Government Agency e-Services Readiness Assessment

ICT Access and e-Services for Hinterland, Poor and Remote Communities in Guyana

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## Definitions

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<tr>
<td>CSR</td>
<td>Corporate Social Responsibility</td>
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<tr>
<td>EHR</td>
<td>An Electronic Health Record (EHR) is an electronic version of a patient’s medical history, that is maintained by the provider over time, and may include all of the key administrative clinical data relevant to that persons care under a particular provider, including demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data and radiology reports.</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of Guyana</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technologies</td>
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<tr>
<td>MOOC</td>
<td>Massively Open Online Courses</td>
</tr>
<tr>
<td>Moodle</td>
<td>Popular open source Learning Management System (LMS)</td>
</tr>
<tr>
<td>MoPH</td>
<td>Ministry of Public Health</td>
</tr>
<tr>
<td>Play2Learn</td>
<td>A gamification platform which provides easy content generation and can be implemented in an LMS</td>
</tr>
<tr>
<td>Tele-Consultation</td>
<td>A use case of e-Health in which a health care professional seeks advice from a colleague remotely using ICT infrastructure</td>
</tr>
<tr>
<td>Tele-Diagnosis</td>
<td>The collection of a patient’s vital bodily data for the purpose of diagnosing a potential illness. The sensory date, e.g. x-rays, photos, ECG, will be analyzed by remote experts and a diagnosis with potential medication recommendation will be sent back to the patient.</td>
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1. Executive Summary

There are many reasons for fostering an eGovernment initiative, such as the increased effectiveness and efficiency of the public sector and the improved quality of government services provided to citizens (G2C), the business sector (G2B) and within the government agencies (G2G), which inevitably lead to economic growth and improved gross domestic product.

Provisioning these government services online needs a close cooperation of all involved agencies and units, including a common vision, mission and strategy as well as a work split and clear mandate for the work to be done. The eGovernment Agency defined its vision to be the ICT vanguard that enables equitable digital citizenship for all Guyanese. This will be achieved by developing and implementing appropriate ICT solutions, i.e., e-Services that will transform the delivery of government services.

These e-Services will address all citizens, regardless of their location, i.e., in the hinterland, poor and remote areas as well as in the economic hotspots along the coast. All e-Services will essentially be free of charge to consumers, thus poor communities are benefitting in the same way as remote and hinterland communities. Special e-Services will target hinterland and remote areas and increase the ability to communicate with the coastal areas, e.g., remote classrooms and Tele-Consultation. The extension of reach of selected e-Services to people living abroad might be considered at a later stage.

In the context of e-Service provisioning by all government agencies and ministries, a target picture of a complete service portfolio comprises all necessary components for an effective eGovernment and shows exemplary use cases for the domains of e-Learning, e-Health and other additional e-Services:

- **eAssistance**: Provides general information concerning the public administration or government. This includes, for instance, opening times, contact numbers, staff information, forms or general description of government agency tasks. It can also be seen as self-marketing of the institution. The advantages for citizens are service improvement (quality and cost) and reaching the agency through multiple channels.

- **eAdministration**: These are the typical public administration tasks and processes, which have to be done by citizens or businesses. Existing processes are handled digitally and possibly through a well-defined electronic workflow with minimal personal face-to-face visits. Examples include applications for all kinds of government issued licenses, electronic censuses, application for social welfare, registration in a new community, or electronic tax declaration.

- **eParticipation**: This e-Service domain comprises online surveys to include the citizens and enterprise in the political process, eCommunities (electronic discussion arenas), internet petitions, or creation of government/agency wikis. Examples are the information about potholes on streets, general feedback about government performance (see: “Tell Us” project) or Q&A sessions with elected officials on government portals.

- **Open Government Data**: All data, which is not expressly categorized as confidential, is proactively and completely published to make it accessible to other government agencies and the public. Open data enables new business models between government, citizens and businesses, but it also constitutes a major cultural and paradigm shift.

- **eSignature**: This enabling service makes it possible to establish the identity of an individual remotely and securely. It is generally a challenge to administrations to guarantee the end beneficiary is truly the one she or he claims to be. Registered email systems or electronic national IDs with special encryption functions can serve as an electronic signature tool.

- **Security** is a paramount guiding principle, which also needs to extend into the digital domain. This can be achieved by adhering to the ISO 27000 guidelines and a certification process.
• **ePayment** is needed for some of the e-Services, which involve monetary transactions, and generally makes handling money more secure. A collaboration with existing payment systems by commercial providers might be prudent.

• A **Government Service Bus** connects all administrative domains and ensures the availability of relevant data to all government stakeholders. Databases need to be harmonized and every citizen and business needs to be identifiable by a unique ID, e.g., the social security number or tax ID.

• **E-Learning, e-Health** and **additional e-Services** are offered by ministries and agencies on top of the government ICT infrastructure to the respective stakeholders.

All stakeholders that have interest in using e-Services have expressed their need for basic communications. Besides this generic need, a detailed look along the building blocks reveals the following interests and needs:

Technical stakeholders, e.g., operators like Digicel and GTT, can provide platforms for eGovernment services. The eGovernment Agency can either license the complete platform and operate it then on their own premises or just use a white label version of the service provided by the stakeholder.

Legal and regulatory stakeholders, e.g., Ministry of Telecommunications, have needs for services in the field of collaboration, document management and dissemination of information.

Financial Stakeholders, e.g., UNDP and IDB, have interest in deploying services that increase the wealth especially in underdeveloped regions of the country. This might include, besides the above mentioned basic communication services, services that foster the development of local business in these remote areas.

Services/use case Stakeholders, e.g., Ministries and UN agencies as PAHO and FAO, have need for basic communication services, and in addition require e-Services that are more sophisticated. The more complex eServices are in particular relevant for ministries (like document management, passport application).

Partners, like foundations, NGOs and companies that provide Corporate Social Responsibility Programs can be a source for cost-effective licensing, e.g., for e-Learning tools.

Business Model stakeholders (e.g., Toshao, community head) hold in many cases the sole rights to grant access to the respective communities and hence deployment of ICT-infrastructure and provision of e-Services depends on their consent. Early involvement of them in the planning of the ICT network and decision making process is crucial. In addition, protecting the installation of infrastructure in the hinterland and remote areas is achieved best by creating a feeling of “ownership” or responsibility for the hardware/infrastructure deployed locally. These local “owners” shall be members of the respective communities, ideally with a strong standing. They are also essential multipliers in regards to the adoption and acceptance of ICT services especially in remote areas.

Setting the right ownership and responsibilities when operating e-Services is of great importance. The eGovernment Agency is the catalyst for e-Service introduction, but also serves the role of gatekeeper and organizer of agency cooperation. It needs to oversee, steer and streamline all efforts towards e-Services, however leaving enough room for individual agencies to pursue important special projects by themselves. Generally, all applications shall be hosted by the eGovernment Agency. However, in specific cases each of the Ministries or Agencies can host and operate the applications itself. The eGovernment Agency should target to host and support about 80% of the services offered online.

Several e-Services were considered fundamental in addressing the needs of hinterland, poor and remote communities, namely e-Learning, e-Health and e-Government services. Special emphasis is given to e-Learning as it is considered as the underpinning of all activities and the platforms can be leveraged in other government domains:

• e-Learning
  - Teacher support: The most effective way to bolster the educational system of a nation is to support its teachers appropriately. The Guyanese government has recognized this and the “One Laptop per Teacher” program has been started. These laptops already come with a slew of different materials,
such as curriculum ideas, governmental forms and electronic textbooks. However, this material is static in nature and there is no means of updating it. A much more flexible way of supporting teachers can be delivered online through specialized learning management applications (LMS), the availability of special support forums for knowledge exchange and mutual support and the subsequent use of electronic media in the classroom.

- Individual Student Learning: In the case of hinterland and remote schools where special subject teachers are very few, students can engage in direct learning with special subject-based applications or gamification platforms that convey specialized knowledge. In addition, these systems are useful when topics need to be re-learned or a student has special needs, which cannot be satisfied in the regular classroom interactions.

- School management application: The hinterland and remote primary and secondary schools are located far away from Georgetown and are hard to reach with long car rides or taking plane trips. Still, there is a need to track and control these schools to elevate them to a standardized school system and curriculum. The national school authority needs a reliable way to communicate with the interior school staff and exercise steering control. Thus, an application which makes it possible to chat with teachers and administrative staff (either text chat or video), gives remote access to schools attendance records and other school statistics, helps in class schedule preparation, and can track school inventory would be a very helpful service.

- Remote Classroom: When there is a shortage of teachers for a certain subject, it is very useful to multiply a teacher’s impact via real-time tele-education. This is the case for remote classroom, where a single class is recorded in one location and transmitted to multiple locations in real-time.

- **E-Health**
  - Basic Asynchronous Services: Implementing simple communication services can make a big impact on the operation of the healthcare services in the hinterland and remote communities.
  - Warehouse management for medical supplies: Medical stores management at central-level stores and at regional district-level stores is a widespread problem in Guyana’s hinterland and remote health centers. Oftentimes the inventory levels are unknown and drugs are kept (and used) well beyond their expiration dates. A common system for creating transparency and aide in drug management should be implemented. There is a trend towards a decentralized model supported by an efficient IT system and a well-organized supply chain.
  - HIS – Health Information System: A HIS can be described as any system that captures, stores, manages or transmits information about the health of individuals or the activities of institutions that work within the health sector. A strong HIS is the backbone of an effective healthcare system. An EHR (electronic health record) is used to capture all relevant information based on a unified patient identifier. This system has to be developed for the entire healthcare system in Guyana and is not special to the HPR communities. However, it should be extended into regional hospitals and health stations as soon as they are reasonably well connected.
  - Tele-Consultation: Teleconsultation means obtaining the professional opinion of an expert who is not physically present at the location where the patient and/or the local health worker are.
  - Tele-Diagnosis: This form of telemedicine is defined as a “diagnosis that is made at a remote location and is based on the evaluation of data transmitted from instruments that monitor the patient and a transfer link to a diagnostic center.”
  - Tele-Surveillance and Early Outbreak Detection for Disease Containment: In order to fight communicable diseases effectively and curb their spreading, accurate and timely field data is necessary. Therefore, health workers consolidate weekly health record statistics gathered from the field at the health stations level and send it to the regional level. MoPH and PAHO would like to reduce this turn-around time for early intervention. This can be addressed through an ICT system that incorporates the collection of clinical information for the purpose of detecting disease outbreaks before reaching epidemic states. Web-based data entry on PCs at health stations can be a first step towards an electronic filing of health data. This can be addressed through an ICT system that incorporates the collection of clinical information for the purpose of detecting disease
outbreaks before reaching epidemic states. Web-based data entry on PCs at health stations can be a first step towards an electronic filing of health data.

- **Diabetes Management**: Diabetes has become an increasing problem for hinterland and remote communities. An effective monitoring and management of diabetes (type I and type II) can make the lives of diabetics much easier and convenient in terms of tracking and analyzing their glucose levels.

- **Maternal Healthcare**: One statistic from the World Health Organization shows that more than 800 women die globally every day from preventable circumstances related to pregnancy and childbirth. Almost all of those women live in developing nations. Major complications accounting for most of these maternal deaths include severe bleeding, infections, high blood pressure during pregnancy, complications during birth and unsafe abortions. Given more education and more access to healthcare workers, there is a good chance to reduce the mortality rate in remote communities.

- **VoIP**: A voice service for the health sector in Guyana will increase the ability to communicate in real time with remote health posts, especially in emergencies. This service will provide a better protection of patient-related information than currently used HF radios.

**E-Government services**

- **Document Management**: To handle documents digitally and to exchange them between different relevant users, a document management system (DMS) needs to be deployed. It represents an IT tool that is used to track, manage and store documents digitally.

- **Basic Email System**: Ministries and government agencies need to use emails following an aligned domain model provided by eGovernment Agency for the government. For security reasons as well as to support a certain “corporate identity” of the country, the usage of free email providers for professional emails shall not be accepted.

- **Birth / Marriage / Death Certificate Provisioning**: Citizens shall be able to use government services online, especially to reduce their needs to travel to the next physical government location. This applies not only to the request for birth certificates, but as well to the submission of marriage and death-related information.

- **Passport Application**: The passport application allows the users to enter all their personal data online, meaning they only have to travel once to the passport agency or never if the whole process documentation can be signed digitally and the passport sent back to the citizen via mail.

**Enabling services**

- **ID/Account Management / digital signature**: Trustworthy accounts of users are essential to use eGovernment services. This account helps to prevent the misuse of the services, e.g., claiming a passport under false ID. With a digital signature, the citizen can digitally sign official documents.

- **E-Payment services**: Online payment is needed to settle fees for government e-Services online but also as a service to enable business and to transfer money between citizens, especially in the hinterland and remote areas.

- **Common Data model**: To increase the usage of digital information and to ease the exchange of information between different governmental entities, a unified and harmonized data model as a foundation for all digital data needs to be developed and enforced by the Government.

- **Carrier-grade service provisioning and hosting**: Services provided by the eGovernment Agency need to be available for the customers 24hrs a day, 365 days a year.

In order to create a roadmap and a detailed implementation plan, the above-mentioned e-Services and their respective use cases have to be prioritized. A prioritization of services for the years 2017 to 2021 includes the following:

- **e-Learning**: Finalizing and extending the One Laptop per Teacher program is the most important initiative. School management does not affect students as much as individual learning programs, thus it should be de-prioritized.
• E-Health: The basic services such as Internet access via a stationary PC and communication availability and providing for enhanced maternal healthcare should be the focuses for the next years. Tele-Surveillance enhances the data gathering capacity and is important for disease control and early intervention capability. Tele-Diagnosis and Tele-Consultation rely on fairly stable and high-bandwidth connections, thus should be deployed when those are ready.

• E-Government services: The programs which are already partially in place (email, DMS, calendar) should be expanded and made into enterprise-grade services. In addition, extending the website hosting capability should be tackled in the first year. The most demanding enabling services like eSignature and ePayment can be implemented at a later stage as prerequisites for complete online transaction services. It should be noted that all service delivery processes need to be re-engineered for being provided online. Mostly also, an offline component (backend) involved needs to fall into place as well.

A high-level cost estimation for the next years to rollout and implement these services is as follows:

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<th>Cost block</th>
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<td>$868.000</td>
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<tr>
<td>Secondary Schools</td>
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<td>$6.400</td>
<td>$1.280.000</td>
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<td>Regional Hospitals</td>
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<th>Cost block</th>
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<td>Community building</td>
<td>249</td>
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<tr>
<td>State building (post)</td>
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<tr>
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<tr>
<td>Total</td>
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Additional services can profit from an ICT infrastructure and the digital connectivity this infrastructure can provide. This include civil security apps, aiming to increase the perceived security situation of the citizens by better connect them to a public security infrastructure. Other e-services can support environmental protection and e-commerce possibilities of the citizens.

To secure a sustainable implementation and operation of these e-Services and the respective infrastructure, an efficient capacity building approach needs to be deployed to permit the single users, irrespective of their location in the country, to build up the needed knowledge.

The capacity building must follow a step-wise approach, starting with the development of basic skills among all stakeholders, continuing to an advanced level up to very specialized capacities for the usage and provision of specific e-Services.
The content of the training will be organized in various modules that build on one another. Depending on the future role of the trainees, different modules are mandatory, recommended and optional. This way the minimum capacities and skills for the usage of ICT-devices, e-Services and the navigation in the internet will be built up at all stakeholder groups. Operations that are more complex like data analyses and presentation design are elaborated in dedicated training blocks.

The challenge in the development of a training plan for the sustainable introduction of e-Services is that there are many stakeholders involved with different skill profiles. Furthermore, the stakeholders can be divided into two major groups:

Firstly, the officials at the ministries will on one hand use the e-Services and on the other hand will define design requirements and create content for the e-Services. The majority of the officials is based in Georgetown.

Secondly, the members from the communities in the hinterland, remote and poor areas will predominantly use the e-Services, especially teachers, health professionals and administrative workers. These stakeholders live in communities geographically scattered over Guyana.

To train stakeholders in the Georgetown area, it is recommended to establish a National Training Center in Georgetown and provide trainings on a regular basis.

To reach stakeholders in the hinterland, remote and poor communities a “train-the-trainer” scheme is recommended: Master trainers will be trained and qualified in the National Training Center and then transfer this knowledge and skills to experts from the communities. There should be one master trainer for each administrative region of Guyana.

The master trainer will instruct and train teachers and health professionals from the communities, who in return will transfer this knowledge to their peers in their communities.

A detailed description of the training concept is shown in the document “Report Work Package 3 – Training Plan.”

Besides this capacity building approach, the eGovernment Agency itself needs to be prepared for the additional new roles it has to fulfill if providing connectivity to the hinterland, poor and remote areas as well as e-Services to all citizens. This includes the needs of additional operational skills, like for the operation of OSS (Operational Support Systems) and BSS (Billing Support Systems), the implementation of a transparent Demand Management Process to align and prioritize the new and additional demands based on available resources and planned roadmaps, as well as the skills to develop, operate and maintain the new e-Services.

2. Situation Analysis of Hinterland, Poor and Remote Communities

The economic situation of a community has a major impact of the adoption and usage of ICT Infrastructure and services. In the baseline data collection, many respondents mentioned unemployment as a major problem in their communities. Not having access to a steady income is also a concern commonly mentioned in the interviews.

In most of the communities visited, the general economic situation is considered to have worsened during the last years. Only two respondents considered local economic conditions to have improved or to be the same as in the past. **The main perceived causes for this situation are a general lack of training and education** and the overdependence of local economy on extractive activities such as mining and logging.

Respondents believe that improved education could help mostly young people to be more prepared to engage in different activities. Besides that, a few of them believe that better telecommunication infrastructure could boost the local economy, bringing more buyers to local products and allowing tourism to flourish.

The general interest and demand for better products and telecommunication services increase, as in some regions people have started to use smartphones for multiple functions, such as: chat, purchasing products, downloading videos, online courses and social media.
Access to Internet is much desired: According to 27% of the respondents, Internet inclusion would help to develop their region and to improve education.

Taking into account the findings from the survey, there are several barriers to be overcome in order to improve ICT access for Hinterland, Remote and Poor regions:

Dealing with some infrastructural barriers:

- poor electricity access
- poor Internet access/data service
- poor access to devices in the communities (phone/computer stores)

Dealing with consumers’ barriers:

- Lack of knowledge of usage of the devices
- Unawareness of all functions of the devices
- Low emotional connection to the devices
- Prices not affordable/inappropriate to economical profiles of respondents
- Lack of feeling of unitedness, even though respondents feel Guyanese – requires different communication approach

2.1 Important Service Needs – A Wish List of Citizens and Institutions in the Interior

The baseline data collection showed, that respondents to the questionnaire do not acknowledge many other means of communication besides those directly mentioned during the interview (landline phones, cellphones, Smartphones, computers, tablets and laptops). An interviewee from an isolated community spoke about the HF Radio, since the one in her community was broken, leaving her without any means of communication.

However, most of the interviewees are willing to get better and are expecting less expensive services. Also in locations where communication networks are comparatively underdeveloped, people want to have access mainly to the Internet.

Respondents have approached government agencies like Ministry of Indigenous Affairs and Local Government to request Internet or simply any help to improve access to communication media in the communities. Among those respondents, the majority requested bringing Internet access to schools. Access to youth research centers and the provisioning of digital information in schools is a strong demand among residents of the communities visited. Some have not had success yet with their requests, but believe that the current government may drive the process of improving access, despite the recognized lack of funds for investments in this sector and despite the short time of the current government being in power to implement such demands.

The private companies that have been contacted by citizens to improve their services or install antennas in the regions did not meet the requests of the applicants as indicated by the interviewees.

“We always get promises, like the Internet being provided, Internet for schools, but that never so far materialized. I used to be a teacher at school and GT&T came and said that they would assist us with free Internet, but it was 7 years ago and up today nothing happened.” (Region 9, Essequibo-Demerara, Aishalton, Female)

The interviewees have a genuine wish not only for better telecommunication services, but also for also general interests in new and/or improved Internet based services. Once more concrete ideas for use the of e-Services are
explained to them, they believe that e-services, such as e-commerce, e-learning, e-banking, and eGovernment not only can be more convenient, but also help people to significantly improve their living standards.

Interviews with public institutions showed, that the major demand to use e-Services for basic reporting, such as digital submission of documents to the respective headquarter in Georgetown, the general exchange of information, and the replacement of paper based communication.

2.1.1 E-Learning

According to the communities’ leaders, more than 75% of those who have started school in the visited communities, did not complete it, but dropped out. Financial difficulties is the reason most frequently mentioned by the respondents: Pupils often have to go to a nearby community in order to complete their studies. This is financially not affordable for them. Another reason mentioned is the necessity to give up school in order to work or help their families.

The availability of e-learning services, such as online classes or virtual classrooms would contribute to improve this situation.

In all analyzed communities, cellular phones are stated as the most commonly used mean of communication. With the exception of communities with nonexistent communication services (besides the HF radio), most interviewees define cellphones and Smartphones as prevalent not only in their own communication-related activities, but also in their communities in general. In places where Internet services and landlines are not present, education workers even use their own personal cellular phones to do tasks related to their job.

On the other side computers, laptops and tablets are not as common as they should be among education professionals – especially considering the specific needs of these professionals. While most teachers, head teachers, and education workers stated their wish for more access to communication and information technology, a similar amount complained about existing conditions. Lack of training, bad or non-existing Internet and Wi-Fi services, as well as delayed delivery of promised equipment were the most frequently mentioned problems.

Nevertheless, in a more positive note, professionals also mentioned current plans to bring technology access and develop computer literacy in their schools. They also recognized the potential of improved connectivity to improve access to information and services - helping both, students and teachers to complete a greater number of tasks, to acquire greater qualification, and to connect with the world.
“Based on my job, I’m not at home most of the time so to communicate with others I would use a cellphone. For the landline, (...) I would use it like four times a day, but the cellphone it is like eight times. [Interviewer:] And you have a cell, do you generally use it when you are working, you need to talk to your family or talking to the students’ parents? [Interviewee:] Students’ parents, other colleagues even the ministry of education if I need to clarify something, to call the ministry of education office.” [Region 5, Rosignol, female]

Education professionals interviewed during the baseline data collection tend to recognize the benefits of using computers, tablets, and laptops. They frequently mentioned some activities in which they could use these devices, e.g. to complete complex tasks or to add new training features to their classes. Nevertheless, many of them do not have proper access to devices and network connectivity to the extent what they consider necessary.

The interviewed students also see the lack of devices other than the Smartphones as a problem. Teachers acknowledge that young people need to be in contact with new technologies in order to stay in the same pace as people with access to better telecommunication infrastructure. However, the teachers themselves do not feel comfortable when using some devices. Therefore, in order to implement programs to improve computer literacy in school, teachers would probably need to obtain extra qualifications.

E-learning is welcomed as a viable option especially in the field of higher education and seen as a technology that could permit professionals and students to acquire additional qualifications more easily.

Quotes from baseline report:

“Now imagine the possibility to get a degree from anywhere for yourself online. How do you feel about this?”

“I’d go for it. I’m learning about it from you, this is the first time I hear about it. I’d prefer to do that. If I have the opportunity to go to the university, I don’t want to leave my family, which is the reason why I can’t go to the university. So you are telling me, you are teaching me about the online classes or whatever you call it and I’d prefer that.” [Region 8, Nappi, Female]

“Well, I feel more comfortable. That’s a different moment. I have really no knowledge about these things (...).” [Region 7, Kako, female]

“I would like that, because actually not only my children, but for the community and the other young people, it would be really nice if they could get a degree from the Internet. For at least, you know, you see the young people in the community develop instead of going down, they go up.” [Region 4, Laluni, Female]

Studying abroad nowadays requires leaving the country, their families, friends and job. E-learning services are seen as a much way to bypass the challenge of physical relocation. Their only concern again is related to the price of the needed Internet connection.

Interviews with public institutions showed, a specific demand for the following services:

- E-Learning for all ages incl. adults, but also for the teachers
- Management/reporting of facilities
- Management of resources
- Access to databases/research
- Connect to abroad/distant learning
- Learning in indigenous languages

### 2.1.2 E-Health

Contagious diseases affect more the population of the “Hinterland and Poor”, as per information from the baseline data collection as well as from the information gathered at the Ministry of Health (2012-2015). The same data from the Ministry of Health indicates that poor communities have a high number of diseases caused by bacteria due to hygiene issues. 25% of the representatives confirmed this information in the baseline data collection interviews. The
Hinterland area, presumably because of the better-developed infrastructure, suffers less from hygiene issues but rather from problems related to violence and drug abuse. Cases of reported violence usually occur in the family scope at events such as sexual molestation of children and domestic violence.

Major health issues Guyana is facing are high rates of maternal mortality, infant mortality and non-communicable diseases such as diabetes and cardiovascular diseases.

Image 3: Infant mortality rates per 1,000 live births in 2014

1 UNDP, Caribbean Human Development Report, 2016
Simple e-Services are already being used by the Ministry of Public Health to increase awareness for and knowledge about chronic non-communicable diseases, such as text messages being sent as push-service to cellular phones via the commercial operators’ networks.

Image 5: Text messages from MoPH to educate about non-communicable diseases

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2 Country statistics and global health estimates by WHO and UN partner, Guyana: WHO statistical profile, 2015
Communicating over longer distances for person working in the health sector is part of their job and it occurs very frequently. Most of experts interviewed for the baseline data collection say that they do it on a daily bases, especially the ones working at emergency service facilities. For example, they have to contact someone from other health centers to transfer patients. The trigger for using different means of telecommunication is mostly work, i.e. caretaking of the patients in order to provide them medical assistance and support they need.

The problem the interviewees are facing in regards to communication is that the patient is often located far from a medical center and/or he needs help during a period of the day when it is impossible to physically reach out to him. Examples are people who live in the villages along the rivers where it is not possible to take a boat in the middle of the night to reach them. During those times, the doctor has to make a decision quickly if it is needed to rescue the patient by plane or if it is sufficient to give instructions via phone / video conference in order to handle the situation successfully.

Another situation would be, that they would need help to examine a patient carefully. Today they have to call someone using their cellphones, or ask someone in person or look at wikipedia/ medicine communities. Privacy concerns were also raised: One person mentioned that having a private conversation through e-mail would be better than using the personal Whatsapp or Facebook account, especially if talking about health issues, like in occasions when talking about diseases like HIV.

Quotes from baseline report:

“Of course it would help me. “Have you ever lived a situation in which you wanted same help?” Yes, I had a patient with an abscess behind his knee and I wanted someone else to participate, to see it, but everybody was busy, so I had to go to the Internet, to research it. This idea would be excellent and better for me, far better for me, because I’m in a remote area and it is the last village in. So imagine something happens, for example, in the middle of the night, look how remote I am. This is closed, that is closed, but I’m the only doctor in the area, so you can imagine that everybody would come to you and the nearest hospital is or in New Amsterdam or in a half hour way. That would be excellent, you know, if I can have, for example, this. If I had a program, where I can speak to someone to give me advices, of course that would be useful. They can instruct me, tell me what to do in some certain situations that would be good, because I’m in a remote area. (Region 5, Mahaica-Berbice, East Indian, Rosignol, Physician, Female)

“I'd say it is having Internet here. Because the pre-condition is to have Internet. As I said before it would be much easier to get in contact if there is an emergency or if you need medical advice, you skype the person. It is much easier to talk to them. You see them face-to-face if there is something you cannot do. In terms of medical training, the program in continuing medical education. So there are these courses online but i don't have Internet here. So we have to travel all the way there where you have the training, to get my credits. It would be much easier to do it online. And that's not only for me there a lot of people that would benefit from it.” (Region 4-Demerara-Mahaica, St Cuthberts, Female)

Health area professionals have great need to use their own devices at their workplace Currently some of the interviewees highlighted that they are forced to cover these business related expenses from their own pocket and they don’t see any improvement of this situation in the near future. The interest of healthcare professionals for ICT in general and their demands for better products and telecommunication services are high.

In general, everything that might address and solve their specific needs is highly welcome:

- Save their time – example: computer to do the report and send it by e-mail
- Better Internet signal (for data)
- Connection/Support – example: sending a case of a particular patient to the supervisor in order to faster processes or intercommunication – at hospital
- Access – related to prices/stores available in the community
- Education – for using computers and understanding the potentials of smartphones

Furthermore, surgery monitoring and assistance in different places of the world for medical improvement has been named explicitly as needed e-health service.
A lack of knowledge in how to use more complex devices like tablets, laptops and smartphones results in a certain reluctance of understanding the benefits of a “connected device” and therefore no motivation in purchasing them. However, once more concrete ideas were presented as examples for use cases, the interviewees showed increased interest in acquiring and using these devices.

There are different opinions among the communities visited: The ones more developed would prefer to use more modern devices (tablets, smartphones) while the ones less developed would prefer to use devices like a computer or a smartphone.

Interviews with public institutions showed, a specific demand for the following services:

- Health Information exchange, document management, digital patient file
- Warehouse management and forecasting of needs (where is which drug and when does it expire?)
- Disease forecast: in-time reporting of exceptional regional outbreaks of illnesses

### 2.1.3 EGovernment

To receive news about the government it requires reading newspaper or news sites on smartphones. According to the findings from the baseline data collection, there are people in remote locations, however, who need to wait up to a whole week until they get access to the printed news as the smartphone usage is not possible.

*Quotes from baseline report:*

> “Well, because of smartphones, there’s an app for everything you need, so I usually use this News 2 Go app and that would… I mean, the beauty of News 2 Go is that you read articles from all the major newspaper, the Guiana Times and things like that.” [Region 1, Barima Wani, Mabaruma, Male]

> “We used to get the information like this when we had the Internet. It was easier for us to go to the Internet and see the news. We had the learning channel, so when it was on, we used to see the news every day, like 7pm to 8pm.” [Region 9, Essequibo-Demerara, Karasabai, Female]

Everything involving governmental activities is considered as very bureaucratic and involving a lot of paper work, even resulting in emotional stress. The eGovernment idea, namely the option of contacting public authorities and services through the Internet, is understood as extremely handy and promising in order to provide easier and practical processes. Particularly, registering newborns in a quicker, less bureaucratic way is considered an advancement compared with the current situation.

*Quotes from baseline report:*

> “…for registering a newborn (...) you have to travel and spend a lot of money to get to the central community and the region to register the newborn and apply for marriage certificate and so on.” [Region 1, Mabaruma, Teacher, Male]

> “Now imagine the possibility of receiving this information or contacting governmental or public authorities (to register a new-born, apply for marriage, etc.) online. How do you feel about this?”

> “I would be happy about that. When things are not going right with your school you can write to it. My ceiling fell the other day. (...) It fell overnight, not during the day. When we got there, it was done. But then I had to use the same phone to try to get the message over. Some people didn’t get it, they say we didn’t call on time. When you call and don’t get through, you’ve got to wait until you get through. So sometimes, two hours after, because you’re far in and these phones, they are not so smart.” [Region 5, Perth, Female]

> “I feel more comfortable. Because right now I have a grandson that doesn’t have a birth certificate... yes, it would be easy for us.” [Region 7, Kako, Female]

> “That’s a major development. The system in Guyana is broken because you may not believe me but I know persons here who are almost 60 and 70 who were born in this country and don’t have a birth certificate, for
one reason or another, but if that could be done or be extended online, that would be very good. I think it would be more efficient persons could stay right here, they don’t have to travel to Georgetown.” (Region 1, Barima Wani, Mabaruma, Male)

The possibility to follow-up through the Internet of parliament debates and activities in real-time has been explicitly named as welcome e-Service during the interviews.

Interviews with public institutions showed a specific demand for the following services:

- Provide carrier grade platform to all “customers”
- Provide enabling services, e.g., ID management, document management, common data models, security and payment services
- Steer planning of software and support its cost efficient sourcing, i.e., support product lifecycle management, demand management
- Establish the right frameworks to work efficiently between the different ministries and agencies, especially in regards to the digital exchange of data

2.1.4 Other Economic Activities

Interviews with representatives of economic activities showed, that most of the long distance communication done by this audience has a professional goal: contact with suppliers who are outside the community to purchase products or to inform co-workers and supervisors about how businesses goes or to ask for help or in cases of emergency.

Quotes from baseline report:

“I use my phone every day. I’m employed at the sugar factory and use it to communicate to the others about the job situation, we also use the cellphone and we need a Smartphone at that time.”

To market their products or promote their businesses, they recognize the importance of marketing and advertising. They advertise using flyers, business cards or distribute small gifts. They are already using Internet resources advertising on Ebay, Facebook, Youtube or specialized websites according to the business area. They promote through word of mouth in places with few inhabitants. In the hotel industry, they recognize an untapped potential of remote areas for tourism, but resent the lack of government support to advertise.

Quotes from baseline report:

„I have no computers yet on the resort and I plan to promote it trying to reach the tour operators across the country in the Suriname with some flyers, business cards, you know, because marketing is very important. And that is why the Internet, the Wi-Fi or whatever, you know, all these things will be very important to the business.“ (Region 6, Berbice-Oriental-Corentyne, Orealla, Male)

„I use Tripadvisor and another one that somebody recently told me about… it’s not in my mind, but he said he’s gonna link us up… so, I’m looking wherever you can link, so they know you exist so you can get clients here.” (Region 2, Demerara-Berbice, Mainstay, Male)

E-commerce is also well received. Respondents from villages where agriculture is the main economic activity are particularly enthusiastic. Firstly, some of them believe that a local, government-run website could provide a service more in line with their direct needs and secondly, they think that having direct access to buyers would solve some uncertainties they are currently experiencing.

Quotes from baseline report:

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3 One example mentioned was: What to do with the cattle that got stuck in the mud (farmer)
“Now imagine the possibility of a government-run website that enables you to trade your goods on a national (or international) platform online. How do you feel about this?”

“Well, now we can use a smartphone to take the picture and sell it to the other person.” (Region 1, Barima, Mabaruma, Male)

“I wanted some seatbelts for my car, because they are damaged, but I can’t find any dealer here or anything, so somebody offered me to buy it online, from Georgetown. For things we don’t have here, the only option is online, but I don’t know how to do it myself, so I need to ask someone else. Of course it would be excellent, because, you know, everybody works and they are so busy, they would prefer to be able to purchase online and do not go to the store.” (Region 5, Mahaica-Berbice, Rosignol, Female)

As there is a great lack of financial institutions in Guyana, respondents typically use services as Western Union or Money Gram when available (greater access in coastal areas) to transfer money. Often they have to travel great distances to get to these institutions or risk losing their money by using somehow unreliable intermediaries to transport the money.

Quotes from baseline report:

“How do you transfer money usually?”

“For example, when children are far away we just send the money with people that are going out. For example, (...) any family member going out I send the money through them.” [Region 7, Kako, Female]

“I normally use Western Union or my neighbor next door is a taxi driver, I’d ask him to take it.” [Region 5, Rosignol, Female]

“Well, if the person is living in Anna Regina I could ask somebody to take it to them, and if the person is living in Georgetown I could just send it through the post office or Western Union.” (Region 2, Pomeroon-Supenaan, Mainstay, Female)

“I go to the post office, deposit and they fax it. I feel unsafe.” (Region 9, Upper Takutu-Upper Essequibo, Lethem, Male)

“Like I’m saying, for me to send money to Georgetown or any other part within region 1, the only available medium in terms of money transfer, we’re talking in the region itself, right? It’s the post office. But there’s a post office at two of the sub-regions, in Mabaruma there’s a post office, there’s a post office in Port Kaituma, I don’t think there’s any post office in Matthews Ridge, so in case I need to send money there, I got to send it with somebody. That person, I trust them to send it, what if they don’t carry the money to the receiver. There’s no guarantee. That’s a risk…” (Region 1, Barima-Wani, Port Kaituma, Male)

“That’s a great idea, but you see the thing about MobileMoney, I don’t think that GT&T has taken the time to actually sensitize and educate persons on actual service, so I’m thinking of persons that might be willing to use their service, but because they don’t get the time to educate the people on the service, you don’t find people using their service.” (Region 1, Barima Wani, Mabaruma, Male)

“Yes, I heard GT&T has this money something, mobile money. Which this service provides. But the GT&T came here and the Toshao said we already have a service. It is just bad. I’m not 100% sure, but what I was told is they came and were turned away. I don’t know how true that is.” (Region 9, Essequibo-Demerara, Aishalton, Female)

“Now imagine the possibility of transferring money via cellphone deposit. How do you feel about this?”

“I’d feel great if I could do it myself on the Internet. It would save me some time and some cash. [Interviewer:] Would that be also easier maybe than traveling to Western Union? [Interviewee:] Yeah. To travel to both sometimes because when you get there, they’re closed or they’re not doing business that day. You won’t even know if they’re not doing business.” [Region 5, Perth, Female]
“Really good. I’m not aware of this that you can send through your phone. Yeah, I’d use it.” [Region 8, Aishalton, female]

E-banking is also seen as extremely convenient. Current options for money transfer are risky, expensive and require extra time and efforts. In this context, the idea of transferring money via mobile phone is generally well received by the interviewees.

Most of the mentioned desires are related to the use of the Internet. Some respondents asked for more Wi-Fi hotspots, while others request services to simplify daily tasks as Mobile Money (banking application via Internet and mobile phone). They also would like to have smartphones with good quality cameras for taking photos. In the view of the respondents the Internet would improve business, help to advertise goods and services, connect consumers not only of a region, but also of the country as a whole. The following are the services being mentioned:

- applications with regional information and chat to exchange local information,
- the online contact with the veterinarian would avoid travel time and often the loss of animals for farmers

For selling goods to remote areas the interviewees would like to use a smartphone to take a picture and send it to people, advertising on cable TV or making connections to people in each community by calling them to bring goods. If using an e-commerce platform operated by the government they see the benefits in savety and reliability in running the processes. Besides that, it would save their time, people would find what they need/ want to purchase and it is a way for growing and developing the business.

For sending money the interviewees have to go to the post office and bank or West Union/ Money Gram or in case it is in another community, sometimes asking someone to do it in person. E-banking idea is considered practical, faster and easy – very valuable and very attractive. Also it seems to be less expensive and much safer than going in person.

Interviews with FAO showed a specific demand for the following services:

- E-Learning and training material
- Access to new markets to buy and sell products
- Access to basic information like weather, news and statistics
- Improve collaboration between farmers in the same region (know who has what, consolidated shipping to reduce individual shipment costs)
- Mobile payment (to reduce crime)

### 2.2 Status Quo of e-Services Readiness Today

This section looks at the current availability of and future plans for e-Services by government agencies and ministries in Guyana and outlines the status quo of need frameworks to provide these services by different Agencies and organizations. It is based on interviews and desk research done during the month of October 2016.

In summary, the e-Learning domain shows to be the most advanced with many support documents and tools available for teachers and students – all information available from a well-structured website of the Ministry of Education. E-Government services through the eGovernment Agency is already planned through a good set of projects, however there is no relevant service accessible by communities in the interior yet. A new website has been launched in October 2016, which is being populated step by step and which yields great potential for hosting requested services described below. Special skills to operate these e-Services have been build up in the organization. The e-Health

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*4 This assessment needs to be understood as not exhaustive as the documented results are based on feedback received from selected ministry employees only and information shared with the team.

*5 Primarily due to the absence of online connectivity in these areas.*
domain shows currently the most potential for improvement concerning serving hinterland and remote hospitals and health stations as no significant e-Services are being provided. Additionally, it has been highlighted that the number of skilled IT experts are limited and not sufficient. In the field of agriculture and business, the situation looks comparable to the health domain: while simple websites are being maintained the potential of e-Services are not yet fully used – partially as the connectivity to communities in remote areas is limited or non-existing.

The eGovernment Agency, as the core ICT service provider for e-Government services, currently focuses the available skills of the team around the provisioning of connectivity and e-Services. As the role and tasks of the agency will grow and extend during the next years significantly, additional skills as well as supporting processes are needed. This will primarily address the domains of service delivery and provisioning as well as the controlled alignment of Business and IT.

The overall e-Services readiness can be described as “Online Communication,” based on the maturity model put forward in Section 3.1. There are government-wide Email, Calendar and document exchange available, even though they are not used by all ministries and agencies yet. Further, these tools need to be made available to hinterland and remote outposts of the respective ministries.

### 2.2.1 E-Learning

The Ministry of Education (MOE) in Guyana is handling the topic of bringing learning online. There exists a special department NCERD – National Center for Educational Resource Development, which is tasked with finding new ways of conveying learning content, among others also fostering the use of ICT in schools and the ministry itself.

This unit is already engaged in e-Learning for a long time: the interviewed employee has been testing electronic means of learning since 2000 and is very closely connected to many international universities and other education institutions. Thus, there are many initiatives ongoing concerning providing electronic learning resources to teachers and students. As evidence, the website of the Ministry of Education holds very good information and is well structured for easy access.

The focus of activities lies on three target groups: 1) Teachers, 2) Students, and 3) Adults, for which there are specific e-Learning (or e-Education) solutions.

**Teachers:** there is a program in place to enhance the Teacher’s ICT competency through a MoU with the UNESCO, Microsoft, and the Commonwealth Secretariat. All graduating teachers are versed in ICT tools through the mandatory ICT classes anchored in the university curriculum. Currently, teachers are supplied with laptops to be used in classes to ease access to teaching materials and familiarize students with ICT.

**Students:** The software SuccessMaker by Pearson Publishing has been successfully trialed in grades 3-6 education. A wider rollout is currently being planned. Further, the ministry website holds textbooks and more information on a range of subjects.

**Adults:** The need to include adults in ICT education has been identified. However, the focus was on children so far.

Through cooperation with external organizations, the ministry (via NCERD) is launching many pilot projects to test software and hardware support systems. For example, Samsung has equipped one classroom in Georgetown with technology (tablets, projector, screen, server, software, etc.) to enable teachers and students to engage in modern learning activities6. This “Smart Classroom” initiative should be extended to schools in the interior.

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Teacher availability is a concern across the educational system in Guyana. A pilot project was launched beginning of 2015 to offer remote interactive classrooms, effectively multiplying a teacher’s lecture with geographically distant classes in real-time. This important use case is further described below in this document.

At the time of writing requested, more detailed information was still forthcoming. Only NCERD has been taken into account. There might be other e-Learning activities ongoing in Guyana.

### 2.2.2 E-Health

The Ministry of Public Health (MoPH) in Guyana has identified the use of ICT as an important next step to increase healthcare quality and reach. It has set up a Management Information System (MIS) department within the ministry to look after the ICT infrastructure and end user devices. This department is mainly concerned with maintenance and repair of the equipment and to a lesser extend with setting the vision and agenda of a comprehensive e-Health implementation.

A good network between health institutions in Georgetown has been set up in the previous decade, which relies on wireless technology to connect the different locations. However, this network does not extend into hinterland or remote communities. For data collection, the MIS staff rely on USB sticks as transfer methods for epidemiology and other data. Only a sporadic exchange of information with the regional hospitals takes place and health stations are even less frequently involved in data monitoring.

Together with its development partners, such as the Worldbank, IDB, PAHO and a Canadian healthcare institute, the MIS department has set up a first e-Health application in 2007, which is still being maintained and used. It was meant to support Malaria and HIV/AIDS initiatives through incident gathering and analysis. After the project ended in 2012, this system has been kept in place, however due to limited staff availability and skills in the MIS department new features which were requested from within the MOPH could not be realized. For instance, nurse training cannot be sufficiently handled with the current system, so an additional, external system (PALTEX) has been proposed by PAHO.

The minister has expressed his desire to expand the e-Health activities to also include hinterland and remote communities through Telehealth and Telemedicine initiatives. There is currently an initiative underway to review the existing ICT landscape in the ministry and create a vision and plan of action for the coming years. Especially, the definition and implementation of a comprehensive Health Information System (HIS) based on the existing application is being considered.

The eGovernment Agency is tightly involved in this ongoing review and offers its support for the implementation phase. Since the MIS has a multitude of specialized databases, it is foreseen that it keeps the responsibility for maintaining those, whereas the eGovernment Agency supports in hosting and infrastructure connectivity.

### 2.2.3 E-Government Services

The eGovernment Agency had been established by the Guyanese government with the vision to bring equitable access to government services to all Guyanese, no matter their physical location, income level or ethnicity. However, throughout the last years the level of government services available online in Guyana has been declining. This development has especially hindered the hinterland, poor and remote communities in taking advantage of government services and participating in public opinion-shaping processes.

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7 http://www.kaieteurnewsonline.com/2015/03/03/smart-classrooms-could-address-teacher-shortage-manickchand/

8 http://www.paho.org/paltex
As an objective, external assessment, the UN eGovernment Development Index (EGDI) shows that Guyana has steadily decreased its eGovernment maturity since 2005. See Image 6 below. Guyana dropped from rank 89 in 2005 down to rank 126 in 2016 in a worldwide comparison of nations.

![E-Government Development Index](image)

**Image 6: UN eGovernment Survey 2016 – Guyana’s ranking declined steadily.**

To counter this trend, the current government has put more emphasis on e-services and, in turn, the eGovernment Agency has created many projects with the aim to bring the current government services closer to people by offering them online. Many of these services will be thus available to hinterland and remote regions for the first time without the need for extensive travel. The following tables show the planned projects.

### Enabling Services

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>What is being done</th>
<th>When will it be ready</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correspondence Management</td>
<td>Source and implement an appropriate application with the basic features that can enhance correspondence management.</td>
<td>Information not available</td>
</tr>
<tr>
<td>Financial Management System - LTE Info Processing System</td>
<td>Computerized and comprehensive financial management software that will manage the Inventory and Accounting activities.</td>
<td>Information not available</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>National eID Project</th>
<th>To transform the existing ID system into a single unique identification system for citizens and residents.</th>
<th>Information not available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training &amp; Capacity Building</td>
<td>Develop and Implement a Training and Capacity Building Program for the eGovernment Unit 2016</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Captive Portal Project</td>
<td>Creation of Captive Portal for Public Internet Access</td>
<td>Information not available</td>
</tr>
<tr>
<td>Center of Excellence in IT Project</td>
<td>Design and Implement a Center of Excellence in Information Technology (CEIT) together with the Government of India</td>
<td>Information not available</td>
</tr>
<tr>
<td>eGov Critical Services</td>
<td>Deployment of IaaS, PaaS and SaaS solutions for Cloud-based Email, web portal, captive portal, appointment scheduling, ...</td>
<td>Information not available</td>
</tr>
<tr>
<td>eGov NDMA Project</td>
<td>To secure legal mandate and establish the institutional framework for the eGovernment Unit. National Data Management Authority Act</td>
<td>Information not available</td>
</tr>
<tr>
<td>Enterprise IT Infrastructure</td>
<td>To procure, install, configure &amp; test a complete enterprise IT infrastructure, network monitoring and helpdesk solution (Solarwinds)</td>
<td>Information not available</td>
</tr>
<tr>
<td>Gov Official Calendaring Solutions</td>
<td>Implementing Bitrix 24 content management systems to support the calendaring and scheduling solution for eGov.</td>
<td>Information not available</td>
</tr>
<tr>
<td>LTEPS Project</td>
<td>Development and implementation of the SIM and Mobile Device Tracking Manager software.</td>
<td>Information not available</td>
</tr>
<tr>
<td>Policy Frame Project</td>
<td>Development of a Policy Framework for the eGovernment Unit, Ministry of the Presidency.</td>
<td>Information not available</td>
</tr>
</tbody>
</table>

| Table 1: eGovernment enabling services and projects (as of Sept. 2016) |

**Government to Government Services (G2G)**

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>What is being done</th>
<th>When will it be ready</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet Access via eGovNet</td>
<td>Agencies can access the internet at broadband speeds available via LTE in the coastal region.</td>
<td>Available now</td>
</tr>
<tr>
<td>Email service</td>
<td>Professional corporate email service available to all requesting agencies. Not all agencies are hosted yet.</td>
<td>Available now</td>
</tr>
</tbody>
</table>
### Doing Business more efficiently - Ministry of Business

The following services and agencies will be supported by digital means:
- Commercial Registry
- Deeds Registry
- Land Registry
- Guyana Revenue Authority
- National Insurance Scheme
- Central Housing and Planning Authority
- Guyana Lands and Surveys Commission

Ongoing; available in several parts in the coming three years until 2018

---

### Integrated Financial Management and Accounting System

More efficient financial accounting in government agencies. Pilot will be done with these ministries: Ministry of Finance, Ministry of Education, Ministry of Public Health, Ministry of Public Security

Ongoing; available in several ministries in the coming three years until 2018

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### MARAD connectivity and services

Connectivity services as well as support for the following MARAD activities: ship registration, ship inspection, certifications, port control functions, port security

Full transformation by end of 2019

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### Colocation data center services

Offer equipment, space, power, bandwidth, cooling, physical security, disaster recovery to government entities and businesses.

Ongoing; no date set

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### UG Teleconferencing

Installation of Huawei Telepresence and Videoconference at The University of Guyana, connecting Turkeyen and Tain Campuses

Ongoing

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Table 2: eGovernment G2G services and projects (as of Sept. 2016)

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### Government to Citizen Services (G2C)

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>What is being done</th>
<th>When will it be ready</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citizens’ Issues Reporting Solution “Tell Us”</td>
<td>“Tell Us” will connect citizens directly to the entities responsible for providing services and responding to their particular needs. The web or mobile-based application will facilitate citizens’ reporting of issues directly responsible agencies. This would significantly reduce transaction times, improve accountability of those agencies, and encourage citizens’ leadership and feedback in the delivery of public services.</td>
<td>October 2016; rollout until end of 2017</td>
</tr>
<tr>
<td>Citizenship and Immigration Information System (CIIS)</td>
<td>Comprising two sub-projects - online passport application processing and online visa applications - this will modernize the Immigration Information and Processing Systems through Guyana and significantly reduce the costs related to these services. In addition, the project will help to bring streamline the business processes related to these services and give clarity to the agencies involved in the delivery of the services.</td>
<td>Q1/2017</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>ICT access and eServices for hinterland, poor and remote communities – UNDP</td>
<td>Enhancing equity in the access to ICT and Government of Guyana services and is the main aim of this project. In particular, the focus is on hinterland, poor and remote communities as the most underserved with greatest need. The project will see the installation of infrastructure, which will enable connectivity in these communities, provision of equipment (laptops) at designated public spaces and training of community members.</td>
<td>Q1/2017</td>
</tr>
<tr>
<td>Government Portal</td>
<td>The Government of Guyana through its agencies provide a host of services to the public. Some of these agencies are not easily accessible and may have procedures that are not well known by the public. The Government portal is a project to provide a one-stop-clearing house for all Government services. The web and mobile accessible platform will provide information on the procedures for the identified service and direct the user to the e-service centers of the respective agency where these exist.</td>
<td>Q4/2016</td>
</tr>
<tr>
<td>Community ICT Hubs</td>
<td>This project is for the establishment of 24 community based public access ICT sites across Guyana (12 Hinterland &amp; 12 Coastland), in the initial instance. The project involves building community relations and ownership of the spaces through and the physical installation of the connectivity infrastructure, the provision of laptops and training for community members.</td>
<td>Ongoing; First installations Q3/2017</td>
</tr>
<tr>
<td>Schools Connectivity</td>
<td>The aim of this project is to connect 50 pilot secondary schools in the first instance into a private lease connection with the National Center for Education Research and Development those that these schools can directly access a number of e-learning resources and provide real time feedback to NCERD. The connection will facilitate faster communication between NCERD and these schools and thus enable monitoring, reporting and problem resolving in the roll out of program.</td>
<td>Rollout starts in September 2016</td>
</tr>
<tr>
<td>Appointment Scheduling</td>
<td>Generally, Government agencies see a large number of persons frequently because of the nature of their services. Usually this involves long queues. In an effort to improve the efficiency of these services and to reduce the costs to citizens, the Government of Guyana has embarked on a process to enable agencies to assign appointments thereby controlling both the intake flow and processing for services.</td>
<td>Pilot Q3/2016; rollout throughout all agencies in 2017</td>
</tr>
</tbody>
</table>

Table 3: eGovernment G2C Services and Projects (as of Sept. 2016)
An Inter-Agency Service Level Agreement (SLA) exists between the eGovernment Agency and the other ministries and agencies to govern the business and technical aspects of eGovernment Network and Internet access services as well as Email and calendar services. These were the first services to be offered and any additional service needs another SLA.

2.3 Status Quo of e-Services relevant frameworks

While the eGovernment Agency shows experience in deploying and operating e-Services, the current organization and skills do not reflect sufficiently the needs in regards to the future ICT service provisioning and deployment. This includes standardized project management skills as well as the skill set of operating a “telecommunications carrier”.

The following observations can be made in regards to the different elements of the organization:

Policy and Training Division
- Strong focus on purely IT topics. If this Center of Excellence should fulfill the tasks to train and operate the regional training hubs and their trainers, the resources listed here are not sufficient.
- Liaisons experts to align with the communities especially in remote areas are missing. The need to increase the alignment in ICT rollout and e-Services deployment has been highlighted by interviewees (see baseline report).

Enterprise Solutions Division
- Misses a team of account managers that are the entry points for demands by the ministries and agencies. This is essential to promote own activities and services as well.
- A team to deal with vendors or potential solution providers is missing.

Program management & Community Development Division
- This division currently oversees a lot of tasks and two key activities that require both significant number of resources but with a different skillset.
- The Program management division needs to expand its resources in the field of experienced project managers (small and large, especially infrastructure-centric, projects)

Infrastructure Division
- OSS/BSS subdomain is missing. This would include the responsibility of Operation Support Systems (OSS) as well as Business support systems (BSS) to be in the position for the eGovernment Agency to extend and scale their service offering as described and proposed in the ICT needs Assessment.
Operational framework design and implementation is currently not reflected in the organization. This would include responsibilities to design new processes, e.g., based on ITIL.

A strategic planning division directly reporting to the CEO and aligning between IT and strategic needs is missing.

Adjusting the legal framework to the requirements of e-Services is a prerequisite for the broad adoption of the services. Following issues must be considered in the legal framework:

- **Data security and privacy**
  Universal rules and policies for collecting, storing, processing and deleting data with special focus on personal data or such regarding the privacy of natural persons. This does also comprise distinct criteria to classify personal data, meaning data related to the private sphere of a person. Personal data about health and medical issues of a person as well as about their religious or political orientation shall have greater protection than other personal data, as misuse of this information can have stronger impact on the respective person. Privacy and data security is also relevant concerning e-Learning as personal data of students such as results from exams and information about absence from school will be collected and electronically processed.

- **Electronic legal transactions**
  Electronic communication media and e-Services must be established as legally effective, legally binding and must be accepted before court in case of legal disputes regarding such contracts closed by electronic communication media. For example, private contracts can be closed by electronic declaration of intent, electronic signatures shall comply with the legal requirements of contracts drawn up in writing and signed in ink and paper.

- **Consumer protection**
  Consumer protection rules must include e-commerce and the increased potential of fraud or failure by addressing the following issues: obligations for commercial sellers to instruct consumers about terms of contract and consumers rights, special conditions to apply right of withdrawal and choice of law clause.

- **Cybercrime**
  With the widespread use of e-Services and electronic media, there is an increased risk of offences committed via electronic media. Criminal law must consider these new technical issues and define respective offences and sanctions.

- **Special laws**
  Wherever specific circumstances regulated by special laws, adjustment of these laws is required. Laws regarding the health sector must cover the circumstances that medical consultation will in future be provided via e-Services. The processing of information ranging from simple communication between patients and medical staff to complex sharing of data between care institutions is integral to good health care. Hence, the legal context for health care will have to be able to accommodate secure transfer of information between health facilities and patients’ homes and a range of stakeholders in the public, private, and international sectors.

The Cybercrime Bill of Guyana (Draft 2016)\(^\text{10}\) addresses all issues related to cybercrime, including violation of privacy and personal data protection rights. To promote the introduction of e-Services and to mitigate risks related to e-Services it is essential to pass the Cybercrime Bill and put it into force in the near-term.

Special e-Service categories and their legal requirements must be considered in the respective special laws, such as an e-Government legal framework and an e-Health legal framework.

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\(^{10}\) Draft of Cybercrime Bill, posted on March 09, 2016 via the Website of the Ministry of legal affairs http://mola.gov.gy/bills/draft-bills
The e-Health framework shall consider:

- **Classification of (personal) data**
  Data related to health must be classified and enjoy higher protection levels than other data. Special requirements regarding data privacy and data security must be determined.

- **Health data to be included in EHRs**
  In order to share health information, the EHR systems used by healthcare providers should have a minimum level of interoperability. In more and more countries, healthcare professionals are therefore requested by mandatory legal rules to share health data in EHR systems created by national or regional authorities.

- **Requirement placed on the institutions hosting EHR Data**
  Data Applicants must provide extensive information demonstrating that their hosting system is secure and sophisticated enough to ensure that the rules on EHRs (e.g. consent, access, confidentiality) are fulfilled and that health data is well protected, especially considering the risk.

- **Patient consent**
  Informing the patient about the consequence and the functioning of shared EHRs prior to the consent is highly recommended as a prerequisite for the public acceptance of the shared EHR system. A three-step approach has been adopted by some EU member states and has proven successful:
  - When a patient visits a healthcare professional in order to receive care, this professional has the duty to keep a record of at least a minimum set of data related to the identity of this patient and related to the care provided; no additional implicit or explicit consent of the patient or even an opt-out possibility is thus needed at this stage.
  - When, based on national or regional law, public authorities decide to make available EHRs for exchange among healthcare professionals (e.g. in order to avoid unnecessary public healthcare costs), such EHR sharing systems can be established and include available individual EHRs without additional explicit consent of the patients. Member States are however free to introduce opt-out possibilities for this stage. This viewpoint corresponds to the one expressed by the Working Party in its opinion of 2007.
  - When a patient visits a healthcare professional who wishes to receive or access health data collected from this patient by other healthcare providers (by means of the EHR sharing system), such access will require prior explicit consent of the patient concerned. This consent constitutes, at the same time, proof that this patient has engaged into a therapeutic relationship with the healthcare professional.

- **Creation, access to and update of EHRs**
  Only authorized health professionals shall gain access to information for legitimate purposes related to the patient, because possibility of abuse is significant and the risk increases when systems become more interconnected. Hence it is required 1) to establish certainty on the categories of healthcare professionals who can have access to patient summaries, and 2) to establish trustworthy official registers of those categories of professionals which can be used for authentication purposes and that need to be accessible on-line.

- **Secondary use of health data**
  The eHealth legal framework shall specify under what conditions and circumstances secondary use of health data is legally permitted, e.g. if the secondary use is not incompatible with the purposes for which the data have been collected, or the secondary use is for historical, statistical or scientific purposes. The same level of data protection levels must apply to secondary uses.

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11 Milieu Ltd & time.lex, funded by the Health Programme of the European Union: Overview of the national laws on electronic health records in the EU Member States and their interaction with the provision of cross-border eHealth services, July 2014 / 63
The e-Government framework shall consider:\(^{12}\)

- **Provide electronic access to governmental services**
  Public authorities and institutions shall be obliged to open up a point of access for the transfer of electronic documents.

- **Information on authorities and their procedures in publicly accessible networks**
  Public authorities shall make information on its work, its address, its business hours and its contact details for postal, telephone and electronic communications generally available in via the Internet. They shall furthermore provide information about their activities under public law.

- **Electronic means of payment**
  Where charges or other fees arise in connection with an administrative procedure carried out by electronic means, the authority shall enable payment of such charges by participating in at least one adequately secure payment procedure that is customary in the area of electronic business transactions.

- **Electronic record-keeping**
  Public authorities should keep their records in electronic form, unless those authorities for whom keeping electronic records is not economical in the long term. Where records are kept in electronic form, appropriate technical and organizational measures are to be undertaken in accordance with the state of the art to ensure that the principles of orderly record-keeping are observed. Where public authorities keep electronic records, they should keep electronic copies of such records on file in electronic form, instead of keeping paper documents.

- **Access to files**
  Where a right to inspect files exists, public authorities, which keep files in electronic form, may grant access to files preferably by electronic means i.e. displaying the electronic documents on a screen, transmitting electronic documents or permitting electronic access to the content of the files. If this is not feasible, access can be granted by providing a printout of the files concerned.

- **Electronic forms**
  Where a legal provision stipulates the use of a certain form providing a signature field, the electronic form shall be accepted as equivalent and corresponding electronic form requirements should be applied (e.g. digital signature).

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\(^{12}\) Based on an analysis of the Act to promote electronic government and to amend other legislation (Federal Law Gazette I 2013 no. 43, published in Bonn, Germany on 31 July 2013, pp. 2749 - 2760)
3. Vision for e-Services offered by Government Agencies

This chapter describes the vision for a framework of government services that are to be offered online. It comprises a possible future state of all e-Services and use cases in a 5-year timeframe as well as a description of the needed stakeholders to implement the e-Services. Furthermore, hints on a governance between the stakeholders are given.

3.1 Overview and Definitions

There are many reasons for fostering an eGovernment initiative, such as the increased effectiveness and efficiency of the public sector and the improved quality of government services provided to citizens (G2C), the business sector (G2B) and within the government agencies (G2G), which inevitably lead to economic growth and improved gross domestic product.

Provisioning these government services online needs a close cooperation of all involved agencies and units, including a common vision, mission and strategy as well as a work split and clear mandate for the work to be done.

The eGovernment Agency has already defined its goals and their actions are guided by the following postulates:  

<table>
<thead>
<tr>
<th>Vision</th>
</tr>
</thead>
<tbody>
<tr>
<td>To be the ICT vanguard that enables equitable digital citizenship for all Guyanese.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our mission is to develop and implement appropriate ICT solutions that will transform the delivery of Government services.</td>
</tr>
</tbody>
</table>

Other ministries and agencies such as the Ministry for Public Health or the Ministry for Education will have to create their individual vision statements with regards to online services, if not already done.

Thereby the eGovernment Agency defines its key directions of providing digital government services as follows:

<table>
<thead>
<tr>
<th>eGovernment</th>
</tr>
</thead>
<tbody>
<tr>
<td>...the development and provisioning of online government services to the citizens and businesses. EGovernment therefore, represents a vital approach in addressing Public Sector efficiency and achieving whole-of-government collaboration in accelerating development and enhancing security nationally.</td>
</tr>
</tbody>
</table>

A well-established and functioning eGovernment system comprises the necessary infrastructure as well as a set of digital services, which are provided based on this infrastructure. The maturity of the digital services offered by the government can be assessed according to the following five phases:

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Online Information: This phase will involve simple provision of government information through electronic means. In this stage, Government organizations will be expected to be providing one-way information to their clients in a static format.

Online communication: This phase involves adding dynamic communication means to the e-Services portfolio that enable limited interaction, such as dedicated government Email, document management systems (DMS), and interactive, moderated forums for discussions, edited newsletters for specific target audiences or search facilities which cover important legislative and executive topics.

Online Interaction: In this stage, Government organizations are expected to be able to use ICT to provide some degree of online interaction with their clients. For instance, citizens can be able to enter requests, complaints, or job applications online, and expect to obtain an appropriate response. In this stage, secure transactions such as financial or confidential transactions that require a high degree of security-clearance authorization and audit capacity are not expected. However, the nature and capacity of each government organization will determine the degree of sophistication in each services provided.

Online Transaction: This stage is characterized by the provision of secure transactions with high level of authorization. Government organizations are expected to be able to provide capabilities and features that will allow clients to complete their transactions in full without the necessity of visiting Government offices. Such services may also allow the Government to function in a 24/7 mode. Typical examples may include one-stop online centers for citizens to apply for passports, permits or licenses, allowing them also to make payments online.

Collaboration: In this stage, government organizations are expected to have been well joined and working together at all levels. The achieving of this stage will allow Government clients to interact with one Government instead of individual Government organizations. This phase require collaboration to bring together suppliers, consumers and the whole government itself into a seamless network focused on increasing value creation.

The introduction of eGovernment services progresses along these phases. An e-Service and use case roadmap needs to reflect this evolution.

These e-Services will address the needs of all citizens, regardless of their location, i.e., in the hinterland, poor and remote areas as well as in the economic hotspots along the coast. Special e-Services will target hinterland and remote areas and increase the ability to communicate with the coastal areas, e.g., remote classrooms where specialized teachers are not available or Tele-Consultation for regional hospitals where healthcare experts are lacking. It should be emphasized that all e-Services provided by government agencies are essentially free of charge, especially the e-Government services use cases. Citizens do not have to own the equipment to use e-Services, but will use provided
PCs, laptops or other hardware for performing the tasks. Thus, all e-Services are independent of personal wealth or incomes, i.e., also benefit the poor communities.

The extension of reach of selected e-Services to people living abroad might be considered at a later stage.

### 3.2 House of Government-Provided e-Services

In the context of e-Service provisioning by all government agencies and ministries, a target picture of a complete service portfolio can look like Image 9 below. It comprises all necessary components for effective eGovernment and shows exemplary use cases for the domains of e-Learning, e-Health and other additional e-Services.

![Image 9: Major building blocks of the government’s e-Service portfolio](image)

**eAssistance:** Provides general information concerning the public administration or government. This includes, for instance, opening times, contact numbers, staff information, forms or general description of government agency tasks. It can also be seen as self-marketing of the institution. The advantages for citizens are service improvement (quality and cost) and reaching the agency through multiple channels.

**eAdministration:** These are the typical public administration tasks and processes that have to be done by citizens or businesses. Existing processes are handled digitally and possibly through a well-defined electronic workflow with minimal personal face-to-face visits. Examples include applications for all kinds of government issued licenses, electronic censuses, application for social welfare, registration in a new community, or electronic tax declaration.

**eParticipation:** This e-Service domain comprises online surveys to include the citizens and enterprise in the political process, eCommunities (electronic discussion arenas), internet petitions, or creation of government/agency wikis. Examples are the information about potholes on streets, general feedback about government performance (see: “Tell Us” project) or Q&A sessions with elected officials on government portals.
Open Government Data: All data, which is not expressly categorized as confidential, is proactively and completely published to make it accessible to other government agencies and the public. Open data enables new business models between government, citizens and businesses, but it also constitutes a major cultural and paradigm shift.

eSignature: This enabling service makes it possible to establish the identity of an individual remotely and securely. It is generally a challenge to administrations to guarantee the end beneficiary is truly the one s/he claims to be. Registered email systems or electronic national IDs with special encryption functions can serve as an electronic signature tool.

Security is a paramount guiding principle which also needs to extend into the digital domain. This can be achieved by adhering to the ISO 27000 guidelines and a certification process.

ePayment is needed for some of the e-Services that involve monetary transactions and generally makes handling money more secure. A collaboration with existing payment systems by commercial providers might be prudent.

A Government Service Bus connects all administrative domains and ensures the availability of relevant data to all government stakeholders. Databases need to be harmonized and every citizen and business needs to be identifiable by a unique ID, e.g., the social security number or tax ID.

E-Learning, e-Health and additional e-Services are offered by ministries and agencies on top of the government ICT infrastructure.

3.3 Stakeholders and Governance

The Information and Communication Technologies have facilitated the design of solutions to deliver government services for social development at the doorstep of rural poor. Understanding the stakeholders and their needs are essential to deploy the right e-Services.

The stakeholder can be clustered along the building blocks that define sustainable ICT Services.

All stakeholders that have interest in using e-Services have expressed their needs for basic communication. Beside these generic interests a detailed look along the building blocks reveal the following interest and needs:
Technical Stakeholders, e.g. Operators like Digicel and GTT+: can provide platform services for eGovernment services. EGovernment Agency can license either the complete platform and operate it then on their own premises or just use a with label version of the service provided by the stakeholder.

Legal and Regulatory Stakeholders, e.g. Ministry of Telecommunication: has needs for services in the field of collaboration, document management and dissemination of information.

Financial Stakeholders, e.g. UNDP and IDB: have interest in deploying services that increase the wealth especially in disfavored regions of the country. This might include, besides the above mentioned basic communication services, services that foster the development of local business in these remote areas.

Services/Use Cases Stakeholders, e.g. Ministries and UN agencies like PAHO and FAO: beside the needs for basic communication services, e-Services that are more sophisticated are needed esp. for ministries (like document management, passport application)

Partners, like foundations, NGOs and companies that provide Corporate Social Responsibility Programs: They can be a source for cheap licenses e.g. for e-learning tools.

Business Model stakeholders (e.g. Toshao, community head) hold in many cases the sole rights to grant access to the respective communities and hence deployment of ICT-infrastructure and provision of e-Services depends on their consent. Early involvement of them in the planning of the ICT network and decision making process is crucial. In addition protecting the installation of infrastructure in the hinterland and remote areas is achieved best by creating a feeling of "ownership" or responsibility for the hardware/infrastructure deployed locally. These local “owners” shall be members of the respective communities, ideally with a strong standing. They are also essential multipliers in regards to the adoption and acceptance of ICT services especially in remote areas.

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Setting the right ownership and responsibilities when operating e-Services is of great importance. The eGovernment Agency is the catalyst for e-Service introduction, but also serves the role of gatekeeper and organizer of agency cooperation. It needs to oversee, steer and streamline all efforts towards e-Services, however leaving enough room for individual agencies to pursue important special projects by themselves. Generally, all applications shall be hosted by the eGovernment Agency. However, in specific cases each of the Ministries or Agencies can host and operate the applications itself. The eGovernment Agency should target to host and support about 80% of the services offered online.

3.4 Guiding Principles

Guiding principles for developing eGovernment initiatives and services should be chosen to complement the eGovernment vision “To be the ICT vanguard that enables equitable digital citizenship for all Guyanese.” In general, these guiding principles can be identified as:
1. **Service Innovation**: The use of eGovernment must be geared towards introducing new work methods by conceiving new operational processes and changing current processes, as well as by changing the Government’s relationship with the public.

2. **Equal Access**: The implementation of ICT in government processes must ensure that all citizens will have equal access; for this purpose, factors such as geographic location, the issue of time, and diversity must be taken into account.

3. **Ease of Use**: Applications that are to be implemented must be oriented towards citizens and, hence, be user friendly. Requires: providing user-friendly Citizen-Care and Business-Centric services for all.

4. **Security and Privacy**: When implementing applications, consideration should be given on using security and privacy mechanisms to ensure the proper use and handling of personal information and transactions.

5. **Partnership and Outsourcing**: The private sector can assist the State in providing eGovernment solutions, as well as in training government employees.

6. **Interoperability**: Each government department will be responsible for maintaining its electronic services and data sets, as well as for ensuring that newly implemented systems leverage existing systems and aligned with eGovernment Agency guidelines and standards set.

7. **Involvement of All Stakeholders**: Applications should ensure that the benefits obtained by citizens from using eGovernment services will be greater than those from visiting government offices in person. Thus, eGovernment investments need to be justifiable in terms of how they help citizens and taxpayers.
4. Description of Selected e-Services

This chapter describes those e-Services in more detail, which are considered fundamental in addressing the needs of hinterland and remote communities as outlined in Chapter 2, namely e-Learning, e-Health and e-Government services. Special emphasis is given to e-Learning as it is considered as the underpinning of all activities and the platforms can be leveraged in other government domains. For every e-Service, there are proposed use cases, which were selected according to the previous needs analysis.

Furthermore, a few additional e-Services are being addressed which can be offered to the Guyanese public, but are not regarded as essential from the start of the program.

4.1 E-Learning – Engaging Teachers and Students Remotely

This section describes the reasons for developing e-Learning and shows when e-Learning is preferred over classroom instruction. It outlines challenges and solutions for the special context of hinterland and remote communities. Further, case studies are given and specific use cases proposed which fit into the Guyanese context.

4.1.1 Overview and Definitions

Many organizations and institutions are using e-Learning because it can be as effective as traditional training at a lower cost. Developing e-learning is more expensive than preparing classroom materials and training the trainers, especially if multimedia or highly interactive methods are used. However, delivery costs for e-learning (including costs of web servers and technical support) are considerably lower than those for classroom facilities, instructor time, participants’ travel and job time lost to attend classroom sessions.

Moreover, e-learning reaches a wider target audience by engaging learners who have difficulty attending conventional classroom training because they are:

- geographically dispersed with limited time and/or resources to travel
- busy with work or family commitments which do not allow them to attend courses on specific dates with a fixed schedule
- located in conflict and post-conflict areas and restricted in their mobility because of security reasons
- limited from participating in classroom sessions because of cultural or religious beliefs
- facing difficulties with real-time communication (e.g. foreign language learners or very shy learners)

E-learning can offer effective instructional methods, such as practicing with associated feedback, combining collaboration activities with self-paced study, personalizing learning paths based on learners’ needs and using simulation and games. Further, all learners receive the same quality of instruction because there is no dependence on a specific instructor.

E-Learning in this document is defined as follows:

E-Learning can be defined as the use of computer and Internet technologies to deliver a broad array of solutions to enable learning and improve performance.

This definition caters to a wide audience, since an integration of all relevant stakeholders in a national e-Learning strategy is recommended. For example, sharing an e-Learning platform developed by the Ministry of Education also
with the Ministry of Health to provide health-related trainings leads to overall synergies and reduction of double-work for the government ministries.

Further, e-Learning on a national scale should not be restricted to students in K-8 or K-12 schools alone, but be open to adult learners also. This broadens the uses for an e-Learning platform to external development partners as well, such as FAO, PAHO or UNDP, to provide assistance to remote communities.

Some questions to ask when choosing among e-learning, face-to-face instruction or other types of informal or on-the-job learning include:

- What is the relative cost of each type of training?
- Is learning best delivered in one unit or spread out over time?
- Does it address a short-term or a long-term learning need?
- Do participants have access to needed computer and communications equipment?
- Are participants sufficiently self-motivated for e-learning or self-study modes of learning?
- Do target participants’ time schedules and geographic locations enable classroom-based learning or other types of synchronous learning?

In general, e-Learning is preferred over other forms of instruction (e.g., in-class learning) when the following elements are given:

- there is a significant amount of content to be delivered to a large number of learners
- learners come from geographically dispersed locations
- learners have limited mobility
- learners have limited daily time to devote to learning
- learners do not have effective listening and reading skills
- learners have at least basic computer and Internet skills
- training aims to build cognitive skills rather than psychomotor skills

E-Learning is not ideal for all learning purposes, so it will most likely not replace in-class instruction completely. However, if e-Learning is used to complement traditional teaching and training to reach more learners, a good balance between cost and impact can be achieved.

4.1.2 Challenges in Hinterland, Poor and Remote Schools

The challenges that hinder educational research in the rural schools include the following:

- **Insufficient educational material**: The educators feel the material they have available for educational research is insufficient. For instance, a school has no videos, televisions, or enough books to support educational research. Moreover, relying on parents is limiting, as this depends on what they know or have experienced.

- **No library**: There is no library that serves any of the schools in the area, which the teachers emphasize as a negative characteristic of most rural schools. The limited numbers of books they have are often packed in boxes in the staff rooms, which the students are unable to easily access.

- **Challenges associated with computer reliability**: Internet access was unavailable at a school for a number of months. The teachers at the school felt this was a challenge as they were unable to use online material (usually accessed via the Google search engine) to support the learning
process, which they had become dependent on. Furthermore, some computers do not work, often freeze, or are too slow.

- **No computer room at School A**: Currently, the computers at a school are kept in the staff room. The staff room is the only secure room in the school, and consequently teachers are unable to teach computer literacy to a whole class. Often, only a small group of students can enter the staff room to do occasional research for the class, with the teacher’s supervision. One solution would be to raise funds to secure one of the classrooms at the school, for future computer literacy training.

- **Plagiarism**: Students who use the internet to research often plagiarize their findings. The teachers do not know how to handle or deal with plagiarism in the school. They appreciate the resourcefulness of the Internet, but plagiarism influences their confidence in encouraging their students to use the Internet for their research.

- **Slow delivery of textbooks and books**: The schools often make orders for books and textbooks from bookshops, through the Ministry of Education (MoE). However, the bookshops often fail to deliver, and the MoE is expected to make a follow-up, which hardly occurs. There may be a lack of communication to follow-up on rural school orders, or an approach for responsible officials to account for the orders. On the other hand, the interviewee felt that the delivery of textbooks had actually improved, as a delivery is made at the end of each year. It is the responsibility of teachers to travel all the way to the next big town to collect textbooks, which proves to be a challenge with limited transport available.

### 4.1.3 Customization Strategy based on Hinterland Village Context

The special context of hinterland and remote communities demands a review of how learning can be made more attractive, sustainable and impactful. There are a few observations, which can lead to more effective e-Learning projects; among others are the following.

- **The development of a library to serve local schools**: Currently, some schools already have libraries included in their facilities or in the village. Nevertheless, many teachers still feel the location of the libraries will pose a challenge for surrounding schools that hope to benefit from the library, because of the lengthy distance and transport limitations for students.

- **An increase in computers**: This was a recommendation made by a school, to support the introduction of computer literacy as a subject at the school. However, they are still aware that the key requirement for this is to secure a classroom that can be used.

- **Improved access to funds**: This is a recommendation from a school to improve classroom infrastructure and prepare a classroom to house computers for literacy training. Furthermore, the school management is keen to purchase new computers or apply for some through the government.

- **Use of ruggedized equipment**: for example, special laptops and PCs, projectors that can withstand the enormous climatic and other environmental stress in the interior. It is recommended to spend more on initial CAPEX than to have to replace the equipment constantly, which also leads to frustrations and demotivation of the users.

- **Simplification of software and hardware**: a software interface should be made as self-explanatory and user friendly as possible. There are specialists – user experience (UX) designers – who should be employed to tweak interfaces for kids and unskilled adult learners such that it is enjoyable to use the computers and other tools. Hardware needs to have as little interfaces as possible while still serving its function. The Apple iPhone is a good example for this minimalistic approach.

**Teacher Training**
• The duration of training should be improved: Sufficient time should be allocated to training sessions to allow teachers to understand the programs and clarify any aspects they do not understand. It was suggested that teachers should at least be provided with training over 1 or 6 months, and apply what they have learned over a longer period of time. This would be more effective than short courses, which are hurried and difficult or impossible to apply.
• Training needs to be conducted locally: Local training would support teachers significantly, as they would use the time available to clarify aspects they do not understand. It would also save on transport costs, and allow more time for teaching, as lessons do not have to be cancelled in order to attend training programs (time is spent travelling and returning from Idutywa, with limited transport availability).
• Appropriate and sufficient documentation should be provided for training programs: Training documentation provided needs to be sufficient for all teachers and easily useable by rural teachers.

4.1.4 Case Studies and Examples of e-Learning Projects

The following examples give a short overview of effective tools and projects from around the world. These can be evaluated in an implementation phase, but also show what is possible in e-Learning today.

4.1.4.1 Learning platform for K-12 Schools (Maths): Khan Academy

Khan Academy is a non-profit organization whose mission is to change education for the better by providing free world-class education to anyone, anywhere. The Khan Academy’s materials and resources are available to anyone — completely free of charge. The growing library of 3000+ videos covers a wide variety of academic topics, including math, science and the humanities. Khan Academy has received widespread media coverage and over five million students per month use the resources worldwide.

**Targeted user group:** Grades 1 – 11. However, best suited for higher grades.

**Application:** After school program (group and individual), resource for instruction during class time, computer lab hours, out-of-school program

**Teachers view functionalities (image 1):**

- Manage students
- Students’ progress
- Skill progress
- test preparation (e.g. MAP assessment)
- Select predefined missions (amount of exercises and videos for specific levels)

**Student’s functionalities (image 2):**

- Dashboard (see their progress, their missions/tasks)
- Video learning
- Exercises

**Subjects:**

- Math
- Science & engineering
- Computing
- Arts & humanities
• Economics & finance
• Test prep

Success factors:
• Get teachers on board
• Align the curriculum to the predefined content and learning concept
• Get students motivated
• Basic ICT skills of teachers and students

Estimated time to implement:
• Easy to implement because it is a web based solution.

Needed ICT connectivity: The material is available offline, so you do not need internet connection, you can still proceed with the program if the internet is down (KA Lite - Running KA Lite as a local server, you can watch Khan Academy videos, do Khan exercises, and track student progress -- all without needing an Internet connection)

Challenges:
• Predefined maths concept need to be understand and aligned with the curriculum

Image 11: Kahn Academy – Teachers View
4.1.4.2 Gamification: Play2Learn by BlazingSoft

Play2Learn\textsuperscript{15} is an educational game platform that is a supplement to improve students' early academic experience. This platform utilizes an interactive 3D role-playing game that teaches, reviews and assesses the student's curriculum materials. Using role-playing game, unlike competitors, connects all curricula together to effectively promote overall interest rather than having only 1-2 favorite games that keep a student interested in particular topics. The game is designed to encourage high academic performance by offering in-game rewards that enhance game play after successful completion of curriculum modules.

**Targeted user group:** Grades 1 – 11. However, better suited to students with affinity to computer gaming.

**Application:** After school program (group and individual), resource for instruction during class time, computer lab hours, out-of-school program

**Teachers view functionalities (image 1):**

- analytics, such as graphs, charts, percentages, and values, for students' academic progress
- average academic performance of the class
- Teacher can create exercises on their own.
- Customize lesson plans
- Prepare homework and tests

**Student’s functionalities (image 2):**

- spotlights different mini-games that are creatively designed to teach a student through exploration, puzzles, and in-game interactions

\textsuperscript{15} Source: http://blazingsoft.com/en/
• students are instantly rewarded for solving academic problems, which are cleverly integrated into the game, with points and items

Subjects:
All the content is in Spanish and is included with the platform. English’s educational content is charged separately in case of being needed.
• Science
• Social studies
• Language (Spanish)
• Math

Success factors:
• Get teachers on board
• Align the curriculum to the predefined content and learning concept
• Get students motivated
• Basic ICT skills of teachers and students

Estimated time to implement: depends on desired functionality. Initial setup can be done within a few days. Demo version accessible immediately online.

Needed ICT connectivity (see image 3): Low-bandwidth Internet connection once needed for log-in. Afterwards stand-alone operation is possible. Teacher updates to curriculum can be done immediately if student online, or else once Internet connection is available again.

Challenges:
• Creating the content
• Older students might not be addressed by the kind of the game
• ICT skills (students+ teacher)

Server requirements:
• Operating system: Ubuntu Server
• Web Server Ngix
• Database: PostgreSQL. Can be run on an external server.
• Python 3.5
• Platform Play2Learn web

Play2Learn Platform: Django 1.8, Gunicorn

Client computer minimum requirements:
• Windows 7 (x32 or x64)
• Dual core processor 1.6GHz or similar
• 2GB available hard disk space
• 3GB RAM
• Screen resolution: 1366x768
• Graphics card HD Graphics 4400 or similar
<table>
<thead>
<tr>
<th>Login</th>
<th>Academic Content Index</th>
<th>SAVE GAME</th>
<th>Activities</th>
<th>Question without Images</th>
<th>Question with Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP</td>
<td>2 KB</td>
<td>1 KB</td>
<td>50 KB</td>
<td>1 KB</td>
<td>1 KB</td>
</tr>
<tr>
<td>DOWN</td>
<td>45 KB</td>
<td>150 KB</td>
<td>1 KB</td>
<td>50 KB</td>
<td>1 KB</td>
</tr>
<tr>
<td>TIMES</td>
<td>1</td>
<td>1</td>
<td>Every [1-5 min]</td>
<td>Every [5-30 sec] in Question Mode</td>
<td>Every [5-30 sec] in Question Mode</td>
</tr>
</tbody>
</table>

**Question Mode**

Solve 10 academic questions. Usually you enter in this mode every [5-15 min].

Table 4: Play2Learn – Network requirements (Download Rates)

**Image 13**: Play2Learn - List of tasks to be accomplished. Every task represents a learning exercise.

**Image 14**: Play2Learn scorebook – Learning progress is represented by gold coins.
4.1.4.3 Mobile Learning (Literacy): Yoza Cellphone Stories

The Yoza Project, originally known as m4Lit (mobile phones for literacy), set out to explore the viability of using mobile phones to support reading and writing by youth in South Africa (SA).

**Targeted user group:** Students at all levels

**Goal of project:**
- Yoza enables reading, writing and engagement via mobile phones
- Short stories and classic literature are published on mobile phones (MXit and on a mobisite)
- Highly interactive: users can comment, vote, enter writing competitions, review stories
- Started in South Africa, initially funded by the Shuttleworth Foundation

**Why?**
- 51% of South African households own no leisure books
- 7% of public schools in South Africa have functional libraries of any kind
- High uptake of phones – up to 90-100% amongst urban youth ... with about 70% internet-capable handsets
- South Africa has excellent mobile infrastructure and coverage
- Relatively low charges for mobile data (but expensive voice and SMS charges)
- A common complaint: “teens don’t read and write enough, teens love their mobile phones” -- so make phones part of the solution!

**Project owner or sponsor:** Shuttleworth Foundation

**First story**
- Workshopped with teens – it’s gotta be “real and relevant” for them
- Published on a mobisite with no marketing – very little uptake
- Published on MXit with Tradepost messages and Splash Screens – 63000 subscribers in a month!
- English and isiXhosa ... most reads were in English

**Yoza today**
- 28 m-novels
• 5 Shakespeare plays
• 11 poems
• Genres include teen issues, romance, soccer, adventure, “classics” such as Shakespeare, poetry
• Some stories are serialized (a chapter a day) and every chapter of every story has a comment prompt or vote prompt
• Stories found in English, Afrikaans and isiXhosa
• Stories are free but costs for mobile data (about 1c US per chapter)
• On MXit all comments are moderated before going live

Yoza stats (from August 2010 to August 2011)
• Complete reads of m-novels, stories and poems: 300,000
• No. of comments: 40,000
• No. of unique visitors: >145,000
• No. of MXit subscribers to Yoza: 69,000
• No. of page views: >5,400,000
• No. of votes: >44,000
• No. of competition entries: >8,500

Technical realization:
The content is free; the only charge is for the data transfer of the content paid to your service provider. On a mobile phone that costs between 5c and 9c per chapter (South African Rands). Note: Cell C customers in South Africa do not pay any data charges when accessing Yoza on MXit.

Image 16: Yoza content on MXit social network (left) and on a mobisite (right)

4.1.4.4 In-Classroom Teacher Support: CyberSmart Africa
CyberSmart Africa, a digital learning social enterprise, has been working with The Earth Institute and teachers and students in Potou, Senegal since 2011 to actively test and refine a whole-classroom learning technology solution that has the potential to achieve massive scale throughout sub-Saharan Africa. Practiced in Poutou Elementary School, and in eight other Senegalese elementary and middle schools over time
Goal of the project:

- Delivering previously unavailable instructional materials — maps, photos, videos and up-to-date quality content—to directly support classroom learning.
- Addressing the needs of the 80% of schools in sub-Saharan Africa without electricity and the millions of children that need to be educated.

Target Group:

- Primary/secondary school students

Technical realization:

- A complete system, the CyberSmart Learning Platform includes an Android computer, an energy-efficient super-bright projector, interactive whiteboard capabilities, solar rechargeable batteries, speakers loud enough for classroom use, advanced 3-D capability, cooling fans, and a unique dust filtration system, quality learning content, and ongoing teacher training.

Key features of the CyberSmart Learning Platform:

- operates without wires or the need to connect to the internet
- lightweight and portable between classrooms
- consumes very little power and integrates a solar-chargeable battery
- heat and dust resistant
- interactive whiteboard capability
- can share content with smartphones and tablets

Financials:

- Estimation: Designed for massive scale, we estimate that the cost can be as low as $US1 per student/month.

References:

https://www.wise-qatar.org/edhub/cybersmart-africa
http://csd.columbia.edu/2015/01/20/the-grassroots-rise-of-a-new-learning-technology/
http://mcneilfoundation.org/digital-learning-in-potou-senegal/
Image 17: Using multimedia to separate domestic from wild animals

Image 18: It is easy and practical to annotate over a scanned textbook, in this case for reading instruction
4.1.4.5 Remote Classroom Training with a Live Instructor over the Internet

Echo360 is a lecture capture and personal capture solution used at many universities. Using this service, instructors can capture audio, video, and content in classrooms or on personal computers, and then distribute that content on the web or in Canvas. It is also possible to stream the lecture in real-time on the Internet while a teacher holds the lecture in front of an audience.

Goal of the project, e.g. at Indiana University:

- Give Students Access to Echo360 Recordings through Moodle
- With classroom-based capture, you have the option to record activities on your computer desktop; room/system audio, including your voice; documents via a document camera; media playing through the classroom audio/visual rack; video of you, the lecturer.

Target Group: remote students taking the class

Technical realization:

- Personal Capture Software:
  - Software application that can be installed on Windows 7, Windows 8 and Mac OS X 10.7 and above.
  - This software application allows instructors to record audio, webcam video and screen sharing video.
  - Screen sharing video captures the movements and activities on an instructor’s computer.
- Lecture Capture Classroom:
  - This is a classroom that has been equipped with special hardware to accommodate the digital capture of an instructor-led class.
  - The classroom includes an installation of the Echo 360 Personal Capture Software on the podium computer, along with special microphones and cameras to record the faculty member and any materials displayed through the projector.

Key features of Echo360 (students view):

- You can access recordings through the Echo Center, either using a direct link provided by your instructor or through the Echo360 tool in Canvas.
- Echo360 recordings are retained for one year.
- All recordings are available for download at any time during this one-year period, if permitted by the instructor.

While viewing a presentation or watching a video, there are several tools that students can use when they access the classroom toolbar.

- Asking questions
- Responding to questions
- Bookmark content
- Flag content as confusing

Key features of Echo360 (teachers view):

- Editing: Browser-based editor supporting the editing.
- Instructor Dashboard (Analytics of behavior of their students)
- Echo Lecture Capture (Classroom Computer) and Echo Personal Capture (Your Computer) available
- Integrate classroom activities
A study conducted by the solution provider shows the following interests and applications for using the solution:

<table>
<thead>
<tr>
<th>Item</th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
<th>% A&amp;SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1.3 Revise and prepare for examination</td>
<td>5</td>
<td>2</td>
<td>24</td>
<td>119</td>
<td>94</td>
<td>87.3</td>
</tr>
<tr>
<td>A.1.2 Replay and revise key concepts</td>
<td>4</td>
<td>7</td>
<td>22</td>
<td>136</td>
<td>75</td>
<td>86.5</td>
</tr>
<tr>
<td>A1.4 Gather information for assignments</td>
<td>2</td>
<td>4</td>
<td>36</td>
<td>130</td>
<td>72</td>
<td>82.8</td>
</tr>
<tr>
<td>A1.1 Revise notes that were made in classes</td>
<td>5</td>
<td>9</td>
<td>29</td>
<td>135</td>
<td>67</td>
<td>82.8</td>
</tr>
<tr>
<td>A1.6 Cover-up for missed lectures due to other commitments</td>
<td>12</td>
<td>14</td>
<td>43</td>
<td>79</td>
<td>96</td>
<td>71.7</td>
</tr>
<tr>
<td>A1.5 As an alternative to traditional physical lecture attendance</td>
<td>18</td>
<td>15</td>
<td>48</td>
<td>89</td>
<td>74</td>
<td>66.8</td>
</tr>
<tr>
<td>A1.8 Collect feedback given by lecturers on assessments</td>
<td>12</td>
<td>27</td>
<td>63</td>
<td>89</td>
<td>53</td>
<td>58.2</td>
</tr>
<tr>
<td>A1.7 Acquire presentation skills</td>
<td>12</td>
<td>43</td>
<td>79</td>
<td>73</td>
<td>37</td>
<td>45.1</td>
</tr>
<tr>
<td>A1.9 Want to experience what a real class feels like</td>
<td>28</td>
<td>31</td>
<td>95</td>
<td>57</td>
<td>33</td>
<td>36.9</td>
</tr>
</tbody>
</table>

SD = strong disagree, D = disagree; N = neither agree nor disagree; A = agree; SA = strongly agree; %A&SA = total percentage of agree and strongly agree

Image 19: Usage scenarios for Echo360 Remote Classroom

Image 20: Echo360 - Recordings are available on demand
<table>
<thead>
<tr>
<th>Segment</th>
<th>Use Case</th>
<th>Echo360 PRO</th>
<th>Echo360 POD</th>
<th>Classroom Capture</th>
<th>Personal Capture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture Hall</td>
<td>- Large Lecture Hall&lt;br&gt;- Projector + PC + HD camera(s)&lt;br&gt;- Complex AV equipment (switching/audio)&lt;br&gt;- 2 or more inputs, live streaming required&lt;br&gt;- Fully scheduled capture typically</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Smart Classroom</td>
<td>- Medium sized lecture hall / large classroom&lt;br&gt;- Projector + PC in room + Digital Camera&lt;br&gt;- 1 or 2 inputs, live webcasting required&lt;br&gt;- Ad-hoc or scheduled capture equally used</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Standard Classroom</td>
<td>- Small classroom&lt;br&gt;- Projector in room, no fixed PC or Camera&lt;br&gt;- 1 Laptop input typically&lt;br&gt;- Ad-Hoc capture typically</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>●</td>
</tr>
</tbody>
</table>

Image 21: Echo360 Analytics Dashboard

Image 22: Echo360 – Selection criteria for the capture hardware

References:
http://www.ascilite.org/conferences/sydney13/program/papers/Fei.pdf
http://blog.echo360.com/echo360-solutions-for-every-classroom-learning-situation-and-budget

17 Legend: ● = primary usecase; ◼=supported usecase, ○=unsupported usecase
4.1.5 Proposed Use Cases for e-Learning in Guyana

The following use cases have been chosen based on the needs expressed by individuals and institutions as outlined in Chapter 2.1. A use case describes the general and abstract concept of the solution without elaborating the detailed implementation or operational aspects of the final e-Service.

4.1.5.1 Teacher support

The most effective way to bolster the educational system of a nation is to support its teachers appropriately. The Guyanese government has recognized this and the “One Laptop per Teacher” program has been started. These laptops already come with a slew of different materials, such as curriculum ideas, governmental forms and electronic textbooks. However, this material is static in nature and there is no means of updating it. A much more flexible way of supporting teachers can be delivered online through specialized learning management applications (LMS), the availability of special support forums for knowledge exchange and mutual support and the subsequent use of electronic media in the classroom.

Learning Management System (LMS)

An LMS is an essential tool for e-Learning professionals and it provides a dynamic and flexible learning platform to be used by both the teacher and the student. It holds learning materials such as textbooks, tracks a student’s progress or provides completely online courses, which can be taken by the student independently. There can also be curriculum examples, blogs, textbooks, online chat between teachers and other modules added to a flexible LMS. The most prominent Open Source LMS is by far Moodle, while SAP SuccessFactors is a good choice for a paid software. The vendor selection should be executed carefully with a good analysis of what the real needs are.

With regards to learning in native indigenous languages, special focus should be laid on the possibility of localization of the LMS. This enables all software menus, descriptions and manuals to be used by indigenous people and thus preserve their culture and heritage. The same holds true also for the other learning tools later in this chapter.

In-classroom electronic learning aids

Some learning topics are very conducive to electronic equipment in the classroom, e.g., geography or music, and they would make learning much more enjoyable for the children. For example, a simple PC with a projector can be used very flexibly to illustrate various topics. A class clicker (even when used on a smartphone) can give valuable feedback if a topic has been understood by most or not. Especially in combination with real-time online access to learning materials (incl. multimedia content), these tools can be a big help to teachers.

4.1.5.2 Individual Student Learning

In the case of hinterland and remote schools where special subject teachers are very few, students can engage in direct learning with special subject-based applications or gamification platforms that convey specialized knowledge. In addition, these systems are useful when topics need to be re-learned or a student has special needs, which cannot be satisfied in the regular classroom interactions. The demand from MoE and other Guyanese institutions has been uttered. Applications and online services such as Khan Academy, Play2Learn, SuccessMaker, Apple iTunes-U, Coursera, MOOCs like MIT’s OpenCourseware or MITx via EdX and other tools and platforms need to be available via online connections to be most effective.

Image 23 outlines how a remote learning system can work which is based on pre-recorded and even externally supplied content. Teachers or specialized editors populated the content management system (mostly an LMS) with training lessons while students take the lessons at their own pace. A monitoring function tracks student progress and informs teachers which students still need additional attention.
Another aspect of individual student learning is access to knowledge databases for research tasks. This should be distinguished from Internet access and Google searches in that very specific databases can be queried. This is especially true for specialized fields like medicine, law or business topics. Appropriate databases can be hosted in local datacenters and offered on the eGovernment Network for free.

### 4.1.5.3 School management application

The hinterland and remote primary and secondary schools are located far away from Georgetown and are hard to reach with long car rides or taking plane trips. Still, there is a need to track and control these schools to elevate them to a standardized school system and curriculum. The national school authority needs a reliable way to communicate with the interior school staff and exercise steering control. Thus, an application which makes it possible to chat with
teachers and administrative staff (either text chat or video), gives remote access to schools attendance records and other school statistics, helps in class schedule preparation, and can track school inventory would be a very helpful service. Image 24 below shows a high-level interaction diagram for a possible service. These are by far not all needed or possible support tasks and only a detailed analysis by the Ministry of Education and related stakeholders can reveal the requirements of a school management platform.

Image 24: School management system – Tracking & reporting of administrative school events and statistics

### 4.1.5.4 Remote Classroom

When there is a shortage of teachers for a certain subject, it is very useful to multiply a teacher’s impact via real-time tele-education. This is the case for remote classroom, where a single class is recorded in one location and transmitted to multiple locations in real-time. In this classroom-based training with a live instructor over the Internet the students get to:

- Participate in class from anywhere in the world with a compatible computer and reliable access to the Internet
- Interact with the instructor and other students through a virtual classroom interface
- Perform course lab exercises through the remote classroom software environment
- Receive world-class training courseware when partnering with other institutions

The ways in which schools are leveraging synchronous remote classroom technologies are expanding every day. Popular tools like Skype and Google Hangouts are increasingly being employed to bring students, guest lecturers, panel participants, and others into the physical or online classroom. There are also a growing number of education-specific apps like WizIQ and e-Lecta to facilitate virtual classroom participation. Web-based audio or video conferencing apps enable this functionality, and options like chat, online whiteboards, and file sharing can enhance the experience. However, for rendering a professional service, an advanced recording and streaming system with

18 http://www.emergingedtech.com/2013/04/applications-to-facilitate-synchronous-remote-classroom-participation/
hardware-supported video stream generation is indispensable. The Echo360 (see case study in Section 4.1.4.5) or other commercial products are more expensive initially, but will deliver great results, be easy to install and handle and save costs in the long term.

Image 25 outlines the general idea of a remote synchronous classroom: a teacher holds a lecture in front of an audience while the recording is being shared in real-time with remote students. Image 26 shows a real-life setup including the specially equipped classroom (multiple video cameras, special lighting, large-screen TV and neutral background walls) as well as the editing workplace where the video stream is generated and sent out.

These systems should not only be used by the Ministry of Education, but also by any other government agency, which has the need for remote education. For instance, the Ministry of Public Health could leverage this tool to launch nurse training programs. This has to be taken into account when designing the systems requirements.

Another use case for this application is the integration into training and information activities in relation to the Amerindian Land Titling Project: briefing and information sessions can be recorded and distributed to multiple indigenous communities at the same time.
Teachers can and need to be trained as well, e.g., in regards to updates and changes in the curriculum. The “one laptop per teacher project” can help teachers to get access to dedicated trainings provided by the Ministry of Education. This training content can be provided on demand and / or in real time (broadcasted) via the eGovernment network.

**Image 26: Remote synchronous classroom – A technician records a live lecture and streams it online**

**WizIQ**

WizIQ is a widely used application for learning and teaching online. With WizIQ, you can take or attend online classes from your home, office, Internet café, library, or even while traveling. It is a powerful tool for collaborative online learning and teaching. People can also use WizIQ smart phones and tablets devices. WizIQ enables synchronous distance learning with tools like real-time virtual classrooms with multi-way audio, multiple live video streams, integrated chat, online whiteboard, application sharing, breakout rooms, and more.

**e-Lecta Live**

e-Lecta Live is also used to carry out remote participation and collaboration solution for online teaching session. e-Lecta Live offers features including whiteboards, video, presentations, text chat, screen and files shares, and it has smart phone tablets support. The software offers a teaching environment that is led and managed by the instructor. e-Lecta Live is especially designed for online universities and schools to manage multiple teachers for hours, to take more than one class in the same time and control students activity. Their ‘benefits’ page suggests various approaches to leveraging the functionality the application offers.

**Source:** CAETE classroom and technical supervision desk at University of Colorado at Boulder

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19 Source: CAETE classroom and technical supervision desk at University of Colorado at Boulder
4.1.6 Potential for Collaboration and Partnerships with Private Sector

It is important to recognize that E-Learning development and delivery are best carried out collaboratively, involving interdisciplinary teams across institutions and at a later stage even countries. There should be adequate recognition and incentives for faculty and institutions to engage in the collaborative design and development of E-Learning services and content.

To promote e-Learning the government of Guyana focuses on the development of a national infrastructure on open knowledge resources. Activities, platforms and services are funded by the government and organizations that are part of the knowledge and education infrastructure as well as by independent NGOs. They serve a social mission, and the proposed structure is seen as an effective and efficient way to serve society. After initial transition costs, the revenues are related to better education for people in hinterland, poor and remote communities especially for second and tertiary education. In the long run better education will contribute to more new businesses and overall economic growth.

Image 27: Business model for E-Learning in Guyana

There is broad potential for collaboration and partnerships with the private sector:

- Educational Institutions

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Educational institutions are the essential resources for the provision and development of educational content. In Guyana, this refers specially to the Ministry of Education and the NCERD – National Center for Educational Resource Development, which is tasked with finding new ways of conveying learning content, among others also fostering the use of ICT in schools and the ministry itself. Furthermore, in the development of content and E-Learning curricula teachers and head teachers of the different regions of Guyana should be involved. Furthermore, any institutions with special knowledge for a specific sector is a relevant stakeholder in the provision of E-Learning content.

International partnerships with educational institutions such as trainings centers and universities shall be established to enrich the content available for e-Learning. Especially for further training after secondary education, synergies can be realized with such partnerships. Access to digital libraries and research centers facilitate education in special interest fields. A partnership with international universities and research centers can become more appealing if joint research programs are used as incentive (e.g. support international research programs on environmental protection / socioeconomic studies / cultural and linguistic studies of the Amerindian culture in Guyana). What is more is that international educational institutions can share their experience with E-Learning systems with the Government of Guyana and thus speed up the introduction of successful E-Learning Services.

- International private sector companies

International private companies can have multifold interests in a collaboration in the field of E-Learning. The major motivation is corporate social responsibility (CSR) programs. Their contribution can consist in the funding of financial resources, provisioning of devices, provisioning of software or maintenance of platforms. For example, Microsoft’s CSR program includes the Microsoft Affordable Access Initiative. The initiative aims to empower the billions of people worldwide who do not have affordable access to the Internet through partnerships, grants, investments, education, and advocacy—to create technology solutions, business models, and policies that help close the digital divide.  

![Image 28: Microsoft corporate social responsibility program: Affordable Access Initiative](https://www.microsoft.com/en-us/affordable-access-initiative/home/)

IBM for example is according to its CSR strategy dedicated to helping further education and workforce development through programs created to assist [...] teachers and students. IBM’s STEM-program has the aim to help teachers teach and students learn:

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“The first letter of “STEM” stands for “science,” yet far too few teachers are prepared to teach it effectively — particularly in the earlier grades. That is why IBM created Teachers TryScience, a global resource for science lessons and support for front-line educators. The Teachers TryScience website offers 589 lessons in 15 languages (including 116 new lessons in four new languages added in 2015 alone), along with 69 pedagogical videos and tutorials. IBM developed each resource in collaboration with master science teachers.

The program made an especially strong impact in Southeast Asia and sub-Saharan Africa in 2015. In Vietnam, the website proved so effective that the Sóc Sơn district in Hanoi integrated Teachers TryScience’s lessons and active learning methodologies into the official secondary school curriculum. And in Kenya, IBM established a partnership with the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA) — the Ministry of Education’s professional development agency for STEM teachers — to train 100 education leaders from urban, rural and arid regions how to integrate Teachers TryScience into their classrooms. This effort helped engage nearly 15,000 students throughout 2015. In 2016, CEMASTEA and IBM plan to train 200 educators in 10 counties — part of a three-year rollout of Teachers TryScience in Kenya. Teacher Advisor, Powered by IBM Watson was created by teachers, for teachers. Now in development, it will serve as a virtual mentor to educators. Teacher Advisor will help teachers enhance their content knowledge, strengthen their lesson-planning skills and improve their overall instructional practice. Best of all, it will be available whenever a teacher needs it — discreetly, confidentially and totally free. Teacher Advisor will launch as a pilot in August 2016, and will be available to all teachers during the 2016 — 17 school year.”

Samsung has a dedicated Smart School initiative aiming to bring digital classrooms to schools all over the world in order to bridge the digital divide. In 2015 Samsung rolled out the program in North Ruimveldt Multilateral Secondary school in Guyana. The program let some 120 students benefit from an e-learning experience. CSR also is an important building block of Google’s corporate strategy, Google supports a broad variety of programs all over the world amongst others the “Equal Opportunities Schools” and the “Get Schooled platform”, an online hub that will provide free college prep information on scholarships, standardized tests, class requirements, and other academic milestones, and the Khan Academy. SAP donates hardware (laptops and tablets) to charitable organizations and selected markets as one part of the CSR program. Cisco does also support multiple initiatives all over the world with expertise, technology, and financial resources. Cisco’s CSR programs focus on access to education, connected health care, economic empowerment, and disaster relief. Oracle focuses on the support of education: The Oracle Education

$13m 133k 30k+
Awards and engagement programs in more than 20 countries
IBM Bluemix development platform codes issued to faculty and students
Emerging innovators engaged by IBM’s developer skills program

Image 29: IBM corporate social responsibility program: University Relations


24 http://go.sap.com/about/social-responsibility.html

Foundation\(^{26}\) is a non-profit organization funded by Oracle to support education starting with hardware donations to US-schools and now providing online learning platforms amongst others. The Raspberry Pi Foundation\(^{27}\) is a UK-based non-profit organization that aims to provide low-cost, high-performance computers as well as education in computing to people all over the world.

- **NGOs**
  Additional collaborations with NGOs can be beneficial in terms of funding as well as knowledge transfer. UNDP and IDB are active supporters of the development of Guyana. UNESCO is another important institution to collaborate with especially in the field of education, as the Government of Guyana can benefit from the experiences and learnings of projects to build E-Learning Services in different countries all over the world.

### 4.1.7 Recommendation for Next Steps to Create an e-Learning Program

The most important goal of any e-Learning initiative is to benefit the target audience in the long-term, i.e., to be successful. There are three essential requirements for making e-Learning initiatives successful:

- **Effective leadership and governance** (educator-led programs);
- **High standards of quality assurance**; and
- **Sufficient capability in terms of systems, people and infrastructure.**

The practical next steps have to address these points and make the initiative tangible for impacted stakeholders. Among the topics to be addressed are:

- **Creation of an** “e-Learning board” **which comprises all relevant government stakeholders. This will drive the initiative and make sure sharing of platforms can occur later.**
- **Assigning the leadership structure for the initiative and scheduling regular meetings. This will give authority to the work stream leaders and enable periodic reviews.**
- **Assessing the current processes, platforms and ongoing initiatives (as is analysis).** There are many independent (silo) efforts underway, which need to be consolidated in a first step. The drivers behind these efforts need to be part of the e-Learning board for the overall e-Learning initiative.
- **Assessment of detailed needs and requirements of the stakeholders in the future e-Learning platform(s).**
- **Filling of appropriate positions within the eGovernment Agency and Ministry of Education.** The new hires need to be skilled and experienced enough to lead infrastructure implementation and software training efforts. Collaboration with external vendors also needs to be steered.
- **Selection of communities (schools) to be connected to the e-Learning platform(s) and start of interaction and discussion with the local leaders and educators.**
- **Tendering Phase:** writing RfP with detailed technical and procedural requirements, launching tender, evaluation of responses, negotiation with short-listed vendors, closure of contract
- **Setup of a dedicated program management office (PMO) to drive and oversee the implementation**
- **Setup of needed infrastructure centralized as well as in the respective communities.**
- **Trial runs of selected vendors’ platforms**
- **Full-scale rollout of e-Learning platform(s) in hinterland and remote communities**
- **Launch of training measures for teachers, students and administrative staff (see separate report on Capacity Building).**

\(^{26}\) [https://www.oraclefoundation.org/](https://www.oraclefoundation.org/)

\(^{27}\) [https://www.raspberrypi.org/about/](https://www.raspberrypi.org/about/)
• Use synergies with exiting learning platforms, e.g., the Guyana Learning Channel. Information broadcasted on that channel can be redistributed and made available as “on demand content” via the e-Learning platform.

4.1.8 Special Network and Device Requirements

There are many e-Learning settings and technologies available to use in schools, each with their own advantages and applications. Often the best solution is a combination of technologies depending on the particular need, use case and learning environment.

While broadband Internet or Intranet access is needed for effective collaboration and streaming services, there are many use cases, which can be operated stand-alone. What all of them have in common is that they rely on electronic equipment in the school itself. Following is a description of typical equipment that can be used in a classroom.

Multimedia Classroom

In a multi-media classroom, educational content is delivered to students in a one-to-many approach. This is cost efficient per pupil, and can provide a large amount of educational resources to students. Classrooms would be equipped with a projector, screen (or large LCD), speakers and a classroom computer. The teacher could display various types of content that is housed either on the classroom computer or on the teacher’s laptop or other device. The teacher would be able to adapt and project various content (e.g., videos, PowerPoint slides, augmented reality, multimedia presentations, the teacher drawing a graph, etc.). A connected classroom would have wireless or wired communications to a “cloud” of resources. The teacher would thus have access to a wide range of content from the library on the cloud. The computer housing the content could be locally based at the school (which would obviate the need for inter-school communications, and be reliable), at a district or national educational headquarters, or elsewhere.

Connected multi-media classrooms would permit distant classroom teaching, in which a teacher in one school or from a studio could deliver live, interactive lectures to classrooms in other schools. The distant classrooms would need to be outfitted with video cameras and microphones, as well as projectors and speakers, to communicate with the distant teacher.

Computer Lab

A computer lab is among the most recognizable form of e-learning technologies. A computer lab usually consists of many single personal computer stations. This is a common arrangement found in schools throughout the world. Many educational software packages available could be installed for student use. Separate stations permit individual students to move at their own pace through material. Teachers can also lead students or student teams through guided exercises, with each following on their own station. Free computer time itself is a valuable educational resource. Installing separate computers is an easy to set up, since it is simply single stations behaving independently. Computer labs can be, however, more expensive per student due to the individual computers and software licenses. They may also have higher power consumption demands, depending on the computer or device, necessitating low-cost power solutions. Multi-seat computing consists of using one powerful personal computer with extra video cards to support up to eight independent “seats” (each with its own monitor, keyboard and mouse running separately). They can be put in a computer lab for students or teachers to use, or in classrooms. There are several commercially available multi-seat operating system software options including by Microsoft and Linux. This system has the advantage of using much less power than other options. It is usually the least expensive per user as well.

Single Station, Personal Computers

Varieties of types of single station devices are available.

1) Personal computer (PC). A PC is a common approach for using computers in homes and offices. It consists minimally of a computer, one or two monitors, a keyboard and mouse. Each computer has its own operating system and software programs. From a setup and maintenance standpoint, this type of system is advantageous. It is easy to
maintain and does not generally require a specially trained computer technician to fix most hardware and software problems. However, if each student were to have a computer, this would be among the more costly options to implement, particularly in rural areas reliant on solar power. This would be useful particularly for teacher stations or single stations in the back of classrooms.

2) **Micro Computer.** A microcomputer is similar to a standard single station except that it uses a small form factor case with a generally slower processor. Power consumption can be much lower than a single station and thus suitable when power is limited. The computers are, however, difficult to repair and may be prone to theft and overheating; the lifespan of these devices is not yet known. Software maintenance is similar to a standard single station.

3) **Laptop or notebook.** Laptops and notebooks are among the easiest educational solution to set up. They usually come with software preinstalled and only a power outlet is needed to begin using the system. The power consumption is low compared to a personal computer. Hardware maintenance can be difficult, but software maintenance is standard. One of the disadvantages is product lifespan; they are easy to steal and are prone to accidents (a spill on the keyboard can easily destroy it; new rugged laptops reduce this risk). New design and battery technologies are lengthening battery life in some machines. Laptops may be an excellent solution for teachers. Teachers could bring a laptop to work from home, and then connect it to the classroom projector.

**Small, Personal Devices**

Small, personal devices such as tablets, smart phones and e-readers are similar in that they are all relatively new technologies. They are rapidly gaining popularity due to their declining price, large number of web-based software applications, powerful graphics, and enjoyment of use. Educational uses could include listening to audio lessons or audio books, gaming, watching videos, and reading. Writing is more difficult if the device does not have a keyboard. Schools and teachers can develop teaching material applications for mobile devices using existing software.

Penetration of mobile cellular Internet is rising rapidly in the Americas and other developing countries because of the availability and relatively low cost of Internet access, text and voice through cellular networks, especially compared to broadband Internet. Because of this, the World Bank, USAID and other donors are actively investigating the potential role of mobile phones and e-learning devices in education. Nevertheless, the maintenance requirements and lifespan of smart phone and other small devices in difficult environments are not yet known. Similar to laptops, they can be easily lost or stolen, and are prone to accidents. A difficulty in adapting educational software is that the various brands and styles have different operating systems and screens, and each may require separate configuration. Their batteries need to be frequently recharged, but individual external solar panels could be used.

1. **Tablet.** A tablet personal computer is similar to a laptop but with a touch screen, and often a smaller hard drive and screen. Tablets may or may not have a keyboard. A touch screen permits a new form of human-machine interaction, the uses for which are becoming increasingly apparent. As educational software is developed to take advantage of touch screens, tablets may become useful for e-learning.

2. **Mobile Phone/Smart Phone.** Today, cellular Internet coverage is often available, even in rural areas (especially compared to broadband). With the rapidly declining cost and increasing features of mobile phones, there is potential to use mobile phones as a web-based e-learning technology. They can also, for example, be used by students in the classroom as a virtual clicker (to answer questions teachers ask in class), or for games or quizzes by using text messaging interfaced to an instructor’s computer or phone. They may be used as an e-reader, or for communicating with other students or teachers.

3. **E-Readers.** E-Readers are becoming popular as a relatively low power, inexpensive replacement for traditional textbooks. Their purchase price is declining. One e-reader could contain multiple textbooks or other readings, and the content could be easily updated. E-readers often have high resolution, monochrome screens making them good for reading text but not for multimedia applications. Where books are expensive, hard to find or need to be frequently updated, e-readers may be very useful. It would be easy to upload in-class “handouts” to student e-readers as well. Copyright agreements and revenue sharing would need to be arranged with the book’s publisher.

**General Affordability Challenge and Solution Approaches**

© Detecon International GmbH

National ICT Needs Assessment Consultancy -- e-Services Readiness Assessment Report (WP3)
Broadband access requires devices capable of accessing the Internet, ranging from computers supplemented with a modem (called USB modem, dongle, or air card) to smartphones, netbooks, and tablets. Beyond service pricing, broadband economic adoption obstacles are linked to device prices. Specific policy initiatives can contribute to reducing the purchasing cost of such devices.

Three types of programs have been implemented to overcome the personal computer ownership barrier:

- The first one focuses on the provision of subsidies, such as vouchers or the provision of lower priced devices for qualifying segments of the population (e.g. students), to reduce the acquisition price of devices. The target in this case could be either households at the lower end of the socio-demographic pyramid, students all the way from primary school to university, and SMEs, especially micro-enterprises.

- The second program is typically targeted at students in primary education, with governments distributing “one Computer per Child”. In this case, computers are provided free of charge to students in public schools. In 2011 the government of Guyana has tailored this approach to the local specifics and started the “One Laptop per Child” program. Today this initiative is revived, but with a slightly changed focus and runs as the “One Laptop per Teacher” Program.

- The third type of initiative entails a reduction of the access price by eliminating or decreasing taxes paid at time of purchasing. Levies affected by this measure could range from sales tax, import duties, and even sector-specific levies.

These programs are more prevalent with regards to computer distribution, although they could be extended to other broadband access devices such as smartphones.

Some countries have reached the conclusion that while foregoing tax collections in the short run, a tax reduction strategy can result in additional adoption of devices and broadband usage, and consequently enhanced economic benefits in the long run.

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**Example from Pakistan: Computer Purchase Program**

To promote economic growth and sustainability within its country, the government of Pakistan committed to increasing ICT and broadband access through a universal service policy. The policy, which launched in 2007 and reflects a partnership with public and private companies, stressed affordable voice and data services, increased broadband access, and the development of telecenters. Funding comes through operator revenues, access promotion charges for mobile networks, and proceeds from spectrum auctions. Amongst other projects enacted through the fund, the computer purchase program made the home computers more affordable for students, government employees, and military personnel. For instance, the Allama Iqbal Open University aims to foster a 1:1 e-learning environment. In doing so, it launched a computer purchase program offering all of its 700,000 students – including its many remote distance-learning students – below-market-rate loans for Intel-based laptop computers. The program, which was created by the Higher Education Commission and Intel, works with local banks to finance the loans. In 2011, Intel collaborated with Meezan, an Islamic bank in Pakistan, to launch “Laptop Ease.” In its first four months alone, the program, which offers a “large-scale hire-purchase scheme for personal computers,” provided 400 laptops to citizens with a 3 – 24 month repayment schedule. By 2012, the program aimed to increase this number to 250 laptops per month.
The advantage of such a program supporting reduced rate loans for the purchase of ICT devices is, that emotional connection to the device purchased at own costs is higher compared to devices that are given to users without any investment required. To complete the “One Laptop per Teacher” program it is recommended to introduce subsidized loans for the purchase of ICT devices to increase broadband accessibility among the population of communities in the hinterland, poor and remote areas. Still the distribution of subsidized devices – and may it be by low-rate loans – always carries the risk of being abused from resellers leveraging the arbitrage business. In order to ensure that people in in the hinterland, poor and remote communities can actually benefit from the subsidized devices instead of any arbitrage dealers, a control mechanism and close monitoring should be started. Access to subsidized loans and devices should be conditioned by certain requirements such as, one device per person only, proof that device is being used by the respective person by tracking of IMEI and IMSI/SIM card for one year after purchase.

4.2 E-Health – Remote Patient Care, Education and Health Data Management

4.2.1 Overview and Definitions

Healthcare is one of the most important and prominent indicators of economic growth and sustainability of a country. Guyana has seen a good growth of economic activity in the last decades and proportionately has spent more on healthcare. However, due to the special geographical expanse and vegetation of the landmass, the hinterland and remote areas are less served with modern healthcare than the more affluent and compact coastal region.

To mitigate this imbalance one can think of the following situations:

- There would be better care given and utilization of resources improved if patients and medical staff in one region could consult experts in another region. Physical travel would be minimized.
- The range and quality of medical procedures performed in a health station could be widened if lesser skilled health workers could be trained to handle more complex tasks without a trainer having to travel physically to the respective health care site. The trainer could as well train multiple health station simultaneously.
- The spreading of a communicable disease could be contained or halted if the respective communities and health workers knew about an epidemic before it hits their remote communities. Effective epidemiology depends on timely gathering and exchange of information from far-flung locations.

The use of ICT is the most effective way to enable the above use cases and bridge the divide between coastal institutions and hinterland and remote regional hospitals and health stations without physically moving resources. It also strengthens the availability of skilled human resources with varying levels of competency.

The following terms are used in this report to describe the use of ICT in remote healthcare (source: WHO and Health Resources Services Administration, USA).

**E-Health** is the use of information and communication technologies (ICT) for health. Examples include treating patients, conducting research, educating the health workforce, tracking diseases and monitoring public health.
Telehealth is the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration. Technologies include videoconferencing, the internet, store-and-forward imaging, streaming media, and terrestrial and wireless communications.

Telemedicine is defined as the use of information and communication technologies (ICT) to deliver healthcare services from a distance. Information transmitted can be utilized by healthcare professionals for patient diagnosis, treatment and monitoring.

E-Health, in general, refers to the use of digital media and ICT in healthcare independent from the location of the caregiver or patients.

Telehealth is different from telemedicine because it refers to a broader scope of remote healthcare services than telemedicine. While telemedicine refers specifically to remote clinical services, telehealth can refer to remote non-clinical services, such as provider training, administrative meetings, and continuing medical education, in addition to clinical services.

Telemedicine has applications in a number of clinical settings that include primary healthcare and emergency care facilities. Telemedicine relies on two basic types of communication: synchronous and asynchronous communication.

- Asynchronous transfer is based on a store-and-forward concept. Information is first obtained and saved. It is forwarded to the doctor or specialist only when required.
- Synchronous transfer is real-time, which relays images and clinical information to the doctor as it is received. It can take the form of video conferencing.

Synchronous transfer of information (e.g., video and audio) requires higher-bandwidth communication infrastructure and high quality of service. Asynchronous data transfer is independent of available bandwidth and quality of service parameters and even sustains interruptions of the connection. Thus, asynchronous means of telehealth provisioning can be deployed easily while the infrastructure and services are being tested. At a later stage when the infrastructure works flawlessly, synchronous services can be added successively.

### 4.2.2 Case Studies of Effective e-Health Projects

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<th>Project Summary</th>
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<td><strong>Project Name</strong></td>
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<td><strong>Project Owner</strong></td>
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<td>Implementation Partner(s)/Stakeholders</td>
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<tr>
<td>Year of project launch</td>
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</table>
| Description of Methodology            | 1. Remote monitoring by ObGyns of high-risk pregnancies facilitated by home visits of midwives  
2. Data collecting                   |
| Time to implement                     | 2 years (2011-2012)          |
| Needed hardware and ICT connectivity requirements |  
- Laptop      
- Mobile phone     
- Apps (MOM application)     
- Medical mobile devices |

### Project Summary

**Project Name**  
STARsystem-Diabetes management’s platform for Canadian' diabetes patients

**Goal of Project**  
- Web-based diabetes support platform to inform, monitor, support and enable diabetics to better take control of their health.  
- The platform is free anywhere, anytime for diabetics who purchase Sanofi’s blood glucose monitors (BGStar, iBGStar)

**Project Owner**  
- SANOFI Canada  
- TELUS Health

**Target User Group**  
- Diabetes patients

**Implementation Partner(s)/Stakeholders**  
- SANOFI Canada  
- TELUS Health

**Year of project launch**  
March 2012

**Description of Methodology**  
1. Questionnaire based self-assessment to identify the diabetic’s knowledge and suggest relevant educational content and activities. Access to tailor educational and self-management health tools via personalized dashboard.  
2. Monitor Blood glucose either via standalone device (BG Star) or adapter for iPhone/iPod (iBGStar) each connected to the platform.  
3. Free personalized Diabetes Coaching sessions by phone or online

**Time to implement**  
N/A

**Needed hardware and ICT connectivity requirements**  
- Insulin Pen  
- Blood Glucose monitors (BGM)  
- Adapter for iPhones
<table>
<thead>
<tr>
<th><strong>Goal of Project</strong></th>
<th>Reduce unnecessary transportation and improve the referral system in rural areas.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Owner</strong></td>
<td>Novartis Foundation</td>
</tr>
<tr>
<td><strong>Target User Group</strong></td>
<td>Health professionals</td>
</tr>
<tr>
<td><strong>Implementation Partner(s)/Stakeholders</strong></td>
<td></td>
</tr>
</tbody>
</table>
  - Agroyesum District Hospital,  
  - Earth Institute at Columbia University,  
  - Ghana Health Service (GHS),  
  - Ghana Medical Association,  
  - Ghana Ministry of Communications,  
  - Ghana Ministry of Health,  
  - Local hospitals & health centers & patient groups,  
  - Medgate, Switzerland,  
  - National Health Insurance Authority, Ghana |
| **Year of project launch** | 2009 |
| **Description of Methodology** | 1. Healthcare personnel are trained in the use of mobile technologies to perform health consultations from a distance.  
  2. This training enabled personnel to communicate via mobile phones within their peer group for coordination and informal tele-counselling. |
| **Time to implement** | N/A |
| **Needed hardware and ICT connectivity requirements** | mobile phone |

### Project Summary

<table>
<thead>
<tr>
<th><strong>Project Name</strong></th>
<th>mDiabetes Project in Senegal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal of Project</strong></td>
<td>Preventing and combating Diabetes and non-communicable diseases</td>
</tr>
<tr>
<td><strong>Project Owner</strong></td>
<td>NA</td>
</tr>
<tr>
<td><strong>Target User Group</strong></td>
<td>Population and health professionals</td>
</tr>
<tr>
<td><strong>Implementation Partner(s)/Stakeholders</strong></td>
<td></td>
</tr>
</tbody>
</table>
  - Government of Senegal: Minister of Health and Social Action,  
  - the Minister of Communication and Digital Economy,  
  - ASSAD (Senegalese Association for the Assistance and Support of Diabetes Patients),  
  - International Diabetes Federation,  
  - UNFM (Université Numérique Francophone Mondiale),  
  - Marc Sankalé Diabetes Center,  
  - Alcatel Lucent  
  - Sonatel,  
  - Orange  
  - BUPA (global international health insurance and services company)/Sanofi (Pharma)  
  - WHO & ITU (“Be Healthy, Be Mobile” Initiative). |
<p>| <strong>Year of project launch</strong> | N/A |
| <strong>Description of Methodology</strong> | 1. with appointment reminders, lifestyle and dietary advice, and the proper observation of treatment to limit risks of complication |</p>
<table>
<thead>
<tr>
<th>Time to implement</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needed hardware and ICT connectivity requirements</td>
<td>Mobile phones (SMS and voice messages)</td>
</tr>
</tbody>
</table>

### Project Summary

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Diabetes Management pilot in US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal of Project</td>
<td>The extension of HCN's (Health Choice Networks) Diabetes Management platform with mobile health applications from Microsoft</td>
</tr>
<tr>
<td>Project Owner</td>
<td>Health Choice Networks</td>
</tr>
<tr>
<td>Target User Group</td>
<td>100 diabetics in the US</td>
</tr>
</tbody>
</table>
| Implementation Partner(s)/Stakeholders | ▪ Microsoft  
▪ TracFone  
▪ Health Choice Networks |
| Year of project launch | August 2014 |
| Description of Methodology | 1. During the pilot 100 Medicaid diabetes patients will be equipped with the phones and free special smart communications services from TracFone.  
2. Patients can communicate securely with their doctors and nurses based on HIPAA compliant (privacy rules) communications and information exchange.  
3. HCN's applications will help participants provide consent, deliver and receive reminders, ensure treatment plan understanding, and aid in disease self-tracking for blood sugar levels and other vital health information.  
4. Personal health record platform that brings disparate data together in a secure environment |
| Time to implement | N/A |
| Needed hardware and ICT connectivity requirements | Smartphones |

### Project Summary

<table>
<thead>
<tr>
<th>Project Name</th>
<th>DiabetesManager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal of Project</td>
<td>Provide a mobile-health platform that allows patients and caregivers at Alere to manage patients' type 2 diabetes using WellDoc's mobile DiabetesManager software</td>
</tr>
<tr>
<td>Project Owner</td>
<td>Alere = Health management services company, devices for diagnostics</td>
</tr>
<tr>
<td>Target User Group</td>
<td>Patients' type 2 diabetes</td>
</tr>
</tbody>
</table>
### Implementation Partner(s)/Stakeholders
- Alere, Health Management Services company, devices for diagnostic
- Welldoc = mobile application provider for diabetes management
- AT&T

### Year of project launch
N/A

### Description of Methodology
1. Patients enter blood glucose readings and medication data into DiabetesManager’s health application on their compatible mobile device or the Web.
2. The software provides automated real-time feedback and behavioural coaching for people with type 2 diabetes.
3. In addition to real-time coaching, DiabetesManager enables Alere nurses, case workers and doctors to communicate directly with patients = USP of Welldoc’s application

### Time to implement
N/A

### Needed hardware and ICT connectivity requirements (laptop needed / special hardware needed / mobile phone only)
- Web
- mobile app

## Project Summary

### Project Name
Remote Blood Glucose Monitoring

### Goal of Project
Improve diabetes treatment via remote blood glucose monitoring

### Project Owner
- Telcare
- Telenor connection

### Target User Group
Parents of children with diabetes and those caring for elderly people with diabetes

### Implementation Partner(s)/Stakeholders
- Telenor Connexion
- Telcare

### Year of project launch
End 2012

### Description of Methodology
1. Connected Blood Glucose Meter instantly transmits a patient’s readings to a private online database, which can be accessed by the patient or, with permission, by a doctor, caregiver or family member.
2. The system charts the results to highlight trends and spot problems, and can be accessed via a web browser or an iPhone app.

### Time to implement
N/A

### Needed hardware and ICT connectivity requirements
- Wireless glucose meter
- Web browser or iPhone app

## Project Summary

### Project Name
Innovative telemedicine in Nigeria

### Goal of Project
- To improve the care of people with hearing loss in Africa
- To perform accurate hearing tests in remote regions in future.
### 4.2.3 Proposed Use Cases for e-Health Services in Guyana

The availability of Telehealth to hinterland and remote areas is almost inexistent. Many day-to-day activities, like filling out questionnaires, submitting health records, acquiring additional health training or soliciting help from an expert in a specialized hospital, can either not be performed at all or need an extraordinary amount of time and effort. E-Health activities are currently concentrated in the coastal areas due to the lack of a plan and dedicated resources to implement it.

Based on the responses of individual health care workers in the HPR communities (see WP1) as well as the interviews of institutional stakeholders (PAHO, MOPH, eGovernment Agency) it can be concluded that bringing basic Internet infrastructure with even limited connectivity to the hinterland and remote communities and offering very basic asynchronous services can improve the quality of care given and data collection ability dramatically.

Furthermore, once a comprehensive HIS has been installed in the central hospital in Georgetown, including electronic health records (EHR), disease information and electronic educational materials, these should be made available to all connected HPR communities.

Once the basic services are rolled out and staff has acquired good skills in ICT, the next phase of synchronous services can be launched. These include interactive medical training in a remote classroom setting, consultations of health workers with remote experts and remote diagnoses when patients interact with doctors directly. In addition, the collection and tracking of vital bodily information should be considered for prevention of illnesses.

Private hospitals and health institutions have a strong standing in Guyana, hence they shall also be leveraged to use eHealth-services provided by the Ministry of Public Health. This leads to these specific design requirements for e-Health services:

- E-Services needs to be designed that they run on infrastructure in private hospitals and can access central servers provided by e-Government Agency or by the Ministry of Public Health
- Design of interfaces used to exchange information between public and private institutions must be openly accessible so that private institutions can adapt their software accordingly. The legal framework must designed accordingly that it permits the exchange for information between private and public institutions
- Exchange of information needs to be encrypted to secure privacy of the data shared.
Basic Asynchronous Services

Even implementing simple communication services can make a big impact on the operation of the healthcare services in the hinterland and remote communities. A survey of healthcare workers and interviews with institutions revealed that the timely transmission of data from regional hospitals to the national hospital in Georgetown would greatly increase the data collection capacity. Furthermore, important disease information and government forms, which are available on simple websites, can speed up patient treatment and administrative processes. Learning can be accomplished if healthcare workers can interact freely online. For these reasons, the following asynchronous services should be on the top of the implementation list:

- A robust, unified email system (as already planned and partially offered by the eGovernment Agency)
- Websites which can be updated quickly (e.g., Wordpress) and include static, downloadable forms
- Web browser-accessible forums for knowledge exchange which are moderated by experts
- Document repository, e.g. a Document Management System for shared access and collaborative creation of documents and other data

Warehouse management for medical supplies: Medical stores management at central-level stores and at regional district-level stores is a widespread problem in Guyana’s hinterland and remote health centers. Oftentimes the inventory levels are unknown and drugs are kept (and used) well beyond their expiration dates. A common system for creating transparency and aiding in drug management should be implemented.

There is a trend towards a decentralized model supported by an efficient IT system and a well-organized supply chain. This should be investigated further and an appropriate IT system should be acquired. The WHO provides a guide to medical store management w.r.t. processes, regulations, organization and IT systems. This serves as a good starting point for system design and vendor evaluation.

HIS – Health Information System: A HIS can be described as any system that captures, stores, manages or transmits information about the health of individuals or the activities of institutions that work within the health sector. A strong HIS is the backbone of an effective healthcare system. An EHR (electronic health record) is used to capture all relevant information based on a unified patient identifier. This system has to be developed for the entire healthcare system in Guyana and is not special to the HPR communities. However, it should be extended into regional hospitals and health stations as soon as they are reasonably well connected.

There need to be facilities to capture the patient’s clinical data through normal workflow. Both paper-based records and film-based records data entry need to be supported, whereas all the medical records generated while using the system such as clinical prescriptions, laboratory reports, diagnostic snaps, and vital signs, can be automatically stored in the system. The key HIS components are as follows:

- Clinical Notes
- Administrative System Components
- Laboratory System Components
- Pharmacy System Components

Implementing an HIS is a long-term undertaking and requires close cooperation of healthcare and government stakeholders. It is recommended to pilot this system in the coastal areas and then migrate to the hinterland and remote areas once the system is working flawlessly.

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29 http://telesehat.com/rits/real-time-interactive-telemedicine-system.html
**Tele-Consultation**: Teleconsultation means obtaining the professional opinion of an expert who is not physically present at the location where the patient and/or the local health worker are. (WHO, 2011)

A common misconception of Tele-Consultation is that it is a video conference where the patient sits down in front of a camera, connects with the doctor and shows his ailments. This type of Tele-Consultation only presents a small part of the market. The majority of Tele-Consultations are likely to be more functional and focus on capturing patient information through interactive forms, questionnaires and photos, rather than a direct interaction with a physician. For example, patients with symptoms of an illness like allergies or acne would complete an online form and send a photo if needed and then receive a diagnosis and a prescription, if necessary.\(^{30}\)

Tele-consultation takes many forms. A doctor at a health station calling a senior colleague at another hospital to get his opinion regarding a difficult case is practicing one form of tele-consultation. A senior specialist at the national Hospital School of Medicine, providing live consultation through video-conferencing to a medical team performing surgery on a 4-year-old boy’s stomach is another form of teleconsultation.

Image 30: Tele-Consultation – A pediatrician seeks advice from a remote colleague

**Tele-Diagnosis**: This form of telemedicine is defined as a “diagnosis that is made at a remote location and is based on the evaluation of data transmitted from instruments that monitor the patient and a transfer link to a diagnostic center.”\(^{31}\) Typical forms of remote sensor data include Digital Stethoscope (General Medical), x-ray scans (Radiology), Ultrasound (Gynecology, Sonology), Digital Notepad (Prescription Writing), ECG (Cardiology), Digital Iriscope (Eye), Digital Dermoscope (Dermatology), or Digital Otoscope (ENT). This form of telemedicine is not necessarily real-time, since the evaluation of the submitted information can take some time and be distributed among many experts. This is in contrast to tele-consultation, where results are expected to be available in short period of time.

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\(^{30}\) [http://www.zipnosis.com/faq](http://www.zipnosis.com/faq)

\(^{31}\) American Heritage® Stedman’s Medical Dictionary
A special field of diagnosis is the measurement of effectiveness of a particular treatment. A novel type of ingestible sensor can be used to obtain information about body functions from within the digestion tract throughout the day of a patient. The system Proteus is one possible way to do this. A small ingestible sensor communicates with a sensor patch and an application on a mobile device to track vital bodily functions. Healthcare providers and caregivers can access the recorded data[^32].

**Tele-Surveillance and Early Outbreak Detection for Disease Containment**

In order to fight communicable diseases effectively and curb their spreading, accurate and timely field data is necessary. Therefore, health workers consolidate weekly health record statistics gathered from the field at the health stations level and send it to the regional level. They in turn will prepare location and week wise disease count details and share it with the national hospital and MoPH. It takes a long time to communicate the disease count details from the interior locations to the state level and mostly only quarterly updates are available. MoPH and PAHO would like to reduce this turn-around time for early intervention.

[^32]: [http://www.proteus.com](http://www.proteus.com)
This can be addressed through an ICT system (see schematic rendering in Image 33) that incorporates the collection of clinical information for the purpose of detecting disease outbreaks before reaching epidemic states. Web-based data entry on PCs at health stations can be a first step towards an electronic filing of health data. However, if the healthcare worker is often in the field at home visits it might be more effective to switch to a smartphone app for data collection. Information like village name, patient’s name, age and sex, date & time of visit, diagnosis, symptoms, prescription can then easily be entered on the spot.

**Image 33: Tele-Surveillance system for clinical data collection and early disease outbreak detection**

**Diabetes Management**

Diabetes has become an increasing problem for hinterland and remote communities. An effective monitoring and management of diabetes (type I and type II) can make the lives of diabetics much easier and convenient in terms of tracking and analyzing their glucose levels. Meanwhile, there are a few mobile solutions available on the market, which address this task. Diabeto of India or MySugr of Germany have been very successful examples of how a simple system can look like and how big of an impact it can have on diabetics. It is recommended to implement a similar system in the Guyanese healthcare landscape or partner with one of the existing providers.
Maternal Healthcare

One statistic from the World Health Organization shows that more than 800 women die globally every day from preventable circumstances related to pregnancy and childbirth. Almost all of those women live in developing nations. Major complications accounting for most of these maternal deaths include severe bleeding, infections, high blood
pressure during pregnancy, complications during birth and unsafe abortions.\textsuperscript{33} Given more education and more access to healthcare workers, there is a good chance to reduce the mortality rate in remote communities.

In Guyana, the problem of maternal mortality is very prevalent in the interior, so much so that the MoPH and PAHO have made this problem to one of their key topics to address. A strong and reliable ICT infrastructure can be the basis for implementing a solution to address pregnancy complications. There are a few information apps for smartphones already available, which can serve as a first step towards this goal, e.g. GiftedMon, maymay, Safe Delivery, Safe Pregnancy and Birth. However, there needs to be a strong network of healthcare workers and support processes in place to eradicate maternal mortality. Some existing projects can serve as guidelines on how to establish these networks, e.g. MAMA – Mobile Alliance for Maternal Action, Zero Mothers Die, Mobile Midwife, auxiliary nurse midwives (ANM) with help of the Suyojana app.

It is recommended that Guyana introduces similar projects based on the eGovernment Network and data center infrastructure.

\textbf{Fixed VoIP}

Communication in remote areas of the country relies heavily on HF radio. Privacy rights of the patients are not taken into account as these conversations are publicly accessible and the transmission is not encrypted. Furthermore, atmospheric disturbances do affect the audio quality.

It is therefore recommended to provide a basic fixed Voice over IP service within the health sector to permit a real time communication between health stations in the hinterland and the regional hospitals as well as with the health related installations in Georgetown. It should be limited to the health sector and not made be available to the public as to not interfere with any potential privately offered telephone service.

\textbf{4.2.4 Special Network and Device Requirements}

The required network speeds depend on the use case to be implemented. The least demanding use case is basic asynchronous services, which only needs connection speeds of less than 100kbps and no special QoS. The most demanding use case is tele-consultation with real-time video streaming, potentially of HD quality. This will need between 512kbps and 2Mbps. If multiple PC stations are assumed per hospital with various use cases, a bandwidth of 3Mbps on average should be implemented. Of course, an overbooking factor is possible since not all stations are active at the same time.

The range of possible specialized equipment for e-Health use cases is very large. There can be x-ray machines, ultrasound and ECG apparatuses, stethoscopes and iriscopes for Tele-Diagnoses. However, on a simplified basis the following devices can be identified.

\textbf{Basic asynchronous services} (Email, web site access, forum access and document management systems):

\begin{itemize}
\item A stationary PC in every connected hospital or health station, incl. printer, scanner, webcam, monitor
\end{itemize}

\textbf{Tele-Consultation}:

\begin{itemize}
\item A stationary PC with high-resolution monitor, webcam, microphone, loudspeakers
\item (possibly) a laptop for traveling doctors with separate webcam for high-resolution images
\end{itemize}

\textbf{Warehouse management}:

\begin{itemize}
\item A portable device like tablet with barcode scan functionality
\end{itemize}

\textsuperscript{33} “8 apps revolutionizing maternal health care in developing nations”, http://mashable.com/2016/03/13/apps-maternal-health/
- (possibly) a stationary PC with monitor and separate barcode scanner

**Tele-Diagnosis:**
- A basic setup can involve a smartphone for taking pictures and an application which sends the picture to the central evaluation hospital/expert
- Further devices depend on specific functional requirements.

**Tele-Surveillance:**
- A stationary PC with monitor is sufficient to enter relevant clinical data

**Diabetes management:**
- A simple smartphone which can run the required application; glucose monitoring device

**Maternal healthcare:**
- A simple smartphone to run the application

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### 4.3 E-Government Services - Linking the Government to its Citizens

#### 4.3.1 Overview and Definitions

The relationship of citizens to their government around the globe is generally strained by a number of subjective impressions: a lot of paperwork, bureaucracy, cramped spaces, long queues and a lot of frustrations. While the demands of citizens are growing, the government needs to change to deliver in a timely manner and in an acceptable quality. Many governments are addressing this issue by re-engineering their processes and updating their infrastructure.

With the introduction of information and communication technologies (ICT), there is the chance to further improve this situation. The role of eGovernment (the use of ICT to deliver government services) is to facilitate the interaction between the government and its stakeholders, including the citizens (G2C), business communities (G2B), and the public administration itself (G2G). In Guyana, the introduction of eGovernment specifically means an extension of government services into the currently underserved hinterland and remote communities to help the government engage and enhance the relationship with its constituency through digital services.

However, the simple introduction of ICT to the government is not enough. Through e-Governance the real goal should be to stimulate change in the society towards more democratic processes, transparency in the governing process, true interaction between government and citizens (including feedback mechanisms where the voice of the citizens can be heard), and finally the transformation towards a digital society.

“E-Governance ... is an important innovation for enhancing good governance and strengthening the democratic process and can also facilitate access to information, freedom of expression, greater equity, efficiency, productivity, growth and social inclusion. Successful eGovernment initiatives can have demonstrable and tangible impact on improving citizen participation and quality of life as a result of effective multi-stakeholder partnerships. (...) Governments need to develop policy frameworks, supported by legislation for e-Governance, that are linked to strategic development objectives.”

The following sections will outline a few examples of eGovernment services and initiatives as well as propose the required use cases to fulfill the needs of the hinterland and remote communities.

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34 Fourth African Development Forum (ADF IV, 2004)
4.3.2 Case Studies of e-Government Initiatives

For each of the e-Government building blocks mentioned in Section 3.2 there exist many implementation examples around the world. Some of the most notable are listed in this Section.

**eAssistance**

“Die Bundesregierung” provides eAssistance in Germany

- “Die Bundesregierung” (German government) focuses primarily on the provision of information with the support of web 2.0
- It includes news from across the government, links to laws, policy documents, thematic websites in particular policy areas, and links to all government ministries.

Government goes Google in Mexico

- Gob.mx is a portal but simply speaking, it is a search engine with integrating services that respond to users’ specific search criteria
- The site also contains statistical information on the questions and comments an agency executive has received as well as how many times he/she has responded.

![Image 36 - Examples eAssistance services](image)

**eAdministration**

World leading government portal, Republic of Korea

- The main government portal is a gateway to services through multiple channels, by theme and subjects.
- Citizens can have a customized channel by inputting their own age, gender and services of interest.
- Back-office integration brings together a powerful search engine offering advanced categorizing function, which can list results by websites, services, and news, including at the local level.

Overheid.nl, Netherlands

- The Netherlands’ services portal is the gateway to the entire public sector and provides access to an enormous amount of information and services.
- An efficient user interface with effective streamlining of public sector departments.

![Image 37 - Examples eAdministration services](image)
4.3.3 Proposed Use Cases for e-Government services in Guyana

The overall aim of the eGovernment Agency is to provide solutions, i.e., services and platforms, in a carrier-grade quality to all "customers". These customers are ministries and other agencies in the case of G2G services and the
citizens of Guyana in the case of G2C services. At a later stage, the target group of G2C services will include Guyanese people living abroad, i.e. the Guyanese diaspora.

The following services should be deployed with a high priority:

**Document Management** (as well electronic document handling)

- **Rationale:** To handle documents digitally and to exchange them between different relevant users, a document management system (DMS) needs to be deployed. It represents an IT tool that is used to track, manage and store documents digitally.

- **Realization:** The following components that need to be deployed are part of a DMS:

  o **Capture:** The capturing of the information can be done via two option, a) the manual entering of information via a computer and guided by information on the screen and b) by automatically optical character recognition of documents.

  o **Metadata:** Metadata may, for example, include the date the document will be stored and the identity of the user storing it. The DMS may also extract metadata from the document automatically or prompt the user to add metadata.

  o **Storage:** Store electronic documents. Storage of the documents often includes management of those same documents; where they are stored, for how long, migration of the documents from one storage media to another (hierarchical storage management) and eventual document destruction.

  o **Retrieval:** Retrieve the electronic documents from the storage. Although the notion of retrieving a particular document is simple, retrieval in the electronic context can be quite complex and powerful. Simple retrieval of individual documents can be supported by allowing the user to specify the unique document identifier, and having the system use the basic index (or a non-indexed query on its data store) to retrieve the document. More flexible retrieval allows the user to specify partial search terms involving the document identifier and/or parts of the expected metadata. This would typically return a list of documents, which match the user’s search terms.

  o **Distribution:** A published document for distribution has to be in a format that cannot be easily altered. As a common practice in law regulated industries, an original master copy of the document is usually never used for distribution other than archiving. If a document is to be distributed electronically in a regulatory environment, then the equipment tasking the job has to be quality endorsed AND validated.

  o **Security:** Document security is vital in many document management applications. Compliance requirements for certain documents can be quite complex depending on the type of documents. If one single DMS for multiple tenants, the strongest security requirements need to be fulfilled. This is especially the case when dealing with health related information.

  o **Workflow:** Workflow is a complex process and some document management systems have a built-in workflow module. There are different types of workflow. Usage depends on the environment to which the electronic document management system (EDMS) is applied. Manual workflow requires a user to view the document and decide whom to send it to. Rules-based workflow allows an administrator to create a rule that dictates the flow of the document through an organization: for instance, an invoice passes through an approval process and then is routed to the accounts-payable department. Dynamic rules allow for branches to be created in a workflow process.

  o **Collaboration:** Collaboration should be inherent in an EDMS. In its basic form, collaborative EDMS should allow documents to be retrieved and worked on by an authorized user. Access should be blocked to other users while work is being performed on the document. Other advanced forms of collaboration act in real time, allowing multiple users to view and modify (or markup) documents at the same time. The resulting document is comprehensive, including all users additions.
Collaboration within Document Management Systems stores the various markups by each individual user during the collaboration session, allowing document history to be monitored.

- **Searching:** Searching finds documents and folders using template attributes or full text search. Documents can be searched using various attributes and document content.

**Basic Email System**

- **Rationale:** Ministries and government agencies need to use emails following an aligned domain model provided by eGovernment Agency for the government. For security reasons as well as to support a certain “corporate identity” of the country, the usage of free email providers for professional emails shall not to be accepted.
- **Realization:** Central email servers need to be deployed to provide services for all ministries and agencies. The structure of these email addresses shall follow a harmonized and structured approach. Political willingness and pressure is needed to migrate official email usage from public free email services to the eGovernment service.

**Birth / Marriages / Death Certificate Provisioning**

- **Rationale:** Citizens shall be able to use government services online, especially to reduce their needs to travel to the next physical government location. This applies to the only request for birth certificates as well as the submission of marriage and death related information.
- **Realization:** A special customized version of the DMS shall be deployed. The citizen can enter the relevant information online.

**Passport application**

- **Rationale:** Currently citizens needs to travel at least twice to the passport agency: once to submit their data and one when they receive their passport. The passport applications allows the users to enter all their personal data online, meaning they only have to travel once to the passport agency or never if the whole process documentation can be signed digitally and the passport sent back to the citizen via mail.
- **Realization:** A special customized version of the DMS shall be deployed. The citizen can enter the relevant information online.

To be able to provide these services several enabling services need to be developed and deployed as well:

**ID/Account Management / digital signature**

- **Rationale:** Trust worth accounts of users are essential to use eGovernment services. This account helps to prevent the misuses of the services, e.g. claiming a passport under false ID. With a digital signature, the citizen can sign digitally official documents. Managing digital identity is essential for all eGovernment activities to operate as a platform for economic development and social progress.
- **Realization:** The digital signature can be deployed using a signature program or via a smart card or digital signature information stored on a national ID card. The management of digital IDs and of its lifecycle generally involves several processes that need to be implemented by the responsible entity:
  1. **Registration process:** In order to be known by the system, the user (citizen, government employee) must first register with it and the conditions related to his/her identity or identity attributes must be checked so he/she can be provided with a set of credentials. This verification of identity requires access to a single governmental database that holds the information about all users free of errors and with a unique identifier (including correct spelling of person’s name, community name, street name). This step may also require access to personal information stored at other governmental entities and the respective permission to access and use them. If this single governmental ID database not existing, it needs to be set up.
  2. **Authorization process:** once registered, when accessing an e-service, appropriate permissions and privileges to access the –service’s resources must be assigned to the individual.
3. **Authentication process**: to access resources, the individual makes an identity claim that can be verified: he/she logs into the system with the credentials provided during the registration process. This process establishes confidence in the user’s identity.

4. **Access control process**: The result of the authentication process is used whereby the system checks that the user has the appropriate authorization to access the requested resources.

5. **Revocation process**: when the user is not associated anymore with the system this process secures that the user’s credentials are rescinded.

To realize this service, a clear national strategy for digital identity management is essential. It should aim to benefit the society at large, including businesses, citizens and the government, and minimize the risks that undermine trusted interactions online. The process for developing the strategy should be inclusive of all stakeholders with a view to identify and take into account their needs. To establish trust, digital identity management practices and requirements should be proportionate to the level of risk in the interactions between the parties involved. The potential impact on privacy of digital identity management practices should be assessed and addressed as appropriate. A clear mandate should be given to one government agency to manage these national identities continuously.

Digital identity management practices should respect legal privacy protection requirements. The development and implementation of digital identity management systems should include privacy protection, including data security, from the outset. Taking advantage of the potential for the technology to support both privacy and security, innovative technical protection measures should reinforce privacy protection requirements.

**Common Data model** to facilitate the digital exchange of information between the different ministries and organizations

- **Rationale**: To increase the usage of digital information and to ease the exchange of information between different governmental entities, a unified and harmonized data model as a foundation for all digital data needs to be developed and enforced by the Government.

- **Realization**: As an informational model, the Common Data Model provides consistent definitions for managed resources such as (where a resource is any ‘thing’ in a customer environment) applications, facilities, buildings, assets, servers, network, storage, processes, people, and functions. It utilizes the Unified Modeling Language (UML) and is designed to work seamlessly with other development efforts based on metadata that is produced from UML. To foster integration among developed solutions, the Common Data Model is in use as the basis of data modeling for interactive/integrated designs. Because the CDM is an information model, solutions are able to maintain existing database schemas while utilizing the Common Data Model. When integrating with other products, CDM definitions and terminology are in use. This fosters consistent, one-time integration function that is re-usable across multiple solutions.

**Carrier grade service provisioning and hosting**

- **Rationale**: Services provided by the eGovernment Agency needs to be available for the customers 24hrs a day, 365 days a year.

- **Realization**: The IT infrastructure and their architecture at eGovernment Agency needs to reflect this approach. This includes automatic stand by power supply as well as a redundancy of the data center.

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35 It is recommended to align these activities with the CARICOM eGovernment Strategy if possible. If technical standards are available and can be used it will help to extend e-Services on a regional level at a later stage.
4.3.4 Special Network and Device Requirements

Services need to be designed that they follow the to-be-developed eGovernment framework and standards, especially in regards to applied data models and interfaces. This will help the maintenance of these services and the integration into new service environments.

Services need to put a special focus on the design of the User Interface (UI) and the User Experience (UX). The menus need to be easy to understand and intuitively usable. Usage of pictures instead of words will additionally lower the service acceptance barriers. Furthermore, the usage of local indigenous languages for the User Interface and the content should be supported.

Services shall be able to run on multiple devices like Laptops and mobile phones and support multi-channel capabilities.

Service platforms need to be robust and reliable, securing a 24/7 availability of the services running on these platforms. This includes that the data centers are operated on a redundant level.

4.4 Potential Future e-Services – From Banking to Nature Preservation

4.4.1 e-Commerce

e-Commerce is the trading or facilitation of trading in products or services using computer networks, such as the Internet. E-commerce businesses may employ some or all of the following:

- Online shopping web sites for retail sales direct to consumers
- Providing or participating in online marketplaces, which process third-party business-to-consumer or consumer-to-consumer sales
- Business-to-business buying and selling
- Marketing to prospective and established customers by e-mail (newsletter)
- Support of online payment

Rationale: An e-Commerce platform can help companies in Guyana to extend their customer base, locally, nationwide and internationally. This applies especially to companies and farmers in the remote and hinterland areas who currently have no access to commercially deployed e-Commerce platforms.

Solution: eGovernment Agency operates the e-Commerce platforms. The responsibility for the content provided and the services offered are within the respective Ministries or agencies. Payment options can be offered in collaboration with established financial institutions and/or using own payment services.

4.4.2 Border Surveillance and Protection

The surveillance and protection of Guyana’s borders takes one of the top spots on the government’s agenda. There are many tasks, which could be supported by an ICT system, e.g., monitoring and thwarting intrusion into the country, reporting border violations, monitoring goods transfers across the border, enforcing regulations. If supported by ICT, all of these tasks would have in common the need for a data backhauling and transport network via fiber, LTE or some other wireless solution (see technology report WP2). What would be very different are the means of collecting the data, which depends on the specific system used. There could be visual surveillance via cameras, intrusion detection via a distributed sensor network, which monitors infrared signals or pressure on the ground.

However, the easiest and most applicable way is still to deploy human border patrols and equip them with voice and multimedia communications. In addition, the local border communities should be included in national security, making them the first level of surveillance and alarm. Outposts can be created with communications equipment, which is being used by locals to notify police forces.
In special circumstances, it might be advantageous to deploy autonomous vehicle systems, e.g., drones or terrestrial vehicles, to supplement human capabilities. These systems can be controlled via either LTE, Wifi or special frequencies and only need a command center for monitoring and recording purposes.

The use if ICT is generally limited to an “observer” role in these circumstances and the exact use case needs to be well defined together with local law enforcement agencies.

### 4.4.3 Public security

Fighting crime in Guyana has been identified as a top priority. Activities have already been launched by the Citizen Security Strengthening Program (CSSP) in collaboration with the eGovernment Agency like the “Safe City Project”, a CCTV surveillance project integrated with patrol management.

The role of ICT and mobile apps can be used esp. in the field of communicating GPS coordinates to friend and police as well as getting and sharing extra information (e.g. planed walking route). This might lead do e-Services like the following, all using a Smartphone as the user device:

- **Increase Minibus/Taxi security:** by scanning the number plate of a minibus/Taxi with an app the user can get information about the accident/safety record and history of the respective minibus. The taxi cooperation can also send information about the booked taxi to the requester.
- **Emergency Button App:** if a user presses this emergency button on his mobile phone app, the position will be shared with police officers close by (e.g. in a radius of 3km). Additionally, the next police station is being informed automatically.
- **Share your route app:** users can share their planned route with named friends. As the current position is being tracked, these friends always see where the user currently is located. This app can be combined with emergency button app.
- **Enhanced “Tell Us”:** A crowdsourcing app users can assess the perceived security situation in an area and share this information with the community. They can share information about the existence of police in the streets etc.

The best app can contribute significantly more if it can connect to an established IT infrastructure of the police, including direct access to an emergency room, connectivity to the next police station. This connectivity can be provided by eGovernment Agency.

### 4.4.4 Nature Preservation

Almost 80 percent of the Cooperative Republic of Guyana in the northeast of South America still consists of near-natural tropical rain forest and tropical wet savannah where there is still minimal human influence. Guyana hosts many types of Amazon flora and fauna. One reason such large areas of the natural environment remain intact is the low population density: with only 3.7 inhabitants per square kilometer of land, Guyana has the lowest population density in South America.

In 2011, the Guyanese parliament passed a law to set up three conservation areas to be managed by the newly created Protected Areas Commission (PAC). One of the areas is the Kanuku Mountains conservation area in the south of the country, measuring over 6,000 km². The completely forested Kanuku Mountains are up to 1,100 in height and are uninhabited. They are located in the heart of the Rupuni savanna but directly about the vast rain forest in the

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The Kanuku Mountains are one of the most ecologically diverse areas in Guyana; they include savanna and gallery forest in the lowlands and rain forest in the mountainous area.37

The main activities for the Protected Area Commission in the nature preservation are:

- Setting up the Guyana conservation area system
- Establishing administrative and monitoring systems for the Kanuku Mountains conservation area
- Update management plans and draw up monitoring plans and biodiversity surveys
- Liaising with representatives of other interest groups such as indigenous communities, Conservation International and regional planning authorities

E-Services can significantly contribute to facilitate the nature preservation activities, especially for the monitoring and conduction of biodiversity surveys. Furthermore, the liaising with indigenous communities will benefit from improved access to E-Services in the remote areas. The indigenous communities play an important role in the conservation of the area, because they report information about the status quo and potential violations of the Protected Area Rules to the respective agencies in charge. Activities such as illegal mining or an illegal road being constructed in the protected area is often first observed and reported by the local indigenous communities.

In a first step, simple text messaging or email will facilitate and speed up the reporting of information about the protected areas from the indigenous communities to the Protected Area Commission. Email and text messages shall be free of charge for the indigenous communities. In a second step, a tailored smartphone app should be implemented, enabling representatives from the local communities to report monitoring data and violations of the protected area rules directly and immediately. The app can follow a similar approach as the “Tell Us” Project38 from the eGovernment Agency.

### 4.4.5 e-Payment Service

An e-payment service is needed to settle fees for government e-services online but also as a service to enable business and to transfer money between citizens, esp. in the hinterland and remote areas. This service, which allows for online money transfer and payments, can improve the user experience of e-Services a lot. Especially the improved security and reduced threat of theft in hinterland and remote communities makes this a much-wanted feature. Furthermore, online banking saves long trips to the next banking outlet, which is oftentimes located in a far-away town. Online payments serve also as enabler for further online commercial activities such as online auctions or marketplaces.

While the current banking system in Guyana is still heavily relying on paper-based documents, the National Bank of Guyana is aiming to modernize the payment system aiming to digitize it. These digital workflows are essential to provide any electronic banking services. E.g., the Bank of Guyana along with the commercial banks engaged in discussions on the introduction of Electronic Funds Transfer. This system will facilitate the transmission of payment instructions in electronic form and will result in funds being available to the beneficiary within the same day. The

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38 "Tell Us" will connect citizens directly to the entities responsible for providing services and responding to their particular needs. The web or mobile based application will facilitate citizens’ reporting of issues directly responsible agencies. This would significantly reduce transaction times, improve accountability of those agencies, and encourage citizens’ leadership and feedback in the delivery of public services. http://www.egov.gy/index.php/en/Site-Info/assets-2.html#cirs
Bank has been upgrading the payments system through the electronic clearing of checks while making preparations for electronic funds transfer. This project is expected to be completed by April 2017. 39

Looking at the e-payment ecosystem, the eGovernment Agency can take over two roles to drive the deployment of this service, the Trusted Service Manager (TSM) and the Payment Solution Company:

Image 40: Digital (mobile) payment ecosystem

The role of the different players in this ecosystem is described below:

**Customer**

The customer needs to be able to be identified. Therefore, he is required to be a subscriber of a mobile network operator or have a digital ID. The customer enters into a service agreement with a Card Issuing Bank for the e-Payment service.

**Merchant**

The merchant is the provider of the goods and services being purchased by the customer at the point of sale (POS) (either a terminal in a shop or a special website). The merchant has a contract with a merchant acquirer that allows the merchant to accept credit and debit payments, which are then processed over the appropriate payment-processing network.

**Acquirer**

The acquirer maintains the merchant account that permits the merchant to accept online payment transactions. The acquirer also provides the interface to the processing network for the authorization and clearing of the merchant’s transactions.

**Card Issuing Bank**

The Card Issuing Bank (CIB) provides the overall payment service and is responsible for the associated customer care. The CIB is responsible for the issuing of the payment application and the customer’s personalization data. The CIB is also responsible for establishing the formal agreement with the customer for the payment service.

Payment Solution Company

The payment solutions companies (such as Visa, MasterCard, American Express, or Service Company’s setup by local banks) maintain their payment networks, and provide other services to its banks such as approval and certification. They also define payment specifications and provide transaction-processing services to support them. To support Pay-Buy-Mobile, no significant change is anticipated to these payment networks or other national payment networks. In case no payment solution company exists in Guyana to provide this functionality for the planned e-Service, e-Government Agency should evaluate, together with the Central Bank of Guyana and other stakeholders from the financial sector, how this payment solution company can be installed.

Mobile Network Operator

The mobile network operator (MNO) is a key addition to the ecosystem in a mobile payment ecosystem. The role of the MNO is to:

- Provide and maintain the network infrastructure that enables the secure OTA delivery and maintenance of the payment application to consumer’s CPE.
- Provide the Security Domain for the payment application on the CPE, which is then controlled by the TSM or CIB
- Provide the customer with relevant CPEs permitting e-payment services
- Provide mobile services customer care. The MNO brings the assets of a mobile customer base, smart card and network infrastructure to the relationship.

Trusted Service Manager

The Trusted Service Manager (TSM) is one of the new additions to the payment industry. This entity is primarily responsible for securely distributing, provisioning and life-cycle management of the e-Payment application and other services to the mobile network operators’ subscriber base on behalf of the service providers. The TSM will have business relationships with both the mobile network operators and the service providers. The role of the TSM as a neutral institution should be maintained by e-Government Agency.

POS Terminal Manufacturer

The role of the terminal/reader manufacturer is to provide terminals/readers and/or CPEs to the merchants and acquirers.

SIM Card Manufacturer

A SIM Card provides the unique identifier for the Mobile Network Operator and therefore for the e-payment service. A digital ID card can also service as an identifier for the e-payment service when not using a mobile device.

CPE Manufacturer

The role of the CPE manufacturer is to provide standardized handsets or devices that will be used for e-Payment, e.g. mobile devices.

It should be noted that in the e-payment value chain, existing players like the CIBs, the merchant acquirer and the payment network will continue to play their main role in the transaction processing. If these roles are not yet sufficiently operational in Guyana, e-Government Agency should align with the stakeholders how these roles can be implemented.
To rollout this service the existing legal frameworks need to be validated on how they can support (or hinder) the successful rollout of an e-payment service. This applies e.g. to the fields of contract laws (is a digital contract binding, are there any contracts that have to excluded from a settlement via e-payment, usage of digital signatures), retention of documents (how are the legal requirements to retain information and can it be stored electronically?), Data security (what happens if the e-payment service has been used illegally?)

Next steps for the realization of this e-Service:

- Align with stakeholders to create the digital financial ecosystem, including with the Bank of Guyana and promote potential service with merchants and consumers (to generate a critical mass of interested users from the beginning)
- Setup the missing functions and respective ICT-systems in the ecosystem like TSM and Payment Solution Company and validate if currently available electronic banking service be used, e.g., partnering with GT&T in Guyana
- Assess the existing legal framework to permits and support ePayment services. This also includes laws securing and regulating payments in general and extending customer protection to this new channel.\(^{40}\)
- Assess if a regulation of the Interchanges Fees are needed if they are too high and represent a barrier for a development of this service.

### 4.4.6 e-Agriculture

E-Services in the context of agriculture shall address two major challenges farmers in the hinterland and remote areas are facing and that have been raised during the interviews with several stakeholders: 1) access to all kinds of information in real time and 2) increase the business opportunities. Taking down the high costs for transportation of goods is also an often voiced request\(^{41}\), however short of introducing a new logistics concept (e.g. involving unmanned aerial vehicles\(^{42}\)) or organizing shared transportation, there is little an ICT infrastructure can do to help streamline physical transportation.

Sharing of information comprises the following use cases:

- **Information exchange**
  
  *Rationale:* farmers need access to real-time information about weather conditions and market prices
  
  *Solution:* a central server hosted by the eGovernment Agency provides relevant information (content). This content is being maintained by the Ministry of Agriculture and/or FAO

- **Collaboration support**
  
  *Rationale:* collaboration can help the exchange of information between different farmers (building of virtual communities). This direct exchange of information can provide faster solution of local problems (if another farmer experienced similar problem in the past) as well as serve as an early indicator for the ministry if the posted questions/problems are systematically analyzed. This can also extend the content provided via the TV program “Farmer’s connection”.
  
  *Solution:* a central server hosted by the eGovernment Agency serves as the platform for the sharing of the

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\(^{40}\) See [http://ec.europa.eu/finance/payments/framework/index_en.htm](http://ec.europa.eu/finance/payments/framework/index_en.htm) for an overview about the approach followed by the European Union.

\(^{41}\) Transportations are sometimes prohibitively high resulting in farmers to need to destroy their harvest on the fields as this will be a cheaper option than paying for the transportation to sell them.

\(^{42}\) Unmanned airplanes are being used in Rwanda to deliver medical supplies to remote health stations.
information provided by the users. This user generated content needs to be monitored by an expert at the Ministry of Agriculture.

- **E-Learning and access to training material**
  
  **Rationale:** e-Learning platform and access to online training material can help the farmers to increase their farming knowledge. This can also extend the content provided via the TV program “Farmer’s connection”
  
  **Solution:** a central server hosted by the eGovernment Agency and maintained by the Ministry of Education serves as the platform for the e-Learning services. The hardware investment can be shared between the ministries. The content of this platform needs to be provided and maintained by the Ministry of Agriculture or an associated agency.

Increase the business opportunities by introducing the following use cases

- **Consolidated Shipping**
  
  **Rationale:** Shipping/transportation costs are often prohibitively high for a single farmer. This leads to the situation that very often farmer are forced due to economic reasons to leave their harvest on the fields instead of selling them. Tackling down the high costs for transportation of goods is therefore an essential factor to increase the economic situation of the farmers. This service permits several farmers in a similar location to share shipment resources e.g. containers resulting in a significant reduction of the individual costs for transportation of goods to the next larger community or harbor.
  
  **Solution:** A consolidated Shipping services will be developed by eGovernment Agency and operated by the Ministry of Agriculture. This service aligns the request for transportation by the different farmers, considering the kind of good and its volume to be transported.

- **e-Selling Platform**
  
  **Rationale:** Especially non-perishable goods can be sold via additional sales channels like an e-Selling platform. This gives the farmers to develop additional customer groups and eventually bypass intermediaries along the value chain, resulting in a higher income.
  
  **Solution:** an e-Market platform will be developed by eGovernment and maintained by the Ministry of Agriculture. Payment services provided by eGovernment can be used as payment option.

- **Mobile Payment**
  
  **Rationale:** Having a large amount of cash especially in remote areas brings a high risk of theft and crime. The reduction of physical cash helps to reduce the crime level while increases the ease of use as mobile payment does not require to anticipate the amount of money that is needed for any transaction.
  
  **Solution:** Opening of eGovernment payment platform to 3rd parties or partnering with an existing electronic payment provider (see Section 4.4.5). The payment process is done via an app on the mobile phone or via text message.
5. Implementation Roadmap and Cost Approximation

5.1 GAPs between Vision and Status Quo and Challenges

To achieve the goals as outlined in the e-Government vision and mission it is essential to understand the current situation of services being deployed by the Agency as well as to understand what challenges need to be addressed.

The current status of the different domains of a comprehensive e-Government service offering is reflected as a heat map, with the colors reflecting different level of “e-Services readiness”:

- **Green** - Several services and technologies are already available to implement e-Services in the respective domain
- **Yellow** – a limited number of services and/or enabling technologies are available to be used
- **Red** – No services or technologies are currently being used and/or deployed in a specific domain.

![Image 41: Heat Map eGovernment Readiness per Domains](image)

In the following domains, services with a different extent and maturity level were identified:

**Green Domains**

The existing ICT Infrastructure has been assessed as suitable to provide e-Services. This includes the availability of capacity in data centers (albeit they need to be extended under the requirements of zero outage) and the planned extension of existing connectivity towards the hinterland and remote areas as well as the increase of connected public buildings along the coastline as outlined in WP2. Other services in this domain are “Enterprise IT Infrastructure” and “Internet Access via eGovNet”.

© Detecon International GmbH

National ICT Needs Assessment Consultancy – e-Services Readiness Assessment Report (WP3)
This does not yet include special skills needed to operate services, like Operations Support & Readiness and Billing & Revenue management.43

Yellow Domains

The services domain “e-Learning” contains several services and activities launched by the Ministry of Education, respectively the National Center for Educational Resource Development (NCERD) in the field of e-Learning.

The services domains “eParticipation” and eAssistance comprise services currently being implemented by the eGovernment agency, like “Tell Us”, “MARAD connectivity and services” and “Government Portal.”

Besides the technical planning and solutions being currently operated or rolled out, other challenges have to be addressed: They have to be tackled during the early implementation phase of the next step:

- Need of adequate number and expertise in ICT human resources, especially in the field of process management and operation
- Need of suitable policy, legal and institutional frameworks for eGovernment
- Attitude and cultural challenges in the use of ICT w.r.t. hinterland and remote communities
- Enhance service delivery infrastructure and less fragmented delivery channels (online and off-line)
- Bridge eGovernment initiatives across multiple ministries
- Secure sustainability of ICT adoption in the public service
- Increase awareness of eGovernment opportunities
- Drive the buildup of integrated information systems
- Develop and deploy a framework to leverage private sector resources and community participation
- Overcome limited research and innovation on eGovernment in Guyana by cooperation with research institutes and solution providers on a national and international scale.

5.2 e-Service Prioritization and Roadmap

In order to create a roadmap and detailed implementation plan, the above-mentioned e-Services and their respective use cases have to be prioritized. The goal of this section is to detail the prioritization criteria and propose a roadmap of use cases to be implemented between 2017 and 2021.

Prioritization Criteria

There are a number of criteria, which can be used for prioritizing the use cases, grouped along three main categorization areas.

- **Impact**
  - number of potential users, frequency of use
  - perceived importance of service by user
  - potential for creating economic value
  - potential hassle reduction for end user

- **Readiness**
  - Users’ willingness to switch to solution
  - Target group availability
  - Ministries/agencies: resources and existing IT infrastructure, readiness to change processes

43 For a complete business process framework see eTOM 16.0
• Delivery: complexity of process, suitability of process for alternative channels, need for personal interaction, dependency on other not yet digital processes

• External factors
  o Experiences from previously launched e-Services
  o Limitation in number, scope and depth to remain manageable by the team
  o Boundary conditions for service prioritization/pilot programs

A first prioritization is suggested in the next section, however the final set of criteria used and the order of implementation needs to be decided by the project team once all parameters have been checked prior to project start.

Roadmap for e-Services and Use Cases

Based on the described prioritization criteria the following roadmap was derived. It is advised to perform pilot projects with a number of communities and government agencies to validate the assumptions and enable the stakeholders to adopt an “online mindset.” Special care should be taken to not only implement the online components of the use case, but also provision for the offline business processes and resources which are required to fulfill the requested government service. A well-established Business Process Redesign (BPR) Methodology can be used by a specialized team. This requires a deep understanding of the current status for processes in the organization to provide a basis for developing the services/processes framework and set the change boundaries.

A Pilot Project...

...must have a wide audience
  • Affect a large number of citizens
  • Affect a large number of government units

...must have compelling reasons to adopt
  • saves time
  • saves money
  • avoids dealing with corruption
  • enforced by law

E-Learning Roadmap

Finalizing and extending the One Laptop per Teacher program is the most important initiative. School management does not affect students as much as individual learning programs, thus it should be de-prioritized.
E-Health Roadmap

The basic services such as Internet access via a stationary PC and communication availability and providing for enhanced maternal healthcare should be the focuses for the next years. Tele-Surveillance enhances the data gathering capacity and is important for disease control and early intervention capability. Tele-Diagnosis and Tele-Consultation rely on fairly stable and high-bandwidth connections, thus should be deployed when those are ready.

<table>
<thead>
<tr>
<th>E-Health Use Case</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Asynchronous Services</td>
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<td></td>
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<tr>
<td>VoIP Services</td>
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<tr>
<td>Maternal Healthcare</td>
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<tr>
<td>Medical supply management</td>
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<tr>
<td>Health Information System</td>
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<tr>
<td>Tele-Surveillance</td>
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<tr>
<td>Diabetes Management</td>
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<tr>
<td>Tele-Diagnosis</td>
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<tr>
<td>Tele-Consultation</td>
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</tbody>
</table>

![Image 43: Proposed rollout of e-Health services](image)

E-Government Roadmap

The programs which are already partially in place (email, DMS, calendar) should be expanded and made into enterprise-grade services. In addition, extending the website hosting capability should be tackled in the first year. The most demanding enabling services like eSignature and ePayment can be implemented at a later stage as prerequisites for complete online transaction services. It should be noted that all service delivery processes need to be re-
engineered for being provided online. There is mostly also an offline component (backend) involved, which needs to fall into place as well.

<table>
<thead>
<tr>
<th>E-Governance Use Case</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Email System</td>
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<td></td>
<td>(already in progress)</td>
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<td></td>
</tr>
<tr>
<td>Document Management</td>
<td></td>
<td></td>
<td>(partially available)</td>
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<td></td>
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<tr>
<td>Carrier-grade Hosting</td>
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<tr>
<td>Birth Certificate Provisioning</td>
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<tr>
<td>Common Data Model</td>
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<tr>
<td>Passport Application</td>
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<tr>
<td>ID Account/eSignature</td>
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<tr>
<td>E-Payment</td>
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</tr>
</tbody>
</table>

*Image 44: Proposed rollout of e-Government services*

Further e-Service use cases (such as the ones mentioned in Section 4.4) should be evaluated by their impact on the eGovernment Agency’s delivery capability and planned and rolled out on an on-demand basis.

In addition to the e-Services and use cases for other government agencies, the eGovernment Agency should include other projects such as: applications for generic services that are not bound to one agency and integration projects to facilitate and support all other projects and applications across Guyana.

**Next Step– The Action Plan**

A detailed Action Plan is the next step towards successful implementation of the roadmap. It should contain a detailed description of all major projects to be implemented and the steps to be taken within the eGovernment Agency. It needs to be at a level of detail that is sufficient to follow up on reaching milestones and objectives.

An Action Plan can have the following structure:

- Vision and objectives for eGovernment initiative
- E-Services projects to be implemented
- Infrastructure projects to be implemented
- Roles and responsibilities
- Timeline with well-defined milestones
- Budget, incl. planning on which funding mechanisms are planned to be applied

After these points have been clarified and agreed upon by the stakeholders, the individual e-Service projects can be launched using a traditional project management methodology.
5.3 High-Level Cost Approximation

This Section outlines an approach to estimate the costs for aforementioned use cases for e-Learning, e-Health and e-Government services. The goal is to approximate the rollout costs for the next 5 years, following the roadmaps shown above.

The costs for e-Services are broken down in backend and frontend costs for IT equipment and software. The pure network connectivity is assumed given at a public building and is not taken into account here.

Since all government services will be rendered from a public building, which is connected to the eGov Network, it is prudent to assume each of these buildings will evolve over time with regards to the available equipment and electronic services offered. Many e-Services can be run on the same frontend hardware, e.g., a stationary PC, but require an upgrade or new installation in the backend. The cost estimation on one hand focuses on each public building to be fitted with equipment, e.g., regional hospitals, and on the other hand shows what approximate costs arise on the backend for each service. The total implementation costs can then be assumed by fixing the number of public buildings to be fitted and multiplying this number with the unit costs per public building, plus adding the one-time backend costs.

For this estimate, it is assumed the e-Services will be rolled out in specific public buildings:

- **e-Learning**: secondary schools and primary schools
- **e-Health**: regional hospitals and health stations
- **e-Government services**: post offices and community buildings (like benabs for Amerindian villages)

Some use cases are more suited for specific public buildings, while others should be uniformly available. The following tables show the proposed matching.

<table>
<thead>
<tr>
<th>e-Learning Services</th>
<th>Primary School</th>
<th>Secondary School</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teacher Support – Equipment</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Individual Student Learning</strong></td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Remote Classrooms</strong></td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Teacher Support – LMS</strong></td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td><strong>School Management</strong></td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>

| Table 5: e-Learning uses cases matching to primary and other schools |
### e-Health services

<table>
<thead>
<tr>
<th></th>
<th>Health Station</th>
<th>Regional Hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic asynchronous services</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Fixed VoIP</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Maternal Healthcare</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Medical Supply Management</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>Healthcare Information System</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>Tele-Surveillance</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Diabetes Management</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>Tele-Diagnosis</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>Tele-Consultation</td>
<td>❌</td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 6: e-Health uses cases matching to health stations and regional hospitals

### e-Government services

<table>
<thead>
<tr>
<th></th>
<th>Community building</th>
<th>State building, e.g. Post Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Email Services</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Document Management System</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Birth/Marriage/Death Certificate</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Passport Application</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>ID Account / eSignature</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>e-Payment</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 7: e-Government uses cases matching to Community buildings and other state buildings (e.g. Post offices)

The enabler services of “carrier-grade hosting” and “common data model” mentioned in Section 4.3.3 are general backend functions and do not impact the cost of a public building directly.

The individual use case frontend and backend costs can be estimated as follows.
### Table 8: Estimated costs for e-Learning services (in USD for 5 years)

<table>
<thead>
<tr>
<th>Service</th>
<th>Frontend (FE)</th>
<th>Backend (BE)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teacher Support – Equipment</strong></td>
<td>$2,000</td>
<td>$0</td>
<td>FE: Fixed PC to prevent theft (not private property of teacher), projector, printer, class clicker, smartphone BE: none</td>
</tr>
<tr>
<td><strong>Individual Student Learning</strong></td>
<td>$6,500</td>
<td>$7000</td>
<td>FE: 10 fixed PCs, Play2Learn client license as learning software (example) BE: Play2Learn blade server hardware + server license (5yrs)</td>
</tr>
<tr>
<td><strong>Remote Classroom</strong></td>
<td>$500</td>
<td>$17,000</td>
<td>FE: client license 5yrs; hardware already present BE: Echo360 appliance, server license (5yrs)</td>
</tr>
<tr>
<td><strong>Teacher Support – LMS</strong></td>
<td>$0</td>
<td>$17,000</td>
<td>FE: hardware already present, client is browser BE: Moodle blade server, extended coding</td>
</tr>
<tr>
<td><strong>School Management</strong></td>
<td>$500</td>
<td>$4,000</td>
<td>FE: client license BE: blade server h/w, server license</td>
</tr>
<tr>
<td>e-Health services</td>
<td>Frontend (FE)</td>
<td>Backend (BE)</td>
<td>Comments</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>---------------</td>
<td>--------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Basic asynchronous services                            | $1,100        | $22,000      | FE: fixed PC, monitor, printer  
BE: Email server extension, Web server extension, DMS server + licenses, coding                                                                                                                                 |
| Fixed VoIP                                              | $300          | $35,000      | FE: Cisco VoIP phone, router, cabling  
BE: Cisco BE6000, User Connect Licenses, implementation                                                                                                                                                |
| Maternal Healthcare                                     | $5,000        | $15,000      | FE: simple smartphone, app  
BE: partnering with external provider, setup, integration                                                                                                                                              |
| Medical Supply Management                               | $200          | $23,000      | FE: client license, PC already present  
BE: blade server, license 5yrs, integration, coding                                                                                                                                                   |
| Healthcare Information System                           | $50           | $24,000      | FE: client license, PC already present  
BE: blade server, licenses 5yrs, integration                                                                                                                                                            |
| Tele-Surveillance                                       | $0            | $22,000      | FE: browser-based, own eGov platform  
BE: blade server, integration, coding                                                                                                                                                                     |
| Diabetes Management                                     | $5,100        | $15,000      | FE: simple smartphone, app  
BE: partner with Diabeto or mySugr, integration                                                                                                                                                         |
| Tele-Diagnosis                                          | $8,000        | $17,000      | FE: HD photo camera, ECG device, iriscope, ultrasound device, excl. x-ray  
BE: blade server, integration, coding                                                                                                                                                                  |
| Tele-Consultation                                       | $1,500        | $10,000      | FE: HD video camera, client license  
BE: Cisco BE6000 (present); integration, coding                                                                                                                                                         |

Table 9: Estimated costs for e-Health services (in USD for 5 years)
<table>
<thead>
<tr>
<th>e-Government Services</th>
<th>Frontend (FE)</th>
<th>Backend (BE)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Email Services</td>
<td>$1,100</td>
<td>$22,000</td>
<td>FE: fixed PC, monitor, printer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BE: Email server, website server, coding, integration</td>
</tr>
<tr>
<td>Document Management System</td>
<td>$100</td>
<td>$10,000</td>
<td>FE: DMS client license</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BE: blade server hardware for DMS, server license, implementation</td>
</tr>
<tr>
<td>Birth/Marriage/Death Certificate</td>
<td>$0</td>
<td>$22,000</td>
<td>FE: PC (already existing), software on own platform</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BE: blade server, coding (own platform), integration</td>
</tr>
<tr>
<td>Passport Application</td>
<td>$0</td>
<td>$18,000</td>
<td>FE: PC (already existing), software on own platform</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BE: blade server, integration, coding (own platform)</td>
</tr>
<tr>
<td>ID Account / eSignature</td>
<td>$750</td>
<td>$20,000</td>
<td>FE: biometric and/or passport/ID reader</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BE: blade server, server license 5yrs, integration, coding</td>
</tr>
<tr>
<td>e-Payment</td>
<td>$0</td>
<td>$72,000</td>
<td>FE: browser-based, eSignature needed, own platform</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BE: blade server, partner integration, coding</td>
</tr>
</tbody>
</table>

Table 10: Estimated costs for e-Government services (in USD for 5 years)

Taking the assignment of use cases to public buildings into account (as described above) and assuming the number of buildings to be covered between 2017 and 2021 as below, the total e-Service implementation costs as shown in the following table. The number of schools is taken from Ministry of Education website, the number of post offices from the Guyana Post office Corporation website.\(^{44}\)

<table>
<thead>
<tr>
<th>Cost block</th>
<th>#</th>
<th>unit cost</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>e-Learning</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Schools</td>
<td>434</td>
<td>$2.000</td>
<td>$868.000</td>
</tr>
<tr>
<td>Secondary Schools</td>
<td>111</td>
<td>$9.500</td>
<td>$1.054.500</td>
</tr>
<tr>
<td>Backend</td>
<td>1</td>
<td>$45.000</td>
<td>$45.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$1.967.500</strong></td>
</tr>
<tr>
<td><strong>e-Health</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Stations</td>
<td>200</td>
<td>$6.400</td>
<td>$1.280.000</td>
</tr>
<tr>
<td>Regional Hospitals</td>
<td>10</td>
<td>$21.250</td>
<td>$212.500</td>
</tr>
<tr>
<td>Backend</td>
<td>1</td>
<td>$183.000</td>
<td>$183.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$1.675.500</strong></td>
</tr>
<tr>
<td><strong>e-Governance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community building</td>
<td>249</td>
<td>$1.950</td>
<td>$485.550</td>
</tr>
<tr>
<td>State building (post)</td>
<td>67</td>
<td>$1.950</td>
<td>$130.650</td>
</tr>
<tr>
<td>Backend</td>
<td>1</td>
<td>$164.000</td>
<td>$164.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$780.200</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$4.423.200</strong></td>
</tr>
</tbody>
</table>

Table 11: Summary of e-Services implementation cost for 2017-2021 in USD
6. Key Success Factors for eGovernment Service Implementation

6.1 Organizational Setup and Required Capacities

From the organizational structure perspective, the following recommendations can be made. The chart below shows the organizational changes in the eGovernment Agency in blue:

![Proposed New Organization of eGovernment Agency](image45.png)

Policy and Training Division

- Extend the knowledge beyond the current focus on IT topics. If this Center of Excellence should fulfill the tasks to train and operate the regional training hubs and their trainers, additional skills especially towards e-Services need to be implemented.
- Liaisons experts to align with the communities especially in remote areas need to be implemented.

Enterprise Solutions Division

- Establish a team of account managers to serve as entry points for demands by the ministries and agencies. This is essential to promote own activities and services as well. It has to be verified if certain customer relations managers currently under “Secretariat” can be moved to this account management team.
- A team to deal with vendors or potential solution providers needs to be set up. This vendor management team is responsible for aligning with procurement departments within the government as well.

Program management & Community Development Division

It is recommended to split up this division. Program and project management should be a dedicated division with the focus on execution of projects within the eGovernment Agency, while the future Community
Development Division focuses on aligning with communities and promoting the strategy and aims of the eGovernment Agency. The liaison experts can be anchored in this division as well.

- The Program management division needs to expand its resources in the field of experienced project managers (small and large, especially infrastructure-centric, projects)

Infrastructure Division

- OSS/BSS subdomain is missing. This would include the responsibility of Operation Support Systems (OSS) as well as Business support systems (BSS) to be in the position for the eGovernment Agency to extend and scale their service offering as described and proposed in the ICT needs Assessment.
- Operational framework design and implementation needs to be reflected in the organization and therefore build up. This would include responsibilities to design new processes, e.g., based on ITIL.
- Division needs to build up extended skills in network infrastructure implementation and maintenance

A strategic planning division needs to be set up as well. This includes primarily the tasks of direct strategy development and execution but should also include, at a later stage, an Enterprise Architecture management team. Their responsibility would be to define the rules of enterprise architecture management and secure the alignment between strategy and IT. It also provides the role of a strategic demand management process to prioritize and forecast new projects.

It has to be noted that a balance between the headcount of administration/management on the one side and the number of experts in the different fields on the other side has to be aligned. The hierarchies should be as flat as possible and reasonable. This will help to keep costs for administration low and helps to drive the overall performance if the experts are empowered to take decisions under their own responsibility. It is therefore recommended to implement one management level below the CEO only (mid-term perspective).

**Needed capacities**

The following breakdown gives an overview about selected different roles needed and their respective skills to extend the service offering of e-Government Agency:

*Infrastructure*

- Engineering Manager
  - **Role Definition**
    - Department manager for the Network Engineering Section assumes functional and administrative leadership responsibilities to department staff.
    - Responsible for technology trend scouting, strategic network architecture design, equipment and platform tendering and vendor relations.
    - Support to top management in formulation of technology strategy.
    - Definition of technical standards and guidelines for network planning, implementation and operation.
    - Close cooperation with strategy department for the definition of features, capabilities and capacities of the network technology in order to define the most economical technical solution to “business” requirements.
  - **Knowledge**
    - Good and proven experiences in developing Network Strategy (fixed, mobile and Satellite)
    - Advanced knowledge of architecture and network equipment
    - Deep knowledge of international standard and guideline for network planning
  - **Functional Skills**
    - Ability to formulate the network strategy
    - Ability to translate technology trends into network architecture
    - Overseeing and contributing to development of guidelines and standards for network planning, implementation and operation.
- Ability to analyze complex systems and to derive appropriate recommendations and solutions
  
  o Soft Skills
  - Ability to lead a team
  - Ability to decide and to take appropriate risk
  - Advance communication and negotiation skill
  - Stakeholder management
  - High degree of service orientation
  - Goal and performance orientation
  - Advance cost awareness and efficiency

- Engineering Specialist
  
  o Role Definition
  - Execution of network engineering and strategic technology design.
  - Execution of technology trend scouting, strategic network architecture design, equipment and platform tendering and vendor relations in respective network domains (e.g. Access, Core, IN/VAS, Transmission, Ancillary systems).
  - Definition of technical standards and guidelines for network planning, implementation and operation.
  - Close cooperation with strategic department for the definition of features, capabilities and capacities of the network technology in order to define the most economical technical solution to “business” requirements.

  o Knowledge
  - Experiences in developing Network Strategy
  - Advance knowledge that regard to architecture and network equipment
  - Knowledge of international standards and guidelines for network planning

  o Functional Skills
  - Ability to formulate the network strategy
  - Ability to translate technology trends into network architecture
  - Overseeing and contributing to development of guidelines and standards for network planning, implementation and operation.
  - Ability to analyze complex systems and to derive appropriate recommendations and solutions
  - Ability to execute proposed solutions and related measures

  o Soft Skills
  - Advanced execution skill
  - Ability to decide and to take appropriate risk
  - Advanced communication and negotiation skill
  - Stakeholder management
  - High degree of service orientation
  - Goal and performance orientation

- Network Planning & Optimization Engineer
  
  o Role Definition
  - Execution of network planning and performance optimization tasks based on the different applied technologies.
  - Planning of network elements and related components (hardware and software) in term of architecture, dimensioning, capacity and functionality for all applicable network domains, i.e. Access, Core, Transmission, VAS/IN and other systems as required.
  - Analysis of commercial- and business requirements in order to provide network configuration and -dimensioning in line with technical standards and guidelines.
- Analysis of network performance measurements and deduction of mitigation measures to optimize network performance towards maximum service experience.
- Utilization of electronic tools and scientific metrics for network planning and performance optimization.
- Preparation of work orders for network configuration in order to achieve integration of new network elements, components or capacity as well as implementation of optimization measures.
  - Knowledge
    - Advance knowledge on RF Planning, link budget and pass RF advance training courses.
    - Expert knowledge in network planning tool (or has training course on network planning tool)
    - Expert knowledge in network KPI and Service Quality Management (SQM).

- Network Implementation Manager
  - Role Definition
    - Department manager for the Network Implementation Section, assumes functional and administrative leadership responsibilities to department staff.
    - Planning and execution of implementation- and modification projects exceeding the configuration of existing network elements.
    - Liaison with vendors and service providers for site design-, acquisition-, permitting- and construction tasks as applicable.
    - Approval of site designs and passive support structures (e.g. housing, towers, duct systems) to accommodate the implementation of active network elements and equipment.
    - Steering and management of internal and external service providers for construction and implementation of active and passive network components.
    - Specification and maintenance of appropriate documentation for all projects (new sites, alterations, decommissioning).
  - Knowledge
    - Proficient knowledge on overall Mobile network but expert knowledge in Radio Access Network
    - Expert knowledge in SLA management and network KPI
    - Knowledge in dealing with communities in remote and hinterland areas;
  - Functional Skills
    - High Experience in Mobile Network implementation.
    - Expert in Network Quality Assurance (QA)
    - Proven skill in managing vendors and project budget

- Civil Work Management
  - Role Definition
    - Management of construction activities for passive network infrastructure and other civil works projects as required.
    - Provision of input to site design and architectural specification according to business requirements.
    - Liaison with architects and civil contractors in definition of work, site design and construction execution.
    - Health&Safety management on construction sites according to legal requirements.
    - Quality management and acceptance for all civil works activities.
    - Execution of major maintenance and alteration projects if associated with civil engineering and construction.
    - Maintenance of civil works related documentation (construction drawings, as-build drawings, and other documentation as required).
Knowledge
- Proficient knowledge on construction design
- Basic knowledge on basic network elements at site including the infrastructure inside.

Functional Skills
- Proven skill in telecom site/tower construction as Base Station Tower, Switching Center etc.
- Experience in project management control process to deal with vendors.

Property Management
Role Definition
- Management of real estate related tasks associated with erection and operation of network elements and company property.
- Application of legal permits for site construction activities (new builds, alterations, decommissioning as required).
- Liaison with external service providers for property-related tasks, such as site acquisition, procurement, leasing and disposal of property and building.
- Conclusion and execution of lease- and procurement contracts for property and building space as well as installation space for telco equipment (site sharing) as applicable. Ensure lease rates are favorable and are in line with business objectives.
- Maintenance of site records and documentation according to specifications.

Knowledge
- Expert knowledge on leasing contract and property management

Functional Skills
- High experienced in rental rate structural
- High experience in negotiation and making leased contract.
- Proven skill on site survey

Soft Skills
- Stakeholder management especially to owners of public buildings (e.g. police, Toshaos)

Network Operation Manager
Role Definition
- Department manager for the Network Operations Section, assumes functional and administrative leadership responsibilities to department staff. Assumption of ownership for all network elements after acceptance from Network Implementation (owner of live network).
- Single point of contact for problems and tasks related to live network.
- Escalation instance for network related problems.
- Management and maintenance of records and documentation related to network, especially network configuration records and network asset register.
- To manage the Network Operations Department and all of the Network elements and its interconnection. Act as the prime point of contact and the focal point for all operational related activities. Managing suppliers, department operational budgets and sub-contractors. Liaise and coordinate repair/restoration activities with other 3rd parties as and when necessary. Act as the central point of contact for all network fault management.

Knowledge
- Expert knowledge on Mobile Network. Able to transfer knowledge to NOC team.
- Expert knowledge in SLA management and network KPI

Functional Skills
- High experience in (Mobile) Network Operation (different technologies)
- High experience on Fault Management.
• Proven skill in Network Management System for system monitoring in term of KPI and SQM. Apply his knowledge and experience to improve network service quality, KPI/KQI.

• **NOC Manager**
  o **Role Definition**
    ▪ Department manager for the Network Operations Centre assumes functional and administrative leadership responsibilities to department staff. Assumption of ownership for all network elements after acceptance from Network Implementation (owner of live network).
    ▪ Central operations entity of all network components, divided into the operations functions of: fault management, configuration management, performance management and security management.
    ▪ Implementation and operation of 24x7 network surveillance.
    ▪ Assumption of responsibility for service assurance.
    ▪ Central contact- and escalation point for customer-facing units (such as Customer Care Centre, Sales, Marketing) for questions and complaints related to live service.
  
  o **Knowledge**
    ▪ Expert knowledge on Mobile Network. Able to transfer knowledge to NOC team.
    ▪ Expert knowledge in SLA management and network KPIs
    ▪ Expert knowledge in eTOM
  
  o **Functional Skills**
    ▪ High experience in Fault Management
    ▪ High Experience in Network Management System for system monitoring and generate report.

• **Fault Management Team Leader**
  o **Role Definition**
    ▪ Team manager for Fault Management Team within the NOC department. Assumes functional and administrative leadership responsibilities to team staff. Responsibility for monitoring of operation condition for all network elements.
    ▪ Organization of 24x7 network and service surveillance by means of shifts. Scheduling of shift roster and shift team composition to ensure required expertise and capacity at any time.
    ▪ First escalation instance for all kinds of network and service problems as appropriate and defined in related process.
    ▪ Leading the identification of network and service degradation or outages and initiation of appropriate mitigation measures.
    ▪ Further escalation of activities to second level support and management as appropriate.
    ▪ Ensure the correct maintenance of documentation related to network monitoring (e.g. trouble ticketing, event recording, emergency change management, failure statistics) and handling of communication related to network events (external and internal).
    ▪ Preparation of statistics and history records for faults and other relevant network events.
  
  o **Knowledge**
    ▪ Expert knowledge on Mobile Network. Able to transfer knowledge to NOC team.
    ▪ Expert knowledge in SLA management and network KPI
    ▪ Expert knowledge in e-Services platforms and technologies
  
  o **Functional Skills**
    ▪ High experience in Fault Management
    ▪ High experience in Network Management System for system monitoring and generate report.
- High experience in service management and monitoring systems

- Fault Management Operator
  o Role Definition
    - Daily operation of Fault Management functions within the network monitoring/NOC and e-services operation/monitoring.
    - 24x7 shift operation for monitoring of services and network elements.
    - Identification of network and service degradation or outages and immediate reaction by means of initiation of mitigation measures.
    - First line diagnosis of failures and service degradation.
    - Escalation of activities to second level support and management as appropriate.
    - Assumption of responsibility for the execution fault mitigation activities until final resolution.
    - Maintenance of documentation related to network monitoring (e.g. trouble ticketing, event recording, emergency change management, failure statistics) and handling of communication related to network events (external and internal).
  o Knowledge
    - Basic knowledge on Mobile Network.
    - Proficient knowledge of the process to handle fault / tickets from internal training.
    - Knowledge in e-Services platforms and technologies
  o Functional Skills
    - Experience in Fault Management
    - Experience in Network Management System for system monitoring and generate report.
    - Experience in service management and monitoring systems

- Configuration and Support Team Leader
  o Role Definition
    - Team manager for Configuration Management Team within the NOC department. Assumes functional and administrative leadership responsibilities to team staff. Responsibility for configuration activities on all network elements.
    - Single point of contact and single entity within the company to change network configuration on elements in live service.
    - Assume responsibility for correct configuration of all instances of network and all elements, according to planning data.
    - Immediate update of related documentation and records in order to ensure correct reflection of network status at any time.
    - Assume responsibility for second line expert support for network technology.
    - Execute initial configuration (new elements) and reconfiguration of live elements and network parameters according to planning data or as emergency mitigation action in case of problems.
    - Identification of shortcomings and upgrade requirements, e.g. firmware and software upgrades, and triggering of respective planning- and procurement process as appropriate.
    - Provide expert opinion and input to other departments related to network technology. Contributes to general technology- and project planning related to network technology.
  o Knowledge
    - Advance knowledge on Mobile Network Elements and its interfaces.
      - Circuit Switch Network
      - Packet Switch Network
      - IN/VAS
      - RAN/RNC
Expert Knowledge on network integration and operation.
Expert Knowledge on Fault Handling process from internal training
Knowledge on team builder or has a leadership training course.

- **Functional Skills**
  - Expert skill on network element’s configuration and modification.
  - Expert in network operation on each network element:
    - Circuit Switch Network
    - Packet Switch Network
    - IN/VAS
    - RF
  - Expert skill in critical fault handling when get the escalation from the lower level.
  - Apply his knowledge to advise management and marketing team to create new products.

**Program Management**

- **Network Project Manager**
  - **Role Definition**
    - Planning, scheduling and execution of implementation projects for active and passive network elements and -components. Project management to ensure project stays within designated timeframe, budget, resources and quality.
    - Project planning, such as budget- and resource allocation.
    - Project execution control and management of related vendors and service providers (external and internal).
    - Cross-functional coordination of projects and related interfaces to ensure acceptance and seamless integration of network elements.
    - Provision of reports related to project progress, budget- and resource utilization and other project related parameters as required.
    - Management of project related documentation.
  - **Knowledge**
    - Expert knowledge level on Radio Network Access (RAN) and Transmission Network.
    - Expert knowledge in project management skills (PRINCE2)
  - **Functional Skills**
    - High experience in network rollout and quality Assurance
    - High experience in project management, managing vendors and project budget to delivery on time and within budget
    - High experience in acceptance test procedure

- **IT Project Manager**
  - **Role Definition**
    - Manage the delivery of all IT & Billing related projects, in accordance with requirements, budget and schedule. Management of project related documentation.
  - **Knowledge**
    - Advance knowledge in Project Management (Ideally certified in PMI, PRINCE or similar)
    - Proficient knowledge in IT and Billing system, data warehouse as well as other OSS/BSS.
    - Proficient knowledge in ITIL processes in IT service management.
    - Proficient knowledge of MS Project and MSOffice suite
  - **Functional Skills**
    - Highly experienced in project management, managing vendors and project budget to delivery on time and within budget
    - Ability to plan, organize and direct the work of a technical staff Soft Skill
Strategic Planning

- IT Architect
  - Role Definition
    - Develop, build and maintain an IT architecture of the IT landscape ensuring that it is efficient, effective and fit for purpose in meeting the immediate and future business requirements of eGovernment Agency.
  - Knowledge
    - Expert knowledge in systems design and development
    - Expert knowledge of information technology, services, standards, procedures and guidelines
    - Advanced knowledge of applicable data privacy practices and laws
    - Proficient knowledge of database architecture and operating principles.
  - Functional Skills
    - Experienced in information processing principles and practices
    - Advanced skills in system operations and procedures
    - Advanced analytical (analysis, evaluation) and problem solving (troubleshooting) skills
    - Advanced technical architecture and technical support documentation skills
    - TOGAF skills for Architecture Management

Enterprise solutions

- E-Services Project Manager
  - Role Definition
    - Planning, scheduling and execution of implementation projects e-services. Project management to ensure project stays within designated timeframe, budget, resources and quality.
    - Project planning, such as budget- and resource allocation.
    - Project execution control and management of related vendors and service providers (external and internal).
    - Cross-functional coordination of projects and related interfaces to ensure acceptance and seamless integration of network elements.
    - Provision of reports related to project progress, budget- and resource utilization and other project related parameters as required.
    - Management of project related documentation.
  - Knowledge
    - Expert knowledge level on service and platform technologies (e.g. Java, C++, Linux)
    - Expert knowledge in project management skills (PRINCE2)
  - Functional Skills
    - High experience in service implementation and quality Assurance
    - High experience in project management, managing vendors and project budget to delivery on time and within budget
    - High experience in acceptance test procedure

Note: Fault management for e-services as described above also applies to this domain.

It has been shown that a comprehensive initiative such as government e-Services implementation hinges on a few success factors, which need to be overserved and implemented as far as possible. Below lists address the four major
domains of organization of the eGovernment Agency, the processes and respected organization as well as the people and IT perspectives.

Image 46: Key success factors for comprehensive ICT management

6.2 Organizational Success Factors

- Get buy-in from higher levels of the organization and support from the responsible minister and other key decision makers at the respective government agency or ministry and hold regular review meetings
- Based on the eGovernment mandate, define the right roles and responsibilities. – Within the Agency and towards the other ministries. From the targets of operational excellence and efficiency, a ratio of 80 to 20 of internal value creation at the eGovernment Agency should be achieved. This means that 80% of the software and infrastructure needs of the ministries and agencies shall be provided by eGovernment and only 20% are special solutions where the selection and deployment process should be under the responsibility of the respective organization.
- Ensure a powerful project management office is in place. The methodology should follow established project management standards like PRINCE2. Projects managers are needed with clear responsibilities and empowerment as well as a dedicated working team consisting of
  - Key business process owners
  - IT department staff
- Set up a clear project organization with a well-defined, practical escalation procedure
- Set up an IT management framework based on established standards like TOGAF and COBIT\(^5\).
- Drive the deregulation of the telecommunication market while closely monitoring and preventing the creation of new monopolies. This will help to bring costs for telecommunications to a reasonable level while increasing the quality of services provided

\(^5\) COBIT® 5 provides structures for risk optimization and optimization of resource utilization while driving enterprise benefit realization. Furthermore COBIT® 5 is supporting IT alignment by bridging the understanding gap between eGovernment strategy requirements and IT capability definitions.
### Case Study eGovernment Framework in Swiss Government

In the year 2007, the Swiss Government approved the eGovernment strategy to be implemented within the next years. Based on this eGovernment strategy, the federal IT steering Unit (FITSU) developed an ICT strategy and an implementation roadmap until the year 2015. Due to the federal structure of the Swiss Confederation, nearly all Swiss cantons developed their own e-Gov strategies and respective implementation roadmaps in parallel at the same time. The overcome this parallel approach and to save resources and increase efficiency, the federal government, representatives of cantons and ICT suppliers joined forces within the eCH association (the eGovernment body) in order to develop the needed eGovernment standards.

#### Business Challenge

- Lack of coordination within the governmental organization (three organizational layers: federal – canton – municipality)
- Development of eGov standards in a highly complex environment with involvement of different stakeholders (following deviating political agendas)
- Individual ICT architecture strategies and different maturity degrees of ICT landscapes in the different units and agencies
- Limited availability of resources (financial and personnel)
- Challenging timeframes for a planned realization

#### Project Approach following the TOGAF framework and their Architecture Development Method (ADM)

**Step 1: Analysis**

- Analysis of eGov strategy and definition of organizational and IT initiatives
- Development of common terminology and procedures
- Identification of action areas and pilot projects
- Definition of architecture principles

**Step 2: TARGET ARCHITECTURE DEVELOPMENT**

- Development of detailed IT and technological architectures for the support of eGov strategy
- Identification of common (federated) and individual architecture elements

**Step 3- SOLUTION DESIGN & MIGRATION PLANNING**

- Evaluation of different implementation scenarios
- Development of a migration strategy with single local implementation steps

**Step 4 IMPLEMENTATION & CONTROLLING**

- Establishment of required governance structures in order to control the eGovernment services implementation
- Implementation of an ongoing planning improvement process
6.3 Design and Mapping of Processes and Services

- Implement a demand management process. Having this process in place is essential as it balances the customers’ requirements with the capabilities of the supply chain hence eGovernment Agency. With the right process in place, management can match supply with demand proactively and execute the plan with minimal disruptions and with an effective usage of available resources. The process is not limited to forecasting. It includes synchronizing supply and demand, increasing flexibility, and reducing variability.
- Having the right e-Service support processes in place is more important than just implementing a software – and it is much more complex. It is essential to considered this in every planning activity for new e-Services.
- Create a clear description of scope and desired outcomes in line with the project methodology being used.
- Include the end user perspective in designing processes and services by conducting end user interviews or surveys.
- Implement pilot services for gaining experience and achieving first results for your stakeholders
- Include outsiders in the process mapping exercise to ensure objective issue analysis, but develop the redesign in the working team, i.e., with key business process owners
- Think big and do not let possible obstacles limit your thinking about service redesign, considering the feedback from users and stakeholders.

6.4 IT and implementation

- Think about a possible Request For Proposal (RFP) already when detailing the process redesign and e-service IT requirements
- Gather sufficient funding from all stakeholders or development partners early in the process
- Execute a stringent vendor management w.r.t. contractually scheduled results/responsibilities
- Ensure regular monitoring and reporting and compare to the set plan of the initiative
- Define project risks and mitigation efforts periodically
- Accept and be ready to fail early – this helps to keep invests to a minimum and give the chance for a successful second attempt.
- High reliable IT infrastructure needs to be provided to secure 24/7 availability of the services. This includes the design of the data center. The following aspects need to be considered:
  - **Architecture:** Low-Key vs. High Profile. The current data center is clearly identifiable from the outside as an eGovernment container. This provides risks in regards to sabotage.
  - **Energy Efficiency:** Design the Data center as a “green” Data center, following LEED standards and defined energy efficiency rules. “A green Data Center is a high-performance facility for the storage, management, and dissemination of data in which the mechanical, lighting, electrical and computer systems are designed for maximum energy efficiency and minimum environmental impact. The construction and operation of a green data center includes advanced technologies and strategies.” The Data Center design can force you to make a choice between LEED certification and reliability/availability.
  - **Security Systems – Monitoring + Access Control:** Deploy CCTV, Biometrics access controls, Leakage detection techniques as well as man traps.
  - **Control Center:** Operating, Network Monitoring, Security Systems, Building Management Systems (BMS), Monitoring vs. Management
  - **Continuous Operation:** Optional Shutdown of dedicated IT-systems / Racks upon alarms of technical or security systems

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46 Leadership in Energy and Environmental Design (LEED) program
Operational Continuity: Deploy redundancy offsite in a secondary location, securing zero outage handover.

Energy Supply: Secure 2nd source of power

### Open Source versus Closed Source (Proprietary)

Open Source and Closed Source are two approaches to the implementation and distribution of software. Open Source Software often comes with a usage license that permits free of charge use. Many public and private organizations have experimented with the deployment of open source software in their environments, with the focus on eventually reducing the Total Costs of Ownership (TCOs). The result gives a mixed picture and leads to the recommendation that Open Source might not be suited for the Guyanese context in general (i.e. replacing standard office products), but might be useful in the back office (e.g. server farms) and for niche solutions. Some points to consider specifically when looking at user-facing software:

1. Multiple professional programs, especially in the public sector, do not run on Linux systems, resulting in the need of having PCs with Windows.
2. Libre Office as a standard open source office product is not as powerful as MS Office. Data formats are not fully compatible and the different UI/UX lead to high training efforts for the users.
3. There is a need for many skilled software engineers to tweak, integrate and maintain an open source based solution.
4. Integration of open source using laptops in existing Windows based environments have been challenging, e.g., resulting in integration problems like not able to print properly.
5. External partners often rely on standard office formats - this has been problematic as the different file formats are incompatible.
6. Open source software in their basic forms are mostly not barrier free for handicapped people to use.
7. Only limited process support, as the acceptance by the users is mostly not given.

### 6.5 IT and Process Management Frameworks

Focus should lie on the implementation of established standards in the management and operation of an IT Department:

- PRINCE2 or other established framework for Project Management
- COBIT5 as an established framework for IT governance
- At a later stage TOGAF to establish an enterprise architecture framework
- ITIL as a set of practices for IT service management
Besides the IT centric standards, the usage of the eTOM framework as a Business Process Framework for the telecommunication industry is recommended as with the increased role of eGovernment Agency in the country the Agency needs to deploy and operate many processes as a telecommunication operator.
7. **Next Steps towards a successful e-Service enablement**

The detailed eServices enablement plan for eGovernment needs to focus on three dimensions:

I. **Capacity Building** – all aspects of developing the right skillsets being able to develop, operate and use e-Services by the different stakeholders

II. **Framework readiness** – organizational, operational, legal steps needed to successfully deploy and operate e-Services

III. **e-Services rollout** – understanding dependencies between needed enabling services and services targeting users like citizens and governmental stakeholders.

In each of these dimensions, there are a number of activities that need to be planned. The following checklists will guide the planning phase.

**Capacity Building**

- Initiate and drive capacity building at e-Government Agency
  - Step 1 – Implement a standardized Project Management Framework (PRINCE2 or PMI)
  - Step 2 – Identify and implement relevant aspects of eTOM framework needed for existing and future domains of activities of eGovernment Agency
  - Step 3 – Transform operation and management according to ITIL and CoBIT
  - Step 4 – Implement Enterprise Architecture Capabilities based on TOGAF
- Setup National Training Center in Georgetown (Location, Trainers, Funding)
- Elaborate skill profile and job descriptions for IT specialists in all ministries
- Elaborate skill profile and job descriptions for master trainers
- Prepare curriculum and develop detailed content of the trainings modules
- Develop and implement an information campaign about risks of using the internet and ICT services and how to stay safe. Develop dedicated information material to ensure children stay safe when using e-Services and the internet.
- Elaborate and implement reporting measures in case users observe harmful conduct when using the internet (fraud, sexual harassment, etc.). Create and empower organizations to report to and publish the contact details to the users.

**Framework readiness**

- Obtain mandate for e-Government Services to be deployed and operated by eGovernment Agency, considering the proposed 80:20 approach in regards to operational ownership of e-services.
- Implement demand management process at eGovernment agency.
- Expand organization of eGovernment Agency and create additional positions required (e.g. account managers, vendor management team) and staff positions within the eGovernment Agency and Ministries. The new hires need to be skilled and experienced enough to lead infrastructure implementation and software training efforts. Collaboration with external vendors also needs to be steered.
- Secure carrier grade operation for e-Government Services
- Setup a dedicated program management office (PMO) to drive and oversee the implementation
- Address legal activities needed to facilitate digital cooperation between different governmental entities.
- Extend legal frameworks (e.g. for health e-Services) in line and anticipating the planned e-Services rollout
- Initiate needed changes in other governmental entities to be ready for the planned e-Services (e.g. police for security services)

**e-Services rollout**

- Create a single “e-Services board” which comprises all relevant government stakeholders. This will drive the initiative and make sure sharing of platforms will be realized.
8. Assign the leadership structure for the initiative and schedule regular meetings. This will give authority to the work stream leaders and enable periodic reviews.
8. Develop roadmap for e-Services rollout, considering dependencies between enabling services and user services, existing skills and financial resources.
8. Start tendering phase: Launch RfI (optional), develop detailed technical and procedural requirements and write the RfP, launch tender, evaluate of responses, negotiate with short-listed vendors, close contract
8. Select locations and start pilot of e-Services
8. Drive full-scale rollout of e-Services platforms in hinterland, poor and remote communities

8. Appendix

8.1 References

Ghirardini, B., “E-learning methodologies - A guide for designing and developing e-learning courses”, FAO (Food and Agriculture Organization of the United Nations, 2011
http://www.wise-qatar.org/edhub/cybersmart-africa
http://csd.columbia.edu/2015/01/20/the-grassroots-rise-of-a-new-learning-technology/
http://mcneilfoundation.org/digital-learning-in-potou-senegal/
http://www.ascilite.org/conferences/sydney13/program/papers/Fei.pdf
http://blog.echo360.com/echo360-solutions-for-every-classroom-learning-situation-and-budget

8.2 List of current projects in the eGovernment Agency (as of Sept. 2016)

<table>
<thead>
<tr>
<th>#</th>
<th>Project Name</th>
<th>Main Objective</th>
<th>Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Application Store Project - Web Portal</td>
<td>Create a web portal to improve the delivery and accessibility of governmental electronic resources.</td>
<td>n/a</td>
</tr>
<tr>
<td>2</td>
<td>Appointment Scheduling Solution</td>
<td>Implement an appointment scheduling solution for the public to reserve a specific date and time for government services.</td>
<td>n/a</td>
</tr>
<tr>
<td>3</td>
<td>Biz Continuity in the Banking Sector</td>
<td>The project seeks to provide secure off site back up business continuity service to the Bank of Guyana.</td>
<td>n/a</td>
</tr>
<tr>
<td>4</td>
<td>Captive Portal Project</td>
<td>Creation of Captive Portal for Public Internet Access</td>
<td>n/a</td>
</tr>
<tr>
<td>5</td>
<td>Center of Excellence in IT Project</td>
<td>Design and Implement a Center of Excellence in Information Technology (CEIT) together with the Government of India</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Project Title</td>
<td>Description</td>
<td>Responsible Party</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>6</td>
<td>Community ICT Hub</td>
<td>To create ICT hubs that provide eGovernment services to residents in 24 poor, rural or hinterland communities across Guyana.</td>
<td>n/a</td>
</tr>
<tr>
<td>7</td>
<td>Corporate Email Project</td>
<td>Implementation of Enterprise Email Solution</td>
<td>Guoyan Rampersaud</td>
</tr>
<tr>
<td>8</td>
<td>Correspondence Mgmt</td>
<td>Source and implement an appropriate application with the basic features that can enhance correspondence management.</td>
<td>Guoyan Rampersaud</td>
</tr>
<tr>
<td>9</td>
<td>CPCE Project</td>
<td>To provide network connectivity to eight Cyril Potter College institutions that fall within range of the eGov network infrastructure.</td>
<td>Lloyd Marks</td>
</tr>
<tr>
<td>10</td>
<td>eGov Critical Services</td>
<td>Deployment of IaaS, PaaS and SaaS solutions for Cloud-based Email, web portal, captive portal, appointment scheduling, ...</td>
<td>Clarence Garraway</td>
</tr>
<tr>
<td>11</td>
<td>eGov NDMA Project</td>
<td>To secure legal mandate and establish the institutional framework for the eGovernment Unit. National Data Management Authority Act</td>
<td>Nichelle Layne</td>
</tr>
<tr>
<td>12</td>
<td>eGov Net</td>
<td>Enable a sustainable EA model to align business processes, technology, and information to deliver G2C, G2G and G2B solutions.</td>
<td>Ganesh Sharma</td>
</tr>
<tr>
<td>13</td>
<td>Enterprise IT Infrastructure</td>
<td>To procure, install, configure &amp; test a complete enterprise IT infrastructure, network monitoring and helpdesk solution (Solarwinds)</td>
<td>Clarence Garraway</td>
</tr>
<tr>
<td>14</td>
<td>Fin Mgmt Sy - LTE Info Processing Sys</td>
<td>Computerized and comprehensive financial management software that will manage the Inventory and Accounting activities.</td>
<td>Joycelyn Forde Garnett</td>
</tr>
<tr>
<td>15</td>
<td>Frequency Convert</td>
<td>To convert 60Hz cycle GPL power supply to 50Hz cycle to feed the Data Centre.</td>
<td>Alec Persaud</td>
</tr>
<tr>
<td>16</td>
<td>Gov.Net Host</td>
<td>Create a portal that provides for a unified, effective web presence, complete with visual designs and information architecture.</td>
<td>Clarence Garraway</td>
</tr>
<tr>
<td>17</td>
<td>Gov Official Calendaring Solutions</td>
<td>Implementing Bitrix 24 content management systems to support the calendaring and scheduling solution for eGov.</td>
<td>Guoyan Rampersaud</td>
</tr>
<tr>
<td>18</td>
<td>GPL Project</td>
<td>Provide a fiber optic infrastructure link from GPL's network to eGov's LTE sites from Parika to Skeldon by end Q3/2016.</td>
<td>Alec Persaud</td>
</tr>
<tr>
<td>19</td>
<td>GT FO Restore</td>
<td>Restore functional capacity to the Georgetown fiber ring, providing network connectivity to 20 ministries/agencies by 03/2016.</td>
<td>Avinash Ramraj</td>
</tr>
<tr>
<td>20</td>
<td>GT Linden FO Project</td>
<td>Establish a communication infrastructure that connects Linden as part of the wider eGov infrastructure.</td>
<td>Rosco Greene</td>
</tr>
<tr>
<td>21</td>
<td>LTEPS Project</td>
<td>Development and implementation of the SIM and Mobile Device Tracking Manager software.</td>
<td>n/a</td>
</tr>
<tr>
<td>22</td>
<td>MARAD project</td>
<td>To extend and modernize the IT architecture at the MARAD.</td>
<td>Rosco Greene</td>
</tr>
<tr>
<td>23</td>
<td>Ministry Of Business Project</td>
<td>Providing connectivity and additional services (internet access, backup services etc.) between the MoB and other gov agencies.</td>
<td>Ish Singh</td>
</tr>
<tr>
<td>24</td>
<td>Min of the Presidency project</td>
<td>Facilitating ease of access, collaboration and dissemination of information within the MOTP and with external agents.</td>
<td>Steveon Thomas</td>
</tr>
<tr>
<td>25</td>
<td>National eID Project</td>
<td>To transform the existing ID system into a single unique identification system for citizens and residents.</td>
<td>Dr. Samantha Scotland</td>
</tr>
<tr>
<td>26</td>
<td>NOC Project</td>
<td>Establishment of the eGovernment Unit Network Operations Center (NOC)</td>
<td>Kevon Smith</td>
</tr>
<tr>
<td></td>
<td>Project Name</td>
<td>Description</td>
<td>Responsible</td>
</tr>
<tr>
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<td>------------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>27</td>
<td>PIAPS Project</td>
<td>Bridge the digital divide by providing public internet access points, by which citizens can access ICT and eGovernment services.</td>
<td>Phillip Walcott</td>
</tr>
<tr>
<td>28</td>
<td>Policy Frame Project</td>
<td>Development of a Policy Framework for the eGovernment Unit, Ministry of the Presidency.</td>
<td>Nichelle Layne</td>
</tr>
<tr>
<td>29</td>
<td>Pol Rep Project</td>
<td>MIS Department of the eGovernment Unit to identify a software solution to function as a repository for the projects.</td>
<td>Asena Marques</td>
</tr>
<tr>
<td>30</td>
<td>GWI Project</td>
<td>Integrate GWI’s network (LAN segments and connected via WAN) with CPE links provided by eGovernment to the LTE network.</td>
<td>Sherwin Felicien</td>
</tr>
<tr>
<td>31</td>
<td>Pub Agency Project</td>
<td>Enable connectivity across government ministries, departments and agencies to promote effective transformational change.</td>
<td>Sherwin Felicien</td>
</tr>
<tr>
<td>32</td>
<td>Pub Srvc Staff Coll</td>
<td>Establishing a very high level public service institution for the purpose of addressing the training needs of public servants</td>
<td>Mfon Akpan</td>
</tr>
<tr>
<td>33</td>
<td>Sec Schools Project</td>
<td>To provide access to ICT and its related services to fifty educational institutions of Guyana.</td>
<td>Ish Singh</td>
</tr>
<tr>
<td>34</td>
<td>SEIP Project</td>
<td>Provide connectivity to the main administrative departments of the MoE at the national and regional levels and Secondary Schools</td>
<td>Ish Singh</td>
</tr>
<tr>
<td>35</td>
<td>Tell-US</td>
<td>Create a multi-platform system whereby members of the public can report on issues affecting them.</td>
<td>Nkasi Nedd</td>
</tr>
<tr>
<td>36</td>
<td>Teaching Improvement Aid Project</td>
<td>Design and implement a training program that addresses at least 85% of the identified training needs for the eGovernment Unit</td>
<td>Abiola Smith</td>
</tr>
<tr>
<td>37</td>
<td>Train &amp; Cap</td>
<td>Develop and Implement a Training and Capacity Building Program for the eGovernment Unit 2016</td>
<td>Abiola Smith</td>
</tr>
<tr>
<td>38</td>
<td>TWGs Project</td>
<td>Establishment of 3 technical working groups with a minimum of 12 suitably qualified members.</td>
<td>Dr. Samantha Scotland</td>
</tr>
<tr>
<td>39</td>
<td>UG Tele</td>
<td>Installation of Huawei Telepresence and Videoconference at The University of Guyana, connecting Turkeyen and Tain Campuses</td>
<td>Robin Ally</td>
</tr>
</tbody>
</table>