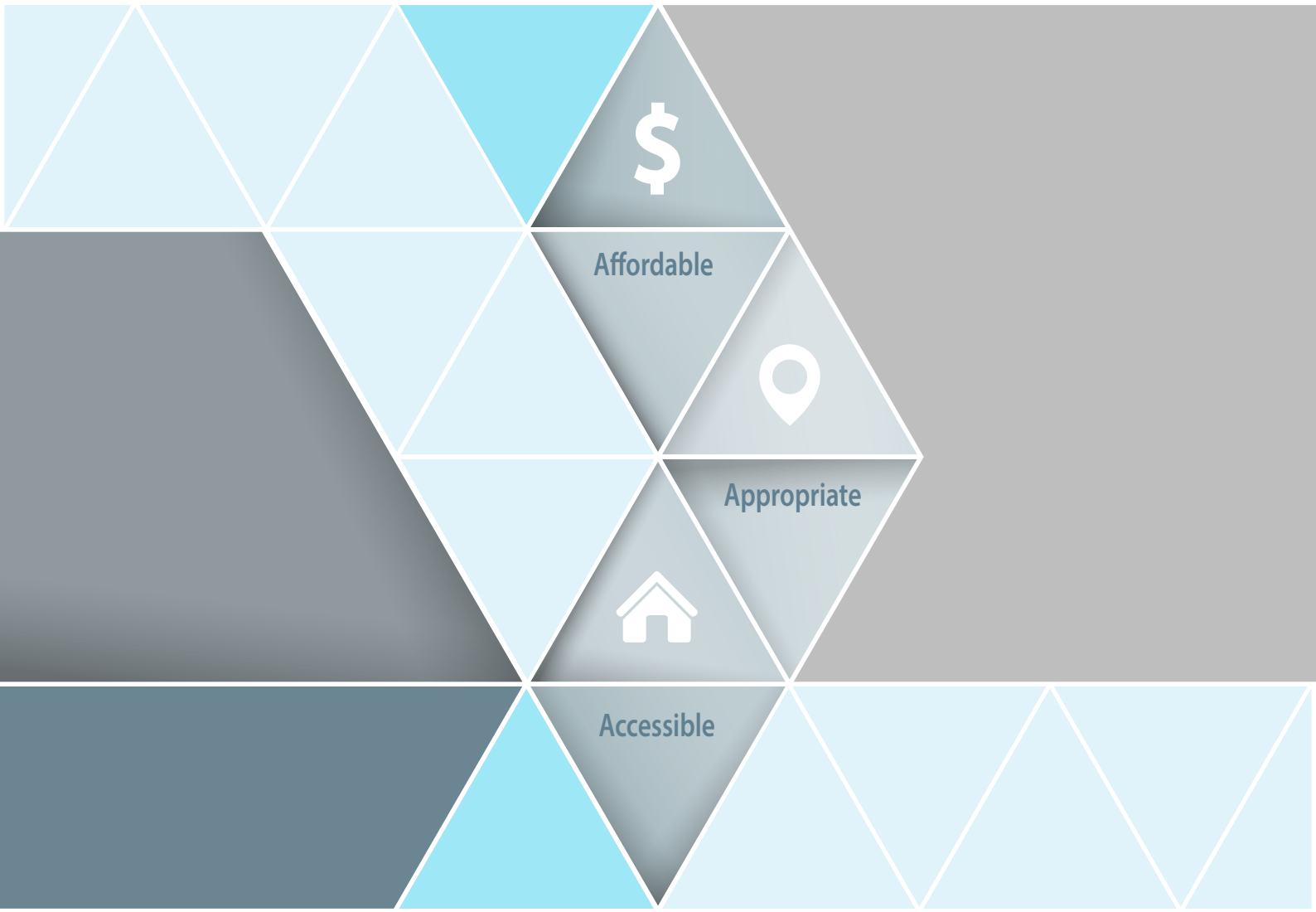
Communications Sector Plan

FY2018 - 2022

Affordable and Appropriate ICT Accessible to All



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This assignment required information and guidance from many people, and in some cases at short notice. It also depended on the commitment of everyone consulted throughout the needs assessment process. We would like to express our gratitude to all of them. A special thank you for the extensive support provided by Muagututi'a Ioana Chan Mow, Associate Professor of Computing, National University of Samoa. And last, but not in the least, a warm Pacific thank you to the Australian Department for Foreign Affairs and Trade (DFAT) for their continued support to Samoa's communications sector and Professor Peter Blunt (Team Leader, Samoa Technical Assistance Facility) for his extensive edits, comments and suggestions on the structure, content and expression of this SP.

Foreword

When it is used appropriately and it is widely accessible and affordable, information and communications technology can make significant contributions to social and economic development. More than 50% of the world is now online[1] and the tyranny of distance is no longer an insurmountable problem. With the imminent landing of the submarine cable and falling costs associated therewith, Samoa is about to enter an important era in its development – a period where bandwidth per capita increases dramatically, making access to the Internet more like a low-cost utility service than an expensive privilege available to only a few.

Samoa's Internet utilisation was predicted to be about 100GB by 2032, but that has now been revised upwards by a factor of 80 to 8,000 GB or 8TB. Connections can be made and sustained between loved ones, between staff and headquarters, businesses and their trading partners, citizens and government; all with the click of a mouse button or the tap of a finger on a touchscreen.

ICTs have a very broad range of possible applications and benefits, such as:

- Enhancing economic productivity because of better education and training and the development of new skills, entrepreneurship, and new (or better penetration of existing) markets.
- Developing new products and services.
- Improving access to financial services such as mobile money, micro-credit, crowd-funding, and crowd-sourcing[2].
- Making commerce more efficient through point of sale systems, online banking and mobile banking.
- Stimulating innovation and enabling new organisational models and business processes.
- Lowering transaction costs by enhancing the speed and quality of information flows for managing knowledge.
- Improving government and business service delivery, particularly by way of electronic service delivery which increases transparency, reduces opportunities for bribery and saves time and money for citizens and businesses[3].

This plan provides direction to policy and action for government and the communications sector and informs citizens and the market about how the sector will be developed over the next five years and where the priorities will lie.

The vision guiding this plan is: "affordable and appropriate ICT accessible to all."

It gives me great pleasure to present the Communications Sector Plan 2018-2022 and to commit my Ministry to doing everything within its powers to help realise its objectives. My thanks go to all those involved in the production of the plan.

Hon. Afamasaga Lepuiai Rico Tupai
Minister for Communications and Information Technology

[1] Online source: http://www.un.org/apps/news/story.asp?NewsID=52690, accessed: May 21 2017.
[2] See Annex D for an explanation of crowd-funding and crowd-sourcing.
[3] Minges & Stork, 2015.

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Abbreviations

Acronym	Meaning	Acronym	Meaning
A2D	Analogue to Digital	NUS	National University of Samoa
A4AI	Alliance for Affordable Internet	OAG	Office of the Attorney General
ACEO	Assistant Chief Executive Officer	OECD	Organisation for Economic Cooperation and Development
ASH	American Samoa to Hawaii	OOTR	Office of the Regulator
CEO	Chief Executive Officer	PPP	Public-Private Partnership
CERT	Cyber security Emergency Response Team	PPP	Purchasing Power Parity
DFAT	Department of Foreign Affairs & Trade	PSC	Public Service Commission
DSC	Data Centre Samoa	RACI	Responsible, Accountable, Consulted, Informed
EPC	Electric Power Corporation	SamCERT	Samoa Cyber Security Emergency Response Team
FY	Fiscal Year	SAT	Samoan Tala
GB	Gigabyte (or 10^9 bytes)	SBS	Samoa Bureau of Statistics
GDP	Gross Domestic Product	SCoC	Samoa Chamber of Commerce
GNI	Gross National Income	SMT	Senior Management Team
GoS	Government of Samoa	SP	Sector Plan
HHI	Herfindahl-Hirschman Index	SQA	Samoa Qualifications Authority
ICT	Information and Communications Technology	SSC	Sector Steering Committee
IoT	Internet of Things	SSCC	Samoa Submarine Cable Company
ISOC	Internet Society	STA	Samoa Tourism Authority
ISP	Internet Service Provider	STAF	Samoa Technical Assistance Facility
IXP	Internet Exchange Point	STEM	Science, Technology, Engineering, & Mathematics
MB	Megabyte (or 10^6 bytes)	SUNGO	Samoa Umbrella for Non-Governmental Organisations
MCIT	Ministry of Communications & Information Technology	SWOT	Strengths, Weaknesses, Opportunities, Threats
MESC	Ministry of Education, Sport, Culture	TCO	Total Cost of Ownership
MFAT	Ministry of Foreign Affairs & Trade	TB	Terabyte (or 10^{12} bytes)
MNRE	Ministry of Natural Resources & Environment	TSSC	Tui Samoa Submarine Cable
MOF	Ministry of Finance	TWG	Technical Working Group
MOH	Ministry of Health	UAE	United Arab Emirates
MOR	Ministry for Revenue	UAF	Universal Access Fund
MWCSD	Ministry of Women, Community & Social Development	VAGST	Value-added Goods and Services Tax
NICTSC	National ICT Steering Committee	WTO	World Trade Organisation

1. Introduction

The communications sector in Samoa comprises three government agencies: The Ministry of Communications and Information Technology (MCIT), the Office of the Regulator (OOTR), and Samoa Post Company Limited (hereafter, Samoa Post). These three bodies should work together to provide for the effective and efficient management of the goods and services that they produce for the benefit of Samoan society and economy - such as the Internet, telephone, television, radio, and postal services, along with products used to access those services like smartphones, tablets, computers, and other digital equipment.

As noted in the Foreword, this plan is designed to give direction to policy and action for government and to inform other actors in the communications sector in all domains of governance – government, the private sector and civil society – of government's intentions. The activities it recommends are set out in a critical path.

The plan has a five-year horizon and is guided by three principles: *affordability*, *accessibility*, and *appropriateness* and these principles are summed up with a new vision for the sector: "Affordable and Appropriate ICT Accessible to All".

2. Where Have We Been?

ICT cuts across all sectors of government, civil society and the private sector. ICT is an enabler of economic and social development for firms and households (OECD & WTO, 2013). Although estimates vary, increases in GDP of between 0.8% and 1.5% can arise from greater access to telecommunications (Czernich et al., 2011; Minges & Stork, 2015). On average, if a country has a teledensity[4] greater than 10%, per capita GDP growth improves by about 0.5% per annum (Waverman et al., 2005). The Samoa Bureau of Statistics (SBS) assigned one third of the real GDP increase in 2013 (0.4% of 1.1%) solely to the communications sector (Minges & Stork, 2015).

Government, recognises the importance of ICT as an enabler and transformer of socio-economic development and began the liberalisation of its market in 1999. Government divested itself of the state-owned and operated telecommunications provider in 2003; converted Samoa Post into a state-owned enterprise in 2003; passed legislation to establish a competitive telecommunications market in 2005; established a market regulator in 2006; issued its second telecommunications operator license in 2007; increased its wholesale Internet access capacity with the American Samoa to Hawaii (ASH) submarine cable in 2009; created a market for subscription-based TV with two operators in 2011; and launched a government-wide area network called the Samoa National Broadband Highway (SNBH) in 2015.

This commitment to telecommunications reform continues today. The National ICT Steering Committee (NICTSC) is chaired by the Hon. Prime Minister and under this SP further reforms will be introduced, aimed at improving access, affordability and the appropriateness of ICT in Samoa - for citizens, the private sector, and government.

Access

The sequence of reforms outlined above has resulted in better access, cost and quality of ICT for all Samoans. The number of people with mobile phone connections increased from 10% in 2004 to over 90% in 2010 (Cave, 2012). Access has improved substantially, but more needs to be done because access is still expensive and not spread evenly across the population.

[4] Teledensity is the ratio between the number of registered telephone connections and the population headcount (see Annexe D).

In a recent survey, the Ministry of Education, Sport, Culture (MESC) found that only 2 of Samoa's 167 government schools were connected to the SNBH, and neither of those could access the Internet. The education system has not prioritised Internet access for schools, which means that children do not have access to information in the same way that children of other countries do and this limits the extent to which they are acquiring skills and knowledge that will equip them for productive participation in the national and international economies.

The main problem is the small number of applications that rely on the SNBH, which means that it is underutilised. Some examples of applications that could be used on the SNBH include: email, web browsing, business applications like accounting software, or an intranet. The SNBH is an outstanding achievement for government, but its underutilisation needs to be rectified if the intended benefits for citizens and government are to be realised.

At present, the two mobile carriers (Digicel and Bluesky) are not required to provide domestic interconnection between their networks. Although the hardware and network infrastructure for a domestic interchange exchange point (IXP) exists within the SNBH, carriers do not make use of it. Without a domestic IXP, accessing local Internet data or content requires a 'round trip' out from Samoa and back again, across international transit links, which incurs fees for the carrier. These fees could be avoided if a domestic IXP was utilised (see Annexe D for an explanation of the function of an IXP). These fees become costs to consumers. For Internet users, counterintuitively, the 'round trip' means that accessing Internet data located domestically is slower than accessing Internet data located on the continental mainland.

Several issues were identified in the regulations and legislation governing the communications sector in Samoa. The most obvious omissions in the legislation and regulations are sections that deal with 'open access'; 'fair and non-discriminatory wholesale pricing'; 'separation of wholesale and retail service provision'; and 'quality of service' (World Bank, 2014). Further issues arise from the fact that the OOTR operates under four different pieces of legislation - because it is responsible for four different utilities (post, electricity, broadcasting, and telecommunications) - and no attempt to unify these separate pieces of legislation, or to make them consistent with one another, has been made. Each act comes with a regulatory scheme, although the telecommunications regulations are limited to the radio transmitter licensing tariffs. The OOTR is responsible for regulating multiple utilities in Samoa and is therefore considered a 'multi-regulator'. Unification of the legislation and regulations would provide for a simpler and clearer set of rules - for service providers in the small markets being regulated and for the OOTR itself to operate under.

The OOTR is also accountable to two different Ministers (Minister of Natural Resources and Environment and the Minister of Communication and Information Technology), which complicates reporting and accountability. Moreover - and this is increasingly the case - management of the electricity grid and energy supply requires the use of Internet-enabled devices and services and, therefore, decisions involving both ministers.

The OOTR administers two types of regulatory scheme: a 'discretionary' scheme and a 'self-regulating' scheme[5]. If Samoa wishes to continue operating as it does now, that is, continue operating as a multi-regulator and regulating according to discretionary and self-regulatory schemes, then as soon as possible: (a) the relationship between the OOTR and market performance needs to be better understood, and (b) made more transparent.

No systematic monitoring and evaluation of the performance of the various markets being regulated is undertaken by the OOTR and so it is difficult to know how regulations, or their

[5] A discretionary scheme is where the regulator defines the regulations guided by policy objectives set by government – regulations are at the *discretion* of the regulator. A self-regulating scheme is one in which the market determines its own de facto regulations. Sometimes, 'self-regulating' is used euphemistically when there is an absence of (needed) regulation or as an interim phase until a time when regulations are developed. A 'fixed' regulatory scheme is one in which regulations are defined by an industry body or association outside the jurisdiction of the regulator and adopted by the regulator.

absence, are affecting the markets in Samoa. At the time of writing, the OOTR explained that it was in the process of undertaking a 'market analysis' but no terms of reference or timeline for the study were publicly available. The absence of this information adds considerable uncertainty to a regulated market, particularly when the regulatory regime is discretionary and the results of the analysis could lead to regulatory changes.

The OOTR cites lower telecommunications costs as evidence of its positive effect on the market. While telecommunication service prices have indeed fallen, and it is likely that telecommunications liberalisation and the OOTR has had a significant hand in the reduction of prices, all aspects of market performance cannot be gauged by this indicator alone. Other aspects of market performance include the service provider market concentration; the quality of services; the number of disputes lodged and resolved and the time and resources it takes to resolve them; the ease with which new entrants to the market can emerge; and the ability of customers to switch service providers.

A request was made of the OOTR to provide the Herfindahl-Hirschman Index (HHI) for the mobile telecommunications market, a frequently-used measure of service provider market concentration (Minges & Stork, 2015), but the index was not provided. The HHI in 2013 was 6,701, derived from market shares for Digicel of 79% and Bluesky of 21%.

Several stakeholders reported that it was unclear where policy ended and regulation began. They also held the view that the OOTR sometimes overstepped its official mandate and was not transparent in the enquiries that it made of businesses. For example, enquiries have been made by the OOTR into retail pricing of new telecommunications services without an explanation as to why those enquiries are being made. These enquiries require considerable time and resources to fulfil - by carriers and ISPs.

Options for utility regulation in Samoa, particularly telecommunications regulation, include:

(a) to maintain the current system (a multi-regulator, managing its own discretionary regulatory scheme), but – at the same time - compare Samoa's regulations and legislation to other similarly-sized telecommunications markets, and then make changes that provide for digital convergence[6] and to make them consistent with one another; or

(b) to outsource the entire regulatory function, permissible under Samoan law since 2008 (clause 7A, Telecommunications Act, Amendment 18, 2008); or

(c) to adopt a fixed regulatory scheme (instead of the current discretionary and self-regulating schemes) available to all World Trade Organisation (WTO) member countries[7].

Option (c) has been proposed before. In one study, it was argued that the credibility of the Samoan utility regulatory function is the main determinant of its market performance, and that small island developing states should avoid using a discretionary regulatory scheme and instead adopt a fixed regulatory scheme (Vakataki 'Ofa, 2010).

The OOTR, on the other hand, claims that it has had to operate in a policy void and, because of this, has taken to writing policy itself, only exacerbating the lack of clarity over what is policy and what is regulation. The OOTR also cites insufficient resources (given its 'multi-regulator' role) and a lack of independence as obstacles to sound regulation.

[6] See Annexe D for an explanation of 'digital convergence'.
[7] Samoa became the 155th WTO member country on May 10 2012.

While dependant on government to approve its budget allocation, the OOTR is a nett revenue generator for government and its fees are a considerable portion of government revenue. It could be argued, however, that utility license fees generated by the OOTR that exceed the base cost of administering the respective regulations and the return to be generated for use of the country's finite resource (i.e. the electromagnetic spectrum), are unnecessary. It could be argued further that excessive regulatory fees constitute indirect taxation on the information economy, which inhibits the use of information by government and society.

Affordability

Generally, Internet access affordability[8] has improved in Asia and the Pacific region, with the cost of 500MB of broadband Internet access falling from 10% of gross national income (GNI) in 2013 to less than 5% in 2015 (Alliance for Affordable Internet, 2017). In Samoa, prices have been falling since competition was introduced in 2007, and affordability is now at around 1.9%[9]. Clearly, this has been good for customers. The ITU's Broadband Commission proposes that Internet access would only be considered affordable in least developed countries (LDC) if 1GB of Internet data (prepaid) costs around 2% of gross national monthly income (Alliance for Affordable Internet, 2017), sometimes referred to loosely as the "1 for 2" benchmark. Samoa is now under this threshold.

However, Samoa graduated from its status as an LDC in 2014, and is now considered a developing country. Therefore, the affordability target set for Samoa can and should be more consistent with that of a developing country. Stakeholders consistently report that over the last five years ICTs have indeed become more accessible and even more affordable, albeit with some way to go before reaching parity with developed country markets.

As a comparison, Internet access prices in the ten most affordable countries in the world ranged from 0.1% in Austria to 0.4% in Switzerland[10]. But even when the comparison is restricted to other small island developing states (in Africa), Samoa is still very expensive. Using the price benchmarking method of the OECD, Samoa offers the 'basket' of mobile phone services for US$17 (with Digicel) and US$22 (with Bluesky), compared with the same baskets of four African small island developing states that are priced between US$4 and US$15 (Minges & Stork, 2015, p. 50).

There is also significant scope for improving the quality of Internet access. Telecommunications carriers in Samoa purchase wholesale bandwidth at around 25 times the price of similar bandwidth in a developed country,[11] which reduces profitability and the range and quality of services they can offer. Internet services are predominantly delivered to homes over wireless 'last mile'[12] links rather than fixed line connections, another factor adversely affecting quality of Internet services.

Affordability of access devices has improved. Mobile phone plans offered by carriers in Samoa now regularly feature a handset-included-free plan whereas five years ago, stakeholders

[8] The International Telecommunications Union's (ITU) Broadband Commission defines affordable Internet access as 500MB of Internet data costing 5% or less of gross national income.

[9] A prepaid service from Bluesky Samoa Limited for at least 1GB of data download costs SAT $16 (Bluesky Samoa Limited, email correspondence, May 16 2017). Monthly GNI as of 2015/16 is SAT $853 (KVA Consult, email correspondence, May 17 2017) based on IMF figures published at the conclusion of Article IV consultations completed on May 1 2017.

[10] Online source: http://www.internetsociety.org/map/global-internet-report/?gclid=CjwKEAjwja_JBRD8idHpxaz0t3wSJAB4rXW5yRW1ot0IZMF6kzcd5wCLJckT-iELy5otpisalV96bhoCF-Hw_wcB#affordability-mobile-broadband, accessed: May 30 2017.

[11] Estimates provided by the SSCC (email correspondence, May 12 2017) state that in Samoa, wholesale bandwidth costs will open to Samoan telecommunications carriers at US$250 per megabyte (MB) of maximum bandwidth on the TSSC. Developed countries will often purchase bandwidth at less than $10 per megabyte of maximum bandwidth because their carriers purchase a larger volume of maximum bandwidth.

[12] The term 'last mile' refers to the physical connection from the telecommunication carrier's local exchange to the premises of the customer, say the customer's home or business, ending at the carrier's termination point in the case of fixed line connections for the 'last mile'. In the case of wireless connections, the carrier's termination point is where customer premises equipment is located for typical use to pick up the radio signals broadcast by the carrier from their base station transceiver or Wi-Fi hotspot.

reported, they did not. While a typical smartphone still retails for 74% more than the price of the same handset in New Zealand,[13] the price was much higher five years ago. This trend of falling prices was consistent across the ICT market (personal computers, tablets, peripherals, mobile phones, and fixed and mobile Internet access). Higher prices clearly impose a significant drag on socio-economic development and competitiveness.

Import duty on ICTs[14] makes them less affordable and encourages citizens to buy the cheaper and less well-made ICTs in the market. Over and above the import duty, ICTs are subjected to value-added goods and services tax[15] (VAGST). Those citizens who travel abroad or have friends or family who can bring goods back to Samoa often do so and there is a large market for this type of ad hoc 'import'. The lower quality ICTs in the market generally tend to breakdown more often and to have shorter life spans so they must be replaced more frequently. Long term, cheaper equipment is more expensive than purchasing established brands with higher quality and longer life-expectancy.

Appropriateness

Prices continue to fall for ICT equipment and they continue to increase in computing power, doubling every two years following what is now a 50-year trend referred to as Moore's Law (see Annexe D for an explanation of Moore's Law). This has enabled small and portable devices like smartphones and tablets to replace the need for larger and costlier desktop and laptop computers. This additional computing power has also created new forms of computing (e.g. 'zero-client', 'thin-client', 'virtualized', 'persistent', 'cloud-', 'hybrid-cloud') that allow the computer power of a single computer to be shared out across a network to other less powerful and less expensive computers, which reduces the cost of computing per user even further.

In Samoa, access to these alternatives forms of computing has been limited. Whilst there are a few examples of alternate forms of computing in Samoa, these have not reached a significant scale. For example, SchoolNet and the Feso'ota'i Centres are the best-known examples of the use of alternative forms of computing, using thin-client computing[16]. But the same benefits and savings have not been made by many other agencies in Samoa, most notably government agencies that still use only traditional PC-based computing.

Expanding the forms of computing available in Samoa will contribute to lower demands on electricity, reduce the need for power protection and stabilisation, and reduce environmental waste through more recyclable devices and longer times between upgrading and replacing computer equipment. These forms of computing, particularly for government and the private sector, can introduce significant operational cost savings over traditional PC-based computing.

[13] Based on a survey of Samsung Galaxy S7 Edge mobile handset prices (SAT $2,499) as advertised in the Samoa Observer in the week commencing April 10 2017 and compared to Google search results for the price of the same mobile handset, but limited to results for retailers in New Zealand and Australia, and converted at the following exchange rates: AUD1.00:SAT1.91 and NZD1.00:SAT1.77.

[14] As at May 18 2017, Ministry of Revenue, import duty on computers is 8%, tablets 8% and mobile phones 20%.

[15] VAGST is currently set at 15%.

[16] See Annexe D for an explanation of thin-client computing.

3. Where Are We Now?

Key Findings

Development of this SP commenced with a broad industry assessment based on 32 stakeholder consultations (see Annexe A). Needs expressed by stakeholders were analysed from six perspectives and not just the provision of technology (Pablo &Pan, 2002). Accordingly, public administration problems that may affect the provision of access to affordable and appropriate ICT for all were included in the assessment. Questions of knowledge management and the effects of regulatory or legislative gaps or economic factors were also briefly considered.

Almost 200 statements of problems and/or needs were gathered from stakeholders and analysed (see Annexe B). It was found that most of the needs reported by stakeholders were traceable to root causes that were non-technical[17] in nature: 84% of the 200 problem statements were classified as: (a) legal and regulatory matters; (b) political and economic conditions (assumed to be under the control of the GoS and/or the MCIT); (c) the effectiveness and efficiency of public administration; and (d) the way in which technical know-how was communicated to stakeholders during technology implementation.

Performance Baseline

The following baseline measurements were taken of the communications sector on the key performance indicators (KPI) to be used over the life of the SP. These provide points of reference against which implementation progress can be monitored and 'end of SP' outcomes can be evaluated:

KPI	Description
KPI 1	Amount of wholesale international bandwidth available to Samoa. Baseline: 100GB.
KPI 2	Number of schools with SNBH Internet access and downloading more than 5GB per month on average over a year. Baseline: 0/167 government schools.
KPI 3	Number of government organisations connected to the SNBH and putting through more than 5GB of data per month on average over a year. Baseline: 101/264 government organisations.

Lessons Learned

Over the last decade, the MCIT, the OOTR and Samoa Post have learned some important lessons about implementing ICT initiatives in Samoa. These lessons should inform the implementation of this SP.

1. *Clear institutional arrangements for action*: the lines of responsibility and accountability used to make decisions and carry out work under this SP need to be documented clearly and understood by stakeholders. Understanding which stakeholders to consult as well as inform is also important for optimising the chances for successful implementation of this SP.
2. *Aiming at meaningful outcomes*: the main beneficiary of good government reform should be the ordinary citizen. Accordingly, measurement of performance should be in terms of the benefits that accrue to citizens because of action under this SP.
3. *Use technical assistance to inform the work that is done*: rather than using technical assistance to do the work, technical assistance should advise and inform staff and build

[17] We use the term "non-technical" to mean that a detailed knowledge of how to implement, use, or work with a technology was not required to meet the need or solve the problem.

government capacity to do the work. Linkages to international institutions can also be made through the selective use of technical assistance. This can reduce dependency and contribute to state sovereignty.

4. *Recognise real constraints*: attention must be paid to constraints or limitations that are present in the governance and development context. This plan is based on a thorough analysis of that context. Constraints such as the availability of skilled human resources are real and need to be addressed first, if more appropriate ICTs are to emerge in the market.

SWOT Analysis

The communications sector can be characterised by the following strengths, weaknesses, opportunities, and threats:

Strengths

- Strong political will for improving ICT in Samoa.
- Small population and geographical concentration make outreach in Samoa inexpensive and straightforward.
- Migrant labour and diaspora remittances account for about 25% of GDP.
- Strong culture of community can help to develop consensus around initiatives quickly.

Weaknesses

- Small market size magnifies inefficiencies in regulation.
- Small market size makes it difficult to create economies of scale.

Opportunities

- New Tui Samoa Submarine Cable (TSSC) will expand the Internet bandwidth available to the country by a factor of 80.
- The existing SNBH infrastructure can host an integrated set of capabilities: the domestic IXP, the national data centre, and the SamCERT facility. This will make for savings in investment and operations.
- Samoa Post operates six centrally-located premises that could provide good access points for low-cost dissemination of information.

Threats

- Climate and natural disasters pose a constant risk to Samoa.
- Insufficient demand from government and from the population for Internet access results in higher prices for wholesale submarine cable access.

4. Where Do We Want to Go?

The current National ICT Policy expires in June 2017 (i.e. end of FY 2017). This SP suggests a new vision, mission, long-term goals and 'end of SP' outcomes to inform the development of the National ICT Policy for the period FY 2018-2022.

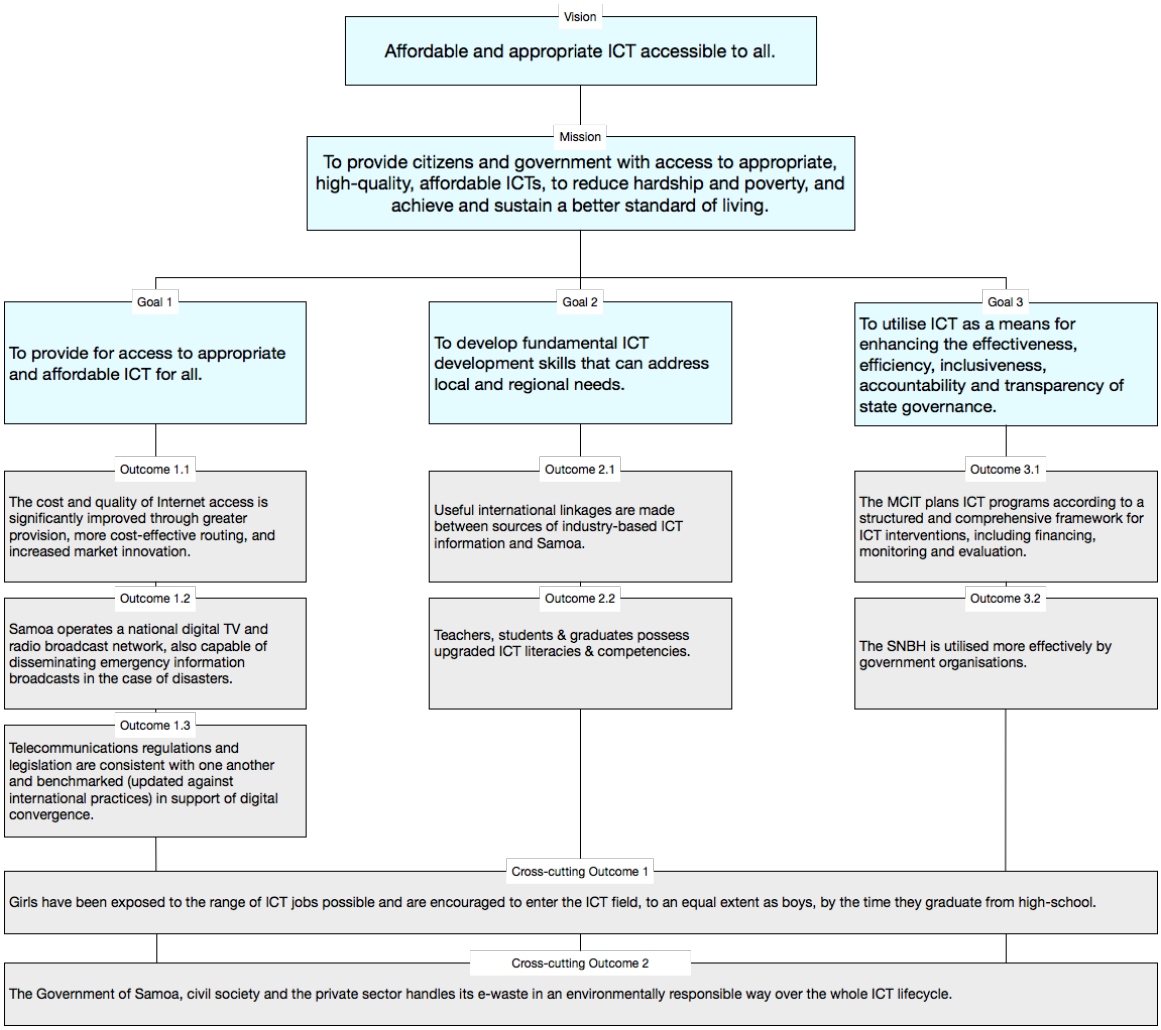

Figure 1: Structure of the Communications SP.

Vision

Vision	Affordable and appropriate ICT accessible to all.

Access to ICTs has improved in Samoa since liberalisation of the communications sector began. An increasing number of civil servants use computers and email for day-to-day operations in government. An increasing number of citizens have access to mobile phones and the Internet and use them at work and at home. Small businesses have begun to emerge in Samoa that use technology as an integral part of their operations and some are wholly technology companies using technology to deliver products and services that would not be possible without ICT.

The plan for the next five years will focus attention on *access* to *affordable* and *appropriate* ICTs in Samoa. Affordable and appropriate ICTs will reduce expenditure, improve sustainability, reduce electricity costs, minimise e-waste, and extend the life of the ICTs used; all, while facilitating the effective and efficient participation of individuals and organisations in the national and international economies. Frequently, affordability is linked to ICT

appropriateness. Using more appropriate ICT may be more expensive in the short-run but long-term cost savings invariably are much greater.

For example, equipping school children with a personal computer or a laptop is costlier in the long run than using newer technologies like tablets and browser-based computers (e.g. Chromebooks[18]). Tablets use less power, cost less, and are more robust, and are therefore better-suited to use by children. Government agencies that replace personal computers with thin-client computers will improve information security; reduce electricity costs and the need for power protection and stabilisation; reduce the human resources needed to administer the computer network; and extend the lifespan of the network of computers from 3-5 years to 7-10 years. These measures could reduce government computing costs by as much as 50%. Government agencies should be open to the use of tablet-based computing devices to increase staff mobility and promote better interactions between government staff and the citizens they serve. Businesses can acquire services only as they need them from the Internet using cloud-based services which will help them operate at lower cost and greater efficiency. This will also reduce the barriers to entry for new businesses in Samoa.

Mission

Mission	To provide citizens and government with access to appropriate, high-quality, affordable ICTs, to reduce hardship and poverty, and achieve and sustain a better standard of living.

The SP prioritises investment in the provision of access to the Internet backbone via the TSSC. When the ASH cable was installed, wholesale Internet capacity increased by a factor of 40. As noted above, the Tui Samoa cable will expand the Internet bandwidth available to the country substantially, from the current 100GB to 8TB, that is, 80 times the current maximum capacity.

The dissemination of information about technology should be a key function of government. The SP aims to increase the degree to which the SNBH is being utilised by providing Internet access to government agencies and free Internet access to all government primary and secondary schools. Teachers will be provided with opportunities and incentives to upgrade skills with ICTs that help them to acquire information to support their teaching (curricula and methods). Internet access can be used to do this cost-effectively with online delivery of pre- and in-service course work. If the National University of Samoa (NUS) can equip graduates with more advanced computing skills – like enterprise architecture, systems analysis and software engineering - there is a greater likelihood of ICT innovation.

[18] A Chromebook is a computer that possess an operating system consisting largely of the Google Chrome web browser. All applications and data are loaded via the web, and Internet access is needed intermittently to operate the computer most effectively.

Long-term Goals

The purpose of this SP is to provide an outline of the activities that will be undertaken between 2017/18 to 2021/22 mainly by the Ministry of Communications and Information Technology (MCIT), the OOTR and Samoa Post. The aim is for the activities to achieve the sector's 'end of SP' outcomes and achieve its long-term goals, which are consistent with the National ICT Policy for the same period. The SP also estimates the costs of what is proposed and sets out how plan implementation will be monitored and evaluated.

Long-term goals	
Goal 1	To provide for access to appropriate and affordable ICT for all.
Goal 2	To develop fundamental ICT development skills that can address local and regional needs.
Goal 3	To utilize ICT as a means for enhancing the effectiveness, efficiency, inclusiveness, accountability and transparency of state governance.

Table 1: Long-term outcomes (goals) of the SP.

Timing

There is a need to align this SP with the electoral cycle. The next parliamentary elections are due to be held in March 2020/21 (FY 2021), and the new National ICT Policy and this SP cover the period July 2017 (FY 2018) to June 2022 (FY 2022). This SP should be renewed in its fifth year for the next five-year period to synchronise it with government terms of office.

Outcomes Map

The long-term goals of this plan are broken down into 'end of SP' outcomes in the table that follows.

Long-term goals or 'end of SP' outcomes	
Goal 1: To provide for access to appropriate and affordable ICT for all.	
Outcome 1.1:	The cost and quality of Internet access is significantly improved through greater provision, more cost-effective routing, and increased market innovation.
Outcome 1.2:	Samoa operates a national digital TV and radio broadcast network, also capable of disseminating emergency information broadcasts in the case of disasters.
Outcome 1.3:	Telecommunications regulations and legislation are consistent with one another and updated against international practices in support of digital convergence.
Goal 2: To develop fundamental ICT development skills that can address local and regional needs.	
Outcome 2.1:	Useful international linkages are made between sources of industry-based ICT information and Samoa.
Outcome 2.2:	Teachers, students and graduates possess upgraded ICT literacies and competencies.
Goal 3: To utilise ICT as a means for enhancing the effectiveness, efficiency, inclusiveness, accountability and transparency of state governance.	
Outcome 3.1:	The MCIT plans ICT programs according to a structured and comprehensive framework for ICT interventions, including financing, monitoring and evaluation.
Outcome 3.2:	The SNBH is prepared for greater utilisation by government organisations.
Cross-cutting:	
X1:	Girls and boys have been exposed to the range of ICT jobs possible and are encouraged to enter the ICT field by the time they graduate from high-school.
X2:	Government, civil society and the private sector manages its e-waste in an environmentally responsible way over the whole ICT lifecycle.

Table 2: Long-term outcomes (goals) and 'end of SP' outcomes of the SP.

Links to the Other Policies, Plans and Strategies

This SP links to superordinate policy, plans and strategies in the following ways. It links to the Samoa Development Strategy (SDS) on 7 of 14 key outcomes. The current National ICT Policy expires in June 2017. A new National ICT Policy will be needed to 'sit above' this SP and a new vision, mission, long-term goals and 'end of SP' outcomes are provided to assist with this. The wide needs assessment done for this SP should inform the new National ICT Policy.

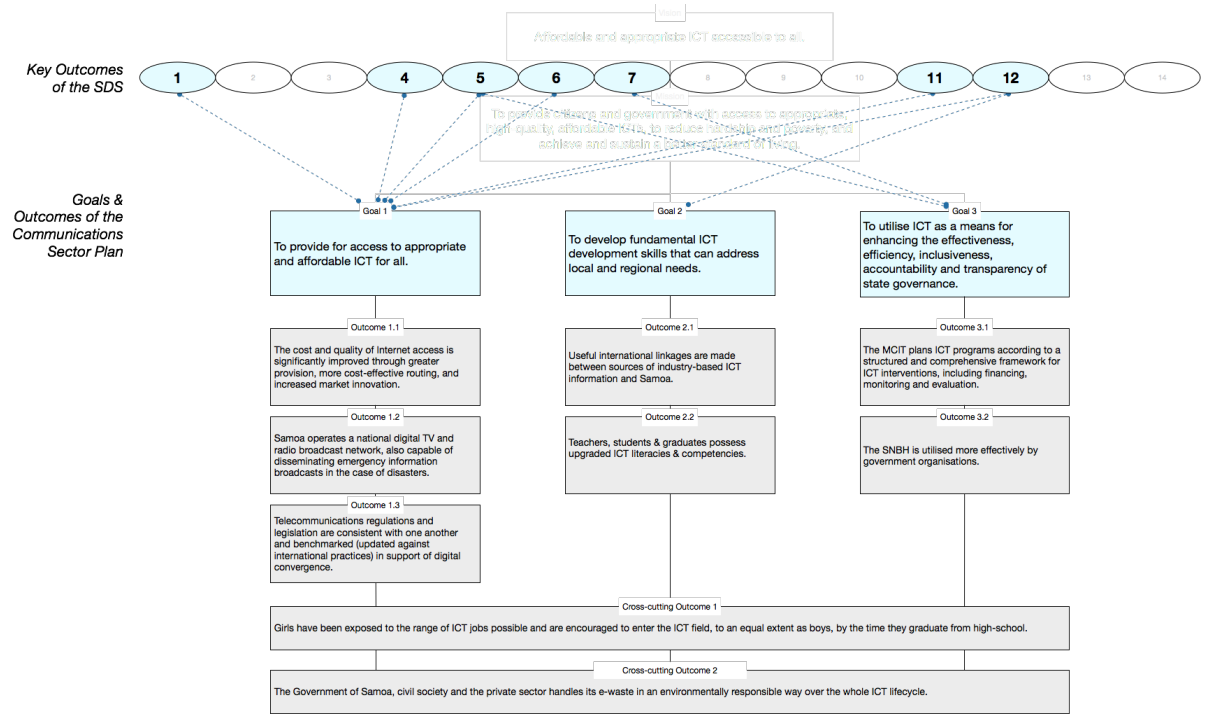

Figure 2: Relationship between key outcomes of the SDS and the communications SP.

Link ID	Key Outcomes of SDS	How 'End of SP' Outcomes Link to Key Outcomes of SDS
1	**Key Outcome 1: Real GDP growth will average 3.0 – 4.0%**	Increases in GDP of between 0.8% and 1.5% can arise from better telecommunications services and deeper market penetration of those services (Czernich et al., 2011). On average, if a country has a teledensity[19] greater than 10%, per capita GDP growth accelerates by about 0.5% per annum (Waverman et al., 2005). At present, the legislation and regulations are not consistent with good practices in the regulation of digitally-converged or converging markets: 'open access'; 'fair and non-discriminatory wholesale pricing'; 'separation of wholesale and retail service provision'; 'quality of service' (World Bank, 2014) are not addressed in the legislation and regulations, and carriers are double-charged for spectrum, in some cases, based on the structure of their network. The Regulator operates under the direction of two ministers and four separate pieces of legislation. [Contributions Made by Achieving: Goal 1 of the SP]
2	**Key Outcome 4: Internet Connectivity and Access Increased**	By laying a new undersea fibre optic cable to Samoa, the country will have access to a greater amount of wholesale Internet bandwidth. Greater wholesale Internet bandwidth allows ISPs to demand more domestically, which allows the cable operator to lock-in prices with inbound and outbound cable routes and so reduce the wholesale cost to all ISPs in the country. Government's SNBH is not connected to the Internet. Individual connections are purchased by government agencies with ISPs. This is inefficient for such a small country and consolidation of the ISP connections and connection to the SNBH will result in significant cost savings for government, but also a greater opportunity to reuse locally-cached data on the SNBH and thereby avoid fetching the same data from international sites, which uses expensive international bandwidth. [Contributions Made by Achieving: Goal 1 of the SP]

[19] Teledensity is the ratio between the number of registered telephone connections and the population headcount. See Annexe D for an explanation of teledensity.

Link ID	Key Outcomes of SDS	How 'End of SP' Outcomes Link to Key Outcomes of SDS
3	**Key Outcome 5: Participation of Private Sector in Development is Enhanced and Government Services Supporting Private Sector Investment are Improved**	Government has an opportunity to lead, and to demonstrate the use of alternative forms of technology to the traditional client-server form. It can do this by producing guidelines on good ICT use and ICT development practices. Useful international linkages can be made between sources of industry-based ICT information and the MCIT. The MCIT can be a better example for the use of ICTs for public administration effectiveness and efficiency. The MCIT can help to inform planning and support innovation by the private sector and civil society by communicating its intentions more clearly. [Contributions Made by Achieving: Goal 1 and 3 of the SP]
4	**Key Outcome 6: Quality of Health Care Service Improved**	Improvement in utilisation of the SNBH by hospitals will enable them to access information and communicate more effectively and efficiently. An efficient and effective computer network is vital for the Ministry of Health's (MOH) e-Health program, which aims to provide a centralised system of patient and caregiver health information, as well as connecting caregivers with patients in rural and remote areas. [Contributions Made by Achieving: Goal 1 of the SP]
5	**Key Outcome 7: Quality Education and Training Improved**	The MCIT can play a role in supporting the MESC to produce guidelines for the use of ICTs by teachers, principals, and students that are technically consistent with good practices in ICT education internationally. The provision of Internet access to government schools is critical to the Samoan education system's relevance to a modern globalised economy. [Contributions Made by Achieving: Goal 3 of the SP]
6	**Key Outcome 11: Improved and Affordable Country Wide ICT Connectivity**	With more "users connected" to the Internet and higher demand for access, the wholesale cost will fall further. [Contributions Made by Achieving: Goal 1 of the SP]
7	**Key Outcome 12: Quality Energy Supply**	Increasingly, the devices used to manage the electricity grid are Internet-enabled devices, part of a global trend known as the formation of the Internet of Things (Bedi et al., 2016, p.70). These devices relay information about the consumption patterns and the quality of the energy supply to the home back to the electricity provider. For an electricity provider, this Internet access must be paid for and this is a large cost. If Internet access prices fall, more "smart" meters can be used on homes on the electricity grid to help the Electric Power Corporation (EPC) plan load times and unblock supply and prevent leakage problems on the grid. [Contributions Made by Achieving: Goal 1 and 2 of the SP]

Table 3: How the SP long-term outcomes (goals) links to key outcomes of the SDS.

Stakeholders

Internal and external groups will be involved in the delivery of outputs under the SP.

Internal Stakeholders

To the extent that all government agencies stand to benefit from this SP, they are stakeholders in it. However, from the point of view of primary responsibility for *implementation*, clearly the most important stakeholders are MCIT, OOTR, Samoa Post, and the Sector Coordination Committee.

Coordination with External Stakeholders

The Communications Sector will also need to work closely with other stakeholders in Samoa to implement the activities proposed under this plan. Coordination will be needed with the following external stakeholders, mainly through the NICTSC:

- Cabinet
- Ministry of Finance
- Ministry of Revenue
- Ministry of Foreign Affairs and Trade
- Ministry of Sport, Education, Culture
- Ministry of Health
- Office of the Attorney General (OAG)
- SBS
- Samoa Qualifications Authority
- Public Service Commission

- Electric Power Corporation
- Ministry Natural Resources and Energy
- Ministry of Works, Transport and Infrastructure
- Ministry of Women, Community, Social Development
- National University of Samoa
- Samoa Submarine Cable Company
- Samoa IT Association
- Samoa Chamber of Commerce
- Samoa Umbrella for Non-Governmental Organisations (SUNGO)
- ISP's, Broadcasters, Carriers

The institutional arrangements for authorisation of work or the delegation of responsibilities, as well as who will be consulted and informed during the implementation of work, will be specified in the "Institutional Arrangements" section of this report.

5. How Are We Going To Get There?

Critical Path

Over the course of the five years of this SP, the following activities on the critical path are the most important. A detailed list of activities is provided in the work plan in Annexe C. At a minimum, the activities below must take place to make a material contribution to the stated long-term goals and 'end of SP' outcomes.

Activity ID	Activity Statement	Year 1 FY 2017/18	Year 2 FY 2018/19	Year 3 FY 2019/20	Year 4 FY 2020/21	Year 5 FY 2021/22
Explanation						
1.1.1	The Tui Samoa Submarine Cable is brought online.					
The TSSC will expand the capacity of the international Internet links to and from Samoa by a factor of 80 times. Greater international connectivity is one of two necessary conditions to reduce the cost of Internet access in Samoa. The MCIT will be responsible for updating the market about the state of the TSSC project.						
1.1.3	Pricing for wholesale access to the TSSC is determined by the SSCC, approved by the OOTR, published, and carriers adopt.					
For telecommunications prices to fall, the second necessary condition is that carriers in Samoa agree to purchase capacity on the TSSC. Carriers in Samoa will purchase wholesale capacity if there is a reasonable business case to suggest that they can sell this capacity to citizens. The OOTR will be responsible for approval of the access pricing, in the case carriers cannot reach agreement with the SSCC. It will be important to avoid volume-based discounts so that dominant market players are not given unfair advantage over smaller ISPs. Consistent with good international practice, wholesale access must be on open and fair terms.						
1.1.6	Telecommunications carriers have access to the IXP and have agreed to interconnect[20] prices.					
To improve the quality of access to domestic content, the OOTR will be responsible for mandating use of the local IXP by carriers. The IXP facility is presently housed at the DCS/SNBH complex but is inoperative. Once settled and the IXP is operational, the OOTR will be responsible for publishing the agreed interconnect prices on its web site.						
1.2.3	Draft or modify legislation and regulations to provide the basis for the switchover from analogue broadcasting to digital broadcasting.					

[20] Interconnect pricing is the price that a carrier charges other carriers for calls and data traffic that ends on their network. For example, if carrier A receives 1000 calls from subscribers on carrier B's network, then carrier A will charge carrier B an interconnect fee for those calls.

Activity ID	Activity Statement	Year 1 FY 2017/18	Year 2 FY 2018/19	Year 3 FY 2019/20	Year 4 FY 2020/21	Year 5 FY 2021/22
Explanation						
Two options exist for providing the necessary legislative and regulatory foundation for digital broadcasting. The existing Broadcasting Act and regulations could be amended to reflect the decisions made by government for how it wishes to implement the switchover from analogue to digital broadcasting. Alternatively, the Broadcasting Act could be merged with the Telecommunications Act and renamed to take a step towards consolidating the legislation and regulatory framework for digital convergence. The MCIT would need to work with the OAG to bring this about.						
1.2.4	Set up a private-public partnership (PPP), select a digital broadcasting equipment supplier, and acquire the digital broadcasting equipment.					
It is in the interest of government to utilise its electromagnetic spectrum efficiently. By switching from analogue signal transmission to digital, the electromagnetic spectrum is conserved and can be redeployed for other revenue-generating purposes. Less electricity is used to operate the broadcasting radios for digital transmission than for analogue transmission. In the case where a broadcasting market is small, the Government may have to subsidise the development of network infrastructure to allow digital transmission, leaving the broadcasters to fund infrastructure that they need to be able to broadcast digitally. Finally, in Samoa, the broadcast equipment needed is called a multiplexer which takes broadcasts from multiple broadcasters and sends them out over the same band of electromagnetic spectrum – this band then contains all the television and radio signals in one stream. It is the only way to manage the spectrum for broadcasting efficiently. This equipment can be regarded as an IXP but for television and radio broadcast signals, instead of for data from ISPs and mobile telecommunication carriers. The multiplexer is shared equally by all broadcasters to send out their broadcasts, much like the IXP is shared equally among all ISPs and carriers that interchange data on it. The Government need not pay for the multiplexing equipment. It could provide financing for it, purchase it using the industry-funded universal access fund, or acquire external funding on concessional terms to incentivise the migration.						
1.3.1	A review of the Telecommunications Act, Amendments, and Regulations is conducted and recommendations are made for making them consistent with one another or for a unified 'Digital Communications' Act.					
The MCIT will consider the best way to simplify the legislative and regulatory framework operating in Samoa. Considerations will need to be made as to whether Samoa maintains the multi-regulator model of utility regulation. The need to consolidate and rationalise the legislative and regulatory framework will be of greater importance if a single regulatory body is responsible for administering the regulations. Consideration should also be given to the separation of the regulatory and legislative functions. The MCIT will need to work closely with the OOTR and the OAG to implement this activity.						
1.3.3	Legislation is drafted to provide for recognition of electronic identity, digital signatures, and electronic document equivalence.					
The MCIT will be responsible for drafting new or modifying existing legislation to allow citizens, businesses and government to use electronic representations of identity and digital signatures, and to recognise that digitally signed electronic documents are equivalent to signed paper documents.						
1.3.4	The performance of the OOTR is measured by assessing: responsiveness, appropriateness, market performance, and quality of services to citizens.					
The MCIT will introduce a means for monitoring and evaluating the effectiveness of regulation of the communications sector that includes regular measurement of indicators of market performance and citizen satisfaction. The protocol will be designed in consultation with the OOTR, carriers, ISPs and broadcasters. The monitoring and evaluation instrument will be published on the MCIT web site along with the results obtained.						
2.1.5	Post offices are re-deployed as ICT centres and fitted with telecentres and free Wi-Fi, providing space for MCIT to broadcast information.					
Samoa Post will be responsible for establishing a series of new "information stands" in each of its six branches. The information stands will allow MCIT to disseminate information about ICTs in Samoa, including alternative forms of ICT, current initiatives of the MCIT, directions to the MCIT and OOTR web sites, and market performance data. Samoa Post, with the help of the MCIT, will deploy free Wi-Fi (with time-based usage limits) in each of the six post offices and possibly small community computing facilities – for example, by using a thin-client computer network.						
2.2.1	Primary and secondary schools are provided with filtered & monitored Internet access.					

Activity ID	Activity Statement	Year 1 FY 2017/18	Year 2 FY 2018/19	Year 3 FY 2019/20	Year 4 FY 2020/21	Year 5 FY 2021/22
Explanation						
The MCIT will be responsible for enabling safe Internet access to be provided across the SNBH to all primary and secondary schools in Samoa. In government primary schools (144)[21], initially Internet access will be for teachers and school administrative staff. In government secondary schools (23)[22], Internet access will be for teachers, school administrative staff, and students.						
2.2.2	The national education survey is modified to include survey questions on teacher and principal ICT literacies.					
The MCIT will assist the MESC with the development of questions for inclusion in the national education survey undertaken each year on the topic of ICT in education. The MESC will be responsible for the implementation of the expanded survey. The questions will address three areas of ICT use in the education system: (a) how is ICT utilised by students and teachers in the classroom? (b) What ICT infrastructure and resources are available to the school? And (c) how is ICT used by the school's administration? Expansion of the national education survey in this way will create a rich data series where there is presently none, and these data can be used for technology planning in the education sector.						
2.2.3	The national teacher curriculum is revised to include ICT literacies, particularly content production, class management and 'blended teaching' approaches (that combine e-learning with traditional methods).					
The MCIT will assist the MESC and NUS with the development of an expanded curriculum for pre-service and in-service teacher training and certification on ICT use. The MESC and NUS will be responsible for the implementation of the new curriculum. The SQA will certify that new ICT competencies are retained by teachers through the pre- and in-service training programs. Competencies will cover two areas of ICT use in education: (a) managing educational content using ICT; and (b) pedagogical models that blend ICT use and traditional teaching in the classroom (as opposed to "computer lab").						
2.2.4	The national student curriculum is revised to incorporate an ICT syllabus corresponding to the skills inventory taken, and is implemented for secondary school grades.					
The MCIT will assist the MESC with the revision of the secondary school curriculum to include systems engineering, computer programming, and algorithms for problem solving.						
2.2.5	NUS will be responsible for introducing an annual alumnus tracking survey.					
The NUS will be responsible for introducing an annual alumnus tracking survey to understand how graduates are using ICT in the workplace, what gaps graduates have in their ICT knowledge relative to the job market, and how ICT skills are being translated into economic value for Samoa. The MCIT will need to determine the scope of the tracking survey and identify any needs stakeholders might have for information produced in a survey of this kind.						
3.1.1	Communications plan is developed and institutionalised in the MCIT.					
The MCIT will develop a communications plan so that stakeholders in Samoa are provided with timely and relevant information about the state of the communications sector. A published communications plan will assist stakeholders to plan, contribute to transparency, and contribute to greater certainty among staff as to what work the MCIT should be doing and the status of that work. It may lead to better relationships between the MCIT, the OOTR, Samoa Post and their respective stakeholders.						
3.1.8	Contracts are reviewed and revised to include a component of performance-based payment for the realisation of user benefits, and the public is informed.					
In consultation with the private sector, the MCIT will define performance criteria to be included in the service contract offered by government for the management, operation, and maintenance of the SNBH. The performance criteria will focus on utilisation of the applications that end users can access on the SNBH, rather than simply whether the organisation is connected to the SNBH or not.						
3.1.9	ICT procurement guidelines are revised.					
Procurement guidelines will be modified to include guidance on how government agencies should calculate and assess the total cost of ICTs. The guidelines will also address e-waste minimisation and the environmental effects of operating ICTs. Some ICTs still contain toxic materials like some rare-earth minerals. It may be necessary to regulate for these and inspect ICTs for these materials at the border.						

[21] MESC, 2016. p.62, table 1, Education Statistical Digest.

[22] MESC, 2016. p.62, table 1, Education Statistical Digest.

Activity ID	Activity Statement	Year 1 FY 2017/18	Year 2 FY 2018/19	Year 3 FY 2019/20	Year 4 FY 2020/21	Year 5 FY 2021/22
Explanation						
3.1.10	All donors are made aware of new procurement guidelines for ICT to be adopted by the GoS.					
The MCIT will be responsible for developing procurement guidelines for sustainable ICTs deemed more appropriate to the Samoan context. ICT purchases by government and by donors will be required to conform to the procurement guidelines. The guidelines will introduce an ICT costing method that accounts for the upfront and recurrent costs associated with an ICT. The guidelines will introduce a method to assess the e-waste burden the ICT will generate. Donors will be given adequate notice about the change in procurement guidelines and the need for compliance by externally funded programs that involve the provision of ICT.						
3.2.1	Network traffic volume monitoring and auditing data maintained by the SNBH operator.					
At present, the SNBH is operated and maintained by a private firm. The firm only monitors whether an organisation who has been given the equipment that allows them to connect to the SNBH is switched on. No historical information is retained concerning the degree of utilisation the organisation makes of their SNBH connection. 244 government agencies are authorised to connect to the SNBH.						
3.2.2	The computing capabilities of the DCS/SNBH facility is enhanced to cope with greater utilisation.					
In preparation for various cost saving and sustainability-improving measures that the MCIT will introduce under this SP, the national Data Centre Samoa (DCS) will need to be upgraded to handle delivery of these new measures. The upgrades will involve the provision of hardware and software to provide two capabilities to end users of the SNBH, namely: (i) server virtualisation services; and (ii) thin-client terminal services. Virtualisation services allow multiple servers to coexist on a single server thereby reducing the amount of server hardware required. Thin-client terminal services allow lower cost and more sustainable computers for end users (as opposed to traditional PCs) to be connected. Thin-client computers last longer than a traditional PC, don't require protection and conditioning equipment, and are more secure. As noted above, these two technologies are likely to reduce government expenditure on ICTs by as much as 50% during the life of the SP.						
3.2.3	Technical Working Group (TWG) is established by the MCIT from ICT units across government and the TWG meets regularly.					
The TWG will meet monthly and will be a forum for ICT staff from across the government to build professional relationships in the workplace, discuss and solve ICT problems they encounter, and to provide a forum for communication of the status of the ICT activities under this SP.						
3.2.7	SamCERT is established at the DCS/SNBH hub facility.					
Once the DCS facility is upgraded, an elementary cyber security emergency response protocol will be devised. The emergency response protocol will define how government will respond in the case of a cyber security incident. The cyber security unit will be established in the DCS/SNBH and, initially, its capabilities will be limited to limit equipment expenditures and allow time for staff to be trained and for them to acquire experience in cyber security. Cyber security is a complicated craft and very few Samoans possess the necessary skills and experience. The protocol will need to be: realistic about the capabilities to be provided; right-sized for the SNBH environment and based on thorough risk assessment. There is a substantial risk that overprovisioning of equipment and software may be promoted by interested suppliers. The MCIT will need to acquire independent technical advice to identify what the most reasonable provision of cyber security resources should be. At most, the initial cyber security capability should include: (a) content monitoring and filtering to deliver safe Internet access to users of the SNBH; (b) centralised virus protection services; (c) intrusion detection and prevention systems; and (d) traffic monitoring, auditing and reporting.						
3.2.8	Servers hosted on the DCS/SNBH are virtualised.					
The MCIT will invest in server virtualisation technology to reduce the amount of server hardware needed and to use the existing hardware more effectively. Staff of the MCIT will need to be trained and certified and this will need to be done overseas. Servers that belong to government organisations that are centralised in the DCS/SNBH facility can be migrated to a virtual server and the spare equipment created by freeing up servers can be used as replacement equipment in the DCS/SNBH. This will be done gradually over two years.						
3.2.9	Desktop computers are replaced by thin-client computers.					
MCIT will manage the change-over, which will be phased over two years. To achieve this, MCIT staff will need to be trained overseas.						

Activity ID	Activity Statement	Year 1 FY 2017/18	Year 2 FY 2018/19	Year 3 FY 2019/20	Year 4 FY 2020/21	Year 5 FY 2021/22
Explanation						
X2.1	E-waste management guidelines are developed and adopted across the GoS, which include comparisons of power consumption for different kinds of computing, materials inside computing devices, and how to dispose of e-waste responsibly.					
The MCIT will develop guidelines or regulations for how to avoid generating e-waste and for managing its safe disposal. The MCIT will promote consideration of e-waste in carrying out its role on the national procurement committee when procurement of ICTs is being assessed. Such guidelines or regulations will be published on the MCIT web site and will feature prominently in the materials on display in branches of Samoa Post.						

Table 4: Critical path of activities through the SP.

Special Attention

Several activities will require special attention because finding local human resources with the necessary skills will be difficult and, in some cases, not possible. Special attention will take the form of one or more of the following: (a) specialised international technical assistance; (b) international comparative study; and (c) periods of mentoring and supervision to aid knowledge transfer.

The following SP activities will require special attention:

Activity ID	Activity Statement	Special Attention
1.2.3	Draft or modify legislation and regulations to provide the basis for the switchover from analogue broadcasting to digital broadcasting.	Specialised international technical assistance will be needed to draft legislation that fits the local context and meets international norms for regulating digital media convergence.
1.3.1	A review of the Telecommunications Act, Amendments, and Regulations is conducted and recommendations are made for making them consistent with one another or for a unified 'Digital Communications' Act.	As for activity 1.2.3.
1.3.3	Legislation is drafted to provide for recognition of electronic identity, digital signatures, and electronic document equivalence.	As for activity 1.2.3.
2.2.2	The national education survey is modified to include survey questions on teacher and principal ICT literacies.	*Specialised international technical assistance* may be needed to protect the common core of education data when the national education survey is expanded and that the new information collected follows international norms for ICT in education surveys and assessments.
2.2.3	The national teacher curriculum is revised to include ICT literacies, particularly content production, class management and 'blended teaching' approaches (that combine e-learning with traditional methods).	An *international comparative study* of teacher ICT curricula should be undertaken to guide the design of and incremental changes to the national teacher curriculum. *Specialised international technical assistance* is likely to be needed as these skills are unlikely to exist in Samoa.
2.2.4	The national student curriculum is revised to incorporate an acquired and localised ICT syllabus corresponding to the skills inventory taken, and is implemented for secondary school grades.	An *international comparative study* of student ICT curricula should be undertaken to guide the design of and incremental changes to the national student curriculum. *Specialised international technical assistance* is likely to be needed as these skills are unlikely to exist in Samoa.
3.2.1	Network traffic volume monitoring and auditing data maintained by the SNBH operator.	*Specialised international technical assistance* will make it easier for an arms-length selection of the technical parameters that will be used to measure performance of the operations, maintenance, and use of the SNBH.

3.2.2	The computing capabilities of the DCS/SNBH facility is enhanced to cope with greater utilisation.	*Specialised international technical assistance* and *periods of mentoring and supervision to aid knowledge transfer* should be used to introduce skills in 'just in time' provisioning[23], data centre design, network operations centre management, network auditing, and network performance optimisation.
3.2.7	SamCERT is established at the DCS/SNBH hub facility.	*Specialised international technical assistance* and *periods of mentoring and supervision to aid knowledge transfer* should be used to introduce skills in security analysis and investigation, application security, cloud and hybrid-cloud security, social engineering, traffic analysis and auditing, end-point security and penetration testing.
3.2.8	Servers hosted on the DCS/SNBH are virtualised.	*Specialised international technical assistance* and *periods of mentoring and supervision to aid knowledge transfer* should be used to introduce skills in virtual switching and networking, virtualised architectures, and physical and virtual server interfacing.
3.2.9	Desktop computers are replaced by thin-client computers.	*Specialised international technical assistance* and *periods of mentoring and supervision to aid knowledge transfer* should be used to introduce skills in remote deployment and administration, thin-client server provisioning, storage management, and desktop monitoring.

Donor Consultation

As far as possible, the SP has been designed so that the largest (and costliest) activities will produce cost savings that match or exceed the proposed expenditures. With that in mind the MCIT prioritised two aspects of the process to develop the SP: (i) a plan that is financially sustainable; and (ii) a plan that is 'owned' by Samoa.

During development of this plan several donor documents were reviewed to obtain an understanding of the current measures of support available to government[24]. But wanting to demonstrate a strong sense of ownership over the SP process and the resulting SP, the MCIT provided the SP team with a summary of past and current donor programs, on the understanding that the government, particularly the MCIT, would present to donors a complete, costed, and compliant (with Samoa's sector planning guidelines) SP.

Omissions

Largely due to time limitations, this SP omits the following information:

1. The *direct and indirect cost savings the activities would produce in the long term*. The SP only itemises charges back to the MCIT for use of the SNBH. It omits other substantial cost savings such as: (a) the reduction in ICT expenditure across government arising from the introduction of thin-client and virtualised computing; (b) the reduction in the cost of the wholesale access price to the TSSC for all Samoans because of greater demand through the provision of Internet to all government schools across the SNBH; and (c) the improvements in productivity across the Samoan economy because high school and university graduates are equipped with better ICT competencies.

2. A *comparison of Samoa's legislation and regulations across all service markets* (post, broadcasting, telecommunications, water, electricity) with other small island developing states. This would have been helpful to the OOTR given its status as a 'multi-regulator', the obvious need for reform, and the dearth of information in this area among PICs;

3. Formal funding commitments from government or from external agencies to finance the SP could have been discussed more thoroughly.

[23] "Just in time" provisioning means to avoid purchasing and installation of equipment that is available but unused.

[24] This SP was developed with support from the Samoa Technical Assistance Facility (STAF) which is funded by the Department of Foreign Affairs & Trade (DFAT), Australia.

Institutional Arrangements

Approval of the Sector Plan

The SP will be submitted by the Sector Steering Committee (SSC) to cabinet for approval.

'Internal' Decisions

The SSC is empowered to: (a) make decisions on matters that affect the communications sector; and (b) make requests for authorisation of decisions for which responsibility lies outside the sector, with ministries, statutory bodies or state-owned enterprises.

'External' Decisions

Decisions that involve implementation by an agency external to the sector or a body from civil society or the private sector will only be made through the referral of a request for authorisation from the SCC to the NICTSC. These will include decisions that affect the whole of government or have an impact that is economy-wide. The NICTSC meets fortnightly. The Prime Minister is the current chair of the NICTSC.

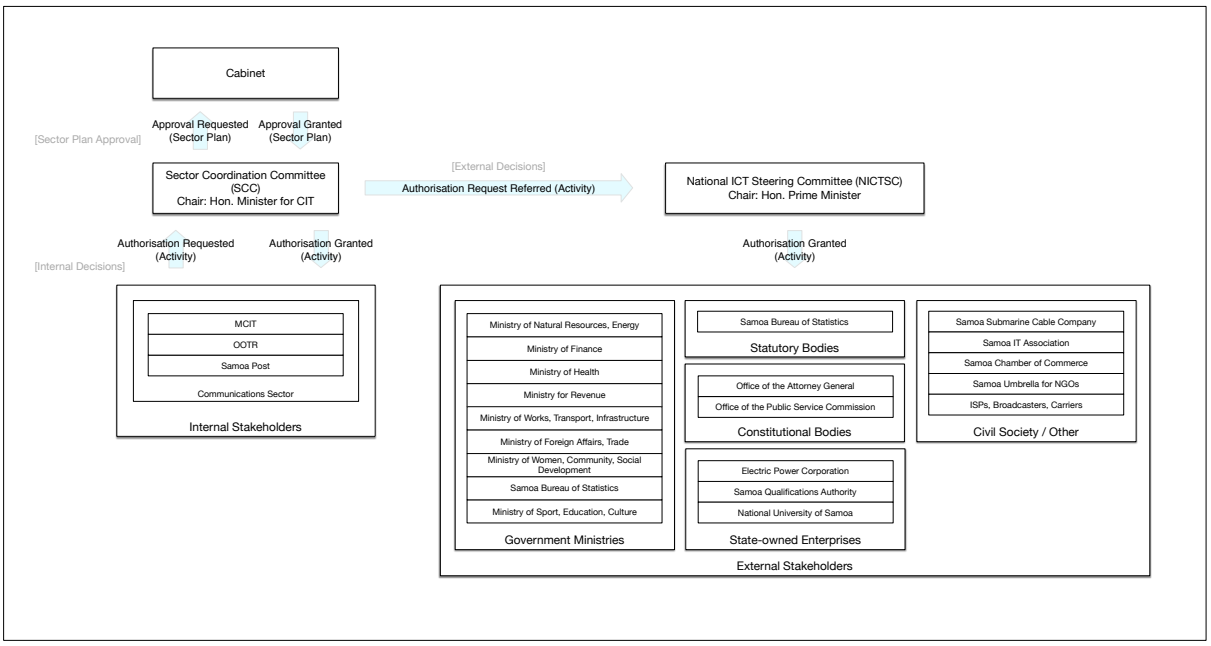

Figure 3: Authorisation mechanisms under the SP.

Management of Implementation

Once the SP is approved, the Hon. Minister will assign responsibility for managing implementation to the CEO/MWTI who will in turn assign one of each of the three goals and the two cross-cutting outcomes to a member of the MWTI Senior Management Team (SMT)

The Hon. Minister and the SSC will be responsible for the removal of obstacles to implementation within the sector, and will refer matters that it cannot decide to the NICTSC. The SMT will meet at least once a month to discuss progress, obstacles faced in the preceding month, and plan for decisions needed in the following month.

Technical Working Group

An ICT technical working group (TWG) will be established for ICT human resources across government. It is envisaged that the TWG will meet once a month to discuss problems and matters pertaining to ICT, particularly if those problems affect the whole of government or address an economy-wide issue. TWGs are employed by the MOH, MOF (e.g., separate accounting and auditing), and the Office of the Public Service Commission.

Responsibility Matrix

The MCIT is responsible for the achievement of the 9 end-of-SP outcomes[25]. In some cases, achieving an outcome will involve other agencies. In all cases, there are one or more stakeholders to be consulted to inform implementation.

Outcome ID	Outcome Statement	Principal implementing agent	Other implementing agents	Other stakeholders
1.1	The cost and quality of Internet access is significantly improved through greater provision, more cost-effective routing, and increased market innovation.	MCIT	MCIT, SSCC, OOTR	Carriers, ISPs
1.2	Samoa operates a national digital TV and radio broadcast network, also capable of disseminating emergency information broadcasts in the case of disasters.	MCIT	MCIT, OOTR	Broadcasters, MNRE
1.3	Telecommunications regulations and legislation are consistent with one another and updated against international practices in support of digital convergence.	MCIT	MCIT, OAG, OOTR	Cabinet, Carriers, ISPs, MNRE, Broadcasters
2.1	Useful international linkages are made between sources of industry-based ICT information and Samoa.	MCIT	N/A	Carriers, ISPs, Broadcasters, SCoC, Samoa IT Association, NUS
2.2	Teachers, students and graduates possess upgraded ICT literacies and competencies.	MCIT	MESC, NUS	Samoa IT Association, SCoC, Carriers, ISPs, Broadcasters
3.1	The MCIT plans ICT programs, including financing, monitoring and evaluation.	MCIT	N/A	MOF, NICTSC, SCoC, Donors
3.2	The SNBH is prepared for greater utilisation by government organisations.	MCIT	OOTR	MESC, MOH, CSL, NICTSC
X1	Girls and boys are encouraged to consider careers in ICT before they graduate from high-school.	MCIT	OOTR	MESC, NUS
X2	Government, civil society and the private sector manage e-waste in an environmentally responsible way over the whole ICT lifecycle.	MCIT	MNRE	MOF

Table 5: Responsibilities matrix.

[25] The 9 'end of SP' outcomes comprise 7 goal-oriented outcomes and 2 cross-cutting outcomes.

Risks & Mitigation Strategies

The main risks facing implementation of the SP and strategies for their mitigation are set out in the table below[26].

Risks and Mitigation Strategies					
Category	**#**	**Risk**	**Mitigation Strategy**	**L**	**C**
Strategic	R1	Carriers avoid purchasing additional wholesale bandwidth because of insufficient local demand for Internet.	The MCIT will enable Internet access via the SNBH and recoup charges from government organisations that connect.	**5**	**5**
	R2	Broadcasters cannot afford to acquire network distribution equipment.	The MCIT should help attract concessional financing on behalf of private sector broadcasters. These funds can be combined with government funds, in the same way as the SSCC has been established to fund the TSSC infrastructure. It may also be possible to re-think the SSCC as a general-purpose vehicle to design, build and operate this and future digital infrastructure investments.	**3**	**4**
	R3	The rotating governance arrangements over the SSCC are time-bound. This could cause significant problems with implementation, particularly if rotation of the chair occurs part way through one of the phases that constitute the building, development or operation of the Tui Samoa Submarine Cable.	The chair could be rotated at the end of project phases, such as design, build, operate.	**5**	**3**
	R4	Resistance by parents to increase the amount of access to the Interne– - because it conflicts with social, religious, and cultural value– - may limit the extent to which ICT can be introduced into schools.	It will be important to review different education systems that have modified their national curricula to include ICT competencies. Awareness about these cases needs to be raised among parents and a significant effort to consult with parents should be made by the MESC and MCIT.	**3**	**4**
	R5	Resistance to modifying the national curriculum for pre-service and in-service teacher training to avoid increasing the difficulty of becoming a teacher. The education system faces a "critical shortage of teachers … a longstanding issue"[27] with declines of 2% for males and 3% for females in 2016.	It is vital that the Samoan education system produce teachers with good ICT literacies. Raising awareness among educators, parents, and administrators of the role that ICT plays in modern education systems may help to build support for the curriculum change. The MCIT will need to invest in outreach activities that gather and present research to support the proposed changes to the curriculum.	**3**	**3**
Operational	R6	Resistance to legislative and regulatory change impairs the telecommunication market's performance.	The MCIT will need to acquire technical assistance to identify the legislative and regulatory shortcomings and to revise them.	**3**	**4**
	R7	Resistance from line ministries to adhere to computing standards, consider open source software centralisation of computing systems, and procurement guidelines.	The MCIT will produce a cost-benefit analysis and business case for presentation to the NICTSC to justify why computing standards, centralised computing systems, and procurement guidelines will be good for government.	**4**	**5**
	R8	Some donors are unable to comply with the ICT procurement rules and this adversely affects the quality and quantity of development assistance.	The MCIT will recommend to the aid coordination committee that donors who cannot comply are advised to offer unconditional on-budget financing in lieu of purchasing ICT goods and services externally, where domestic purchasing is possible.	**2**	**2**

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L = Likelihood	C = Consequence
5 = Almost certain 4 = Likely 3 = Possible 2 = Unlikely 1 = Highly unlikely	5 = Severe: would prevent achievement of SP goals and outcomes 4 = Major: would threaten goals and outcomes; requires close management 3 = Moderate: would necessitate significant adjustment to the overall function 2 = Minor: would threaten an element of the function 1 = Negligible: routine procedures sufficient to deal with the consequences

[27] MESC, 2016. p.32, Education Statistics Digest.

6. What Resources Will Be Required?

Medium-term Expenditure Framework

The current forward estimates of the nett *operational* expenditure for the communications sector[28] over the five years from 2017/18 total $13.8m[29].

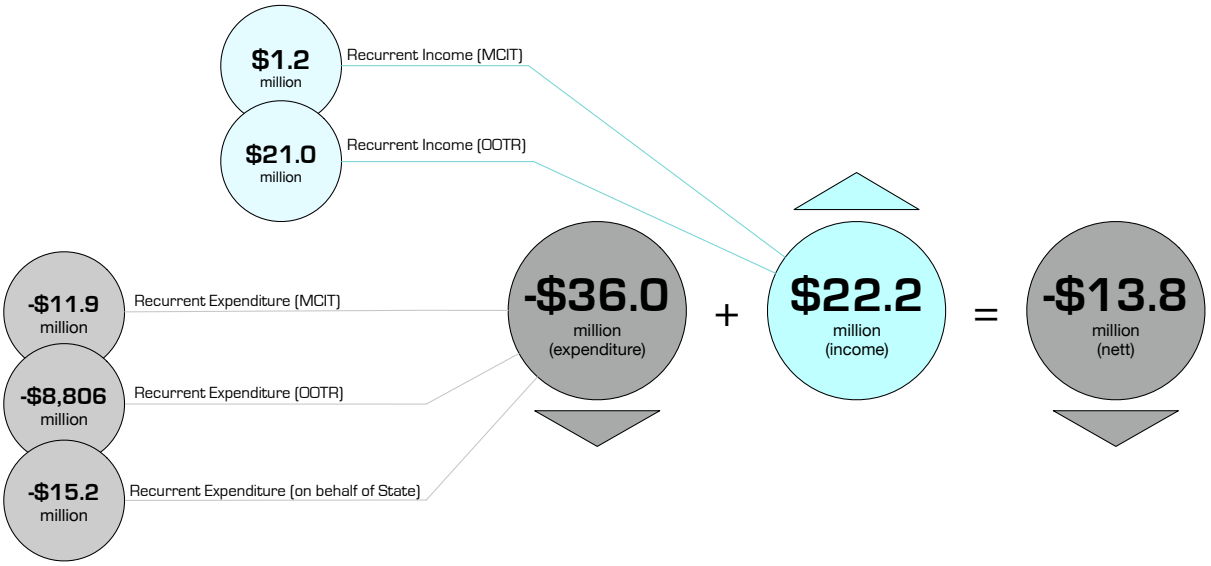

Figure 4: Operational expenditure summary 2017/18 to 2021/22.

The estimates set out below encompass both capital and operational expenditures associated with planning, building and maintaining ICT services to the communications sector. Forecasts are presented on an annual basis. Assumptions made to cost the SP are set out in Annexe E.

Operational Expenditure						
Current approved forward estimates[30]	**Year 1 2017/18**	**Year 2 2018/19**	**Year 3 2019/20**	**Year 4 2020/21**	**Year 5 2021/22**	**Total**
Add…						
Recurrent Income (MCIT)[31]	241,727	241,727	241,727	241,727	241,727	1,208,635
Recurrent Income (OOTR)[32]	4,000,000	4,100,000	4,200,000	4,300,000	4,400,000	21,000,000
Total Recurrent Income	4,241,727	4,341,727	4,441,727	4,541,727	4,641,727	22,208,635
Deduct…						
Recurrent Expenditure (MCIT)	-2,454,107	-2,503,837	-2,454,613	-2,300,000	-2,200,000	-11,912,557
Recurrent Expenditure (OOTR)	-1,691,873	-1,719,631	-1,694,282	-1,800,000	-1,900,000	-8,805,786
Recurrent Expenditure (for State)	-3,301,026	-2,972,511	-2,972,511	-3,000,000	-3,000,000	-15,246,048
Total Recurrent Expenditure	-7,447,006	-7,195,979	-7,121,406	-7,100,000	-7,100,000	-35,964,391
Nett Recurrent Expenditure	**-3,205,279**	**-2,854,252**	**-2,679,679**	**-2,558,273**	**-2,458,273**	**-13,755,756**

Table 6: Operational expenditure as per approved forward estimates[34,30].

[28] Includes operational income and expenditure for OOTR and MCIT only.

[29] All figures are in Samoan Tala (SAT $).

[30] Forward estimates for year's 4 and 5 are not approved and are extrapolations of the approved forward estimates for the purpose of this SP.

[31] Radio advertising on 2AP.

[32] Spectrum leasing and radio licensing fees.

Capital Expenditure						
This SP	**Year 1 2017/18**	**Year 2 2018/19**	**Year 3 2019/20**	**Year 4 2020/21**	**Year 5 2021/22**	**Total**
Goal 1: [access & affordability]	-1,390,000	-1,990,000	-290,000	-295,000	-295,000	-4,260,000
Goal 2: [develop ICT literacies]	-50,000	-3,673,740	-2,513,740	-2,513,740	-2,493,740	-11,244,960
Goal 3: [enhance state governance]	-600,000	-660,000	-750,000	-521,500	-321,500	-2,853,000
Cross-cutting Outcomes	-150,000	-30,000	0	0	0	-180,000
Total Capital Expenditure (this SP)	-2,090,000	-6,353,740	-3,553,740	-3,330,240	-3,110,240	-18,437,960
Deduct charges back to State[33]	799,200	799,200	799,200	799,200	799,200	3,996,000
Nett Capital Expenditure (this SP)	-1,290,800	-5,554,540	-2,754,540	-2,531,040	-2,311,040	-14,441,960

Table 7: Capital expenditure (this SP)[34].

Nett *capital* expenditure under this SP is $14.4m, after adding back $4m to be recovered from other government agencies for use of the SNBH.

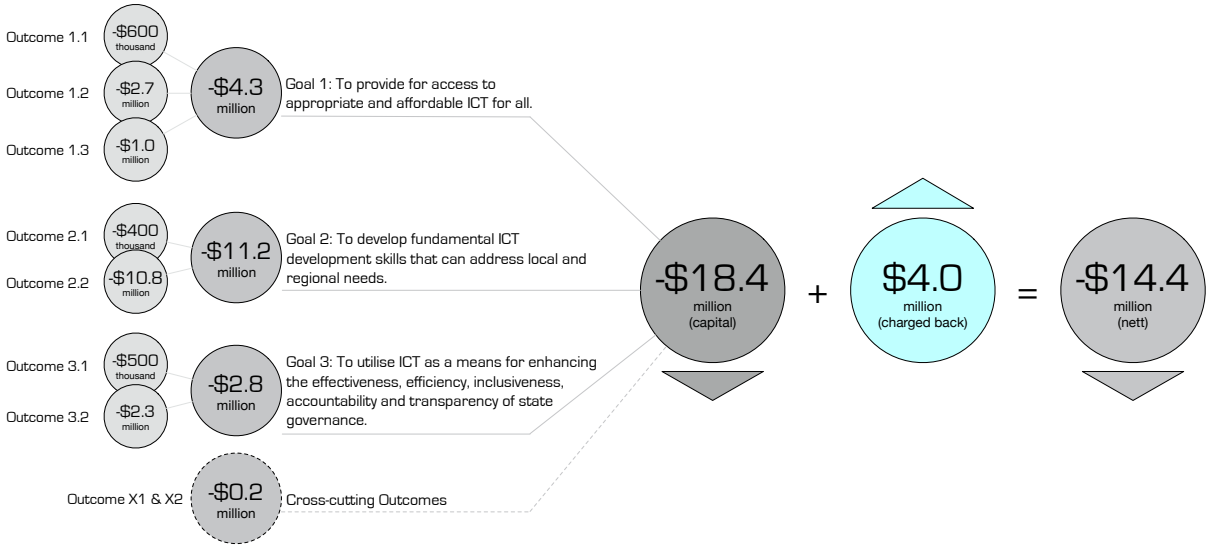

Figure 5: Capital expenditure summary 2017/18 to 2021/22 (under this SP).

Funding Sources

Some of the activities proposed under the SP can be implemented using existing MCIT appropriation but additional funding will be required for other operating and all development expenditures proposed under the SP.

Some items in the SP will need to be funded by "charging back" to other ministries the costs incurred by the MCIT on their behalf. For example, the cost of the provision of Internet access to government primary and secondary schools will need to be funded from a range of funding sources, including the MESC's appropriation, who in turn may decide to pass part of this cost back to schools. A schedule of charges will need to be developed and organisations given adequate notice that the SNBH will be charged for. It should be recognised that the economies of scale afforded by the SNBH will mean lower charges for services than could be obtained by

[33] For use of the SNBH.

[34] All figures in SAT $.

government organisations were they to approach the market and acquire them as a stand-alone customer. The charges made will clearly need to be commercially competitive.

The following funding sources will be used to fund the SP:

National Budget

Operational savings made by switching away from more expensive traditional PC-based computing within the government to more secure, sustainable and cost-effective thin-client computing will provide savings for government-wide computing of about 50%.

Charges Back to Other Ministries

The MCIT will introduce a 'charge back' to all government agencies that access the SNBH for whatever computing services they receive across the network. At present, government agencies use the SNBH for file storage, backup and disaster recovery services, internal email and computer programmes for their organisation (e.g. 'FinanceOne' for the Ministry of Finance). At all times, the total charges a government agency pays should be lower than if they attempted to replicate all the services individually.

Universal Access Fund

Samoa's Universal Access Fund (UAF) is inactive. It has never received contributions by carriers or ISPs, although they have been levied by the OOTR. Carriers and ISPs question the levy and have asked for what purpose the UAF will be used. No recognisable public charter was known to carriers and ISPs although the MCIT said that they have a UAF in operation.

The MCIT will therefore need to develop and publish a UAF charter to explain how the UAF will be operated. Contributions will be made by the OOTR, on behalf of the carriers and ISPs, from existing fees collected. In other words, no additional levy will be applied to carriers and ISPs to contribute into the UAF now. This will mean a slight reduction in the income of the OOTR, but it will also mean the UAF will be available eventually for applications by carriers and ISPs to build infrastructure for all Samoans. The terms and conditions for how applications to the fund will be handled will need to be defined. Awarding funds from the UAF for universal service obligations will need to be managed independently of the OOTR and the MCIT to avoid regulatory or political 'capture' of the UAF.

The re-initialisation, funding and utilisation of the UAF is in line with international good practices for extending the reach of networks to areas that are otherwise unprofitable for a carrier or ISP to serve. The UAF can be used to fund 'fixed line' or wireless infrastructure in areas that are underserved. The UAF can be used to increase quality where connections already exist but are of poor quality. The UAF could even be used to partially fund the digital broadcasting PPP and multiplexing equipment it needs to start the analogue to digital switchover.

Other Funding Sources

- Co-investment vehicles
- ADB/World Bank
- Department of Foreign Affairs and Trade (DFAT) for technical assistance
- Internet Society's IXP toolkit grant

7. How Will We Know When We Have Arrived?

Sector performance will be measured using several key performance indicators (KPIs) - three at the goal level (KPI 1-3) and five at the outcome level KPI (4-8).

Monitoring and Evaluation Framework

Goal-level Indicators

KPI	Description
KPI 1	Amount of wholesale international bandwidth available to Samoa. Baseline: 100GB. Target: 8,000GB or 8TB
KPI 2	Number of government schools with SNBH Internet access and downloading more than 5GB per month on average over a year. *Baseline: 0 /167 government schools. Target: 167 / 167 government schools.*
KPI 3	Number of government organisations connected to the SNBH and putting through more than 5GB of data per month on average over a year. *Baseline: 264 / 264 government organisations. Target: 100% of government of organisations.*

Table 8: Goal-level key performance indicators.

Outcome-level Indicators

KPI	Description
KPI 4	Wholesale access price per megabyte offered to carriers. *Baseline: US$250/MB. Target: US$200/MB.*
KPI 5	Number of households receiving digital TV broadcasts 'over the air'. *Baseline: 0% of households. Target: 50% of households.*
KPI 6	Number of public servants accessing the Internet across the SNBH. *Baseline: 0% of civil servants. Target: 50% of civil servants.*
KPI 7	Post offices deployed with free Wi-Fi, e-waste disposal, and as a one-stop shop for materials published by the MCIT. *Baseline: 0 post offices. Target: 6 post offices.*
KPI 8	Introduction of computer science competencies taught within a degree program at the NUS. *Baseline: no competencies are taught. Target: a series of fundamental computer science competencies are taught.*

Table 9: Outcome-level key performance indicators.

Further Investigation

There are two activities that deserve further investigation as soon as possible:

1. *Modification of the national census and the national household expenditure survey* to include internationally comparable ICT statistics. There is a dearth of ICT data in PICs (Cave, 2012; Minges & Stork, 2015) that are suitable for national and regional ICT planning. In the absence of such data, planning ICT leads to either: (a) providing more ICT than is needed; or (b) less ICT than is needed, resulting in poor quality of service to end users (slow speeds, no access, intermittent access, etc.)

2. The senior management team of the MCIT, along with other ICT unit leaders across government need to be *exposed to virtualisation and thin-client technologies 'in action'*. Implementing these two technologies will be difficult without seeing them in action first. Guided study tours to facilities that utilise virtualisation and thin-client technologies will be helpful in this regard.

Planned Architecture of the SNBH

Improving the degree to which the SNBH is utilised by government will involve several activities and there will be a need for components to be added to the SNBH infrastructure (see below).

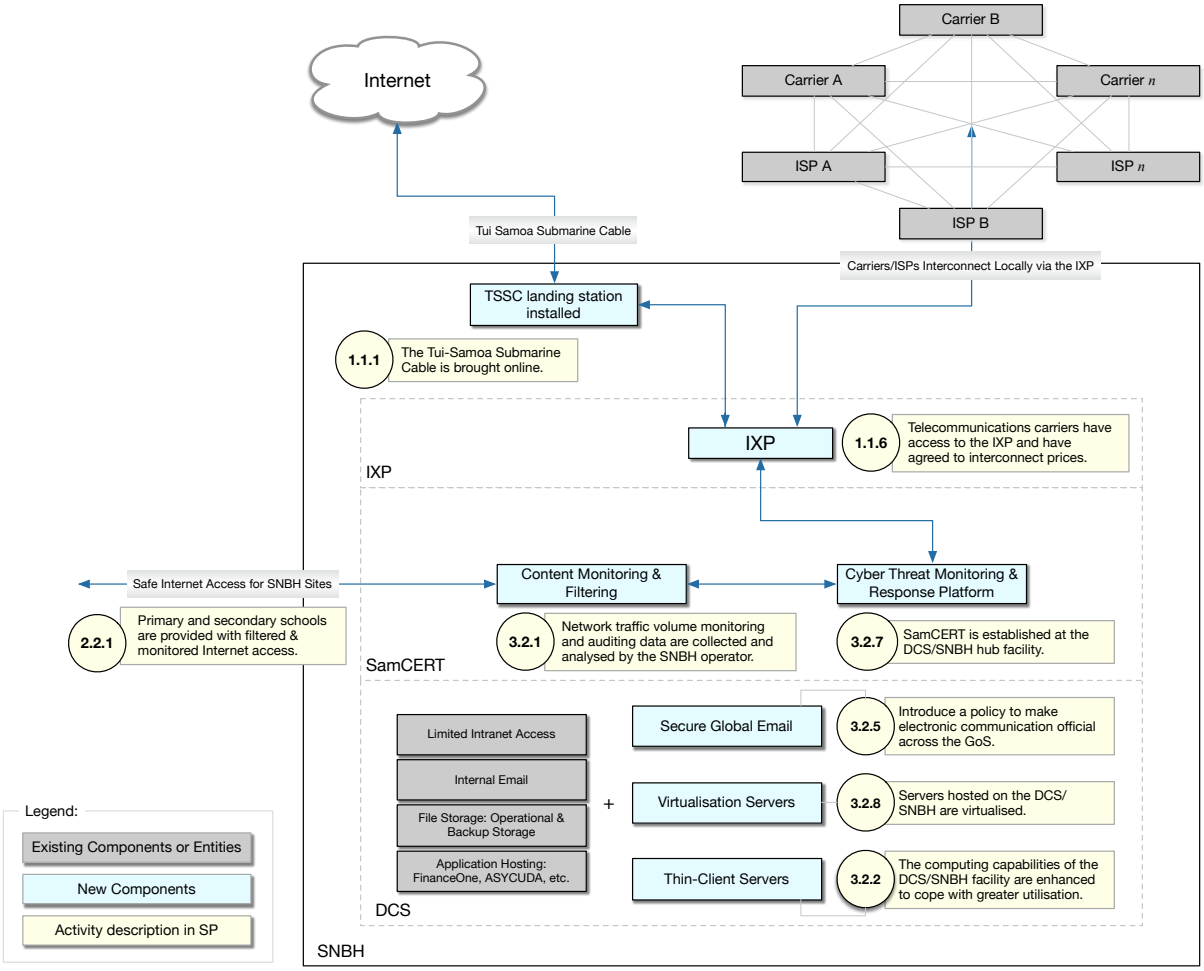

Figure 6: The architecture of the SNBH following implementation of SP activities and the new components installed.

Annexes

Annexe A: Stakeholder Consultations

#	Date, Time	Participants	Location
1	30/03/2017, 09-00-09:30	Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team KVA Consult (KVAC) Maria Petelo, Team Administrator, KVAC Tony Willenberg, Team Leader, Sector Planning Team Samoa Technical Assistance Facility (STAF)	Sheraton Hotel Lobby
2	30/03/2017, 14:00-14:15	Muliufi Nickel (Ufi), Sector Coordinator Ministry of Commerce, Industry and Labour (MCIL) Tony Willenberg, Team Leader, Sector Planning Team, STAF	KVA Consult Offices, 1st Floor
3	30/03/2017, 16:00-16:15	Kolone Vaai, Co-managing Director, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	KVA Consult Offices, 1st Floor
4	31/03/2017, 09:30-11:00	Tua'imáló Asamu Ah Sam, Chief Executive Officer Ministry of Communications and Information Technology (MCIT) Manusamoa Tony Saaga, ACEO, ICT, MICT Talatalaga Matau, ACEO, Policy, MCIT Margaret Godinet, ACEO, Corporate Services, MCIT Letoa Matini Fasino, ACEO, National Radio 2AP, MCIT Susana Stowers, Principal Policy Officer, MCIT Sisavaii Tagata, Senior Policy Officer, MCIT Mariajane Sua, Senior Policy Officer, MCIT Faaifo Faaifo, Senior Policy Officer, MCIT Tony Willenberg, Team Leader, Sector Planning Team, STAF Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Maria Petelo, Team Administrator, Sector Planning Team, KVAC	MCIT, 6th Floor, TATTE Building
5	31/03/2017, 12:00-12:15	Kolone Vaai, Co-managing Director, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	KVA Consult s, 1st Floor
6	31/03/2017, 13:30-14:30	Hon. Afamasaga Lepuiai Rico Tupai, Minister, MCIT Tua'imálóAsamu Ah Sam, CEO, MCIT Tony Willenberg, Team Leader, Sector Planning Team, STAF Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Maria Petelo, Team Administrator, Sector Planning Team, KVAC	Central Government Complex Fiame Mataafa Building, Level 5
7	07/04/2017, 10:00-10:30	Milos Surla, CEO, Digicel Limited Toalepai Waikato F Lefale, Head of Corporate Affairs, Digicel Limited Tony Willenberg, Team Leader, Sector Planning Team, STAF Maria Petelo, Team Administrator, Sector Planning Team, KVAC	Digicel Main Offices, NPF Plaza.
8	07/04/2017, 12:30-13:30	Pulotu Lyndon Chu Ling, CEO, MCIL Muliufi Nickel, ACEO, Trade Commerce and Manufacturing Unit Fiu Jacinta Matulino, ACEO, Industry Development and Investment Promotion Fepuleai Roger Toleafoa, ACEO, Fair Trading and Codex Alimentarius Tony Willenberg, Team Leader, Sector Planning Team, STAF Maria Petelo, Team Administrator, Sector Planning Team, KVAC	Ministry of Commerce Industry and Labour Central Government Complex Fiame Mataafa Building
9	07/04/2017, 14:00-16:30	Muagututi'a Ioana Chan Mow, Associate Professor of Computing, National University of Samoa Tony Willenberg, Team Leader, Sector Planning Team, STAF Maria Petelo, Team Administrator, Sector Planning Team, KVAC Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC	KVA Consult Offices, 1st Floor
10	10/04/2017, 11:00-12:00	Letoa Matini, ACEO, National Radio 2AP and Acting CEO Talatalaga Matau, ACEO, Policy Division Manusamoa Tony Saaga, ACEO, ICT Faaifo Faaifo, Senior Policy Officer, MCIT Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	Ministry of Communications and Information Technology 6th Floor, TATTE Building
11	11/04/2017, 10:00-11:45	Leilani Gulavo, President, IT Association of Samoa Fa'aso'otauloa Sam Saili, CEO, SkyEye (Samoa) Pelenato Pelenato, CEO, BitSolutions Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	KVA Consult Offices, 1st Floor
12	11/04/2017, 12:20-13:30	Ester Manila Silipa, Acting CEO and ACEO Research, Policy and Planning, SQA Mapusua Mose Ah Sani, ACEO Corporate Services Division, SQA Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC	SQA Offices 2nd Floor, TATTE Building

#	Date, Time	Participants	Location
		Tony Willenberg, Team Leader, Sector Planning Team, STAF	
13	11/04/2017, 14:30-15:40	Loau Aloiva'a Su'a, Acting General Manager, Principal Marketing and Retail, Samoa Post Maria Petelo, Team Administrator, Sector Planning Team, KVAC	Samoa Post Offices, Apia.
14	11/04/2017, 16:00-17:15	Verona Parker, CEO, TV3 Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	TV3 Offices.
15	12/04/2017, 10:00-11:00	Lefaoalii Unutoa Auelua-Fonoti, Regulator Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	Office of the Telecommunications Regulator
16	12/04/2017, 11:30-12:30	Hobart Vaai, CEO, Chamber of Commerce Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	Chamber of Commerce Offices
17	12/04/2017, 14:00-15:00	Laeimau Oketevi Tanuvasa, CEO, Computer Services Limited Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	Computer Services Limited Offices
18	13/04/2017, 10:00-11:00	Su'a Steven Leota, CEO, Netvo Limited Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	KVA Consult Offices, 1st Floor
19	13/04/2017, 14:00-15:00	Faauiga Afamasaga Mulitalo, Acting CEO, ACEO Corporate Services, Ministry of Women, Community and Social Development Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	Ministry of Women, Community and Social Development
20	15/04/2017, 10:00-13:00	Muagututi'a Ioana Chan Mow, Assoc. Prof. Computing, National University of Samoa Tony Willenberg, Team Leader, Sector Planning Team, STAF	Sheraton Foyer Lounge
21	18/04/2017, 09:00-10:00	Werner Kappus (ACEO ICT, MESC) Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	Ministry of Education, Sport, and Culture
22	18/04/2017, 11:00-12:00	Alex Abraham (Country Manager, Bluesky Samoa) Dave Main (Sales Director, Bluesky Samoa) Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	Bluesky Limited Offices
23	18/04/2017, 14:00-15:00	Terrence Su'a (Member, Samoa Institute of Accountants) Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	Samoa Institute of Accountants Offices
24	20/04/2017, 11:00-12:00	Tologata Tile Lei'a Tuimalealiifano, General Manager, EPC Edward Ulberg, Manager, Communication and Information Technology Pale Sofia Silipa, Manager, Finance and Commerce Tupai Mau Simanu, Chief Engineer, Quality Assurance and Development Tauiliili Ekiumeni Fauolo, Manager, Power Generation Tuiafelolo John Stanley, Manager, Corporate Governance Asiata Tafu Salevao, Chief Engineer, Distribution and Utilisation Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	EPC Offices
25	24/04/2017, 11:00-12:00	Leiataua Henry Ah Ching, Acting CEO Finance, MOF Joy Pagaialii, Senior OOTRr, Sector Unit, MOF Faavae Mulitalo, OOTRr, Sector Unit, MOF Manusamoa Tony Saaga, ACEO, ICT Letoa Matini Asaua , ACEO, National Radio 2AP and Acting CEO Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	Ministry of Finance
26	24/04/2017, 13:30-14:30	Runamusina Maua, Acting CEO/DG Health, ACEO CIT Suetena Loia, Principal ICT Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	KVA Consult Offices, 1st Floor

#	Date, Time	Participants	Location
27	25/04/2017, 10:00-11:00	Rosa Maulolo, Acting CEO Maria Petelo, Team Administrator, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	SUNGO OOTRs
28	28/04/2017, 09:30-10:30	Manusamoa Tony Saaga, ACEO, ICT, MICT Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	Ministry of Communications and Information Technology 6th Floor, TATTE Building
29	28/04/2017, 14:30-15:30	Emannuel Delanoue, CEO, SSCC Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	SSCC Offices
30	25/05/2017, 10:30-11:30	Lita Lui, Assistant CEO, Aid Coordination Division, MOF Sosefina Talauta-Tualaulelei, National Advisor, Sector Planning Team, KVAC Tony Willenberg, Team Leader, Sector Planning Team, STAF	MOF
31	25/05/2017	Amanda Jewell, Deputy High Commissioner & Counsellor Development, DFAT Clyde Hamilton, First Secretary, DFAT Elisapeta Eteuati Kerslake, Education Human Resources Development, DFAT Fred Brooker, Principal Education Advisor, CEI International Professor Peter Blunt, Facility Team Leader, STAF Tony Willenberg, Team Leader, Sector Planning Team, STAF	Australian High Commission
32	26/05/2017	Sue Langford, High Commissioner, DFAT Clyde Hamilton, First Secretary, DFAT Professor Peter Blunt, Facility Team Leader, STAF Tony Willenberg, Team Leader, Sector Planning Team, STAF	Australian High Commission

Annexe B: Needs/Problem Statements

A downloadable copy of these statements is available in a Microsoft Excel workbook (.xlsx) here. In some cases, a problem or needs statements was recorded and some text was replaced with the word "<redacted>". This was done to preserve the anonymity of stakeholders.

#	Need or Problem Described
1	We want a 'digital economy' or a 'knowledge-based economy'.
2	We think that many of the enabling environment variables are absent in Samoa, for some of the planned initiatives.
3	We see ICT as cross-cutting and we want better cooperation between Ministries.
4	We recognise the need for better teachers to improve the quality of ICT literacies among candidates hired.
5	We don't have sufficient resources.
6	We don't have adequately trained human resources.
7	We don't have access to good and best practices.
8	We proposed that the CSL becomes a SOE.
9	We think that the Samoa National Broadband Highway (SNBH) can be better utilised.
10	We wish to on-sell data centre services to other Pacific Islands to recoup a portion of the capital invested in the submarine cabling projects.
11	We think the education system lacks teachers with core computer science and information technology skills and knowledge. What is taught is applied informatics.
12	We are economically small in the Pacific we're not sufficiently leveraging the synergies available working regionally, rather than "going it alone".
13	We are not leveraging our central geographic location in the Pacific.
14	The cost of wholesale fibre is still expensive.
15	The utilisation of ICTs in society is not high enough.
16	We want to see Samoans exercise their minds.
17	We think telecommunications reform is not fast enough.
18	The dominant player's prices cannot be dropped lower than what the Regulator says.
19	Variable ISP license fee, but people want fixed prices for service. Regulation forces us to take the 'delivery risk'.
20	Interconnect prices need to be re-visited to keep up with the kinds of traffic flows that the market demands.
21	Tariffs on imported ICT products means people are buying the cheaper and less reliable equipment and more often.
22	Internet access is far too expensive and inhibits trade both domestically and internationally. Suppliers are "further" away from markets because of the higher prices.
23	We think the lack of an e-commerce framework means that businesses don't know how to cost-effectively put up online commerce web sites.
24	We think attention to cyber security and to provide a "best practice" security model for businesses engaging in online commerce would help businesses.
25	Disruptions are regular to both power and Internet access.
26	Without a domestic credit bureau, there are no ways to prime the economy with access to even short-term credit.
27	Citizen identity system is important as different customary titles create potentially different identities, contributes to manual credit assessment difficulty.
28	Consolidation of portals for citizen documentation would be cheaper.

#	Need or Problem Described
29	FDI registration is not possible today in Samoa.
30	Online payment providers globally sometimes do not show Western Samoa as a country in the list of recognised countries.
31	Utility interruption and instability causes damage and destruction of business equipment.
32	Absence of an online marketplace for Samoan goods and service.
33	Faster release of goods at the border should be possible because of the ASYCUDA system. Better examination selection practices and publicity.
34	Rural access to ICTs is possible, as smartphones are now almost pervasive in the country, but insufficient local content.
35	More can be done in education of business to consume services in the cloud to reduce the need for local physical infrastructure.
36	There are insufficient digital literacies among university staff.
37	We also need a bottom-up approach so children learn literacies at a younger age.
38	Student access to ICT equipment is often unaffordable.
39	Internet access unaffordable to most students at home inhibits the learning that is possible online and using online resources.
40	We need a sector plan that shows its links to the Samoa Development Strategy.
41	Our planning needs to be more intentional and better communicated to stakeholders.
42	Donors leading the technology agenda causes a skew in what our market then provides. Aid tethered to the supply by foreign companies is not a good idea for sustainability.
43	Why can we not tap into unused capacity on the SNBH?
44	Missing coordination between the MCIT and MESC and NUS.
45	Annual tracer study needed for alumni of the NUS in the marketplace.
46	We need to make known what total cost of ownership (TCO) is to students and the civil service.
47	Range of IT skills of educators even at the NUS is low, how to bring in new teaching staff and retain?
48	Sometimes when they are good they are deployed to teach other subjects.
49	Vulnerable, disabled and special needs groups is part of a national commitment and must be reflected in the Sector Plan.
50	The Sector Plan needs to account for the needs of the Postal Services, Broadcaster, digital TV stakeholders and the NGO association of Samoa, EPC.
51	The affordability of the digital multiplexer for government to switchover to digital TV is a problem. We can't lower our broadcast costs without it.
52	Digital radio initiative is important for cost reduction and recurrent funding, but how do we switch people across?
53	The rotating board of the SSCC may make strategy implementation difficult as it is time-bound, not output-bound.
54	Cost of Internet access is volume-based and is a disincentive to use.
55	Government departments don't provide access to government data sets.
56	Government information sharing standards don't exist.
57	International scholarships, with bonding if needed, to prevent scholars going elsewhere if they show promise in CS/IT.
58	Costs to operate cloud- or hybrid-cloud solutions are too high, so you must do it the old way.
59	Cannot develop based on "open source" because of bandwidth costs to download source code.
60	Cannot remotely work easily and getting left behind. Limits cross-border virtual teams that could help us learn faster.

#	Need or Problem Described
61	Teleworking is impossible so cannot even go after remote jobs online through Freelancer or other marketplaces.
62	Reliability of ISPs interrupts their business and so they have three ISP contracts to provide their business with adequate coverage.
63	The good ICT projects are in government and they don't necessarily have the skills to deliver or the incentive to deliver.
64	The MCIT is not involved in the procurement process or the evaluation process of ICT project to the degree that they could be.
65	SDS has not prioritised computing literacies and so there is no drive for the SQA to check the market about the impact of the absence of this skill set.
66	There is no database on qualifications, who attains them and what happens to them socio-economically once they have attained them.
67	University program accreditation usually slips a little between what curricula is accredited for and what is delivered.
68	Girls do no participate in STEM and ICT at the same rate as boys.
69	The lack of use of electronic communications in the education system drastically affects demand for SNBH connectivity.
70	Few resources available to stimulate the system.
71	All 6 branches of Samoa Post are in enviable positions in towns, but need new ideas for renewal.
72	Digital broadcasting multiplexer cannot be afforded by the private sector.
73	Without an assessment of total cost, government may think that they are doing it cheaper and with better quality, but it may not be the case.
74	Media is not as effective and critical of government if the media units are inside government.
75	Transmission costs could go from 80k to 20k, if the switch to digital is possible.
76	Sometimes government goes as far as undermining the development and retention of staff in the private sector, perhaps without knowing they are doing so.
77	Equipment of the broadcasters are possibly 11 or more years old and desperately needs upgrading.
78	Local ownership of the digital multiplexing system is desirable, but the same thing need to happen with it as what happened to the Tui Samoa Submarine Cable.
79	Security over information is the reasons they will not connect to the SNBH.
80	Lack of resources for the Regulator's office.
81	Absence of policy by the MCIT leads to an absence of guidance for developing regulations.
82	In the absence of policy, we write it ourselves, but that is a conflict of interest.
83	We would like an independent budget, now we direct all fees into the budget.
84	The Telecommunications Act needs to be changed to redesign interconnect fees schedule.
85	The Telecommunications Regulations need to reflect fixed pricing for customers in the ISP license structure.
86	Redefinition of the dominant player is needed.
87	Current assessments by the regulator need to be transparent. Who is involved? What is being assessed? Is the sector aware of the assessment timeline?
88	We are waiting on data from <redacted>. What data? What <redacted>? For what purpose? How will the data be used?
89	It is difficult to keep up with technology changes.
90	It would be helpful if there was a implementation toolkit for connectivity to the SNBH.
91	Inputs to the plan need to be agreed with all stakeholders to the plan.

#	Need or Problem Described
92	We need funds for development of capacity to stay up-to-date with technology changes.
93	Strengthen ability to make use of the new Tui-Samoa cable by expanding and upgrading infrastructure.
94	Improved accessibility and affordability of ICT devices through a reduction or removal of tariffs, incentives and/or subsidies.
95	Local payment gateways established for Samoa.
96	Investment in an innovation framework for more advanced technologies.
97	Education and human resource development needs to improve in Samoa.
98	Government could meet regularly with the <redacted> which acts as a unified voice of the <redacted> sector.
99	Better understanding of the different jobs possible in the ICT sector made aware through the secondary, tertiary and vocational schools.
100	Nation-wide education and awareness raising program about Internet services and ICTs in general.
101	Contest or fund to incentivise students to engage in ICT activities.
102	Government funding PCs not thin-client, and we have the expertise to offer this to them to save money.
103	SNBH should be made available to the private sector as it is currently underutilised.
104	Government staff are not sufficiently skilled because they don't interface with vendors in the same way we do.
105	Government has insufficient experience in change management.
106	In government, ICT pays better than lawyers in the private sector.
107	Content caching will save the country a lot of money to avoid international transit interconnect fees.
108	<redacted> are unclear on how their payment is structured?
109	Aid is tied to foreign supplies and suppliers which we are then asked to support. This is difficult and in some cases untenable.
110	Government needs to report timelines and deadlines to the public.
111	Private sector environment is not nurturing for graduates.
112	There is no arbitration function or ombudsman in the telecommunications sector. The AG acts as the arbitrator.
113	Foreign aid tethered to international products and services does nothing to promote the local economy and creates sustainability problems.
114	Communication between the Ministry and the citizen and private sector needs to improve. We could benefit from more face-to-face meetings.
115	Execution speed needs to improve and maybe they are working hard but without timelines and clear actions we don't know what they are doing.
116	Commitment to timelines must improve.
117	Policy or strategy not sufficiently socialised.
118	MCIT's involvement in procurement should be more prominent.
119	Small players are not given a chance to compete.
120	Government could do more to foster innovation locally.
121	Government could help establish partnerships between foreign companies and local companies.
122	Small players could be blocked out by wholesale access to the cable that is too high a price.
123	We don't have a say in the operation of the Samoa Submarine Cable Company behaviour.
124	We need a way to connect in with remote communities.

#	Need or Problem Described
125	Internet access is expensive.
126	Our ministry is not treated equally with ICT resources.
127	The IT department needs <redacted>, to get resources.
128	Our ICT needs are mainly so we can administer our ministry more effectively.
129	Telecentres are run by women and are very expensive to run.
130	Our <redacted> system is expensive and costs about <redacted> to operate. Funding runs out next year.
131	We would consider an open-source alternative but we don't know of one.
132	We have a lack of teachers in our education system to begin with.
133	The teachers we do have require skills upgrading when it comes to their use of ICTs.
134	Insufficient teaching and learning resource relevant to the local context.
135	We can't afford PCs, but we can afford tablets and smartphones.
136	There is a reluctance to recognise tablets as adequate computing devices.
137	We need to upgrade our teaching pedagogy for learning in a computer-blended environment.
138	It starts with the school principal. If a principal is not computer literate they don't want to be exposed.
139	We need a mechanism to get people up to a basic level of ICT competency, such as using the International Computer Driver's License.
140	Principals don't use email. Why not?
141	1/2 primary schools are connected to the SNBH.
142	2/78 were switched on and connecting in a recent audit by the MESC.
143	1/4 of sites had no signal.
144	There is little incentive to switch on the SNBH because there are no applications to run across it.
145	Bus trips are desirable and so the incentive to send and receive by email is low.
146	SchoolNet is not connected to the SNBH and is an outdated modality for access to applications perhaps only for the poorest of students.
147	When there is equipment, there is no Wi-Fi as access. This is controlled from the principal's OOTR and this then relates back to the ICT literacy of the principal.
148	Teachers have phones and don't know how to tether their laptop to their phone.
149	The SNBH was planned back in 2008. Government is slow to execute.
150	Students and teachers are choosing cheaper items because there is no access to the more expensive items. Cheaper access devices, higher TCO.
151	We could reuse old PCs as thin-clients but we spend our money on new PCs - this is not sustainable.
152	Computer studies are separated into a dedicated class, rather than integrated into the curriculum of each subject.
153	The "playing field" is not level. You guys are rich, you can afford it.
154	We need subsidies taken out of the market.
155	We need a <redacted> subscribers to breakeven when a BTS costs <redacted> to put up.
156	Skill set in the regulator's office needs improve.
157	Complaints by the regulator are often not within the remit of the regulator to make.
158	Regulator charges point-to-multipoint, even though they have already licensed the spectrum. So, carriers need to make network architectural decisions to offset the regulation.

#	Need or Problem Described
159	We would like to move the office's workflows to electronic software.
160	Internet access is very high.
161	Cost of proprietary software is very high, and we would like to look at "open source" alternatives.
162	We don't know, what we don't know.
163	Agents for Xero already here. They are new and they are making progress educating the market and attracting customers.
164	People don't realise that they are already outsourcing when they use certain services, like Gmail.
165	Government could play a leading role in helping to develop and socialise materials on ICT.
166	Government could play a leading role in helping businesses to understand digital strategy.
167	The EPC is trying to run cost-saving equipment across the Internet but fees are exorbitant: prepaid electricity and remote metering and monitoring.
168	Unclear on the mandate of the MCIT.
169	Unclear on the effectiveness of the <redacted>. Are they equipped to be a <redacted>?
170	Unclear why we need a regulator to generate income for government, we feel it is at the cost of the market functioning well.
171	Fibre-optic "last miles", with wireless backhaul is a network architectural oversight that is extremely costly to fix or compensate for?
172	A local cache might be a good idea to keep "local traffic local" and avoid wasteful routing.
173	It would help if customer awareness of "smart" systems was raised as it will help the country overall.
174	An assessment of TCO of technology is made by the submitting ministry, the MCIT has no guidance on how to calculate this.
175	ICT expenditure has exploded as individual ICT divisions have emerged in each Ministry.
176	No standard operating environment definition to help define purchases of ICT we should be making.
177	We still cannot do video conferencing, vital for <redacted> services.
178	There are issues only at certain times of the day, e.g. 12 noon to 14:00.
179	There is no definition of minimum ICT service standards to be expected.
180	Internet access is expensive.
181	Devices are unaffordable.
182	Cyber security is a problem for us.
183	Certification authority needed for Samoa and awareness raised as to why we need to use digital certification.
184	Cable laid to help reduce the prices of Internet bandwidth. We are duplicating resources when we should be saving this unnecessary expense.
185	Role clarity between regulator and the MCIT is needed.
186	We think we need a chief information security officer role in the <redacted>.
187	Knowledge sharing policy needed to ensure staff share what's learned upon return from a study tour.
188	<redacted> ISP's to use the local SNBH cache instead of resorting to international routes.
189	Local aggregate demand needs to improve. There is only so much population growth.
190	SNBH is heavily under-utilised and should be connected to the Internet via competitive tendering process.
191	Level of requests for data on the cable is very low <redacted>.
192	Regulator disagrees with volume discounts, but agrees with single price for access to the cable.

#	Need or Problem Described
193	Regional applications are still lacking which will impact cable utilisation. US content is still more desirable and that is where all traffic is destined for.
194	Volume will go up without a data centre, prices will drop without a data centre.
195	Regulator need not be a profit centre any more.
196	Incentives for the regulator need to be market performance-based.
197	Rotation of the chair of the board of directors is likely to result in a lack of accountability. Two main phases of this PPP: build and operate. Rotation should not be time-based.
198	<redacted> could do more to be measured for performance of the end systems. Are they on? Are they putting through traffic?

Annexe C: Work Plan Activities

ID	Activities	CP	FY 2017/18				FY 2018/19				FY 2019/20				FY 2020/21				FY 2021/22			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	**Goal 1: To provide for access to appropriate and affordable ICT for all.**																					
1.1	**Outcome 1.1: The cost and quality of Internet access is significantly improved through greater provision, more cost-effective routing, and increased market innovation.**																					
1.1.1	The Tui-Samoa Submarine Cable is brought online.	yes																				
1.1.2	Baseline survey of the cost and quality of Internet access is undertaken in the marketplace.																					
1.1.3	Pricing for wholesale access to the TSSC is determined by the SSCC, approved by the OOTR, published, and carriers adopt.	yes																				
1.1.4	Introduce free Wi-Fi for tourists at the international airport, major ports and Samoa Post branches.																					
1.1.5	Baseline performance of the network internet exchange point (IXP) is established.																					
1.1.6	Telecommunications carriers have access to the IXP and have agreed to interconnect prices.	yes																				
1.2	**Outcome 1.2: Samoa operates a national digital TV and radio broadcast network, also capable of disseminating emergency information broadcasts in the case of disasters.**																					
1.2.1	Set benchmark terrestrial TV (& Radio) coverage: e.g. 97% of Samoa's population.																					
1.2.2	Hold a broadcasting "round table" to assess needs of the digital broadcasting industry players.																					
1.2.3	Draft legislative and regulatory instruments to provide basis for analogue to digital switchover.	yes																				
1.2.4	Setup a PPP, select a digital broadcasting equipment provider, and acquire the digital multiplexing equipment.	yes																				
1.2.5	Determine signalling protocol (based on ITU region, equipment availability and price).																					
1.2.6	Regulator defines the licensing model for digital broadcasters, including provision for emergency services provision.																					
1.2.7	Analogue broadcasters arrange budget allocations and government determines gaps for possible support.																					
1.2.8	Design & disseminate educational materials for citizens to understand the analogue to digital switchover.																					
1.2.9	Identify suppliers of set top box equipment and ensure supply contracts are signed.																					
1.2.10	Publish the national analogue to digital switchover plan.																					
1.2.11	Start the digital switchover period and support start-up of all digital broadcasters and suppliers of digital access equipment.																					
1.2.12	Simulcast period in which both digital and analogue broadcasts occur.																					
1.2.13	Analogue TV switch off.																					
1.2.14	Manage coverage issues with a central complaints number.																					
1.3	**Outcome 1.3: Telecommunications regulations and legislation are consistent with one another and benchmarked (updated against international practices) in support of digital convergence.**																					
1.3.1	Review of the telecommunications Act, Amendments, and Regulations is conducted and recommendations made for making them consistent with one another or for a unified Digital Convergence Act.	yes																				

ID	Activities	CP	FY 2017/18				FY 2018/19				FY 2019/20				FY 2020/21				FY 2021/22			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1.3.2	Industry regulatory benchmarking of prices undertaken and then repeated annually, with the results published according to publically announced timetable.																					
1.3.3	Legislation drafted to provide recognition of electronic identity and recognise digital signatures under Samoan law.	yes																				
1.3.4	A performance measurement program is in use in the regulatory environment that prioritises: responsiveness, appropriateness, market performance, and quality of services to citizens.	yes																				
1.3.5	Establish a digital certificate authority (or relationship with an authority) and certificate authorisation service providers.																					
1.3.6	Samoa appears in the 'drop-down list' of countries in the most common payment gateways/processors to enable citizens to transact online.																					
2	**Goal 2: To develop fundamental ICT development skills that can address local and regional needs.**																					
2.1	**Outcome 2.1: Useful international linkages are made between sources of industry-based ICT information and Samoa.**																					
2.1.1	MCIT reviews its strategy to identify ICT product and service providers and to establish linkages to those firms.																					
2.1.2	A regular "showcase" of technologies is viewable to Samoans to raise awareness of what is happening elsewhere in the world in ICTs and to foster innovative thinking among stakeholders.																					
2.1.3	Publish a handbook on cyber security for users, businesses and government.																					
2.1.4	Post OOTRs are re-deployed as ICT centres and fitted with telecentres and free Wi-Fi, providing space for MCIT to broadcast information.	yes																				
2.1.5	Quarterly "think tank" meetings conducted with SCoC and small businesses that cannot afford to join the chamber.																					
2.2	**Outcome 2.2: Teachers, students & graduates possess upgraded ICT literacies & competencies.**																					
2.2.1	Primary and secondary schools are provided with filtered & monitored Internet access.																					
2.2.2	The national education survey is modified to include survey questions on student, teacher and principal ICT literacies.																					
2.2.3	The national teacher curriculum is revised to include ICT literacies, particularly content production, class management and 'blended teaching' approaches (that combine e-learning with traditional methods).	yes																				
2.2.4	The national student curriculum is revised to incorporate an acquired and localised ICT syllabus corresponding to the skills inventory taken, and is implemented for secondary school grades.	yes																				
2.2.5	NUS will be responsible for introducing an annual alumnus tracking survey.	yes																				
3	**Goal 3: To utilise ICT as a means for enhancing the effectiveness, efficiency, inclusiveness, accountability and transparency of state governance.**																					
3.1	**Outcome 3.1: The MCIT plans ICT programs according to a structured and comprehensive framework for ICT interventions, including financing, monitoring and evaluation.**																					
3.1.1	A communications plan is developed and institutionalised in the MCIT.	yes																				
3.1.2	MCIT establishes a blog that explains what it is doing in relation to ICT.																					
3.1.3	Broadcast email lists are setup and used within the MCIT, the OOTR and Samoa Post for communications with stakeholders.																					
3.1.4	Change management training for senior management team of the MCIT.																					
3.1.5	Project management training for senior management team of the MCIT.																					

ID	Activities	CP	FY 2017/18				FY 2018/19				FY 2019/20				FY 2020/21				FY 2021/22			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
3.1.6	Training in service level agreement structure and writing for senior management of the MCIT.																					
3.1.7	Contracts are reviewed and revised to include a component of performance-based payment for the realisation of user benefits, and the public is informed.	yes																				
3.1.8	ICT procurement guidelines are revised.	yes																				
3.1.9	All donors are made aware of new procurement guidelines to be adopted by the GoS for ICT.	yes																				
3.1.10	The sector (MCIT, OOTR and Samoa Post) maintains and monitors and reports on SP progress.																					
3.2	**Outcome 3.2 The SNBH is prepared for greater utilisation by government organisations.**																					
3.2.1	Network traffic volume monitoring and auditing data are collected and analysed by the SNBH operator.	yes																				
3.2.2	The computing capabilities of the DCS/SNBH facility are enhanced to cope with greater utilisation.	yes																				
3.2.3	A TWG is established by the MCIT from ICT units across government and the TWG meets regularly.	yes																				
3.2.4	Guidelines are written for ICT administration for use in the public sector, including use of "standard operating environments" and an explanation of TCO, and adopted.																					
3.2.5	Introduce a policy to make electronic communication official across the GoS.																					
3.2.6	Conduct a baseline network security audit of the SNBH hub and publish results.																					
3.2.7	SamCERT is established at the DCS/SNBH hub facility.	yes																				
3.2.8	Servers hosted on the DCS/SNBH are virtualised.	yes																				
3.2.9	Desktop computers are replaced by thin-client computers.	yes																				
3.2.10	System administrators are identified, trained and certified in the new technologies: server virtualisation and thin-client administration.																					
3.2.11	Consolidation of servers among the smallest government agencies takes place.																					
X	**Cross-cutting Outcomes**																					
X1	**Girls and boys are encouraged to enter the ICT field by the time they graduate from high-school.**																					
X1.1	The current school "ICT Day" programme (presently run by the OOTR) is expanded to include new ICT jobs and is given support by the MCIT, targeting girls in year 10, and again in year 12.																					
X2	**The Government of Samoa, civil society and the private sector handles its e-waste in an environmentally responsible way over the whole ICT lifecycle.**																					
X2.1	Publish a handbook or user's guide on e-waste management including comparisons of power consumption for different kinds of computing, materials inside computing devices, and how to dispose of e-waste responsibly.	yes																				
X2.2	Publish a handbook on alternative computing models including comparisons of environmental impacts.																					
X2.3	E-waste collection points are established in Samoa Post OOTRs for toner cartridges.																					

Annexe D: Definition of Terms

Byte

A measure of an amount of digital data and corresponds to 8 bits or binary 1's and 0's. When measuring the capacity of network links, i.e. how much data a link send through at one time between its two endpoints, multiples of a byte are used to represent that capacity. A kilobyte is 10^3 bytes or 1,000 bytes. A megabyte is 10^6 bytes or a million bytes. A gigabyte is 10^9 bytes. A terabyte is 10^{12} bytes.

Crowdfunding

"Is the practice of funding a project or venture by raising monetary contributions from many people. Crowdfunding is a form of crowdsourcing and of alternative finance. In 2015, it was estimated that worldwide over US$34 billion was raised this way. Although the concept can also be executed through mail-order subscriptions, benefit events, and other methods, it is now often performed via Internet-mediated registries. This modern crowdfunding model is generally based on three types of actors: the project initiator who proposes the idea and/or project to be funded, individuals or groups who support the idea, and a moderating organization (the "platform") that brings the parties together to launch the idea. Crowdfunding has been used to fund a wide range for-profit entrepreneurial ventures such as artistic and creative projects, medical expenses, travel, or community-oriented social entrepreneurship projects."[35]

Crowdsourcing

"Is a specific sourcing arrangement in which individuals or organizations use contributions from Internet users to obtain needed services or ideas. Crowdsourcing was coined in 2005 as a portmanteau of "crowd" and "outsourcing". This mode of sourcing, which is to divide work between participants to achieve a cumulative result, was already successful prior to the digital age (i.e., "offline"). Crowdsourcing is distinguished from outsourcing in that the work can come from an undefined public (instead of being commissioned from a specific, named group) and in that crowdsourcing, includes a mix of bottom-up and top-down processes. Advantages of using crowdsourcing may include improved costs, speed, quality, flexibility, scalability, or diversity. Crowdsourcing in the form of idea competitions or innovation contests provides a way for organizations to learn beyond what their "base of minds" of employees provides (e.g., LEGO Ideas). Crowdsourcing can also involve rather tedious "micro tasks" that are performed in parallel by large, paid crowds (e.g., Amazon Mechanical Turk). Crowdsourcing has also been used for non-commercial work and to develop common goods (e.g., Wikipedia). Arguably the best-known example of crowdsourcing as of 2015 is crowdfunding, the collection of funds from the crowd (e.g., Kickstarter)."[36]

Digital Convergence

Refers to a trend where an increasing number of forms of information are digitised and transported on the global Internet.

[35] Online source: https://en.wikipedia.org/wiki/Crowdfunding, accessed: May 21 2017.

[36] Online source: https://en.wikipedia.org/wiki/Crowdsourcing, accessed: May 21 2017.

Herfindahl-Hirschman Index (HHI)

The HHI is a measure of concentration of market dominance. "It is calculated by squaring the market share [as a whole number, not a percentage] of each firm competing in a market, and then summing the resulting numbers, and can range from close to zero to 10,000. The U.S. Department of Justice uses the HHI for evaluating potential mergers issues."[37] In a monopoly market, the HHI will be 10,000 corresponding to a single firm with 100% of the market share. The lower the HHI the more competitive the market is considered.

The HHI is calculated according to the formula below, where *x* is the market share as a number (not a percentage), and *i* ranges from 1 to *n* market participants.

$$HHI = \sum_{i=1}^{n} {x_i}^2$$

Internet Exchange Points (IXP)

IXPs help Internet data reach recipients in the same country without using international transit links. It helps keep local Internet traffic, local. An IXP is used in the cases there are multiple network carriers in a country and is usually regulated by interconnect tariffs which specify the costs borne by each carrier to setup and maintain an IXP.

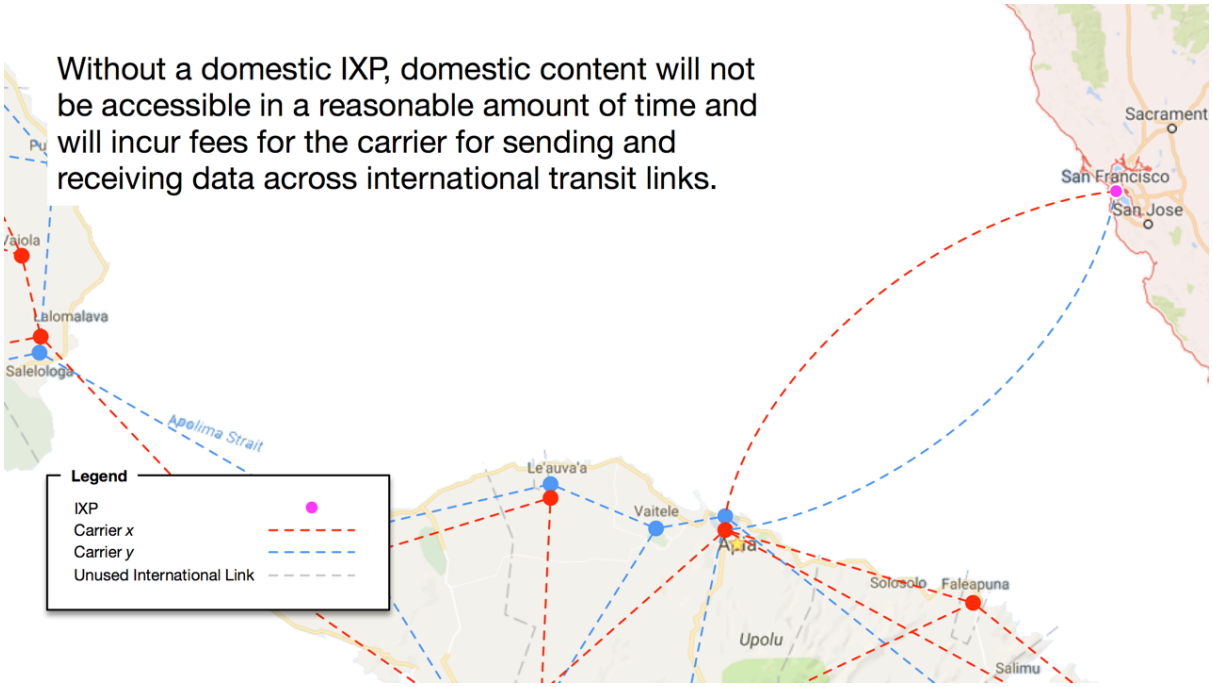

Figure 7: Absence of a domestic IXP.

[37] Online source: www.investopedia.com/terms/h/hhi.asp, accessed: May 20 2017.

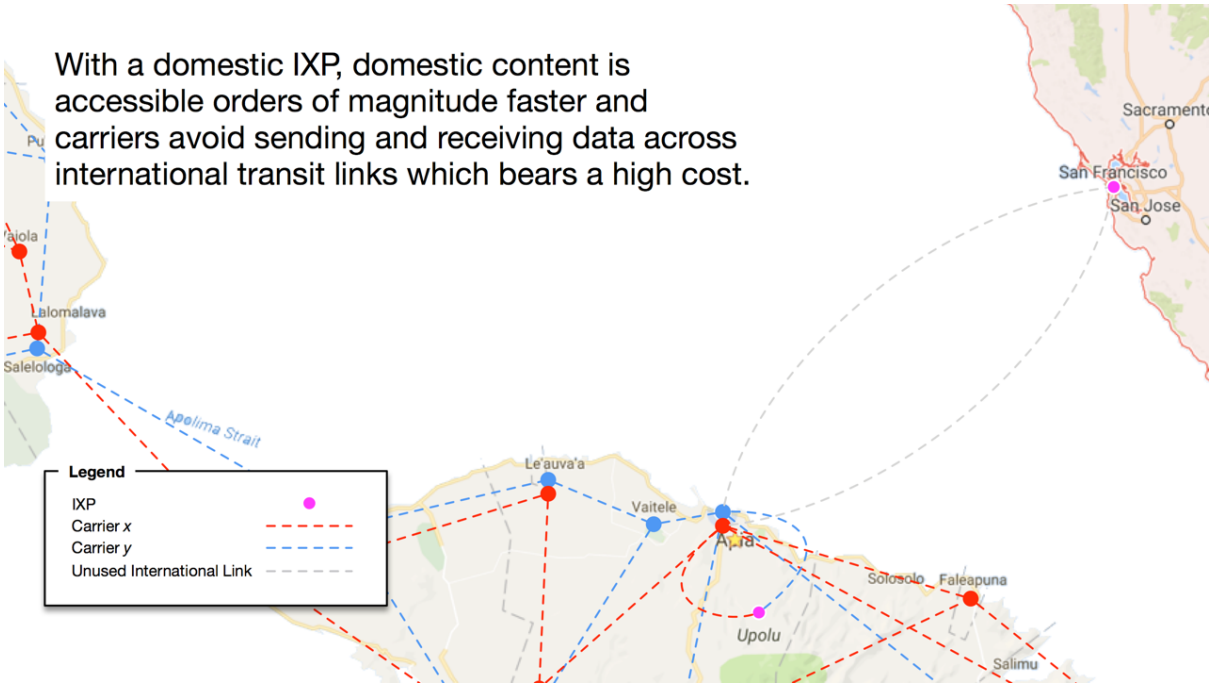

Figure 8: With a domestic IXP.

Internet of Things (IoT)

A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things. The IoT consists of device manufacturers, network operators, application platforms, software developers, and cloud-based data analysis services working together to deliver more helpful services to end users. Devices connect and communicate with each other using Bluetooth, Wi-Fi, mobile phone networks, proprietary radio networks and the global Internet. Current investment in IoT is largely in developing "smart" cities, "smart metering and electricity and water grids, connected vehicles and healthcare (p.70, Bedi et al., 2016).

Moore's Law

"Moore's law refers to an observation made by Intel co-founder Gordon Moore in 1965. He noticed that the number of transistors per square inch on integrated circuits had doubled every year since their invention. Moore's law predicts that this trend will continue into the foreseeable future. Although the pace has slowed, the number of transistors per square inch has since doubled approximately every 18 months. This is used as the current definition of Moore's law."[38]

Network Effect

"In economics and business, a network effect (also called network externality or demand-side economies of scale) is the effect that one user of a good or service has on the value of that product to other people. When a network effect is present, the value of a product or service is dependent on the number of others using it. The classic example is the telephone. The more people who own telephones, the more valuable the telephone is to each owner. This creates a positive externality because a user may purchase a telephone without intending to create value for other users, but does so in any case. Online social networks work in the same way, with sites like Twitter and Facebook becoming more attractive as more users join. The expression

[38] Online source: http://www.investopedia.com/terms/m/mooreslaw.asp, accessed: May 21 2017.

"network effect" is applied most commonly to positive network externalities as in the case of the telephone. Negative network externalities can also occur, where more users make a product less valuable, but are more commonly referred to as "congestion" (as in traffic congestion or network congestion). Over time, positive network effects can create a bandwagon effect as the network becomes more valuable and more people join, in a positive feedback loop."[39]

Persistent Computing

Persistent computing is a form of computing where software and an operating system are loaded completely into memory of a computer from flash media which the user inserts into the computer at the start of a computing session. Flash media being any form of persistent storage. The operating system and applications' state is loaded onto the computer, and then the user interacts with the computer's operating system and its applications. When the user has finished computing the operating system and application "state" is recorded back on the flash memory and then ejected from the computer. Like how zero-client computing works, persistent computing instead uses flash memory (usually carried by the end user) in place of a remote server, from which to obtain its "image" for use by the end user.

Purchasing Power Parity (PPP)

Purchasing power parity is measured by finding the values (in USD) of a basket of consumer goods that are present in each country (such as orange juice, pencils, etc.). If that basket costs $100 in the US and $200 in the Samoa, then the purchasing power parity exchange rate is 1:2. For example, suppose that the US has a higher GDP per capita ($18) than Samoa ($16). That means that Americans on average produce $2 more than Samoans. However, they are not necessarily richer. Suppose that one litre of orange juice costs $6 in US and only $2 in Samoa; then $6 in the US exchanges to only $2 worth of Samoan goods, since the Americans can only buy 3 litres (GDP of $18 / $6 = 3 litres) while the Samoans can buy 8 litres (GDP of $16 / $2 = 8 litres). Therefore, in terms of orange juice, the Samoans are richer, because they can buy more orange juice.[40]

Teledensity

Teledensity is the ratio between the number of citizens and the number of registered communications connections in the country. Samoa's teledensity has improved from 6% in 2002 to over 95% in 2014 and this is represented below.

[39] Online source: https://en.wikipedia.org/wiki/Network_effect, accessed: May 21 2017.

[40] Online source: https://simple.wikipedia.org/wiki/Purchasing_Power_Parity, accessed: May 16 2017.

Figure 9: Samoa's teledensity has gone from 6% in 2002 to over 95% in 2014.

Thin-client Computing

Thin-client computing is a form of computing where the operating system and applications (or "image") normally loaded up on a computer are instead run as a self-contained program on a larger and remote server, alongside other "images" each running for a separate end user, simultaneously. The user hardware just sends keystrokes, mouse clicks and mouse movements to the server, and the server responds, directing those events internally to the "image" running on its hardware. The "image" is manipulated in memory, and the effect that would normally be displayed on a user's own computer (if the "image was running on a dedicated PC) is instead sent to the remote hardware (the thin-client) for display. This requires less computing power on the end user's hardware, as the server does the work of many end users. This also requires a more powerful server as the server is responsible for processing the events (keystrokes, mouse clicks, mouse movements) from multiple thin-clients at the same time. The server effectively operates like a mainframe computer does with its numerous connected terminals, only that the server is manipulating the graphical display state of many "images" rather than the state of many character-based terminals.

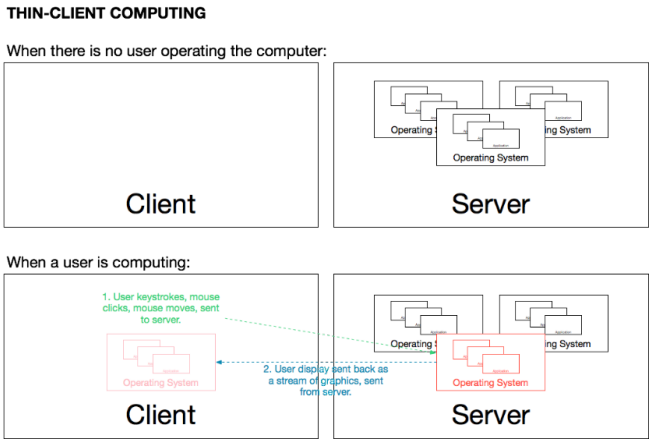

Figure 10: Thin-client computing.

Virtualised Computing

Virtualised computing is a form of computing where software can be run without knowing (or being concerned with) the technical specifications of the underlying physical computer hardware on which it runs. To compute virtually means to run a software application (called a hypervisor) on physical computer hardware, and then installing the operating system and applications (an "image") into the hypervisor. The hypervisor is a software version of a physical computer – a (software) computer within a (hardware) computer. This indirect method for accessing the physical hardware (i.e. the software and the physical hardware interactions are mediated by the hypervisor) enables the "image" installed on the hypervisor to be moved from one piece of hardware to another. Regardless of the physical computer hardware, if it runs the same hypervisor, the "image" can be moved to it and operated on it.

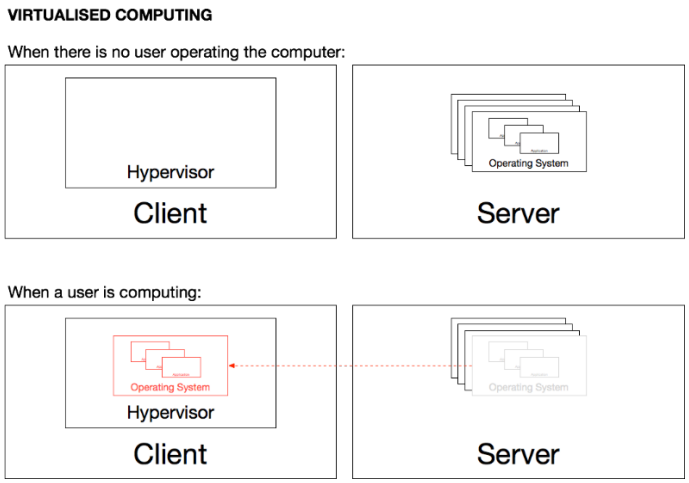

Figure 11: Virtualised computing.

Zero-client Computing

Zero-client computing is form of computing where the operating system and applications (together called an "image") for a piece of hardware, are not installed on the hardware. When a user first interacts with the hardware (the client), the client is configured to fetch an "image" from a server which is then transferred back to the client, installed and activated so a user may operate it. When the user has finished computing, the client "image" is saved back to the server and the client hardware erased to an empty state. This method of computing allows for multiple "images" to be stored on the server and the single piece of hardware to be used with multiple "images".

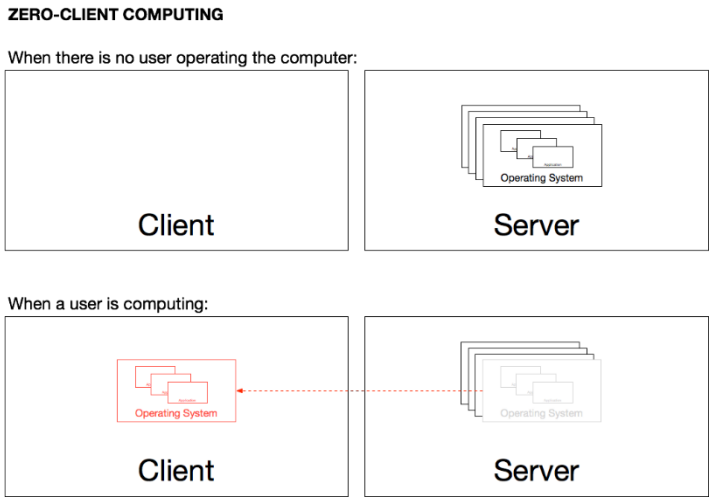

Figure 12: Zero-client computing.

Annexe E: MTEF Assumptions

Activity ID	Activity Description			
1.1.4	Introduce free Wi-Fi for tourists at the international airport, major ports and Samoa Post branches.			
Value	**Data Point**	**Source**	**Basis**	**Calculation**
150,000	Number of tourists per year to Samoa[41]	Estimate, STA	Total	750,000
0.1	GB data downloaded per visitor	Estimate	Annualised	150,000
10	Cost per GB in SAT $	Estimate		
5	Years expenditure incurred over	Estimate		

Activity ID	Activity Description			
1.2.4	Setup a PPP, select a digital broadcasting equipment provider, and acquire the digital multiplexing equipment.			
Value	**Data Point**	**Source**	**Basis**	**Calculation**
2,000,000	Cost of digital broadcast multiplexing equipment in SAT $	Estimate	Total	2,000,000
2	Years expenditure incurred over	Estimate	Annualised	1,000,000

Activity ID	Activity Description			
1.2.8	Design & disseminate educational materials for citizens to understand the analogue to digital switchover.			
Value	**Data Point**	**Source**	**Basis**	**Calculation**
100	Number of 15-second advertising spots on TV	Estimate	Total	700,000
100	Number of 15-second advertising spots on radio 2AP	Estimate	Annualised	140,000
2,000	Cost per advertising spot on radio 2AP in SAT $	Estimate		
5,000	Cost per advertising spot on TV in SAT $	Estimate		
5	Years expenditure incurred over	Estimate		

Activity ID	Activity Description			
2.2.4	Primary and secondary schools are provided with filtered & monitored Internet access.			
Value	**Data Point**	**Source**	**Basis**	**Calculation**
1,080	Number of primary teachers	p.32, MESC 2016	Total	2,473,740
541	Number of secondary teachers	p.55, MESC 2016	Annualised	2,473,740
10%	Overhead for all staff	Estimate		
1,783	Total staff	Calculated		
10,177	Number of Government secondary school students	p.63, MESC 2016		
23	Number of Government secondary schools	p.62, MESC 2016		
144	Number of Government primary schools	p.62, MESC 2016		
5	GB of data provided each month for teachers	Estimate		
2	GB of data provided each month for students	Estimate		
10	Cost per GB of data in SAT $	Digicel, estimate as of May 2017		
1	Years expenditure incurred over	Estimate		

Activity ID	Activity Description			
3.2.7	SamCERT is established at the DCS/SNBH hub facility.			
Value	**Data Point**	**Source**	**Basis**	**Calculation**
3	Number of servers	Estimate	Total	260,000
20,000	Cost of servers in SAT $	Estimate	Annualised	260,000
200,000	Cost of content filtering & monitoring software in SAT $	Estimate		
1	Years expenditure incurred over	Estimate		

[41] Including family reunions.

Activity ID	Activity Description			
3.2.8	Servers hosted on the DCS/SNBH are virtualised.			
Value	**Data Point**	**Source**	**Basis**	**Calculation**
5	Number of servers	Estimate	Total	400,000
20,000	Cost of servers in SAT $	Estimate	Annualised	200,000
300,000	Cost of Virtualisation ecosystem software in SAT $	Estimate		
2	Years expenditure incurred over	Estimate		

Activity ID	Activity Description			
3.2.9	Desktop computers are replaced by thin-client computers.			
Value	**Data Point**	**Source**	**Basis**	**Calculation**
5	Number of servers	Estimate	Total	WST643,000
20,000	Cost of servers in SAT $	Estimate	Annualised	WST321,500
300,000	Cost of thin-client ecosystem software in SAT $	Estimate		
21	Number of staff in the Ministry of Public Enterprises (MPE)	p.23, Strengthening Job Evaluation in the Samoan Public Service, STAF-1		
37	Number of staff in the Ministry of Communications and Information Technology (MCIT)	p.23, Strengthening Job Evaluation in the Samoan Public Service, STAF-1		
57	Number of staff in the Ministry of Prime Minister and Cabinet (MPMC)	p.23, Strengthening Job Evaluation in the Samoan Public Service, STAF-1		
63	Number of staff in the Ministry of Works, Transport and Infrastructure (MWTI)	p.23, Strengthening Job Evaluation in the Samoan Public Service, STAF-1		
65	Number of staff in the Ministry of Foreign Affairs and Trade (MFAT)	p.23, Strengthening Job Evaluation in the Samoan Public Service, STAF-1		
243	Number of thin-client computers	Calculated		
1,000	Cost of thin-client computers in SAT $	Estimate		
2	Years expenditure incurred over	Estimate		

Activity ID	Activity Description			
3.2.10	System administrators are identified, trained and certified in the new technologies: server virtualisation and thin-client administration.			
Value	**Data Point**	**Source**	**Basis**	**Calculation**
40	Number of training courses	Estimate	Total	800,000
20,000	Cost per training course and certification in SAT $	Estimate	Annualised	400,000
2	Years expenditure incurred over	Estimate		

Annexe F: Outcomes and Outputs

ID	Activities	Outputs	Year 1 2017/18	Year 2 2018/19	Year 3 2019/20	Year 4 2020/21	Year 5 2021/22	Total
1	**Goal 1: To provide for access to appropriate and affordable ICT for all.**							
1.1	Outcome 1.1: The cost and quality of Internet access is significantly improved through greater provision, more cost-effective routing, and increased market innovation.	▪ An increase in available International wholesale bandwidth to Samoa; ▪ Carriers contracted to obtain increased bandwidth through the SSCC; ▪ Wholesale access prices are published on the OOTR web site; ▪ Wi-Fi access points are located at the airport and the Apia wharf and are operational; ▪ Baseline throughput of data by government agencies on the SNBH is obtained and published; and ▪ Carriers interconnect via the domestic IXP located in the DCS/SNBH.	$0	$150,000	$150,000	$150,000	$150,000	$600,000
1.2	Outcome 1.2: Samoa operates a national digital TV and radio broadcast network, also capable of disseminating emergency information broadcasts in the case of disasters.	▪ Public announcement made about the % of the Samoan population to be covered by digital (radio and TV) broadcasting; ▪ Summary of concerns and issues raised by broadcasters at the "round table" is documented and made available online; ▪ The Broadcasting Act (2010) and the accompanying regulations are updated for digital broadcasting or merged into a new digital services act; ▪ Digital broadcasting multiplexing equipment is acquired; ▪ Broadcasters are contracted to use the network equipment; ▪ Awareness raising materials for digital TV and radio broadcasting are available in all post offices in Samoa; ▪ TV and radio commercials are run to explain the analogue to digital switch over to the public; ▪ The national digital switchover plan is developed and published online; and ▪ Analogue TV and radio broadcasting is switched off.	$1,140,000	$1,140,000	$140,000	$145,000	$145,000	$2,710,000
1.3	Outcome 1.3: Telecommunications regulations and legislation are consistent with one another and benchmarked (updated against international practices) in support of digital convergence.	▪ Formal recommendations are made for revision of the Telecommunications Act and accompanying Regulations, including reporting of findings from the benchmarking exercise; ▪ Report on the regulatory benchmarking exercise produced and published online: ▪ Legislation exists which recognises industry accepted digital credentials in an equivalent way to other document-based identity protocols: ▪ Monitoring & evaluation framework exists against which performance of the OOTR is gauged; ▪ Digital certificates can be obtained for .ws businesses; and ▪ An annual market study is undertaken and the methodology, timetable and results are published.	$250,000	$700,000	$0	$0	$0	$950,000

ID	Activities	Outputs	Year 1 2017/18	Year 2 2018/19	Year 3 2019/20	Year 4 2020/21	Year 5 2021/22	Total
		Subtotal for Goal 1	**$1,390,000**	**$1,990,000**	**$290,000**	**$295,000**	**$295,000**	**$4,260,000**
2	**Goal 2: To develop fundamental ICT development skills that can address local and regional needs.**							
2.1	Outcome 2.1: Useful international linkages are made between sources of industry-based ICT information and Samoa.	▪ A list of strategic linkages and the relevance of those links to the MCIT is documented; ▪ An annual "showcase" of international technologies event is held; ▪ A cybersecurity handbook is available in printed or online form; and ▪ Post offices offer free time-limited Wi-Fi access in all branches.	$0	$300,000	$40,000	$40,000	$20,000	$400,000
2.2	Outcome 2.2: Teachers, students & graduates possess upgraded ICT literacies & competencies.	▪ The national educational digest publishes a view of ICT utilisation which is more detailed, including statistics on Internet access, access devices, and use by teachers, students and principals; ▪ A revised national education curriculum for teacher pre- and in-service training is implemented which includes competencies in ICT literacy; ▪ A revised national education curriculum for students is implemented which includes competencies in ICT creation; and ▪ An annual alumnus survey is administered to determine job skills held and job skills demanded in the Samoan workforce and published online.	$50,000	$3,373,740	$2,473,740	$2,473,740	$2,473,740	$10,844,960
		Subtotal for Goal 2	**$50,000**	**$3,673,740**	**$2,513,740**	**$2,513,740**	**$2,493,740**	**$11,244,960**
3	**Goal 3: To utilise ICT as a means for enhancing the effectiveness, efficiency, inclusiveness, accountability and transparency of state governance.**							
3.1	Outcome 3.1: The MCIT plans ICT programs according to a structured and comprehensive framework for ICT interventions, including financing, monitoring and evaluation.	▪ A communications plan is written and published online; ▪ An MCIT blog is online and contains entries each month about the work it undertakes under its communications SP; ▪ Senior management team of the ICT are trained and can demonstrate how they manage change effectively; ▪ Senior management team of the ICT are trained and can demonstrate how they manage projects effectively; ▪ Part of the payment made to the company that operates and maintains the SNBH, is performance-based; ▪ The national procurement guidelines are revised to require TCO calculations and plans for disposal of e-waste, prior to approval; and ▪ Donors are officially advised of the new procurement guidelines for ICT procurement.	$500,000	$0	$0	$0	$0	$500,000

ID	Activities	Outputs	Year 1 2017/18	Year 2 2018/19	Year 3 2019/20	Year 4 2020/21	Year 5 2021/22	Total
3.2	Outcome 3.2 The SNBH is prepared for greater utilisation by government organisations.	▪ A network utilisation and throughput report is produced by the network operations service provider monthly and provided to the MCIT; ▪ A systems administration handbook is available; ▪ Policy is issued by the GoS for compulsory government communications via government approved and secure email services; ▪ A basic CERT capability exists on the SNBH; ▪ Virtualised server infrastructure exists and is used by at least five ministries within the GoS; ▪ At least five ministries use thin-client computing technology; and ▪ At least five staff within the SNBH DCS are trained in both virtualised and thin-client network implementation and administration.	$0	$660,000	$750,000	$521,500	$321,500	$2,253,000
		Subtotal for Goal 3	**$500,000**	**$660,000**	**$750,000**	**$521,500**	**$321,500**	**$2,753,000**
X	**Cross-cutting Outcomes**							
X1	Girls have been exposed to the range of ICT jobs possible and are encouraged to enter the ICT field, to an equal extent as boys, by the time they graduate from high-school.	▪						
X2	The Government of Samoa, civil society and the private sector handles its e-waste in an environmentally responsible way over the whole ICT lifecycle.	▪ An e-waste handbook is available. The handbook contains information on the environmental cost to operate different forms of computing; and ▪ Disposal bins are available for the recycling of printer toner cartridges in a domestic recycling facility.	$150,000	$30,000	$0	$0	$0	$180,000
		Subtotal for Cross-cutting Outcomes	**$150,000**	**$30,000**	**$0**	**$0**	**$0**	**$180,000**
		Total	**$2,090,000**	**$6,353,740**	**$3,553,740**	**$3,330,240**	**$3,110,240**	**$18,437,960**

References

Alliance for Affordable Internet Access, 2017. Annual Report. *World Wide Web Foundation,* February 2017.

Bedi, I.S., et al., 2016. Trends in Telecommunications Reform. *International Telecommunications Union (ITU),* Geneva, Switzerland.

Cave D., 2012. Digital Islands: How the Pacific's ICT Revolution is Transforming the Region, *Lowy Institute for International Policy*, November 2012.

Czernich, N., Falck, O., Kretschmer, T., and Woessmann, L., 2011. Broadband infrastructure and economic growth. *The Economic Journal*, 121(552), pp.505-532.

Department of Foreign Affairs and Trade, 2016. Aid Investment Plan 2015-2019, *Government of Australia*.

Internet Society, 2015. Internet Exchange Points: An Internet Society Public Policy Briefing, *Internet Society.*

Logan, S., Mow, I. C., Suwamaru, J. K., and Watson, A., 2017. Mobile Technology in Pacific Island Countries: The Potential for M-Government, Chapter 5 in Achieving Sustainable E-Government in Pacific Island States. *Public Administration and Information Technology*.

Minges, M. and Stork, C., 2015. Economic and social impact of ICTs in the Pacific, Pacific Region Infrastructure Facility, *Asian Development Bank, Sydney, Australia, June 2015*.

MESC, 2016. National Education Statistical Digest and Addendum, *Government*.

Mow, I.T.C., 2014. Issues and challenges, strategies and recommendations, in the development of ICT in a small island developing state: The case of Samoa. *The Electronic Journal of Information Systems in Developing Countries*, 63.

Online source: http://www.internetworldstats.com/pacific.htm#ws, accessed: May 9 2017.

OECD and WTO, 2013. Aid for Trade and Value Chains in Information and Communications Technologies. *Organisation for Economic Cooperation and Development (OECD) and World Trade Organisation (WTO),* June 28 2013.

Pablo, Z.D. and Pan, S.L., 2002. A multi-disciplinary analysis of e-governance: Where do we start. In *Proceedings of the 6th Pacific Conference on Information Systems* (PACIS 2002) pp.288-302.

Waverman, L., Meschi, M., and Fuss, M. (2005). The impact of telecoms on economic growth in developing countries (pp. 10-23). In Africa: The impact of mobile phones. *The Vodafone Policy Paper Series,* Number 2.

World Bank, 2014. Project Information Document (Concept Stage), report #PIDC417, approved: December 8 2014, *Washington D.C.*