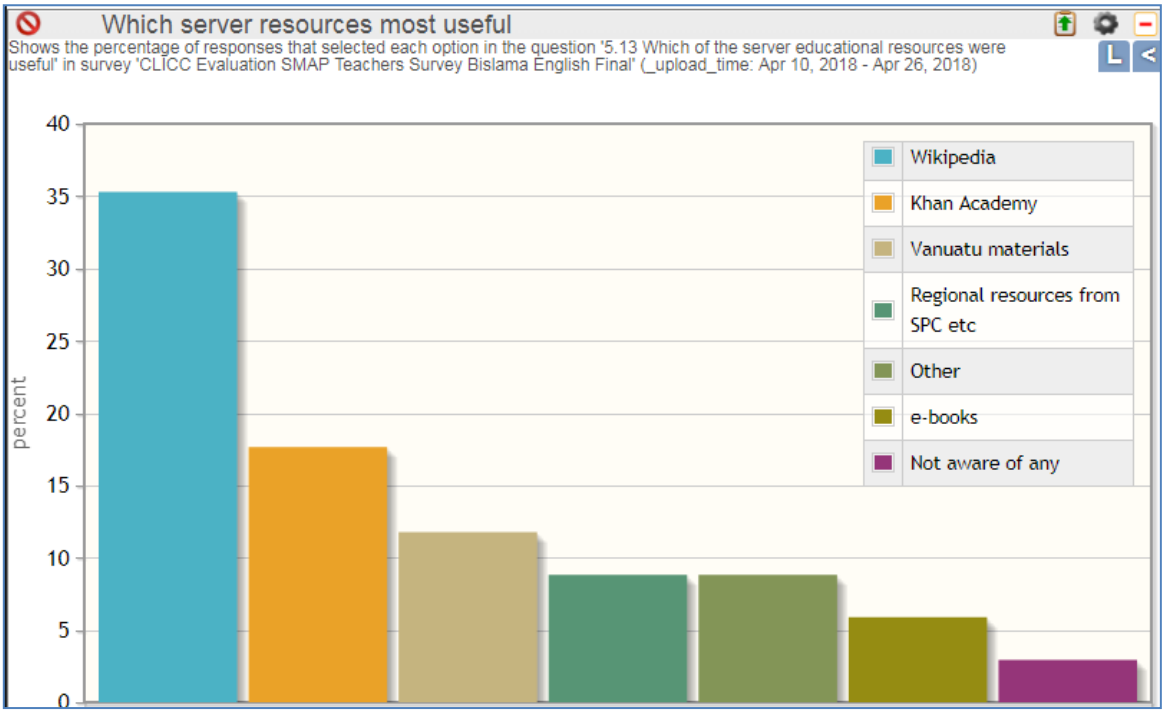


Figure 6: How teachers rated the usefulness of the OERs

As has been discussed earlier, technical issues have created barriers for accessing the local cloud resources. We found that barriers included difficulties with passwords and incorrect configuration of the gateways, together with lack of awareness about the resources. The current design of the servers requires a single login for both Internet access and portal resources. It may be better to separate out Internet access (which requires more security and control) from the local cloud which should be easy to access and use on any device (computer, phone, tablet).

However, even where the server was working and configured correctly throughout the programme (for example as at Matevulu school), one can see that not all the teachers were benefiting or even aware of the resources.

Where they were used, it is clear that they were appreciated by the teachers especially for subject knowledge and lesson preparation. More than one teacher commented on the usefulness of the local resources in supplementing the limited collection of books in the school libraries. They also mentioned it was very useful at times when the Internet was not available. Examples given were mainly in science subjects, social science and less so in other subjects.

Not all teachers agreed they were useful for their subjects. One teacher stated "I don't use the educational resources much. The open resources are mostly for science areas and I couldn't find much in the Vanuatu curriculum resources. I don't know why". Another teacher said she could not find anything at all when she had looked on the server portal. In her subject area (English), many of the existing resources were not as helpful (Khan Academy, Wikipedia, and the Encyclopaedia). She made the comment that the resources seemed to be more helpful for teaching and learning science. This concern about good alignment with the Vanuatu curriculum was shared by another individual on Santo who suggested that the resources on the Server Portal should be more in line with the Vanuatu curriculum, and to the research needs and learning areas relating to that.

Where the computer lab was properly configured with the gateway servers and used intensively for scheduled computer classes, as at Matevulu school, it was clear that students were routinely accessing the portal. There were isolated instances of innovation in local content creation. For instance, the ICT teacher at Matevulu was planning to develop a local website for the students so that they could upload their work (using the local Wordpress application). Likewise in Tafea, they had already identified the need to upload local content to the servers, including some Bislama language Youtube videos that the Principal thought would be of interest to women in the community. However, these more advanced skills required training. Although the Owncloud and Wordpress local applications could be used to

upload new content to the server, it was not clear to the CLICC supervisors. A simpler method for uploading and organising local content is needed.

The needs of primary schools students and teachers for e-learning resources (i.e. online or the local portal resources) may be different to the secondary schools. Portal resources may include some content suitable for younger students (i.e. the typing tutorials and some of the Khan Academy videos providing that the teacher is aware of them), but in general the OERs content was pitched at older students or adults. A walled garden of resources, carefully curated for each curriculum content area would be especially useful for the younger primary students, who are generally not allowed or able to access the Internet.

There is also a need to distinguish between resources for classroom activities (including apps and educational games) from content that is engaged with individually by students for assignments. The TFS programme did provide a set of free educational apps (free Android apps available on the Google Play Store) for the tablets, but the server contents seem poorly matched with the needs of all but the older students in Years 7 and 8 who are required to conduct basic research.

Of the free apps pre-loaded on the tablets, the few teachers in the TFS schools who were using them in classes rated the science apps as useful, including ones that teach the human anatomy, the world map and an astronomy app. The typing tutorial was mentioned, and tools such as the calculator app, a numeracy and phonetics app. However, teachers overwhelmingly stated that they need more training to use them. One teacher thought that "there are some very good educational apps but it needs teachers to be trained". Another said, "Some of us who have been overseas know better how to use them tablets, but some of the teachers don't see the importance or benefits". Training in the use of digital resources and so called digital pedagogies is a recommendation of the ADB in a recent report[6], ICT for Better Education in the Pacific.

Several countries in the region are piloting tablets in schools. It may be useful for MoET to compare with these other approaches, including how they provision e-learning resources.

One model being piloted in Solomon Islands by the Ministry of Education's ADB funded ICT for Better Education project uses the Kiokit sets of ruggedised tablets. These kits are configured with educational apps and games linked to a local wireless server with OERs. The kits are designed to be stored and used in the classroom, and do not connect with the Internet. Instead, the interactive apps are designed for the younger age groups and to aid literacy and numeracy. Thus, the model focuses on dedicated e-learning resources designed for particular educational outcomes and target group.

The Kiribati Ministry of Education and Australian Government funded Kiribati Education Improvement Program is holding a Kiribati Tablet Trial in which tablet computers are pre-loaded with learning resources and applications to support their delivery of the curriculum. Each classroom receives a KioKit which contains 40 robust tablet computers for the students to use in class.

The standard KioKit content package was developed for African schools and may lack relevance to the local curriculum. The Kiribati project is responding to this issue by wiping the standard KioKit resources and replacing them with a targeted collection of e-learning resources for Year 4, mapped to the syllabus in each area. The resources are organised into three categories, namely:

- Learn - Structured Learning Resources linked to the syllabus
- Play - Games (or APKs) that run on the Kio Tablets offline
- Grow - Reference materials to allow students to extend

The resources are pre-loaded onto tablet computers for the teacher and students, and accompanied by a teacher training programme (in collaboration with the Teacher College).

[6] ADB (2018), ICT for Better Education in the Pacific

A question raised is whether such a prescriptive approach may lead to over-standardisation on certain texts and teaching methods with less emphasis on the kind of learning activities that require a more open curriculum and tend to be more student-centred and enquiry-led.

Furthermore, it would be very resource intensive to provide e-learning resources suitable for each school year and content area, and keep them current. The ADB's 2018 report recognises this, i.e. that a lack of human and financial resources is a key barrier to developing high-quality e-learning materials in the region. They suggests that a regional centre should be established to collate and improve e-learning resources.

Whatever the case may be, MoET should consider the most effective way to improve the quality of e-learning resources used in schools. A simple first step may be to establish an e-learning unit or function within the Ministry responsible for building and maintaining a repository or index of recommended content collections in OpenVEMIS.

Research is needed to answer such questions. Importantly, the Kiribati pilot trial is being externally evaluated (by the University of Chicago) to ensure a rigorous research process. It is a key recommendation of the ADB's 2018 report that such upstream research be carried out: "ICT for education (ICT4E) initiatives should be developed based on in-depth analysis of domestic circumstances and education sector goals".

One observation we can make in comparing the Kiribati initiative above with the CLICC/TFS project is that the former integrates the approaches to content, training, and technology and locates them unambiguously within the curriculum. With the much wider objectives of the UAP, some of this specificity may have been lacking, but on the other hand the lessons learned from the pilot project provide the opportunity to connect to the wider national development context.

5.2.4 Information Literacy

In parallel with the need for quality-assured, curriculum linked e-learning content, is the need to build the capacity of teachers and students to evaluate quality online resources.

Information literacy was explicitly raised as a concept by at least one teacher and was alluded to by several others including a retired curriculum writer who was also a user of a CLICC. These respondents understood information literacy as where to go to get good and reputable information and how to judge the information once it is accessed.

A male teacher at Tafea College who was instrumental in the establishment of the CLICC and has been functioning as the Chairperson talked to us directly about 'information literacy' issues. He understood this as the need to support students and other computer and Internet users in evaluating the information they have access to on the Internet (more than just being able to identify 'fake news') particularly for research and general knowledge purposes.

Actively working with his students so they may be able to weigh information from the Internet, he would direct them to rely more on sites like Google Scholar and to check their online sources. In his words '*You don't just go and pick up any information and believe it. You need to get the right information from the right place'*.

However, he observed that other teachers may not be doing this so consciously. He explained that, "*Lots of teachers in Vanuatu may see the potential for accessing a lot of information through the Internet, but they really need to know how to assess this information and how to help their students assess it too*".

This informant's history is revealing. Still only in his 30s, he had been one of the first AUF students to take online studies, worked as a journalist and with a UN agency as a communications officer before he retrained as a teacher. This background gives significant weight to his insights into the issue of information literacy in a bilingual education system. He felt that because of his diverse education background, and the capacity to take online courses, he has 'been able to see things beyond Vanuatu'. He emphasized the necessity of information 'to help students understand more about the world' in order to develop the country and the education system. His own training in the social sciences and history has also supported him in better supporting students to use information from diverse sources.

Another informant with a deep understanding of the issue is a retired Vanuatu curriculum writer, who we interviewed at Sarakata school. He explained that although there is a computer teacher who supervises, the CLICC needs another person to guide students and others on "what's useful and what's not on the Internet and (local cloud resources)". He is concerned about what the teachers use as resources from the internet or CLICC to teach the students. When students end up in another school without this facility then that school "might not fit them". Thus, a consistent approach to information and sourcing is needed across the education system.

Moreira[7] researched information literacy in elementary schools and even though her research site was European , her paper provides some practical suggestions that are relevant to our region.

Amongst other definitions and models described in the paper, the American Library Association's 1989 definition remains useful, stating that "to be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (ALA, 1989).

Moreira concludes that information literacy is an educational imperative with the ultimate goal for students to develop "the capability of both critically evaluating the information they encounter and of continuing to use the skills to confidently handle the new challenges that will confront them throughout their lives".

She recommends that, "In order to satisfy the students' needs the teachers' needs and, more comprehensively, society needs, it is essential to start a more profound and extended cooperation between the school librarians and its teachers, fulfilling in that way some of the gaps existing in today's education."

As a starting point, it may be helpful for the Vanuatu government to consider some basic and accessible materials on information literacy and assisting students and people in general with how to weigh the information they access online. As there is little awareness of this issue, it is important that the Vanuatu Government provide some leadership to schools and communities. School leaders should also be made aware of this 'educational imperative' and should nurture a culture of information literacy across their schools, using the resources they have available. For instance, the research also raises questions about the role of school libraries and librarians in supporting digital information access and building information literacy skills. As a longer term goal, Vanuatu should consider how to support and strengthen these capacities in schools, and also through incorporation into teacher education so that new teachers are suitably trained.

Issues concerning the so-called "new literacies" including information and technology literacy were not just raised in relation to teaching and learning but also in relation to community access. However, awareness and skills alone may not be the only factors that impact on people's capabilities or inclinations to use ICTs and the Internet. This is discussed further in the discussion on community access below.

5.2.5 School Libraries and Digital Librarians

The discussion on information literacy dovetails with the observations we made in the field concerning the role of school libraries. It may be important to consider these two issues together.

Several informants including teachers cited the ability to access up to date information as a key benefit, and that the ICTs helped as their library resources had become out of date. In a number of schools informants told us that the ICTs and Internet were filling a gap left by inadequate libraries with outdated and limited materials.

However, there are a number of concerns around information literacy raised by these observations that should be considered more deeply. Books and journals in a library are not the same as resources and information on the Internet – as discussed above, the quality of online information is often different (and potentially undergoes far less scrutiny and very little quality control). The debate about whether the Internet can and should replace libraries is a global discussion that may have some relevance in a place like Vanuatu too. Not simply assuming that internet access will

[7] Moreira (2010), Information Literacy in Elementary Schools, Royal School of Library and Information Science

replace poor physical libraries (and the inability to maintain and update them), on an equal footing, would be a good start.

Based on her research described above, Moreira (2010) calls for improved collaboration and communication between teachers and the school librarian, and between the classroom and the library. One way of doing this, she says, could be to establish an "Information Literacy class, where teachers and librarians would work together in order to complement both their knowledge and in this way help the students achieve more and better Information Literacy skills". Students could sit and discuss the results they have found online, guided by the librarian.

Vanuatu might therefore reconsider the role of the school librarian, and the library as a space where information literacy may be might be learned in schools. This has been recognised elsewhere in the region, for instance an advisor for the Kiribati Education Improvement Program explained that they are keen to promote the role of 'digital librarians' in modern schools. It seems, he said, that they can act as the bridge between teachers and the sea of digital resources available for their lessons, while also supervising 'unstructured' access to the lab / tablet / digital learning environment outside of classes. He explained that they have recruited this role in Kiribati's teachers college and it has been invaluable for the lecturers.

As mentioned previously, if the school has acquired class sets of tablet computers, they might be better located in the library should the school have one and if it is suitably secure, supervised and with power and Internet access. This would create enhanced conditions for students and teachers in accessing and evaluating information compared to computer labs. As Moreira says, the school library is "a place where individual differences are intertwined with the diversity of resources and technologies.... When students work in groups, they learn to argue for their opinions, and criticize others in a constructive way... The librarian may act as a guide for the group, and support them as much as required in their usage of the library as a resource in their problem-solving activities".

Not all schools have libraries and fewer may have trained librarians. Fewer still may have technology literacy and ICT skills. Some may just be teachers who are assigned the role without any training. It is not clear, therefore, how Vanuatu could embed the modernised role of librarian across the education system. It may be best to start with teacher education, in-service education, and raise the issue of school libraries to provincial education offices, school principals and managements as an objective for school improvement.

Information literacy might also be seen as a national issue, and thus of significant to Vanuatu's universal access programme. It is not just an issue for the educational uses of the CLICCs and tablets, but community usage as well. It is interesting that some telecentres in developing countries, such as those designed around UNESCO's community multimedia centres (CMC) model, include libraries. In fact there are all kinds of public Internet facilities that bring digital and non-digital resources together, are inclusive and support discussion and learning.

5.2.6 Teaching and learning

The educational benefits are currently centred around use of the computer labs. To create more optimal conditions for supporting teaching and learning, the broadband connectivity and means to access it should be extended into the classrooms.

In the case of the CLICC programme, broadband was provided to a facility or building at the school, usually an existing computer lab or a space made available for the new lab. Secondary schools are mainly benefiting from the enhanced facilities for teaching computer science, and primary schools mainly from being able to accommodate regular hands-on computer training for all their students.

The teachers interviewed were almost unanimous in the observation that the ICTs are enhancing students' interest in learning (see Figure 7 below). This impact was explained by some teachers as due to the students being able to research on the Internet. In general, the senior students in both primary (Years 6-8) and Secondary (Years 11-13) were benefiting the most from student research as those have the best access.

However, we only saw a few cases where there was evidence of regular use of the CLICC resources in the classrooms for teaching.

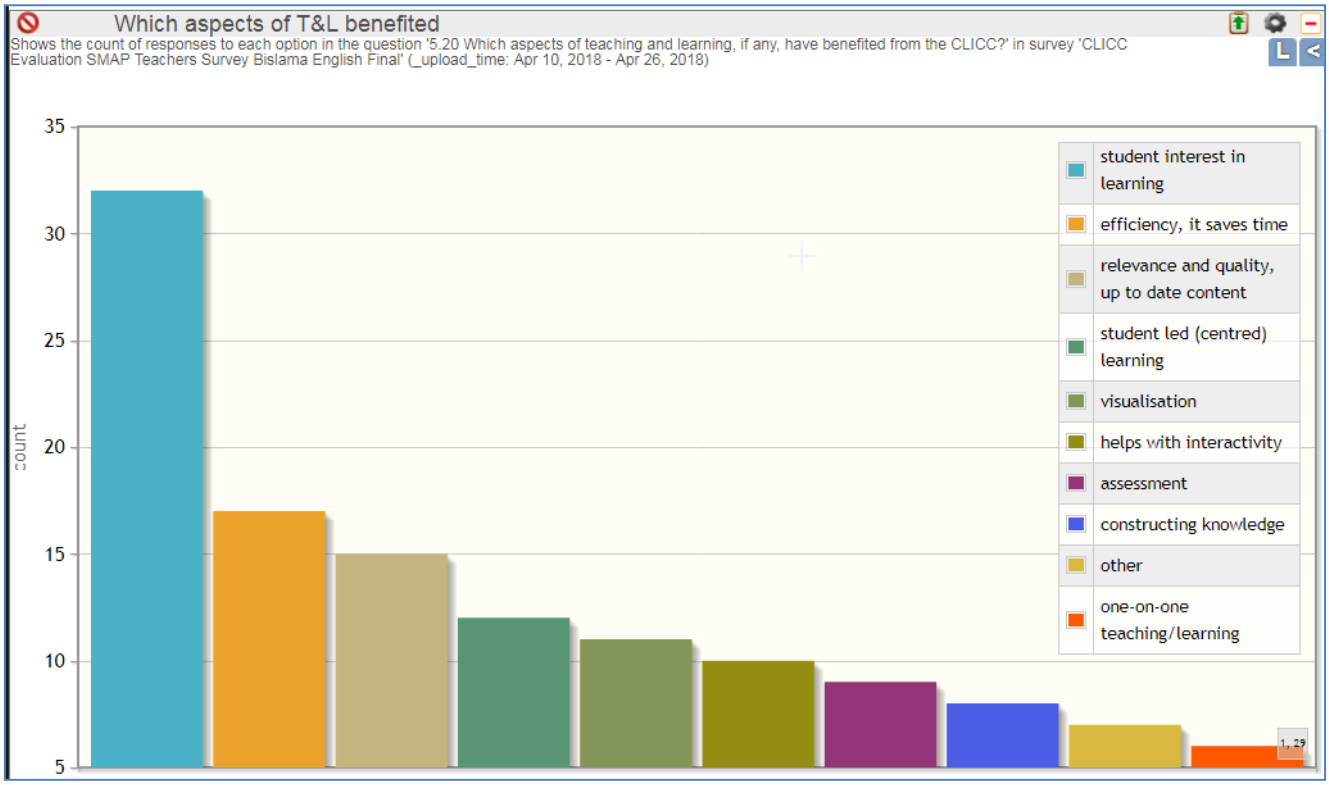


Figure 7: The aspects of teaching and learning that teachers said were impacted by the ICTs (n=34)

International agencies and others[8] are quite clear on this aspect of school connectivity - the challenge is not only in getting access to connectivity to the schools, but in ensuring meaningful use of it. The focus should be on broadband Internet and ICT adoption within schools. Furthermore, the amount of connectivity within a school is just as important as the amount of connectivity provided to the school. This implies that along with broadband provisioning, schools need local area networks to distribute it to where it is needed, whenever it is needed.

Although the CLICC and TFS facilities were provided with a wireless network as the main means of connectivity, it was not designed to cater for the whole school area and the range was limited. The need to extend the wireless network to the classrooms was recognised in the larger secondary schools, especially Tafea College who have already started to improve their Wi-Fi coverage. The Principal of Tafea college stated that the school had identified the need to extend ICT support into the learning environment and the classrooms. He wanted to install a "screen" in every classroom and they were already looking into funding from UNELCO.

We found evidence that many teachers were actively downloading resources to help with lesson preparation, and for use as a teaching resource. However, the evidence of teachers routinely using resources from the Internet or the server "live" in the classrooms came mainly from the senior colleges. For instance, the Principal of Tafea estimated that teachers would use the school's two projectors around four times a week on average - he pointed out that one teacher was doing so at the time of the interview - and at Epi High School (a TFS school) there was evidence from interviews and from an equipment sign-out book that a few teachers were using them on occasion in class.

In all, 20 of the 34 teachers interviewed said they could use a projector with a computer. However, it would still be an overstatement to describe these examples of usage as "systematic". Even where it was happening, by no means all the teachers were adopting it. In fact of the 34 teachers interviewed, only 7 selected using a laptop in class and 6 using a projector in class, as shown below.

[8] e.g. Broadband Commission, ITU (e.g. Connect-a-school), UNESCO, The Internet Society, CISCO's Smart Policy

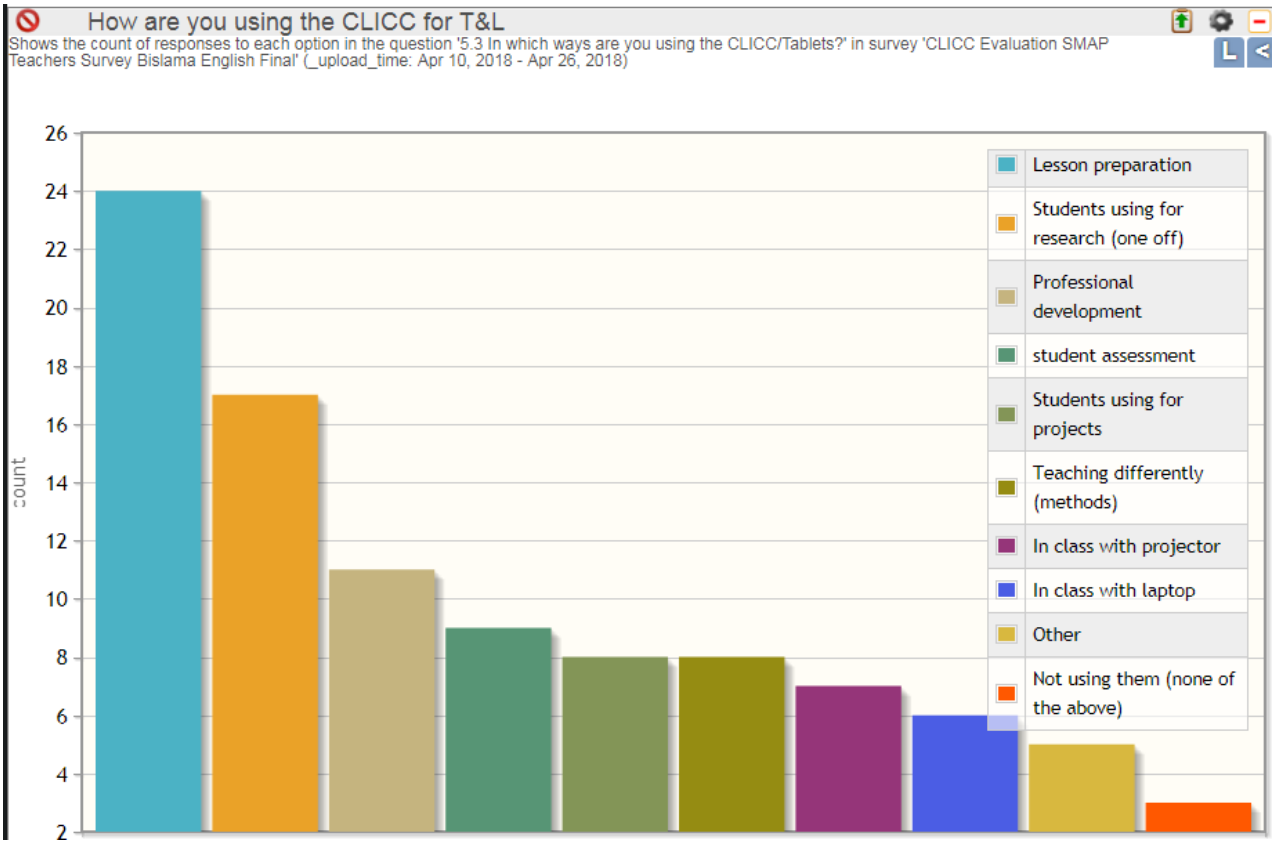


Figure 8: How teachers are using the CLICC/TFS facilities for teaching and learning (n=34)

Having the skills to use the tablets is obviously a main factor. Where tablets were available to use in the classrooms, most teachers said they lacked the skills to use them, and they overwhelmingly called for training in using them for teaching. This disadvantaged the older and possibly some female teachers - the men were described as being more forward with their claims to the technology - "men always stand up and say they have a right to use it". One teacher at Merei Center school noted that it was only the younger or recently graduated teachers who were able to use the tablets in class with the students.

Tafea gave some examples of the resources being downloaded for classroom use, including videos and animations to aid visualisation, bilingual maths formulas and chain of process diagrams for science. They also used the CLICC to print out handouts every day. A reliable facility for printing, copying and scanning is an important basic benefit for teachers, improving efficiency and also the quality of the learning materials that students have at hand.

A few teachers commented that online resources allow them to cover a whole topic more effectively in the relatively short space of time they have to teach it (sometimes a lesson is only 35 or 45 minutes long). 50% of teachers interviewed selected improved efficiency (saves time) as one of the benefits for their teaching. For example, they can move away from board writing through the whole lesson by preparing a PowerPoint in advance, in which they have summarised information from the Internet. The Internet is assisting with teaching ideas, where the teachers have the basic computing skills and are able to search the Internet. One primary school Principal explained that when maths teachers find it hard to explain a particular topic, they can view a YouTube video to get ideas.

Whilst the provision of basics such as availability of Internet and ICTs in the classrooms and basic skills to use them may have the highest priority at this stage, it is useful to acknowledge that these factors alone may be insufficient for systematic and widespread adoption of ICTs for teaching and learning. Around the world, including in the region, it is not uncommon to find classrooms with locked cupboards full of unused tablets and computers, left behind by failed projects. Teacher psychology can inform us in regard to managing expectations around training of teachers in ICTs and digital pedagogies.

In addition to knowledge of ICTs, attitudes and feelings of inadequacy about ICTs (which are quite common) are likely to have significant impacts on the ICT integration process. In-service training should work more on this aspect especially in the early stages of training. To achieve high quality, effective teaching and learning, teachers must believe or be made to feel that ICT is a valuable educational tool to boost the teaching-learning process [9]. This alone is not enough, as school leaders must nurture an ICT culture that is open to all - as we have seen, ICT is often a gendered "space".

Training on how to use more advanced computing skills – particularly those that are applicable to the classroom – may be of use. However, it was interesting that one teacher at Tafea who was very skilled in IT and who had received training in using IT for teaching still said he was using the CLICC for his own research, but in the classroom he said he was still writing on the board. To explore why, we might refer to research that shows that beliefs, attitudes and reasoning are as important as knowledge in the adoption and of ICTs by teachers and integration into their practice.

Shulman's model of pedagogical reasoning and action, updated for the digital age by Starkey[10] describes how teachers work through the teaching process starting with comprehension of subject knowledge, its transformation into teachable representations, evaluation, reflection and new comprehensions. They may have been teaching a subject quite successfully for many years, and will question the need for ICTs if it does not fit into this process.

Pedagogical beliefs form over many years and can be very resistant to change, especially if a teacher's experience predates the technology. Beliefs are distinguished from knowledge, as stemming from affective feelings and emotions and personal experiences. Pedagogical beliefs intersect with beliefs about the role of ICTs, either in collision or collusion[11]. In the latter case, teachers are more likely to add ICT to their existing traditional methods than to develop new practices, and in that case creating the conditions to build on what they are already doing may be a better strategy than one that expects them to adopt radically new methods.

This research base demonstrates that even in highly technologically developed contexts, it is still a challenge to transform teachers practice with ICTs. In addition to bridging the technology and resources with the classroom it seems necessary to create the conditions whereby teachers are able to seamlessly and logically embed them into their practice.

There are two good examples of different approaches in the region to illustrate what could be done, and MoET is encouraged to take note of them.

The first example is the Tablet Trial of the Kiribati Education Improvement Program, already mentioned above. In this trial, teachers are being equipped and trained to use tablets together with mini projectors, together with the class sets of tablets. The teacher's tablet has the ability to remotely control the students, allowing the equivalent of page turning, and annotation. The suite of contents as described earlier, is prepared specially for the curriculum and includes collections of educational games (activities) and resources for extended learning.

In this way, the tablets deployment in Kiribati is specifically targeting classroom use. This compares with the TFS where the intended application in the school is less clear and interpreted differently by schools. The Kiribati project, which is being evaluated by the University of Chicago, should therefore yield useful practical information for MoET on how to improve Vanuatu schools use of these assets.

[9] Rastogi and Malhotra (2013), ICT Skills and Attitude as Determinants of ICT Pedagogy Integration, European Academic Research, Vol 1, Issue 3, June 2013

[10] Starkey, L. (2010). Teachers' pedagogical reasoning and action in the digital age, Teachers and Teaching, 16(2), 233-244.

[11] Prestridge S. (2012) The beliefs behind the teacher that influences their ICT practices, Computers & Education, Volume 58, Issue 1, January 2012, Pages 449–458

Figure 9: Teachers in Kiribati training in the use of tablets for classroom teaching (reproduced by permission)

A second example comes from the Fiji Muslim League (FML) schools, where they have been using interactive projectors in their classrooms since 2014.

The "smart classroom project" was funded by a grant from Islamic Development Bank IDB for upgrading teachers. 30 teachers, including school heads went to Singapore on a study tour and observed the predominantly technology-based teaching. The delegation observed that students' interest was high and discipline good. The technology was being used in wide range of ways and it was "encouraging to see". Subsequently, 22 FML schools were given the technology for their Year 7 and 8 classes and the teachers a programme of training.

The "smart classroom" consists of short-throw projectors with infrared sensors, controlled by a laptop and with a wireless interface to connect also to any local cloud or Internet. This effectively turns a white board or any surface into a touch screen, so that the projected desktop can be controlled by touching the whiteboard or with the laptop. The whiteboard can be written on with markers and thus mixed modes of presentation are freely available.

In effect these are like electronic whiteboards, but may be just a little simpler and intuitive to operate - one less barrier for the teachers to overcome. They are also much cheaper than electronic whiteboards, with the models used in Fiji currently under AUD 2,000.

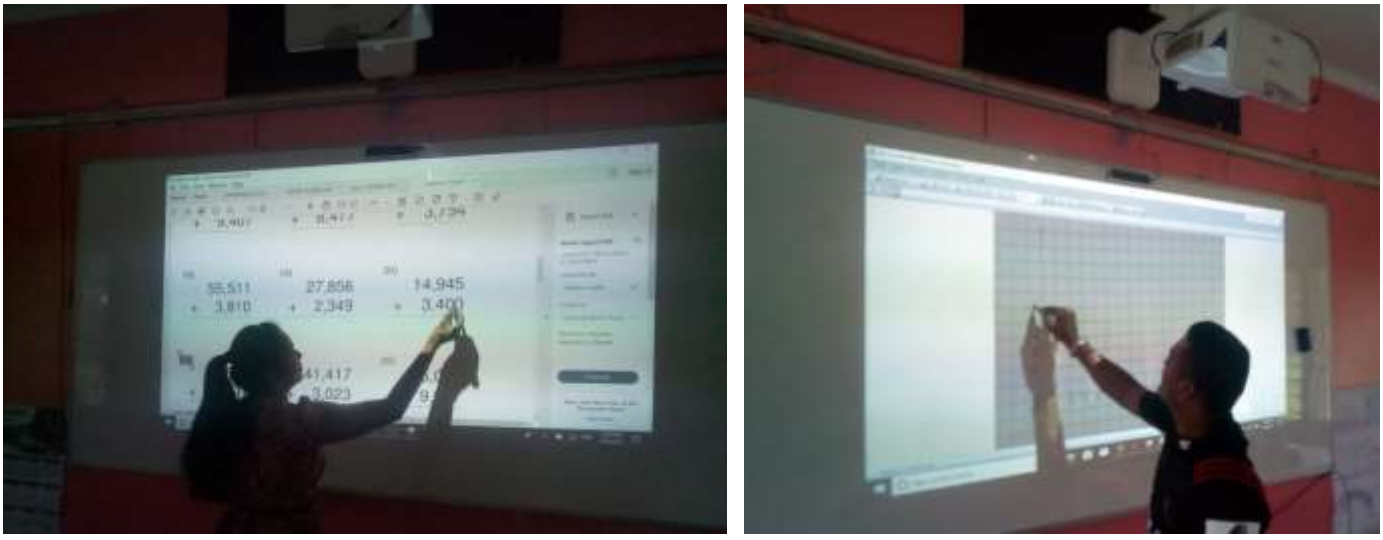


Figure 10: Teachers in Fiji demonstrating the "smart classroom", simple ways of using the interactive projectors (reproduced by permission)

Basic computing skills are needed, and it is up to the teacher to decide when and how to use it. For instance, simple beginnings such as preparing a grid on which graphs can be drawn in advance of a lesson, e-learning content (online or downloaded) can be presented and students own projects presentations can be shared.

The FML schools are adamant that this technology can easily be adopted by teachers. It is true that basic skills are needed, but in the Fiji situation the majority of teachers do have them, and as one Principal related, the FML challenged all their teachers to acquire the necessary basic skills if they wanted to remain posted at those schools. This was backed up with emphasis on computer training as part of the teachers in-service professional development.

Comparing with the CLICC programme, one advantage is that the classrooms are equipped and ready to use, without any additional setting up of equipment by teachers. This is in effect what the Tafea Principal was aspiring to with a "screen" in every classroom. It is thus a fully enabled environment. It does not enforce any radical change in teaching methods - but makes it possible to easily and seamlessly introduce multimedia and interactive content into their lessons.

The FML schools emphatically claimed that the students were benefiting from improved interest in learning, and that this was resulting in improved attendance rates and behaviour. They also linked some impressive improvements in results to the introduction of the technology. For instance one school noted an improvement from 32% to 82% in their Year 8 Literacy and Numeracy Assessment (LANA) pass rate from 2016 to 2017. One school conducted a survey of students, and 28 out of 42 students stated the improvement was down to the smart classrooms.

Moving towards a truly digital pedagogy may be a distant vision for Vanuatu as yet, but the two examples above illustrate a practical first step. It would of course be necessary to assess their suitability for Vanuatu conditions and identify which is the best fit for a school. For instance the tablet approach may be more suited to some rural primary schools where teachers' computing skills are low, and where schools may be off the electrical grid. The interactive projectors linked to the school gateway servers should be a natural progression with the secondary schools, and may also have a transformative impact in the primary schools, overcoming some of the barriers we have noted. Training is of course an imperative - this is discussed later in this report.

5.2.7 Benefits for teachers

Providing the Internet and computers are working, and teachers have the basic skills, teachers are benefiting from the Internet in all the sites. It is interesting to see some of the innovations. For instance we heard how some were searching for templates to help with student assessment and for ideas on a school improvement plan. The ability to make use of the Internet in this way demonstrates a kind of digital capability.

Figure 11 illustrates that the most common response from teachers on how it is benefiting them is that the CLICC improves access to better resources for their teaching areas and for improving their subject knowledge.

The interview questions allowed them to expand on these choices and these are summarised below in Table 7. Teachers report benefits in many areas, especially in saving time and improving their productivity, improved access to resources especially where libraries are seen as out of date or inadequate for their needs.

Not all teachers in a school enjoy these benefits because they may not have sufficient ICT skills, or because of other barriers such as discussed in this report. The table should be used as guide to the emerging trends.

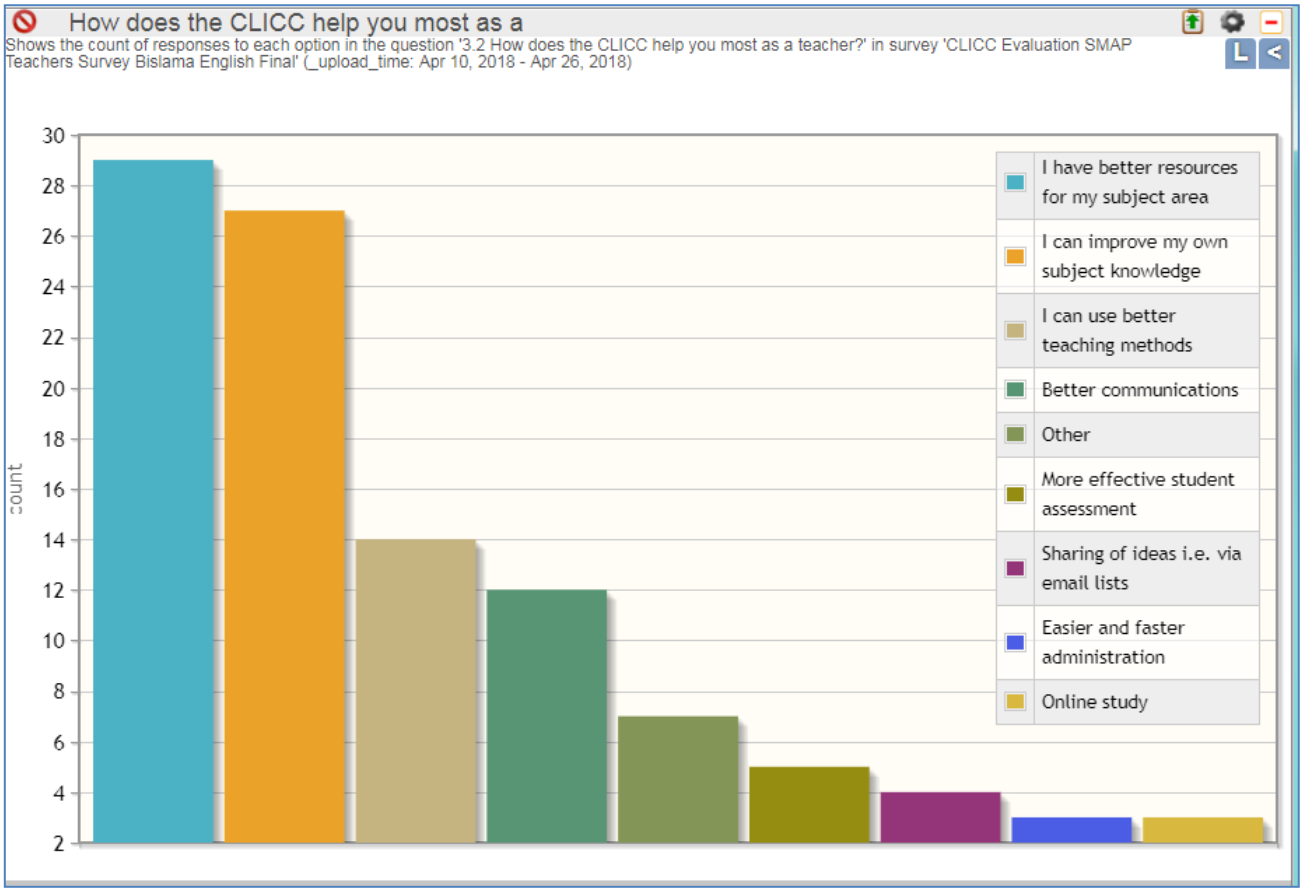


Figure 11: Teachers responses to the question "how does the CLICC help you most as a teacher?"

Area of benefit	**Summary of teachers' responses and examples**
Teaching efficiency	Saves time. Instead of writing on the board I can just type up notes and hand to students. Sometimes she has used it to type up notes for students Using paper is like wasting too much time, using Internet is very fast and reliable Will save me time especially if I can save my school work from this year and still use it next year It helps a lot by reducing the amount of need to go through textbook. We have 45 minutes to teach and that time is too short for me.
Teaching methods	By using CLICC I typed summarized my topic and print it hand it over to the students instead of me writing it on the board for everyone to copy. Videos to use for teaching Teaching becomes effective Use projector to make presentation
Teaching preparation	Improve my time table and lesson plan Lesson preparation
Student assessment	Completing student reports. Write student report cards
Teaching and learning resources	We don't have textbook resources for that so they rely on Internet resources. Especially useful rural teachers especially in Year 13. Grammar & library and books they have are not good. You have to be creative to find information. The library was out of date. To do my research on the subject because our library was no good. Help me research my Subject. I can access stuff beyond my knowledge using the internet at the CLICC.

	There is a shortage of material so Internet is a necessary source of information Teachers come to get information for their lessons, eg Tourism, Geography Future plan is to create an archive for resources or other school cultural activities Can access accredited sites to provide students with more accurate information.
Teaching ICT	Essential for ICT class
Communication	I used it also to send email to banks in Vila to authorise the school payment Easy to communicate. I look after the year 10 program so I have to always use the CLICC to check for email updates from the Ministry of education in Port Vila. Email over sea is much cheaper than calling
Teacher ICT skills	Learn how to use computers. Grades my skills in using the computer Teaching teachers more on the use of computer
Teachers and families access to Internet	We teachers pay 1000vt per month to use the CLICC. This fee covers all uses: class periods, professional use or personal use. I find this fee is cheaper than paying for mobile data on my phone. Teachers can access CLICC internet at their homes (i.e. at that site)
Professional development	Some teachers are taking postgraduate online courses at USP Fiji If (teachers) take USP courses they can become permanent staff. Without the upgrades, they remain temporary teachers. (this teacher was on probation" for ten years. Just became permanent partly helped by the Internet access even without USP course)
Motivation	Teachers and students both are really looking forward to learning
Tablets	Can use (a tablet) as a calculator. Very helpful because (the tablets) have everything in there. (this is a teacher who doesn't know how to use computers or have access to computers) Computer screen is better (than tablet).
Reduced travel	When this centre was introduce the students no longer go to Luganville to do their research
How benefits to teachers can be improved	Have one PC with screen or projector in each classroom, then can make teaching with ICT easier Admin should encourage teachers or make them aware of the CLICC's benefits and uses. Teachers are used to their same style of teaching. They want to provide a short course to teachers on ICT use on their next break Content must be relevant to Vanuatu national curriculum. Encourage online courses or other professional development for teachers Teachers need more training in ICT (the most common response) Awareness for teachers of uses of the CLICC

Table 7: Summary of the ways teachers report that the CLICC or TFS is benefiting them

5.2.8 Benefits for school administrations

The roll out and adoption of OpenVEMIS is obviously a major benefit. Although OpenVEMIS can be accessed with any Internet connection including tethering on a mobile phone, the CLICCs have been used in a coordinated way in the roll out and thus become centres of knowledge for the ongoing EMIS programme. We found for instance that teachers in Tanna from other schools have on occasion come to use the CLICC at Loukatai for entering their school and student data, partly due to the attraction of large screens and keyboards and an IT teacher available to assist.

All schools where the Internet was available were up to speed in all areas such as entering school information, inventory, teacher records, financial data, student registration and classes, and student attendance data. Our impression was that OpenVEMIS was seen as an advantage and they were motivated to use it. The vulnerability of paper records - especially with the annual cyclone risk - was cited to use more than once to demonstrate the

advantages of a cloud based EMIS. The vital records of student registration were safeguarded. Another point made was the promptness of information entered into the EMIS, compared with sending papers by mail or courier.

It was obvious that the Provincial Education Offices have been closely involved and are able to use the CLICCs as hubs for the roll out.

Other benefits for school administrations reflect the general benefits for teachers in Table 8. The most common benefits are from the efficient and more "paperless" office and communications. Schools emphasised the time savings, reduced need to travel to town, some noted that teachers absence is lower, and that MoET can monitor teachers performance because of reports send by email.

Obviously the improved and prompt communications are helping in many aspects. For instance some schools had applied for Internet banking and could view their statements immediately rather than waiting for the end of the month, which was very useful for parents too as their fee payments could be verified quickly. Administrations also find useful templates and examples on the Internet, for instance USP for templates for school policies.

Not all administrations are innovating in these ways, however, and perhaps MoET might help share these simple "quick wins" with schools and give guidance.

It was hoped that the CLICCs could act as hub schools and share benefits with nearby schools. This was happening to some extent, but was affected by local contexts. For instance the primary schools in Tanna would have to spend quite a lot on travel to Loukatai, which was a concern for them. School politics may discourage other schools if they don't feel they are really allowed to share access.

However, there were good examples of interschool collaboration. For instance at Sarakata we were told that a group of teachers from Santo East is going to come and run training in the CLICC for two weeks. The informant explained that, "Other schools have computers, but if they need to do something where every teacher is hands on, they come here". This shows that CLICCs can be hubs for knowhow and support for using the ICTs. It is clear that OpenVEMIS is helping this dynamic, and MoET should look out for other opportunities.

5.2.9 Professional Development

Many of the benefits for teachers mentioned above relate to professional development. For instance, the impact on subject knowledge and productivity. Aside from those, the most obvious opportunity is online study.

Of the 34 teachers interviewed, 13 replied "yes" to the question, "Do you use the CLICC to study any online courses". Of these, a slightly higher percentage of the 11 female teachers in the sample replied in the affirmative.

The most common course provider was USP (8 teachers), followed by free/open online courses (3). Other providers mentioned were MoET, Fiji Institute of Technology and Vanuatu Institute of Technology . 5 teachers reported having completed a course whilst studying at the CLICC.

Teachers are also studying at the schools supported by AUF, however AUF declined to provide any data. This was a disappointment for the evaluators, because AUF have a lot of experience around how to maintain sustainable learning facilities and ICTs.

Obviously, access to online learning should be a key feature for the CLICCs. For instance, as one informant related, "If teachers take USP courses they can become permanent staff. Without the upgrades, they remain temporary teachers". The teacher who told us this should know; he had been on probation for ten years, but had just become a permanent staff member (partly helped by the Internet access even without USP course).

As mentioned elsewhere in this report, it is a real commitment in time and sometimes money to enrol on a course online study. This is why it essential that the Internet access and computers remain stable and available. The examples we heard of those who signed up (and paid up) for courses but the facility subsequently became unavailable demonstrate that this can be costly for those who invested in it, and trust will be lost in this opportunity.

The Education and TVET authorities (Vanuatu Skills Partnership) might consider coordinating and making available to teachers regularly updated information on what courses are available, including free and open courses. There are many free and open courses available (sometimes known as MOOCs[12]), and guidance on what courses are most relevant and available would be useful to teachers. For instance, sharing up to date information on this could be helped by an email community (or teachers Facebook page). The UAP email community set up for the original CLICC training is regularly used to share information like this.

Some of the institutions that offer free courses are well known such as the UK's Open University, and even MIT, and support is also available via the Virtual University for the Small States of the Commonwealth (VUSSC).

One notable provider is the New Zealand-based OERu[13] who offer high quality free short courses that earn micro-credits leading to recognised qualifications. These are particularly suited to the Pacific and especially suitable for educators. The author is aware of several teachers in regional countries who have enrolled and found the study programmes suitable and appropriate.

5.2.10 Teachers Computer Skills and Digital Capabilities

Once people have basic skills, Internet access becomes unequivocally a benefit. However, we found that even in the larger secondary schools with quite embedded ICT culture, by no means all teachers would have even the most basic of computer skills. Although there were obviously some teachers in most schools with reasonable skills, the datum is very low and practice many teachers are struggling to benefit from the CLICCs and tablets. This was reflected by a widespread call for more training - when asked what the priorities should be, most informants mentioned this.

Figure 12 shows the ICT skills that the 34 teachers we interviewed said that they possessed. Although none of them said they had no skills whatsoever, a close inspection reveals that the most common skills are limited to the more simple applications such as typing, searching with Google, and email. For instance, significantly fewer teachers claimed they were able to view Youtube, use Skype or a simple spreadsheet application.

In some primary schools, it seemed that it was mainly just the students that were using the CLICCs for scheduled training and other organised uses. Scheduled training for teachers appeared not to be taking place or considered a priority. In some cases the CLICC seemed to be open only during school hours, and the issue with password management and multiple gateways also caused confusion and was a barrier to consistent access by teachers. Even in a "quality" primary school, Sarakata, It is not clear that the teachers at the school in general have very advanced or solid computing skills. The Principal said that with some support the teachers COULD use the ICTs for teaching (not that they were).

Computer skills disparities also affected the larger secondary schools. At Matevulu we found the same issues concerning teachers not having basic computer skills, and typically not being trained through the CLICC. Many of the teachers who had computing skills were younger or more recently graduated teachers who had developed their computing skills independently (as students themselves, for example).The interview confirms that only of the 34 teachers that we interviewed, only 1 reported that they had their initial ICT training at the CLICC. All the others had their first ICT training before the CLICC was established, mostly self-taught, some learned whilst at college/university, at a previous job, they learned when still at school, or by friends.

CLICCs and TFS schools should consider scheduling basic training targeting those teachers with the least skills, as a special needs group. This group should be given special attention. These are the ones who are in danger of being left behind, whereas many teachers with some skills have the capability to use the CLICC and tablets to learn more.

[12] Massively Open Online Courses
[13] http://oeru.org/courses

As a longer term strategy, the Ministry of Education should consider bringing in a minimum ICT competency standard for teachers that will lift the "datum" to a level where teachers will not be left behind.

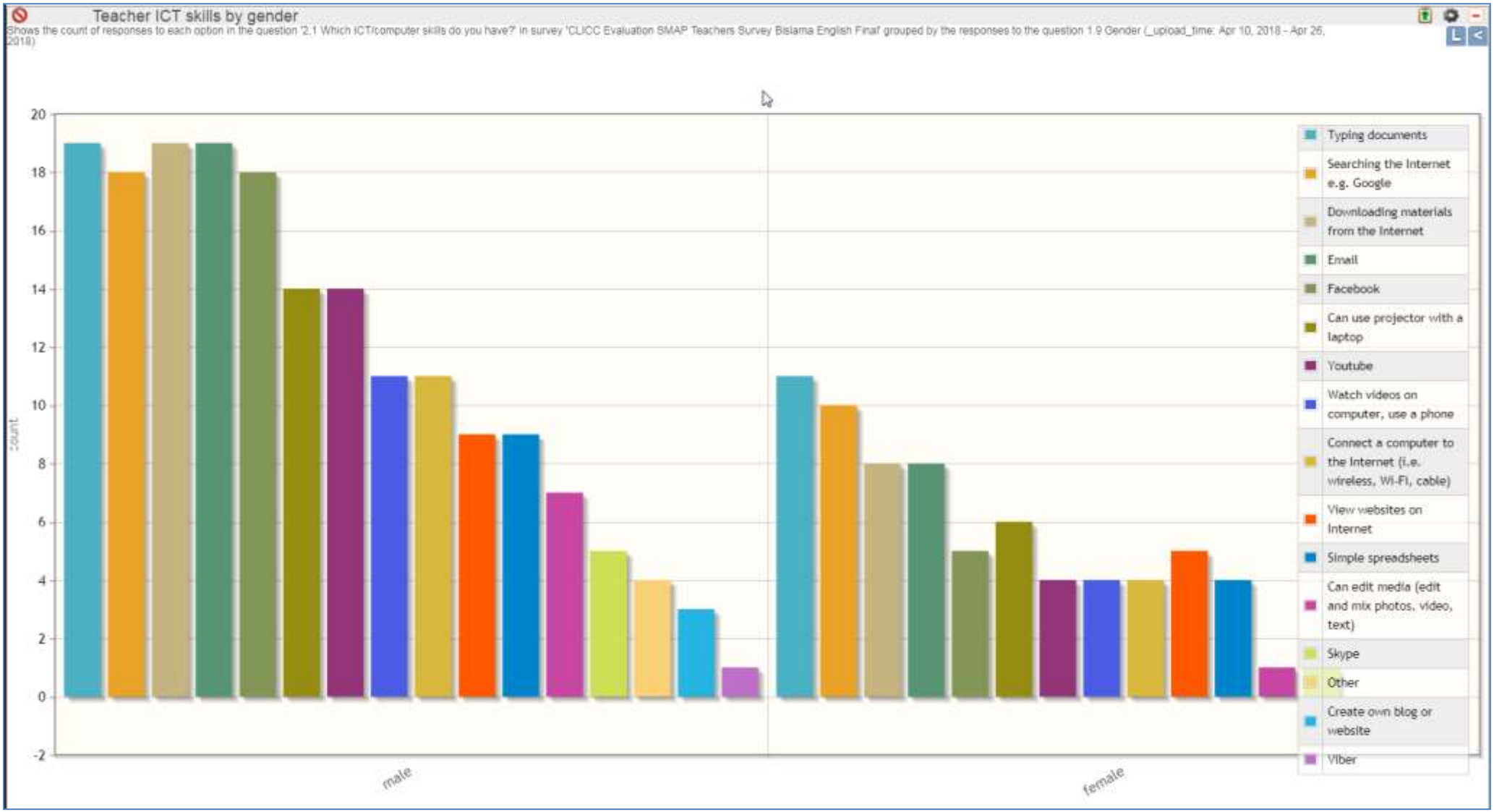


Figure 12: Teachers' ICT skills by gender (n=34)

As ICTs and the Internet are becoming more and more required in many aspects in life, the danger is that some teachers may be being left behind. The Internet heralds many changes in the way things are done, including education. If we do not carry experienced teachers along with the changes, we risk disempowering or deskilling those who cannot or prefer not to adopt the new ICTs into their practice.

The importance of this issue and how if not addressed it will become more of a problem to push through reforms, is revealed in the experience of an advisor assisting with the roll out of EMIS in Fiji and Vanuatu. He related that when at provincial EMIS trainings the 10% with no basic computer skills would often waste them hours, spent training them "what is a browser" when they should be learning to use the EMIS. This would drag down the quality of the training.

It may be time to start planning how to lift the skills of the few who are being left behind. Perhaps a suitable standard or "teachers computer driving license" could be envisaged and a suitable course designed. This could gradually be introduced with targets set until it is a requirement. It could be integrated into Professional development and teachers could access it various ways, including Moodle, through certified trainers in the provinces and of course at the CLICCs.

The Ministry should also look at including ICT skills in teachers profiles in OpenVEMIS so that they can be tracked and this would also give some indication of the impacts of ICT-trained teachers.

A recommendation for teacher education would be to work on teachers perceptions of how technology relates to their teaching areas. Many teachers commented that the Internet was mostly useful for maths and science subjects and not so much for others. This common belief contributes to the lack of motivation some teachers may have to acquire ICT skills. Teacher education should address this, for instance in teaching the relationship between technology, pedagogy and subject teaching (TPACK[14]) and the aim should be to incentivise and empower teachers by teaching them the relevance that Internet and ICTs have to their content area and the opportunities arising for their practice.

Digital Capability is another useful concept, that brings together a number of new literacies (including information literacy and digital skills) into a framework that can be used for professional development. Digital capabilities are more than skills alone, when one is capable can put them into meaningful practice in different contexts. Digital capabilities fit an individual for living, learning and working in a digital society. For more about the Digital Capabilities see the framework developed by the University of Adelaide[15].

5.2.11 Coordination with Provincial Education Offices

Two school support officers in Malekula to whom we spoke were very much in support of the CLICCs but said there has to be better coordination. There has to be a CLICC representative in the Malampa education office in order to assist wherever they can. For instance to assess their postings of IT teachers and to ensure there is a qualified IT teacher at a school with a CLICC.

They also pointed out that there was an IT association on Malekula that could play a role in providing critical technical support and ongoing training. They recommended that refresher training should be provided for IT teachers at CLICCs periodically, and were adamant that the ICT teachers should be trained, not the Principals.

[14] TPACK stands for Technological Pedagogical Content Knowledge. It is a theory that was developed to explain the set of knowledge that teachers need to teach their students a subject (content area), teach effectively, and use technology.
[15] Digital Capabilities Framework, University of Adelaide https://www.adelaide.edu.au/library/digital-capabilities/project/

5.3 Community Access and Benefits

A general observation we made was that community access and use seems not to be happening to the extent that the stakeholders expected and intended by design. Rather than being multi-purpose, open access spaces for learning, research, computing and information for everyone to use, the CLICC facilities often seem to have become more limited in their use as computer labs mainly to support dedicated IT classes.

There are however, instances where the potentials were demonstrated and key functions of the model were recognised. Even though those might not always have proved sustainable, our field data provides us with useful indications concerning the way forwards.

One should also remember that educational benefits are also benefits for the community, and people have multiple roles. A teacher may also be a parent of students in the school and a member of the community, and may have other roles (women's group, family business, etc). There may be positive dynamics from this (improved engagement) but also tensions or conflicts of interest.

The barriers to community access that we identified are discussed in detail below. In some case there is no real 'community' nearby and where there is, most people either use their own devices for accessing Internet, or they don't know anything about what the computer can do, or how to use it. Community access where it is happening seems to be mostly through the Internet, and for communication, social media and entertainments such as watching videos.

This low and unfocused utilisation may be impacting on the sustainability of the facilities in terms of reduced support from the community. Many schools are managed by community-based School Councils. At one rural school, the Chairman was vocal in questioning the benefits. He said that he did not see the equipment being used effectively and very few from the community used it, but yet the school was having to spend what he saw as a significant amount to continue the Internet subscription. He suggested that "*You grow kava for money, you grow cassava to eat, but what is the benefit of the Internet?*". Unless the benefits of the Internet are clearly demonstrated and understood by this community, it is likely that they may discontinue grant allocation for the broadband.

5.3.1 Impact of unreliability

Lack of continuity of service - poor reliability resulting in low availability of the facilities - was noted as a killer of local innovation. The technical reasons why a significant number of the centres failed to provide a consistent service has been discussed above. Where a service has been introduced and is recognised as an opportunity by individuals or groups in the community, but is then withdrawn for whatever reason, the unfulfilled expectations that were built up can be more damaging than if there had been no service at all.

We spoke to one female who had seen the potential for distance learning and soon after the facility opened, had subscribed to an online course. However, when the facility shut down some time after, she was worse off than if she had not enrolled - having to travel at some expense on a regular basis to continue her studies or risk losing her investment.

Likewise, at one CLICC that is situated close to a quite vibrant community, there seemed to have been expectations created for some community members including businesses (stores and a bungalow) who were trained in how to use it and told that it would be available to them. When it broke down soon after and was never fixed, it created issues for a number of them.

Although reliability was a major barrier during the piloting of the CLICCs, these kind of mainly technical issues should be reasonably uncomplicated to address in a revamped programme, especially given the improving trend in rural Internet services.

Heavy demand for the facilities based in secondary schools was also a factor limiting access to people from outside the school. Students require access for computing classes, and also for research purposes (often scheduled in one hour blocks) generally leaving little time for other people to use the CLICCs.

5.3.2 Perceptual barriers

In some cases there were perceptual barriers regarding who the facility is intended for. For instance, in some Francophone schools especially those whose CLICC was supported by AUF, some people expressed the perception that the facilities were for AUF students only. On the other hand, in other cases Francophone people might perceive the facility as preferentially supporting the Anglophone community, due to the predominance of English only content and English keyboards.

We noted also that at some schools people from the community stated that they were not sure if the school was allowing regular open access to the school grounds to community members. In some cases this was despite the awareness talks given by TRR (sometimes repeatedly). Social coding of the facility may be playing a part in this issue, so that despite awareness talks, it may still not seem accessible for different groups within the community.

Questions to be asked include how the is school communicating to the community that the facility is to be shared. What does the actual ICT space and the layout communicate to people? Is the "private cubicle" style, mimicking cyber cafes, appropriate for a multi-purpose information and learning centre? Are the opening times appropriate to everyone and are the access charges appropriate and affordable for everyone?

This is obviously a highly gendered issue and that aspect is discussed further below.

5.3.3 Local contexts

The wider political context of schools and communities can also result in perceptions that act as barriers limiting or discouraging people from using the facilities. It would be hard to understand the challenges around some of the CLICCs without understanding the broader and less visible dynamics. For instance at one school the late Principal had become involved in politics, the CLICC was unable to operate at peak times because the local electrical grid was turned off in the afternoons, and there had been some tension between the primary school (where the CLICC was located) and the adjacent secondary school (host to an AUF facility). The presence of the Catholic Church, which has a particularly directive and engaged relationship around education matters, may also have had some influence affecting real or perceived priorities placed on the CLICC.

Put together, and despite the obvious potential of a CLICC in such an economically active community, these issues seem to have complicated the prompt restoration of the facility after it was significantly damaged in 2017 by Cyclone Cook.

5.3.4 Awareness

The comment that people need to know more about the purpose and potential of the Internet and CLICC/TFS facilities and have the skills to use it was heard at all the research sites.

The word cloud in Figure 13 below, illustrates the twin priorities identified by teachers in recommending how the facilities may better support parents and the community, awareness and training.

Some schools had carefully considered the issue of marketing the CLICC/TFS to their surrounding communities. At Tafea College the Principal said that the school had identified this need. The school is located somewhat inland and the nearest villages not particularly close. He explained that the surrounding community, in his opinion, were hardly benefiting from the Internet even though 3G access was available to them. This was because, although many people now owned smart phones with touch screens, they only used them for voice communication. Aware of the heavy usage of the main CLICC by the school, he explained that they were considering purchasing a plot of land closer to the road and build a computer lab facility there for community to use.

The incentive for this may be as much about alternative/supplementary income generation for the school, as it is about improving public access. However, it was interesting that this Principal has been thinking carefully about how to go about "marketing", and not just assuming that simple awareness raising would suffice. He said, "*You can't market something that people know nothing about*". This implies that even advertising won't work or invitations to computer

classes if people have no idea about what the Internet or computers can do and how it might benefit them in their daily lives. He also touched on a possible strategy, to build community usage by partnering with projects or organisations whose programmes would be of interest (for women in particular) and thus the CLICC more marketable. This links to the discussion on "meaningful access", below.

Figure 13: Word cloud from 34 teachers' responses to the question "how could benefits to parents and communities be improved?".

Awareness raising programmes were also held at Sarakata school, which is very different from Tafea being located right in a well-served urban area in the second town of Luganville. Awareness raising sessions were held for to parents during parent/school meetings and notices were given out explaining that people could come and use it. The Principal also notified nearby schools and a kindergarten. However, she said, "*Almost nobody came especially this year. Maybe the school should open another entrance at the back of the computer lab so that community can easily access it*". Her suggested solution would also be to improve the times the facility was available for parents and the public. It may be the case that needs and demand would be different in such an urban area, where many have access and are using the Internet already. The features of quality, unlimited access and the large screens and keyboards of the computer lab may be key features to promote, along with the training for a community who may see the benefits of the Internet differently to Tanna's rural population.

5.3.5 Skills and capabilities

As can be seen in the world cloud above, along with awareness, the communities and teachers are calling for basic computer training for community users. As one informant stated, a lot of people in the community would like to use it (the CLICC) but they don't know how to. A key recommendation is that scheduled training in basic computing for the public should be a top priority.

Computer skill training for the public is a dilemma given the current CLICC model. The secondary schools, as we have seen, suffer from heavy demand from their scheduled ICT classes and from scheduled student research, and even the junior students in those schools struggle to get time in the CLICC. Primary schools may have a little more free time during working hours to invite public access, despite also having to cater for students' training. However, they have the added problem of recruiting and financing a suitably qualified supervisor for the CLICC, who is usually a volunteer or on a minimum wage as a locally appointed ICT teacher.

Loukatai Primary School benefited from a very competent and committed local volunteer who supervised the CLICC for almost two years before leaving to study overseas. He and his wife shared the role and they organised computer

training for both the students and parents and community. His replacement is also a very competent young man who has a qualification from CNS, the computer training specialists in Port Vila.

From this experience, Loukatai school is well qualified in raising their main recommendation concerning training. This that the CLICC's should offer accredited courses that are recognised officially in Vanuatu. Although the school has successfully trained young people from the community who have then gone on to obtain work, the lack of a recognised certificate may be disincentivising people from signing up for training. It may be worthwhile for the stakeholders to work with the suitable authorities such as the Vanuatu Qualifications Authority to address this.

Taking a lead from theoretical perspectives[16] , it may be useful to think beyond skills and consider peoples' "capabilities" and "functionings". For instance, the capability to use a public-access facility such as a CLICC is more than a skill or even a set of skills, it requires an assessment of what the facility offers (affordances) and how best they can be used effectively and appropriately to further one's aims.

Functionings are the "states of being and doing", when capabilities are put into action. ICT-based capabilities need to be converted into actual functionings, and whether this takes place depends on individual choice, which is a mix of personal preferences, specific needs, and social norms[17] (gender based norms are discussed below).

In summary, ICT skills do not necessarily lead to empowerment, i.e. people can receive computer training but for various reasons are not able to put their new skills to use and optimally benefit from them.

5.3.6 Significant usage by the community

Unfortunately, there has been no continuous survey of CLICC customers to capture the reasons they have been using the CLICC facilities. Instead, the team was able to take note of a range of instances - significant examples - and come to some conclusions about the degree to which this was happening.

Importantly, we have observed some of the contextual factors that are limiting access. These have been described above. In this section the kinds of community usage will be discussed, with suggestions of how the social, economic and human development benefits to the community may be improved. Table 8 below lists some of the types of usage by members of the community and ideas that informants gave for improving benefits to the community.

A key benefit of the CLICC that applies to both the school and the surrounding community is access to up to date disaster information, as well as up to date information and news in general, and local as in news of events in Vila. Some schools are posting and sharing this kind of information with surrounding communities. This is seen as useful as newspapers take time to reach rural areas if at all. This was mentioned to us by several school administrators and community members. Schools and IT teachers have learned where to locate cyclone warnings and visualisations on the Internet and say these are very helpful as the meteo reports on the radio lag behind somewhat.

When the internet is functioning, this gives a community advance warning of cyclones and tsunamis. This warning mechanism may be especially useful in remote rural locations. It may also help to prepare and secure the facility in a timely fashion. An associated point is that CLICC facilities should be housed only in strengthened buildings, fitted with air conditioning if power is available, and that schools should have contingency plans to secure and protect the equipment with tarpaulins or otherwise, as a cyclone approaches.

Typing letters, charging phones (when power was available), printing out documents and copying were some of the most common uses of the CLICC in several locations. Movie watching, social media access, and communication with overseas friends/family, were also common uses of the equipment provided through the CLICC, particularly by students.

[16] E.g. ICT Choice Framework, Kleine (2010) derived from Sen's Capability Approach.
[17] From a summary of frameworks to assess the impact of ICT4D, Heeks and Molla (2009)

Although only seen in isolated instances, given all the issues experienced at those sites, the targeting of productive sectors to suit the needs of specific communities is being demonstrated, especially agriculture.

Table 8: Significant instances of community usage of the CLICC/TFS

CLICC/TFS School	Examples of significant usage	Responses to the question : "How can we improve benefits to community?"
Eles Center School	• Contacting family members overseas, i.e. RSE/SWP workers • Returned RSE/SWP workers acquire online information to help them build houses • Bungalow owners not using the CLICC; they use phones; bookings (AirB&B) are managed in Vila by relatives • A Mamas Computer Club (women's computer group) predating the CLICC benefited from the Internet access, using their laptops donated by USAID. They would meet every week to train other women. MCC now appears to be dormant but the original trainers might be "revived". • Accessing local news, e.g. Pacific Mini Games, Port Vila, 2017 • Hosted Principal's Conference • Some women use the CLICC after school and weekends • Children ask parents for 100 vatu to use for entertainment and social media	• More government e-services needed • More stores in Port Vila should have Internet catalogues • School should organise public meeting to agree opening times that suit people
Loukatai Primary School	• Cyclone alerts and information printed for public, regarded as very helpful. • Community volunteer (TRR Consumer Champion, child protection, research) uses and values the CLICC • Computer training courses provided. One young woman obtained a job with a Port Vila-based NGO as a result of her training, which required computer literacy. • Printing and copying of information by (and about) the school for the parents. • Community people use the CLICC for typing and printing. • A bungalow owner used to come but now has own Internet. • Students come to enrol on USP. • A Pastor comes to do his email. He is a champion user of the CLICC.	• Need to offer recognised computer courses. • Need to have information about what online courses are available for local people. • Main concern is retention of a suitably qualified CLICC supervisor / IT teacher.
Tafea College	• An agriculture officer used to come and use the facility but he moved to Vila • Parents access cyclone information • People coming to watch religious videos on Youtube for monthly prayers for church • Limited community use so far (mainly used by the school)	• School plans to purchase land near road for a small community access facility (i.e. extend the existing CLICC) • Need to provide content interesting for local women • Partner with NGOs to help women (and men) understand potential and how to use Internet to help them
St. Anne School	• A health worker accessed medical information from the health encyclopaedia on the server portal when the Internet was down, and has used the CLICC when the mobile network was unreliable. She mentioned Public Health had set up online courses for nurses but it didn't happen when the CLICC stopped working. • Limited use due to CLICC functioning only a short time, and no power in afternoons • Bungalow owners did not use the CLICC [Note: the facility was not operating for most of the programme 2 years, esp. after a cyclone]	• A former member of the CLICC committee and Chair of Fishermen's Association said if it was functioning, he could see it being useful to help monitor fishery resources, apply for business licenses, link to national statistics, small business could have training in business related software such as MYOB
Matevulu College	• This school is quite isolated and there are no real "communities" nearby that can benefit from the facility.	•

Sarakata Primary School	• Community members & parents do not seem to be using the CLICC (council member & parent) • An Agriculture student at national College of Agriculture used the facility when the college had no Internet [Note: Sarakata is in an urban area where people have good 4G coverage and presumably lots of options for accessing Internet]	• Several attempts have been made to advertise the CLICC to parents and community, and other schools and educational institutions. • Open up a separate access door to the lab, so that people feel less intrusive entering the school compound.
Merei Center School	• Youths would stand around the school boundary downloading, etc. • One teacher reported that community members are not allowed to use the tablets. • When Tassiriki hosted a National Presbyterian Church Meeting the TFS facility provided Internet access to participants for a fee (and access to the tablets). Sanma PEO witnessed heavy usage by participants. • Senior Elder used it for religious study with NTM, Melbourne, and obtained a certificate • If local source of mobile credit runs out, people use FB Messenger to request friends/family transfer some • When Internet working, access to cyclone and tsunami warning information is very useful for this community • Access bible e-book or online [Note: Most community members in a context like this have very little computer knowledge or skills. There would need to be much more awareness about the uses and practical applications of the computers/internet, and a lot more training provided in order to support more productive community use in a context like this]	• School should build a room for ICT storage (i.e. dedicated space for the tablets and for guests/users) • Community users are encouraged to bring own devices to access Internet • School management (and TFS) is better in the hands of community, as it is now • Female assistant needed, the right person to look after and facilitate use of the tablets
College d'Orap	[Note from evaluators: The internet was only available for 1-2 months after the TRR equipment was set up. There is a surrounding community who could benefit from the resource (Internet, and access to computers) but to date they have not really been benefiting because of the ongoing issues, and it appeared school was not allowing regular and/or open access to the school grounds to community members.]	• Internet access needed. Very important for school. • Need better reliability of power.
College de Walarano	• When the CLICC was working the school had trained about 35 community members basic computing skills and how to use the CLICC. These community members were provided with a certificate. • One individual signed up to do online courses, but when the Internet access went down, she needed to go to USP at Norsup to finish her course causing her expense. • APTC courses offered in 2016. [Note from evaluators: The ISP network was down for 11 months of the 2-years programme]	• Reliable Internet access needed. Expectations were built and then not delivered. • Internet not delivered in 2016 should be rolled forwards to this year. • A trained IT officer is needed as the TRR-trained persons are no longer at the school. • Training for community to understand use of computers and awareness of uses of the CLICC. • The offline (server) resources are limited to science areas.
Lambubu Primary School	• TVET had used it to run two different agriculturally-focused workshops (one week each on two occasions). • Community access was sold via tickets, (but tended to be somewhat sold out to men and boys) • People using to contact relatives, marketing products and accessing news (many are farmers) • One teacher said: Community long to see the CLICC up and running again. The Youth here have always enjoyed watching movies and downloading songs. The community also using it to communicate with their families overseas especially in Australia and New Zealand (RSE & SWP seasonal work).	• Need IT officer to have specific training to fix nComputers and need them fixed • Allow more parents and community to help

Epi High School	• A community leader and former politician takes part in a lot of community work, needs the CLICC every now and then to communicate with partners, project managers, sponsors, for finding potential sponsors, applying for projects etc. • Political activity: he has a political establishment there and needs to type letters, emails etc...to be functioning and active. • Business: the CLICC helps also him with his other businesses • Some tourism related uses • People contacting relatives overseas • Entertainment purposes • [Note: this TFS school seemed to have a few committed users]	• Add a computer lab, tablet screens are too small • A replacement server is needed as of early 2018. • The community is seem interested but maybe they would benefit more from the CLICC if there are enough computers- the tablets are used mainly by student classes. • There should be a computer lab to accommodate the community and students or maybe a separate one for public. The CLICC is very useful to the school. • Provide community with training and awareness on the uses and benefits of the CLICC. • For the community to benefit more they need to be aware of the benefits and that they could also access it...they tend to think that it's the school's and they're not allowed to use it • Provide French keyboards • I want to see the community making good use of that CLICC. If need be there should be a separate lab for the community to access at the school. The school and community hold a good relationship so I don't see any reason why the community isn't using the CLICC. People in the community also aren't aware that they could use it. • If there's awareness to mothers and women on the uses and benefits then they could get information about issues affecting them e.g. child maintenance, how to report cases or criminal cases. When the women attend conferences or meetings they could be referred to websites to update themselves on women's issues in the country

The health worker who had accessed medical information from the server portal when the ISP network was down and for other reasons, demonstrates that an offline cache of important relevant resources does have value, especially for Vanuatu's rural areas vulnerable to natural hazards and less reliable services. It showed that in this case, "generic" resources sourced from the world of open access information can be relevant and useful to professional people such as medics.

In two cases at different sites we saw how useful such a facility is to local champions, i.e. motivated and capable people committed to helping and developing the community. This includes a volunteer and a local politician who had been an MP. These people might be recognised in some way, at least they should have access to a "helpdesk" so that they can help improve the service, report problems and be useful (and be rewarded) as local experts when needed.

The improved ability to communicate reliably with family and relatives was highly valued. Dislocation is a feature of modernity, as people migrate to access educational and economic opportunities. In almost all the sites we visited, people mentioned that the CLICC was used for communicating with family members who are seasonal workers in New Zealand or Australia. Although smart phones apps such as Skype and Viber are available to people, skills to use them may be lacking or the CLICC computers with unlimited broadband and large screens may be easier and better for the purpose.

This is an example of a leading application that can help promote general use and thus benefits. There were some interesting stories around the seasonal work aspect. A Chief resident near Eles Center School said that when he was overseas under the programme his young daughter had sent him a photo of herself sitting at a CLICC computer. This inspired him to buy her a laptop computer, which he took back with him.

Such leading applications could be noted and more general support provided for them in the CLICC and TFS centres. For instance, seasonal work agents should make use of the CLICC facilities. Training could be provided to use Skype, Viber, with up to date information about the RSE, how to apply and who to contact, cultural advice and testimonies from returned workers. The whole process of applying should be reviewed and bottlenecks such as having to obtain IDs or documents in Port Vila in person should be considered for replacement by online means. Information and know-how regarding related services such as online money transfer, awareness of e-banking and so on should be on hand at the CLICC. Educational uses could also be build around such applications - from cultural exchanges or school twinnings to student assignments about seasonal work.

Using the facilities to access social media, especially Facebook, was a common theme and sometimes a concern of our informants. We noticed mixed perceptions including negative views of social media that reflect the national and regional debate on the more undesirable impacts of Facebook (such as fake news and cyber bullying). The most common comment was that students are being unproductive when accessing Facebook, and one Chief commented that students sometimes complain when they see teachers accessing Facebook in class on their mobiles.

Whilst schools might need policies to control the more diversionary use of social media by students, the CLICCs could also highlight the ways social media is helping Vanuatu in more targeted ways. There are many productive and constructive applications of social media active in Vanuatu, for instance Facebook groups and pages that enable people's political, cultural and civic participation, bring people together around important issues such as climate change and raise the voices of marginalised groups. CLICCs as learning spaces can be hubs for civic education and learning around citizenship. Along with this, social media literacy should be taught in the CLICCs, i.e. awareness of the risks including privacy issues and the risks mentioned above.

Facebook can also work well with communities of practice (e.g. teachers, farmers, cooperatives) because it is easy for the network to grow without special training and to access on phones and computers. For instance the Fiji teachers' Facebook group is very popular with thousands of members is regarded as very effective in sharing ideas and knowledge. The New Zealand-based High Tech Youth Network actively encourages online collaboration between youth innovators but uses a private platform to improve safety for the children.

Many of the CLICCs were used as venues for meetings, workshops and conferences, including Principals Conferences, OpenVEMIS and other trainings. This feature could be leveraged much more especially with help of the Provinces,

Churches, NGOs and Government Ministries such as Cooperatives, Internal Affairs, Agriculture and Forestry and Health.

Churches can be key to integration of such facilities, especially when a local respected pastor becomes a champion user as was seen at Loukatai. This was not happening in all cases, and perhaps that is an area where improved partnerships with Churches could help drive beneficial and productive use of these facilities.

The opportunities to study online distance learning courses was demonstrated in a few locations, and as with teacher PD, more information should be circulated regarding online courses that are available to the public.

Another question is whether, in such situations where there is little support or training, tablets may be easier for community people - especially given the now widespread familiarity with touch screen phones. It is difficult to make any general conclusions about this by comparing TFS sites, because of the different contexts. The tablets seem to be used effectively by a few community users at one site although some commented on the small screens. School policies also differ - at one school the community were not allowed to use the tablets which is obviously a factor in low usage.

A general observation is that the CLICCs need to be better monitored, so that usage patterns can be recognised and thereby better inform stakeholders of opportunities to support growth in terms of productive uses. There are varied ways to do this, either by periodic surveys, continuing surveys (for instance users can be invited to complete short surveys linked to a central database). Volunteers may be interested and motivated to keep records and share stories and experiences, for instance with blogs, a Youtube channel, etc.

5.3.7 Meaningful access

Obviously, to benefit from using a public Internet access facility there must be a need or desire that is satisfied. There must obviously be a purpose to it - a meaningful context. This provides the logic and incentive to use the facility. Needs are like capabilities in they operate at a higher level than skills. If one has a genuine need and fully understand how the ICT can assist you with it, one can always learn the specific skills.

Learning basic computer skills is an end in itself, and hold meaning in many ways, i.e. the trainee is aware that this may be generally useful for him or her in the future. Thus, the provision of regular computer training for the community is of fundamental value.

The phrase "meaningful access" is found in many recent documents and declarations concerning sustainable development. For instance, the UN Broadband Commission on Human Rights in the Davos Statement (2016) makes the distinction between access and meaningful access, "Too few of the world's citizens are connected to the Internet, and even fewer have meaningful access" and qualifies this by explaining that meaningful Internet access requires relevant, affordable content, available in the right language and offering the capability to transform information into actionable knowledge".

This definition helps us to discriminate between individual access to the Internet via mobile phone and unlimited broadband accessed with keyboards and large screens in a facilitated and supportive learning environment. A lesson learned here is that the CLICCs should work on this added value, emphasising the support, guidance and training, rather than model themselves on private cyber cafes as was seen to be happening in some CLICCs. Awareness campaigns and programmes that aim to improve the benefits for the community should emphasise these features.

A study of the Gender Digital Divide in Myanmar by IREX (2017) noted that in their field research the perceived benefits of ICT use by women was quite narrow, reflected in the narrow range of mainly voice and text applications they used on their phones. As stated above, we note a similar observation in Vanuatu, especially in rural areas.

The gender focus is especially helpful as it foregrounds the different needs of men and women and is therefore equally relevant to both genders. In regards to meaningful access for all, it is certainly not true that "one size fits all". For instance, the Myanmar gender assessments "strongly suggest that men and women in Myanmar have different governance priorities, with women more likely to cite health care, education, sanitation, and microfinance as pressing issues".

The report recommends that more digital content should be aligned with women's interests along with efforts to support their e-readiness. Programmes to improve meaningful access for women will surely amplify the benefits (real and perceived) for everyone, thereby encouraging the men and targeting specific men's needs as well.

The Principal at Tafea College makes exactly this conclusion. When discussing the subject of awareness and marketing of the CLICC to the community, he suggested that what was needed were project-based approaches where women could learn to access practical and interesting information meaningful to them. In this way the accompanying training in computer skills and learning about what the Internet has to offer them would be contextualised and purposive.

He mentioned they wanted to upload content targeting women in the community, for instance on popular subjects such as nutrition, WASH, family health, garden agriculture and handicrafts. They had already located some Bislama videos on such topics and planned to upload them to the server - thus showing the emergence an interesting dynamic that would drive the general improvement of the facility. The way forwards, he explained, would be to partner with NGOs in thematic projects that leverage e-readiness, and by way of example mentioned that, "Everyone knows ADRA", i.e. the Adventist Development and Relief Agency.

What this describes is a need for better programming linkages. The IREX report reflects a similar view and recommends that (for the Myanmar case) that besides government-led efforts, private ICT firms, CSOs, and international non-governmental organizations (INGOs) should work together to "expand the ecosystem for digital services" in health, education, agriculture and WASH information in particular.

A cautionary note should be added here, as there is a risk of ghettoizing women's ICT usage. Along with the provision of popular kinds of information (often domestic related) women's capabilities should be developed for open learning and information access based on their own free choices.

5.3.8 Meaningful Development

A basic objective of the UAP is universal access to government services. Unless equality of access is ensured, the danger is that an e-governance divide can open which can separate elites from other citizens. The provision of e-government and governance related services through the CLICCs should therefore be considered a priority and special measures are needed to ensure that communities are aware and able to access them. Along with this, the dependencies need to be addressed. For instance, a service may require a certain kind of ID. If so, a means of acquiring the ID locally must also be available.

As well as making available e-services and opportunities related to the modern market economy, it may be useful to highlight some alternative perspectives and how they contribute to the sustainable development discourse.

Firstly, society in Vanuatu is mostly organised around the traditional economy, defined as the way in which indigenous ni-Vanuatu societies are organised to look after the concerns and resources of their members[18] . Vanuatu is quite unique in that the contribution of traditional economy is recognised in state development policy. The trick will be to provide services through the CLICCs that support transactions related to aspects of the traditional economy, such as food security and customary land tenure. In making these facilities sit well with their communities, it will be necessary to listen more closely to what is important to them.

Literature on ICT4D in recent years has often understood development in terms of Human Development[19], a concept that encapsulates productivity (health, education, income, individual well-being), equality (gender, ethnicity, social class, geographical), sustainability (community well-being, environmental sustainability), and empowerment (political freedom and engagement, government accountability).

Along with the positive outcomes of "digital transformation" there is a risk of creating new kinds of inequalities. Impact assessments using the human development framework can identify the (sometimes profound) disruptions to society that ICTs can bring, and so informed we can better help society to prepare for the changes. It would be good if the

[18] Described by Vanuatu politician and academic Ralph Regenvanu, (i.e. 2009)
[19] Andersson & Hatakka, (2013),

universal access programme is sensitive to such risks and may thereby carry the people along with the changes, moving towards the kind of modernity that Vanuatu people want in line with their core values.

Finally, a collection of research essays published by ANU[20] on the moral economy of mobile phones illustrates choices that people in the Pacific region make in appropriating technology, and how those choices may be for affective or cultural purposes as much as the instrumental, market related purposes. These kinds of utilisation can may easily be overlooked or dismissed as "personal uses" but may actually contribute significantly to how local people value and benefit from the technology[21] and how comfortable they feel to use it.

5.3.9 Appropriate programming linkages

Ideally, public Internet facilities based on universal access principles such as the democratisation of information should be multipurpose and not restricted to a small set of applications. However, we have seen that there is low demand due to limited awareness of the Internet and how it can help people. This was most noticeable in rural areas but is likely to be an issue in urban areas. One strategy to help generate demand should be to look for a few programme linkages that are a good fit for the surrounding communities, and to build people's digital skills around them. The aim should be to provide a few leading applications responding to demand from and benefiting the community, whilst also supporting open-ended capacity building, digital capabilities and encouraging innovation.

To identify appropriate programme linkages a needs assessment process should be carried out as part of the selection process. This should be participatory, and can include techniques such as community mapping.

For instance, a remote rural community may have a profile featuring fishing, market and subsistence gardening and the church features a lot in village life. Few community members in a context like may have more than very basic computer skills and knowledge of the Internet. It makes sense to put resources like the CLICCs in such locations but they have to be a good fit for the community, well monitored, and with appropriate training provided. Linkages could be made through NGO and other programmes, including the church, that connect to local priorities. These might include food security, customary land tenure, public health and nutrition, the church, online religious study, e-services around market access for fish.

Another CLICC is located in a small provincial town close to an air field and a shipping port. The school is based within an well organised community. The school was originally set up as a church school, so has deep and strong links with the broader community, and communication and information sharing between the school and the community is good. Some potential programming linkages that became apparent from the interviews include business development and support for community development projects.

Priorities for an urban school with good mobile coverage where people have many other means of accessing the Internet should target on adding value, for instance stressing the unlimited features of the broadband, teleconferencing, specific kinds of digital capabilities such as audio and video editing, website creation and so on. The aim should be to provide what the cyber cafe does not, for example to actively inform and help people access e-services (e.g. business development, sending remittances, online courses and whatever is in demand). The High Tech Youth model featuring multimedia production and innovation with technology would work well in urban settings and should be popular, whilst helping to provide opportunities for unemployed youth.

The government should lead the way with their development partners including NGOs and private companies to "expand the ecosystem for digital services" and to organise programming for the CLICCs in the key sectors such as Agriculture, Health, Business and Livelihoods Development. It is obvious that there are many e-services already

[20] The Moral Economy of Mobile Phones, ANU, 2018

[21] For instance, Kleine (2011) relates how women using telecentres for seemingly personal entertainment (i.e. news, video watching and general knowledge) were expanding their psychological resources. Along with other impacts such as expanding of peoples' social networks, this leads to general empowerment - with more chance it can translate into economic activity.

available and some programmes using mobile devices to bring other e-services to rural people are not being coordinated well with the CLICC and TFS programme. The CLICCs should be a hub and centre of knowledge for such services.

Programming can be supported in many ways including scheduling training workshops, building and nurturing online communities of practice (knowledge communities) as well as providing relevant and targeted information for the local library (server resources). People especially find video tutorials in appropriate languages accessible (as long as headphones are provided!).

Programming linkages would combine the focal point for training and support services at the CLICC with the locally relevant content and information that is needs-based and can be transformed into practical and actionable knowledge. Such programmed content could also be made available through apps for smart phones, thus extending direct and practical support from the CLICC into aspects of people's daily lives.

5.3.10 Better coordination with Provincial Governments

There should be better coordination with the Provincial Governments concerning such programmes. They are well placed to understand and address the different contexts and needs and thereby ensure linkages are well targeted. We spoke with officers of three provinces, and heard that although they had managed the use of the CLICCs for the OpenVEMIS training programme, they strongly recommended that their offices be more closely involved.

5.3.11 Recognising the role of Local Champions

There are often local champions, dedicated members of the communities who volunteer to help develop their communities in different ways. These may be people who have particular access and experience, such as an ex-MP we interviewed at one of the research sites, or ordinary members of the community who have been making themselves useful such as a lady at another site. In some cases the local pastors become champions. These people often go unrecognised beyond their localities. Such persons could surely be very effective in helping their communities to find meaningful applications of the facilities, bridging the computer labs or tablets with local needs in ways that the more technical IT teachers may be unable or too busy with scheduled teaching and training. Those local champions could also be involved in monitoring. A lot of interesting activity may be going "under the radar".

On a cautionary note, the use of volunteers should be transparently managed as there is a danger of individuals unduly influencing how the resources are used for political or personal benefit.

5.3.12 Agriculture and Fisheries

Lambubu Primary School is one of the CLICCs that seemed to be operating quite well in support of the community's needs. These mostly are related to more organised agriculture and agribusiness. Although the CLICC had issues with reliability of the computers, when operating it is highly valued (one informant told us: "The community long to see the CLICC up and running again"). The school seems well embedded in and has a good relationship with the community. TVET agriculture courses were held there on two occasions and there is evidence that people have been accessing the CLICC in their role as farmers quite regularly when it was working.

This is a good example of well targeted programming. It could be built on further by investigating the particular training and e-services that could benefit aspects of the agricultural partnerships operating there. For instance, the school has a large processing plant right next to it, but we were told they don't use the CLICC because they have their own Internet access. However, there must be some kinds of training services, relevant online courses and advice on e-services that could be of benefit to them.

A male former member of the CLICC Committee at St. Anne School who holds various roles in the community including Chair of the Fisherman's Association (and was responsible for a marine protected area) saw the potential to support sustainable fisheries, for instance:

- They could use it to monitor fisheries resources (catches, fish populations) and to help enforcement. As the officer responsible for this now, he just uses a notebook and his mobile phone (not a smart phone) to collect and report this kind of data. However, he said that some fisheries officers like him in other communities (including Hog Harbour) had been provided with tablets to collect this kind of information (and training in how to do this).
- He thought that many government entities (e.g. Fishers, National Statistics) were staring to use computers and online data collection tools and processes, so the CLICC could help their community to access these centralized government services too.

5.3.13 Microenterprise and Business Development

There is of course general belief that ICTs benefit business activity and growth. In the case of the communities hosting the UAP facilities, we might expect positive impacts on small and medium enterprise (SME) development.

From the interview data, we cannot conclude that the programme has had significant impact on business development. We asked about tourism, and found that there were some benefits but also several potential beneficiaries were not using the facilities for various reasons. In general, we found little evidence of official business usage. However, it is likely that some usage of the CLICCs is linked to the more informal sector, i.e. microenterprise activity.

Very small enterprises, known as microenterprises, may be of particular relevance and importance for the UAP. This category should stand to benefit from access to quality broadband and the services offered by and through telecentres such as the CLICCs. Microenterprises are of fundamental importance to the economy, and yet not a lot is known about them or their particular needs. As they are often operating in the informal sector, a lot of microenterprise activity may be going "under the radar".

Makoza[22] has looked at the impact of ICTs on microenterprises in developing countries using the Sustainable Livelihood Approach[23] (SLA) as a theoretical lens. Microenterprises play a vital role in the socio-economic development in developing countries. Defined as having less than 5 employees, often unregistered and operating in the informal economy and with less separation between personal and business finances than official business, they often tend to serve and empower the most vulnerable members of the society. The play an embryonic role in socioeconomic development, stimulating new kinds of economic activity and responding to local demand. Some SMMEs have short lifetimes, but others take root.

In terms of practical programming linkages, the national (and provincial) stakeholders should consider ways to support the particular needs of microenterprises. The SLA is a suggested analytical approach that is sensitive to the contexts, and would help people "enhance their livelihoods through the use of assets and empowerment using information". Additionally, all current e-services for business development should be readily available at the CLICCs and the managers should be trained to help people learn about them.

A starting point would be to extend existing programmes that are already helping rural people access e-services. For instance we heard from one informant in Port Olry that a Local Area Secretary had come to help the community

[22] Makoza, F (2010), Application of Sustainable Livelihood Approach in assessing the impact of ICT use in microenterprises in developing countries, Department of Information Systems, University of Cape Town

[23] An approach to development adapted by various agencies that can be used to analyse livelihoods' vulnerabilities, assets, structural contexts and processes. In this case, how ICTs can influence those aspects to support micro-entrepreneurs.

apply for their Business Licenses using a tablet. He came and photographed individuals, in front of their business, and entered basic information into a tablet. This can be the kind of support that should be made available at the UAP centres. CLICC and TFS facilitators should be helping people access e-services in a similar way. Perhaps the government should survey all their Ministries and identify other such opportunities and if necessary adapt them for the web and create guidance materials for the supervisors (the Area Officers could train them in this case).

CLICC managers should also be required to actively reach out to businesses and offer training. Many of the communities hosting UAP centres are economically active with different kinds of businesses, including nakamals, bungalows, stores, fuel sellers, fishing, logging, restaurants and bungalows and other livelihoods. We heard that at College de Walarano they had trained approximately 35 people, including store keepers and a bungalow owner how to use the computers, and provided basic computing skills training. These community members were provided with a certificate. This should be a standard and regular service for the CLICCs, and might be formalised through a suitable agency that allows trainees to be tracked and given more support building on the computer training.

Another opportunity concerns returning seasonal workers who are bringing home new capabilities and ideas for business activity (for instance hospitality). Seasonal work is a common theme across Vanuatu. Many have have family members benefiting and thus there should be linkages that CLICCs could support.

5.3.14 Cooperative Movement

During the field work we interviewed some informants who were involved with cooperatives, but did not observe any significant use of the CLICCs to support them, although it is likely general communication has helped at times.

The Office of the Registrar of Cooperatives and Business Development (ORCBDS) was consulted prior to the field work. The services available from ORCBDS include advice and support including training, dividends, marketing and disputes resolution.

The CLICCs should be provided with all the current promotional materials and advice on establishing coops. Simple training materials are available also, including governance, book keeping, simple mathematics and basic financial literacy. There is also an email group (community of practice) that is maintained by Cooperatives. The CLICCs should be made able to help people to subscribe (and offer basic email training where people need it). This would then constitute a package of resources with support for people interested in setting up cooperatives.

There is also a National Cooperatives Week for raising awareness. The CLICCs could act as hubs to participate remotely during this week.

5.3.15 Health Programming Linkages

Although it was only one isolated instance, it is important to mention the experience of one health professional working in Port Olry. She said that she had used the Internet provided by the CLICC at St. Anne School. The Wi-Fi was accessible in the Health Centre and she had also gone into the computer lab for research purposes. She said the CLICC was helpful to them because if they had trouble contacting doctors in Luganville by phone, they could search for medical information on the server portal. This had been useful to her when the mobile network was down. She said she accessed the server by logging in with the public password and "the resources were right there when you logged in".

Before the CLICC had stopped working she said also that a public health agency had set up some online courses for nurses and had planned to run them through the CLICC". It didn’t happen because the facility stopped working after a cyclone.

It is also reported that the CLICC at Sulua Center School on Maewo had been supporting the health clinics and medics on that remote island quite effectively with communications for a while, although this has now ceased as the school has not renewed the broadband subscription.

The Ministry of Health (Policy and Planning Unit) was consulted prior to the field work and a summary of the open source health resources such as the medical encyclopaedia available on the CLICC and TFS servers was shared with them. The WHO Health Information Systems Officer saw the potential to promote the CLICC/TFS facilities more in the health sector, and for adding more (and assumably Vanuatu specific and official resources). The CLICCs could also be used for live teleconferencing with rural medical professionals, who might log in to attend such sessions at scheduled times or in emergencies (notified by SMS), and of course to access telemedicine portals.

The field observations above indicate that there is interest for linking health programming to the CLICCs. It is not clear why the Public Health online courses mentioned above were not offered across all the CLICCs - at least those with health clinics in the vicinity. This should be revisited. There are also opportunities from regional programmes, in particular the Pacific Open Learning Health Network (POLHN[24]). The POLHN centres around the region are set up with similar facilities as a CLICC and there may be some opportunity to collaborate to make those training services available through CLICCs, especially in strategic locations and remoter parts such as Maewo.

5.3.16 Continuing Education

Although a few informants told us of members of the public who had studied online courses, the most common remark was that people did not know what courses are available. The CLICCs and TFS should be a hub for online learning and where to find information and help.

As with online study by teachers, the Ministry of Education and Training and Vanuatu TVET should consider ways to provide guidance on what courses are available, especially vocational courses in all areas relating to people's needs, women's needs in particular. Coordination is needed across all the sectors mentioned here. A circular of some kind, email list for making announcements or other ways to advertise courses and study opportunities would be very helpful. Likewise, the network of CLICCs should be advertised and awareness raised generally of their potential as distance learning venues.

In Solomons Islands the Second Chance Programme aims to give school leavers a second chance to re-enter the education system with different pathways leading either to academic qualifications or vocational education. If such programmes were available in Vanuatu, the CLICCs could act as hub schools, not only providing knowledge and resources but facilities for online tuition and teacher training for the programme.

5.3.17 Culture and Media

One of the priority goals of the National Sustainable Development Plan is maintaining a vibrant cultural identity. In line with this, the CLICC labs with their fast unlimited broadband and digital tools could become hubs for media development, news stringing, sharing and archiving of cultural information, community media, cultural education and research. The Vanuatu Cultural Centre should be consulted.

In particular there are a couple of promising initiatives that are helping young people to innovate with technology.

For instance, the *Smart Sistas* project[25] is a collaboration between US Peace Corps, an ICT professionals association (VIGNET) and NGOs, and they welcome additional partners to strengthen the program. They are committed to

[24] http://polhn.org
[25] http://smartsistas.vu

empowering girls to pursue educational opportunities in the Information Communications Technology field. It would seem like an excellent opportunity for collaboration.

The addition of multimedia production software and some suitably trained facilitators could open up opportunities for young people to innovate with digital media. In particular, the model of the New Zealand-based *High Tech Youth Network* (HTYN) should be considered. The HTYN helps underserved communities increase their digital knowledge. Initially funded under the Foundation North's Maori and Pacific Education Initiative, it provides free after school sessions offering children a chance to learn about electronic publishing, photoshop, animation and 3D graphic design. The programme was such a success that seven studios have opened around New Zealand as well as in Fiji, Samoa and Hawaii[26]. Whether or not the same blueprint is used in a formal collaboration with HTYN or by emulating this initiative locally, this would be a fabulous way to join all the dots around universal access, education, equal opportunity, broadband and technology.

[26] https://www.foundationnorth.org.nz/stories/people/high-tech-youth-network/

5.4 Gender Equality and Social Inclusion

Gender equality is not about "counting women" but about equal outcomes for both men and women, boys and girls. Applying a gender lens[27] often reveals power relations and social norms that cause inequalities. Although it is true women are often more disadvantaged, gender inequalities affect men and boys too and boys face education disadvantages in many countries[28]. According to the DFAT funded Access to Quality Education Programme (AQEP), there are three levels of action in countering gender inequality and improving social inclusion. These are (a) to build on individual capacity of people of all genders, (b) seek to change relations between people in the household and community so they can work together to address their common problems and (c) seek to transform structures such as social norms that discriminate.

We should therefore build an active process applying the gender lens to the CLICC/TFS programme, firstly with the aim of ensuring no one is left behind and ensure all boys and girls fulfil their right to complete 12 years of education of good quality (SDG Goal 4).

We asked all the respondents about girls access to the CLICC/TFS. It was commonly heard that girls were accessing the facilities on an equal basis to the boys. In fact some teachers observed that girls tended to stay on after classes when the CLICC was available, whereas boys tended to be more interested in sports. We did not hear any opinions that girls had unequal access. However, there may be opportunities to use the UAP facilities to help address gender biases affecting girls and boys. A proper assessment would be needed, but as an example, ICTs can help with group work where both girls and boys can experience leadership roles, and under achieving students can find new kinds of learning support.

Teachers may also use the broadband access to find videos that address prejudices and lack of knowledge about marginalised groups. One described how students were finding videos that presented positive role models, and he said that this had helped students "to change their ways".

On the previous page we have described two initiatives that help girls and boys learn digital skills such as video and audio production, programming and other innovations with ICTs. Such approaches can help to include marginalised groups (such as unemployed youth). A focus on building digital capabilities could help groups who are marginalised because they lack awareness of how the Internet could benefit them. As we have seen, we found that many in the community (in some locations more than others) did not really have any idea of what the Internet was, let alone meaningful ways in which they could use it. Thus there is little incentive to even learn the skills.

The IREX study on Gender Digital Divide in Myanmar found that women were more likely to report “no need” than “affordability” as the reason they do not own a mobile phone (and we can say the same about learning how to use the CLICCs). This was due to "a reliance on family members or friends to share devices; limited exposure to the types of information, products, and services available online; and a dearth of relevant digital content by and for women to tempt them."

As mentioned above, ICT-based capabilities need to be converted into actual functionings and that process is mediated by social norms, in addition to personal preferences and specific needs. We see the evidence of strong social norms limited women's access. This is especially noticed in rural areas where there are generally low ICT skills and awareness.

For instance, a community church leader in one rural village told us that he thought men would stop their wives from using the ICTs and Internet, and that and women don't have computing skills or know "how to go in the Internet". He

[27] "Men and women are socially conditioned to occupy different roles and face different expectations and challenges. These biases are often subtle or invisible. Often, they’re not intentional or malicious. Regardless, treating all people equally does not necessarily result in equal outcomes. In order to be fair, your organisation must be prepared to treat men and women differently; to remove barriers and to encourage inclusion. You can start this process by applying a “gender lens” to your activities." From https://www.fundingcentre.com.au/help/gender-lens

[28] Achieving gender equality in education: don't forget the boys. Policy Paper 35, Global Education Monitoring Report (2018) UNESCO

said that women in community do not use the facility at all. Furthermore, he thought that women did not have time to come to the facility to use the Internet and that they wouldn't see the value. He asked "what would they gain from using the tablets and internet?".

At another location that we being used to access agriculture information, a chief commented that for women to benefit from the CLICC, they need the skills or to know the uses of the Internet or CLICC.

Another informant commented on meaningful content as a way women in the community could benefit more from that CLICC. He said that if there is awareness raising for mothers and women on the uses and benefits then they could get information about issues affecting them, for instance regarding child maintenance and how to report abuses or criminal cases. He said when the women attend conferences or meetings, they often are referred to check websites to update themselves on women's issues in the country (e.g. Vanuatu women's centre websites), and asked how they could do that when they don't even know how to access or browse the internet. Thus, women need to he helped with meaningful content as well as building their digital capabilities.

Women's computer clubs should be using the CLICCs, although we observed only a few instances. At Eles school there had been a Mama's Computer Club that predated the CLICC. This was supported by USAID and others. The mothers were trained and laptops donated to them, and would meet weekly to train others. The CLICC added the opportunity to access the Internet, and according to our informants the club could be revived. Epi also seemed to have active women's groups but we did not hear of them using the TFS.

Kleine (2011) points out that telecentres are gendered spaces, and women's needs may be overlooked especially when the exclusively male facilitators of the facilities are also senior school administrators. Women may have special training needs and learning preferences to men, and in a male dominated regime may not feel socially in a position to ask questions or challenge decisions. The social coding of the space may also be inadvertently gendered.

At one CLICC the team was told that access was managed using a system involving tickets. However, those sold would be taken up by young men and students, and often they were not available for women to purchase. This gendered use of the equipment was supported by comments made by some community leaders as well, who said that they only saw 'boys' using the computer lab, with the exception of female teachers and students. Public access facilities should be socially coded for everyone, and in general this means open plan with areas for discussion and opportunities to ask questions. Affordability and opening times also need to reflect women and girls needs.

We interviewed one female teacher in one school, who was teaching lower classes, who felt that the equipment was rigidly controlled by the (male) principal. In terms of her ability to use computers/tablets, she said that beyond using them to watch videos and movies, 'Mi tudak nomo' (I am completely in the dark about it all [computing]). She said she had some questions for the researcher, and the first one she asked was: 'are the resources for the use of the teachers, or are they just for the Principal to use?'.

The teacher went on to suggest a strategy of training more female facilitators. She said '*it would be better to train women. They would use [computers/tablets] well; men just rush but women would use it well and teach others carefully and clearly. Women do 'clean' work! Women also have the right to use them, and they would do it well. But now the women teachers just aren't using them*.' She said they especially need training and if they were trained, they could share their knowledge with other women.

As a general observation, in the Vanuatu education system, women seem to predominantly teach the lower primary grades with more men at the senior levels. This won't be the case everywhere, but is probably the case in a lot of rural schools. It may be one of the reasons why the ICT space seemed to be so obviously gendered to us. It is partly societal, and should be addressed by future work in the CLICCs and in this broader space, but may also reflect the broader context in the educational sector too.

5.5 Financial Sustainability

Sustainability has many aspects including the technological factors, management capabilities, and supply and demand viability. This section discusses the financial aspect first and then touches on the wider context.

5.5.1 Affordability

There was mixed feedback from schools on the affordability of the broadband. Following the 2-year programme and 100% subsidy, schools have to renew their subscriptions by negotiating directly with ISPs.

The monthly prices that schools have negotiated are as follows:

- Digicel for VUV 20,000 per month or VUV 35,000 for larger schools for a better service level
- Telsat is offering schools new subscriptions for VUV 22,200 per month

The schools that had renewed seemed happy with the service. It is to be hoped that these services remain available and open for more schools. TRR would do well to consult with all the ISPs and consolidate these services for schools for the longer term.

Secondary schools that are making good use of the broadband and recognise the value may be willing to spend more, for instance at one school they said their overall IT budget was close to 1 million Vatu , including salaries for ICT assistants, and planned expansion. Certainly, the 35,000 Vatu per month for "very fast" Internet was regarded as affordable. However, the levies that this school is charging for students and teachers appear to indicate that the school is raising considerable surplus funds over the broadband costs.

Other secondary schools that had a more chequered experience with their broadband connections, may need convincing that the service can be restored reliably. In one case the school was expecting a two year broadband service but for various reasons the service was only delivered for one month. A school administrator asked whether the promised service could be brought forwards to this year. Obviously this is now a factor explaining why they haven't renewed their service.

At another school, they have not renewed their subscription despite having enjoyed reasonably consistent broadband service over the two years. However, they had experienced issues with their nComputing system. As the CLICC seems to be quite highly valued (one informant said people "long for it to be working again"), it seems likely that this school would renew their subscription if the equipment issues can be resolved, perhaps by replacing the troublesome nComputing system with PCs or laptops.

We know that three other schools in the programme have not renewed at time of writing. Indications are that this is due to "financial reasons" but as the examples we give here illustrate, it is likely that there are other compounding issues.

The basic running cost for primary schools is higher than secondary schools, which have government-salaried ICT teachers. Primary schools have to recruit supervisors for their CLICCs and pay their salaries. At the minimum wage this would add around VUV 30,000 per month. As the Primary schools are generally less well resourced, this means that primary schools bear a proportionately higher cost. We can see from the data transfer records (GB per month) that they also utilise the Internet less (and get less for their money).

Where the Internet was working well, and had worked most of the time during the programme, the primary schools seemed to be more prepared to commit to an ICT budget of around VUV 200,000 per year and to raise funds from student levies to finance the locally recruited IT teacher's salary. Respondents seemed more likely than not to say that

it was less expensive than tethering using a mobile phone, probably because of the realisation that the broadband was not data capped.

This were exceptions to this, for instance the Principal of a primary school with a CLICC (not visited by the field researchers) who seemed satisfied with their Digicel service in public, expressed a different view privately and said she thought the broadband was unnecessary and expensive, as 3G was available. In another instance, the Principal of a large secondary school had chosen to renew the Internet subscription for their well-utilised CLICC with a TVL 3G service that resulted in a dramatic worsening of Internet speed and reliability. It may therefore be necessary to provide Principals and school management with more information on the features of broadband, the principles of school connectivity as described earlier, and the pros and cons of alternatives such as 3/4G.

Affordability was not just a matter of finance. Value for money is a consideration. teachers and school administrations valued the Internet access at the very least for the administration gains, as seen below, including prompt communication and OpenVEMIS.

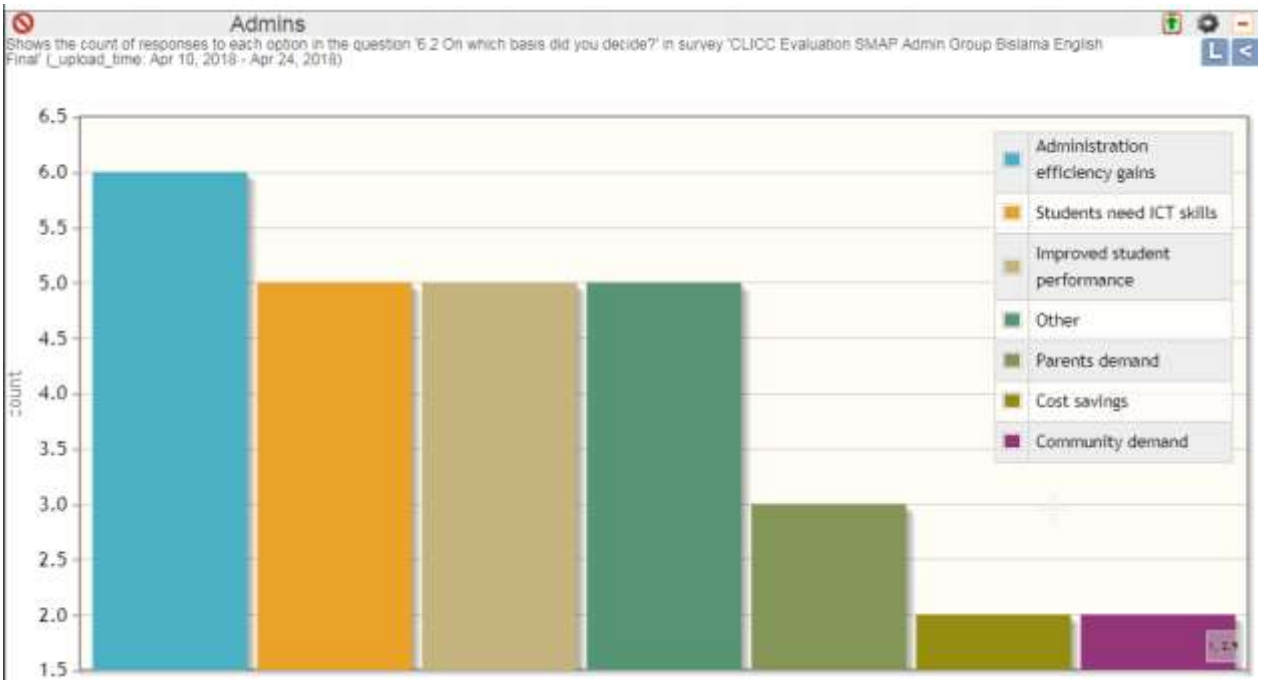


Figure 14 : The basis on which school administrators decided to renew the broadband subscriptions.

Other reasons given by administrators for renewing the subscriptions from their own budgets included

- To improve student learning and give professional skills to teachers
- We need Internet as a student requirement, as we teach ICT as a main subject. Also students have improved greatly, and research results are much better.
- We need internet for compulsory classes.
- Financial income (leveraging the CLICC to raise funds for the school)
- It supports academic performance of students and teachers, teachers rely on it to upgrade skills and knowledge

However, it is not just the school administrations but the communities who oversee the school finances, directly in the case of some community schools via school councils , who need to be convinced of the value. This was not always the case. For instance, at one primary school the principal supported their facility enthusiastically and in his opinion the school can afford the cost. He was making it a priority to write the business case.

A business plan may be useful for convincing the chairman of the school council which manages and approves the school budget. He was more cautious and questioned the ability to generate the required revenue. He said that "TRR is expecting (the school) to invest a significant amount of money, but it's not clear how they can generate the revenue for it. They are not generating any other revenue from it. They are not putting a levy on students. They are only putting a fee on internet use but it's a very small amount". The business case should make clear the educational benefits and benefits to the community, and how the costs can be sustained.

5.5.2 Fee structures and levies charged by schools

Most of the CLICCs charged students levies, ostensibly to pay for the running costs. The figures shown below are those quoted by school administrators and others.

School	Costs for 2018 (Vatu)	Student levies	Community charges (Vatu)
School 1	Internet subscription is approx 220,000 (they expect 100,000 of that from user pay revenue)	No levy	100 / hr
School 2	385,000 (Internet and IT teacher salary)	Students 250 / month (Classes 3-6 only)	200 / hr for Wi-Fi only 250 / hr using school PCs 1000 / week Wi-Fi only 1500 / week using school PCs
School 3	Up to 1,000,000 for Internet, IT assistants salaries and IT projects	Students 2000 / term Teachers 1000 / month	300 per hour, Printing 20 per page
School 4	n/a	n/a	n/a
School 5	Approx 230,000 for Internet	Students 2000 / year	n/a
School 6	Approx 240,000 / yr for Internet	Conflicting reports. Used to be 1000 / term per student, may have been reduced.	500 / month or 20 / minute Parents and students no extra charge
School 7	264,000 for Internet (Est. 470,000 total costs)	200 / term per student	Was free but they plan to start charging community users
School 8	n/a	n/a	n/a
School 9	n/a	n/a	n/a
School 10	n/a	n/a	200 per day 250 per week 1000 per month
School 11	100,000 budget for 2018. Internet est. 240,000 / yr	Teachers 1000 / month	Free previously. No clear plan yet as costs are being assessed.

Table 9: Internet costs

The fee structures for students, teachers and community members seem quite random and inconsistent. Whilst the government has capped the fees that can be charged to families[29] it might be good for TRR or MOET to provide a suggested fee schedule.

For instance, the secondary schools seem to be raising significantly more from student levies than the running costs require. It is not clear what this revenue was being used for. Another issue concerns unequal access, as junior students have less time allocated to use the CLICCs than the senior years who have scheduled ICT classes, even though they are

[29] The MoET has a policy on additional funds schools are allowed to charge students, limited to 200 Vatu per student/term for primary and 500 Vatu for secondary students.

paying the same levy. There is also the question of whether it is right to charge a levy when the Internet goes down for several months.

Another issue that needs addressing is that it appears some schools charge students the same as outsiders to use the facility out of school hours, even if they are paying a levy with school fees.

Some schools charge teachers a levy even though some of them have to teach ICT. However, where teachers were being charged 1000 vatu per month, some thought it less expensive than paying for mobile data.

5.5.3 ISP managed solution

Where sustainability has proved to be a challenge, an alternative way to manage public access facilities is for the ISP to take over the management of the gateway, for instance by setting up a public hotspot and selling tickets for access. The school could buy access in this way to suit their budget. In return the site owner would grant access for the ISP to base a commercial operation there.

This has proved to be a suitable arrangement in some locations in the region, for instance in remote East Rennell in the Solomon Islands, where a distance learning centre had been disused for several years because of difficulty in sustaining the VSAT-based Internet connection. In 2016, the Our Telekom entered into a collaboration with the community, and installed a Ku-band VSAT system there and has been maintaining the service including all technical support. People buy Internet access using a ticketing system. In return, the community sign an agreement guaranteeing the ISP access to the land. The facility is now running sustainably as the Niupani Internet and Training Centre. It may also be possible for the ISP to build a mobile tower there, something which would be very popular with the community.

This might be an attractive compromise in some locations. ISPs might be a little risk averse especially with the most remote locations, but if this was done as part of a public-private partnership under the UAP, the right incentives might be provided in return for innovation.

5.5.4 Wider dimensions of sustainability

Financial sustainability as a success criterion is a common subject for discussion in the ICT4D literature[30] . According to this literature, sustainability cannot thrive on funds alone. Rather, sustainability depends on social, institutional, and financial viability. UNESCO conclude that community participation and commitment are the fundamental conditions for the sustainability of CMCs (the UNESCO model for community telecentres) because of the "socio-economic and cultural community bonding and acceptance". This compares with other models that are less participatory such as those that are merely outlets of government e-services.

In this evaluation we have concluded that public access telecentres need to be good fits with their communities and to manage and balance both supply and demand sustainability. For instance sustainability depends partly on the retention of good quality, trained and knowledgeable staff for the CLICCs and TFS facilities), and demand sustainability depends partly on converting meaningful access into real benefits, and peoples' capabilities to do this depend on knowledge and awareness of what the facility can provide.

Public Internet access facilities need to balance services against competing needs. For instance, universal access is fundamentally about the democratization of information access. This perspective emphasises free choice in how citizens use the facilities. On the other hand, the evidence shows that there is low demand because many people in both rural and urban communities have limited skills or awareness. This perspective suggests a need for more

[30] Furuholt, B (2018) The role telecentres play in providing e-government services in rural areas, Wiley Research Article DOI: 10.1002/isd2.12006

intervention and provision of specific services. In summary, sustainable demand needs to be nurtured by helping people develop capabilities whilst identifying and supporting applications that are specifically of interest to groups in the host communities.

The figure below illustrates a model of the supply and demand sustainability of public Internet access facilities that is consistent with our findings.

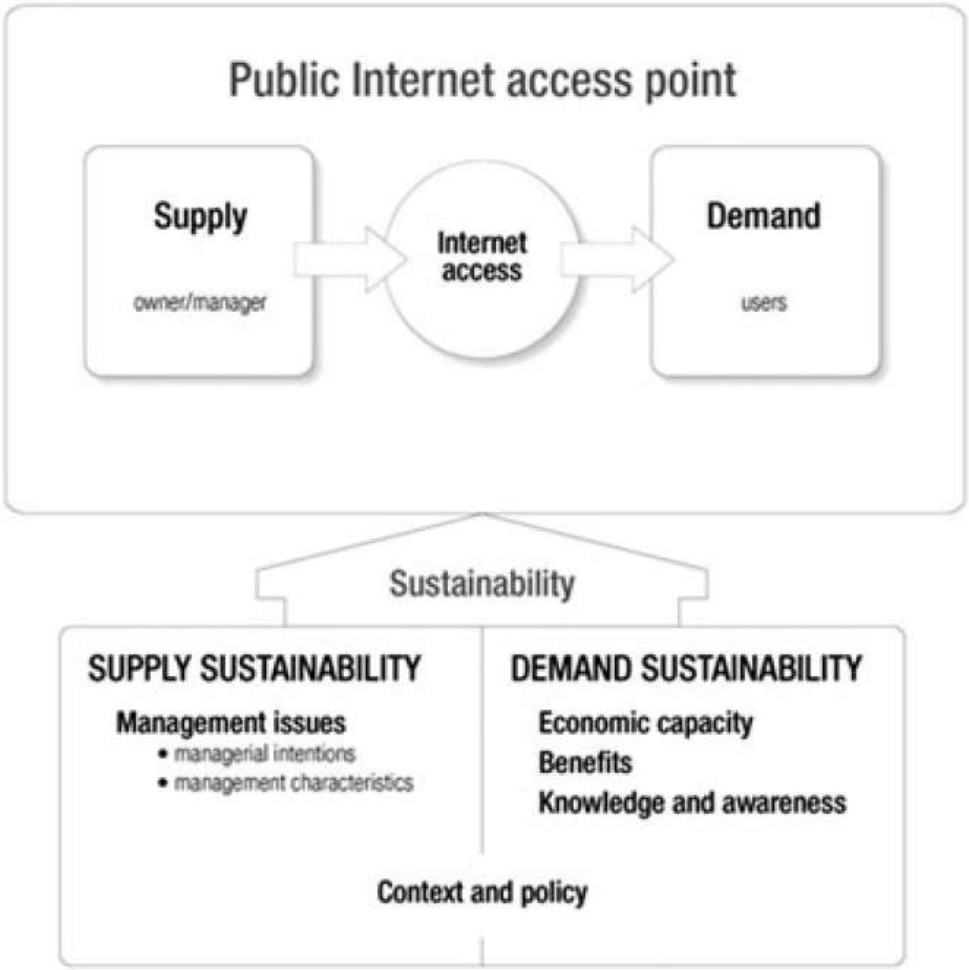


Figure 15 : A model of supply and demand sustainability for public Internet access facilities[31]

[31] Furuholt, B. (2009). Bridging the Digital Divide: Sustainable Supply and Demand of Internet Access in Developing Countries. (1 ed.) Aalborg University: Department of Computer Science, Aalborg University. (Ph.D. thesis; No. 49, Vol. 1).

5.6 Cyber Risks and Security

As with other areas cyber security is cross cutting and could be discussed in regard to technology, information access, social media, and other areas.

For instance, several informants had concerns about what they called bad websites, but not a lot of discussion seems to be taking place about how to judge the information they are accessing in more mainstream websites (perhaps reflecting wider society in Vanuatu). Thus the risk is relative to the degree of information literacy of the users.

Another example concerns meaningful access for women. In some communities, especially remote rural ones, many women (and men) are unaware of what the Internet is for and how it benefits them. However, when they are only hearing about the undesirable aspects the tendency is to reinforce their views of the technology as not being relevant and possibly harmful. Learning meaningful uses of the technology may reverse this tendency and motivate people to consider more constructive ways of dealing with risk than to "shut down the source".

The interviews included questions for all informants to capture their perceptions of risks from the Internet and ICTs. We noted that there may be sensitivities at play making it difficult for informants to mention certain experiences. For instance, in one case a member of the community told us that a school staff member had been involved in misusing a CLICC.

When asked whether any "bad things had happened" as a result of the programme, 11 of the 34 teachers interviewed replied in the affirmative. Their specific perceptions of the risks are shown in the figure below, disaggregated by gender.

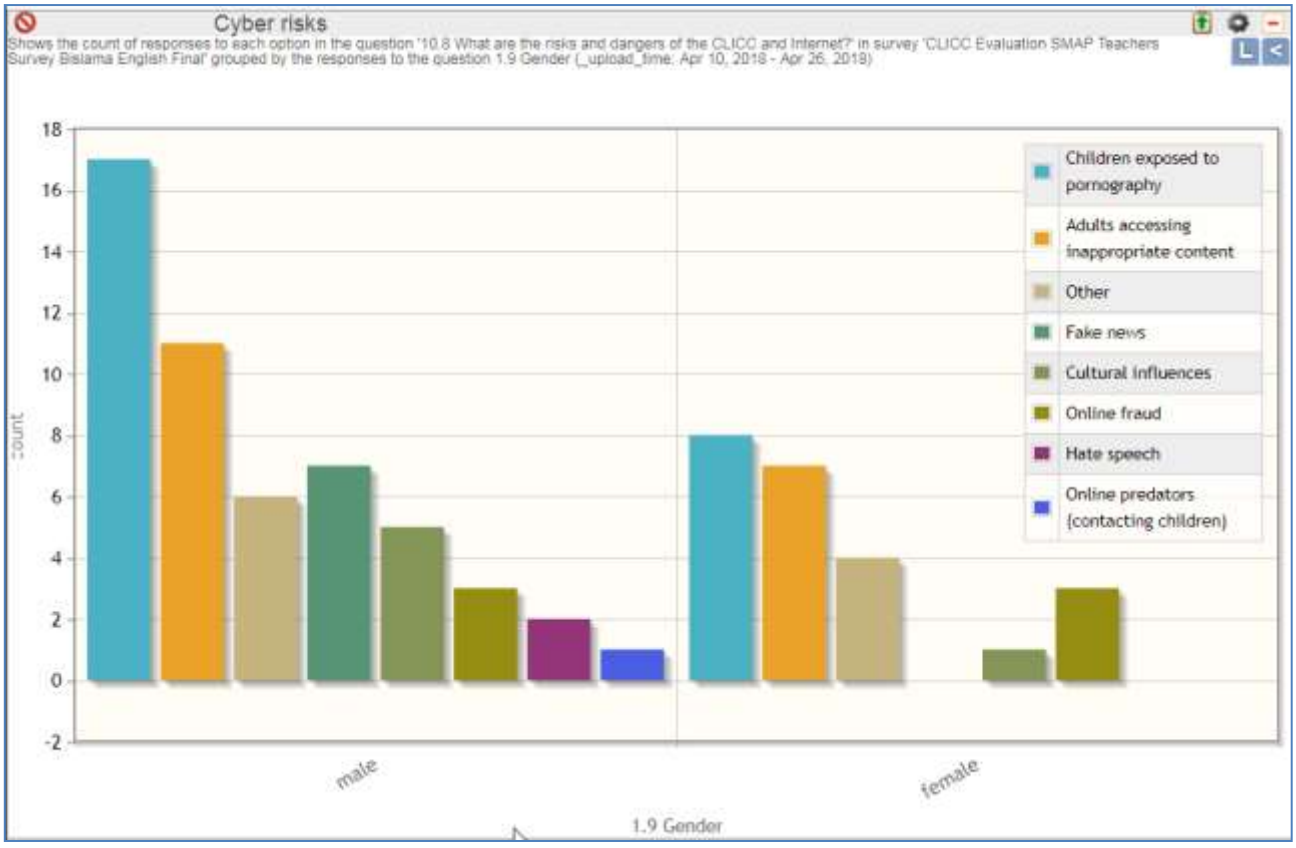


Figure 16 : How respondents perceived the risks

Other risks mentioned include health risks (damage to eyesight from viewing screen for long periods), misuse by teachers who are seen by students looking at Facebook on their phones in class (mentioned by a community chief), the risk of influences on behaviour.

The main risk perceived by the schools and communities is obviously access to pornography. This has been a concern for some parents. If reports of the CLICCs being used to access such material continue, it risks losing the support of the community. One community volunteer and CLICC committee member who had earlier been the supervisor said that when the CLICC was set up he had held a parents and community meeting and promised them that such activity would not be allowed. He was therefore concerned when occasional reports continued to be heard.

As well as the risk of exposure of such materials to children and misuse of the school space to access such materials by adults, schools can overreact and overly tighten down access to the Internet. This might end up limiting some of the potential benefits in the process. For instance, the younger years in primary schools are as a general rule not allowed access to the Internet, even when supervised. Open access to young people may also be limited, and where the facility is in a remote area with no alternative that can somewhat defeat the purpose of the centres.

As the CLICCs are situated in and used by schools, reducing risks to children must be the imperative. There is therefore a strong case for a better filtering solution to block pornography. Blocking pornography is also in high demand from the schools and communities, as evidenced by their responses when asked how best to control risks.

At the moment the CLICCs rely on school-level filtering but without providing specialist firewalls, and this results in the issues described. Even if the firewall is provided, it would need centralised control and subscriptions (licenses etc) or would become out of date. The CLICC servers are currently set up to point to OpenDNS but this depends on the system always configured correctly and the supervisor trained in how to manage it. Those free solutions are always something of a moving target and therefore not stable without expert monitoring. OpenDNS is only partly effective and will not filter the results of image searches, for instance.

The risk of children stumbling on pornographic content therefore remains. It is recommended that technical experts revisit this aspect and consider the best alternatives. This could be in collaboration with the ISPs, with the use of a government gateway maintained by the Ministry of Education.

Other issues such as fake news and cyber bullying were not mentioned specifically by informants, and are perhaps not understood or expressed in those terms. This related to information literacy.

As with all strategies dealing with these issues, there must be an educational component. In relation to the need for this, one community informant said that, "*Chiefs must play their roles effectively. Address the issues. Parents also must teach their kids on the good and bad sides of the internet*".

Of course, parents wouldn't be able to advise their kids well if they do not use or have knowledge of the internet themselves. There should therefore be a role for community leaders and church leaders to provide oversight and inform the community that they should be mindful of unverified and sometimes malicious information on the Internet and to use their discretion. In association with this, schools could arrange for experts (including police officers) to attend the community meetings and sign up for official programmes that help schools deal with cyber security and cyber safety.

The Ministry might consider helping schools develop policies around Internet use. Those should link to the Ministry's policies and national policies where appropriate. Those should not only be ICT focused but child focused. For instance in Fiji the Ministry has a Child Protection in Schools policy that stipulates the roles of registered Child Protection Officers (CPOs) who are to be appointed by schools. Those roles could be adapted to cover cyber risks. Vanuatu might look at similar arrangements, using the appropriate structures in Vanuatu.

One interesting perspective of risks expressed to us from a male community member concerned women's access, and may be related to social norms. he was concerned that, "*If women get to know how to access internet they'll spend more time browsing the internet, even on their phones, and so would create a new culture. They would stop making mats, or the usual traditional stuff they usually do*."

Some other downsides of the Internet or risks to be managed were observed by the school administrations:

- Community members are not trusting each other
- Need to control FB, at times, teachers and students distracted
- Exposure to bad social practice
- Sometimes if students aren't being watched they can watch movies or football matches or computer games
- Boys watch footballers and emulate their haircuts, downloading music and popular culture
- When someone becomes used to researching online, they cannot research properly with books when the Internet is down. Face to face communication becomes less. People become lazy.

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6. Concluding Remarks

In 2015, The Government of Vanuatu took the bold decision, supported with funding from DFAT, to roll out the installation of Computer Lab and Internet Community Centres (CLICCs) and Tablets for Schools (TFS) facilities in 19 schools across the country, following an extensive selection process that required schools to engage with their communities (where applicable) in making their submissions. The programme design was underpinned by the priorities, principles and approaches that are articulated in the National ICT Policy and with the cooperation of all primary stakeholders.

Over the following two years the teachers, students and their host communities have experienced the benefits of broadband for their professional work, study and research, and a larger public is now benefiting from more equal access to information, services and opportunities. The broadband services and plans developed by the ISPs to service the programme were largely judged to be affordable by schools, and are now commercially available for other schools and public Internet access facilities.

After two years of operations, the subsidy was ended and most of the schools have renewed their connections. The evaluation team visited 11 of the schools at this time, and found most of the CLICCs and TFS equipment working and in good condition, despite some failings owing to technology and external reasons. All the facilities appeared to be highly valued by their schools, and where situated within communities they were also valued by them. There have also been challenges, but these are to be expected in any such pilot programme and it is imperative that these are identified now and lessons learned.

It is appropriate in these concluding remarks to relate the impacts to the country's highest level policy framework, i.e. the National Sustainable Development Plan (NSDP). The programme is certainly supporting objective SOC 6.7 that seeks to guarantee the public's right to information. The programme supports all the objectives of SOC 2, the main policy goal concerning education which aims for an inclusive, equitable and quality education system with life long learning for all. Of course these impacts can be enhanced considerably, and the issues highlighted in this report should be considered as a guide for improvement. For instance extending support for classroom teaching with ICT, giving guidance on information literacy and providing curriculum linked e-resources.

In direct and indirect ways the programme contributes to several of the NSDP objectives. For instance, all the schools reported the benefits of the CLICCs as cyclone warning (and advisory) systems for the community (relates to objective ENV 3.1). Most of the NSDP policy objectives would be excellent topics for study assignments. For instance students could research the "blue-green economy" and relate the national goals to local community perspectives, showcasing their work online in appropriate project websites. It is hoped that this would be driven by the curriculum, and with national projects or competitions to add impetus.

Concerning educational benefits, connecting schools to the Internet means that things can be done differently (administration, teaching and learning, life-long learning). Doing things differently requires a change in the business model, and always involves training. Therefore, if the programme is to be continued and extended, the Ministry of Education and Training will need to become more engaged. It is necessary to systematically raise the level of ICT competency of all teachers, including both basic computing skills and how to teach with technology. In the longer term a broader framework of the digital capabilities needed by teachers and students should be developed and translated into an action plan. Along with teacher professional development, minimum standards for ICTs in schools and school Internet connectivity should be developed and tracked with OpenVEMIS.

It should be noted that following two years of the programme, a cadre of experienced and enthusiastic CLICC managers and school administrators remain connected by an online community of practice. This represents a significant pool of

knowledge about the programme and of ICT in education in Vanuatu in general. If the MOET takes over the coordination of the CLICC/TFS programme, it will be vital to nurture this community.

Whilst the main benefits for schools are unequivocally the computer labs and Internet for ICT classes and research for secondary schools, and hands on computer training for primary students, community benefits are more elusive. The message from the evaluation is that local contexts are all important, and CLICCs need to fit well with their host communities. Not all schools are really community based, and for those it may be best to focus on the educational uses. After all, teachers and students are also citizens and benefit also from the universal access provisions. In other schools where there is a viable community close by, more engagement is needed to identify needs and stimulate demand, whilst strengthening peoples' capability to use the Internet and equipment in ways meaningful to them. Along with this, there should be better targeting of government e-services and online training opportunities through the CLICCs, with training for the managers. Encouraging innovation of technology by young people is an excellent way to energise the centres and build demand, whilst incubating future digital media talent for the country.

The stakeholders now need to identify which organisation will take over the supervision of the programme and consider how to build on it. The most obvious candidate is MOET, but this should be agreed by the national UAP stakeholders. Once that is known, a focal point should be created within that organisation and a helpdesk set up to start reengaging with schools to bring all the CLICC/TFS sites back online and functional as designed.

Annexes

1. Map and additional information on all the CLICC/TFS sites
2. Policy background
3. Evaluation key questions
4. Interview questions
5. Terms of Reference