

CAMBODIA

**REVIEW OF GOVERNMENT INFORMATION AND
COMMUNICATIONS TECHNOLOGIES (ICTS)
POLICIES AND INVESTMENTS**

POLICY NOTE

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List of Acronyms

Association of Southeast Asian Nations	ASEAN
Automated System for Customs Data	ASYCUDA
Capability Maturity Model Integration	CMMI
Chief Information Officer	CIO
Council of Administration reform	CAR
Electronic approval system	EAS
Government Administration Information system	GAIS
Information Communications Technology	ICT
Information Communications Technology for Development	ICT4D
Information Technology	IT
Internet Service Provider	ISP
Japan International Cooperation Agency	JICA
Management Information System	MIS
Memorandum of Understanding	MOU
Ministry of Agriculture Forestry and Fisheries	MAFF
Ministry of Commerce	MOC
Ministry of Culture and Fine Arts	MCFA
Ministry of Economy and Finance	MEF
Ministry of Education Youth and Sports	MOEYS
Ministry of Environment	MOE
Ministry of Foreign Affairs and International Cooperation	MFAIC
Ministry of Health	MOH
Ministry of Industry Mines and Energy	MIME
Ministry of Information	MoInfo
Ministry of Interior	MoInt
Ministry of Justice	MOJ
Ministry of Labor and Vocational Training	MLVT
Ministry of Land Management, Urban Planning & Construction	MLMUPC
Ministry of National Defense	MOND
Ministry of Parliamentary Affairs and Inspection	MONASRI
Ministry of Planning	MOP
Ministry of Post and Telecommunications of Cambodia	MPTC
Ministry of Public Works and Transport	MPWT
Ministry of Religions and Cults	MRC
Ministry of Rural Development	MRD
Ministry of Social Affairs Veteran and Youth Rehabilitation	MSAVYR
Ministry of Tourism	MOT
Ministry of Water Resources and Meteorology	MWRM
Ministry of Women Affairs	MWA
National Decentralization and De-concentration Program	NCDDP
National Information and Communications Development Authority	NiDA
National Information Infrastructure	NII
National Institute of Statistics	NIS
Office of the Council of Ministers	OCM
Provincial administration Information System	PAIS
Public Financial Management Reform Program	PFMRP
State Secretariat of Civil Aviation	SSCA
State Secretariat of Civil Service	SSCS

I Executive Summary

Many governments strive to increase efficiency in the use of public resources, enhance the accountability of civil servants, and improve public service delivery to citizens and businesses. Developing and developed countries alike are harnessing advanced communications and computing technologies to achieve these and other goals to improve government performance. Well-functioning information systems are essential to build a foundation for a knowledge-based government in which information and expertise are readily available for policy-makers to make informed decisions.

Further, governments are using information and communication technologies (ICT) as tools to reduce transaction costs and processing time, and increase government revenues. For instance, the e-Customs System in Ghana (GCNet) increased customs revenues by 49 percent in its first 18 months of operation and reduced clearance times from three weeks to two days. Further, the potential to access public services at home or at a local Internet kiosk empowers citizens in rural areas, including women and minorities. Access to relevant public information on rights and benefits, inheritance and family laws, health care, and housing can be provided through the Internet or mobile phone which translates to easier access and less time than traveling to or queuing up at government departments.

The Royal Government of Cambodia (the Government) has taken various initiatives regarding the streamlining of ICTs in administration functions and several core agencies have invested or are planning on investing in information systems, databases of various types, websites, communications networks, etc. Total donor investment committed to government ICT projects from 2006 to 2008 totaled \$83.5 million. However, this figure will be significantly higher when the cost for ICT components under sector projects, such as under education, public finance, and trade are included.

As the number of projects with ICT components increases in the Government, leadership and overall governance of ICT implementation will become increasingly important. ICT investments often involve high costs and big risks. Failure rates of ICT projects in governments around the world are notable. Costs for failure not only include monetary loss but costs in terms of reputation of the implementing agency or donor, and diminished incentives for future attempts in using ICTs.

Key Findings

The study found that ICT investments are often treated as one-time investments mainly because investments in ICTs are mostly made under donor-funded projects and that the need to plan for costs associated with maintenance support and recurring costs, such as software license fees, and software and equipment upgrades, are not adequately taken into consideration. Further, lack of coordination is leading to duplicate investments in ICTs that could be shared among multiple agencies and missed opportunities in easing communications by increasing connectivity between related agencies.

The National ICT Development Authority has made attempts in rolling out an IT application (i.e. electronic approval system) that cuts across government however, consensus was not reached among key stakeholders in government and therefore, the system is only being used at the municipal-level in Phnom Penh. A number of agencies have plans to develop IT applications to provide citizens and businesses access to public services through their websites. However, the initiatives are focused on electronically streamlining in-house work processes and have yet to focus on using ICTs to deliver services to rural locations and to citizens at large.

There are several ICT-related policy documents, including the draft ICT Policy which broadly defines how ICTs will be leveraged to achieve national socio-economic goals in various sectors. What is lacking are the detailed policies, decrees, and laws that are necessary to guide individual agencies in ICT implementation. Technical standards that provide guidance on the preferred way agencies interact with each other are necessary to achieve interoperability information systems.

Cambodia has a small but sophisticated local IT industry which has been established by foreign expatriates and Cambodians who are overseas or have returned from overseas. Involvement of IT contractors in government ICT projects has been limited to technical support such as website design, installation of IT systems, and training on how to use and maintain the IT systems. Yet, the IT industry can share experiences in change management and process re-engineering that have made a tremendous difference in the private sector, such as reduced costs, streamlined processes, and increased customer satisfaction.

Key Recommendations

- Coordinate with development partners to move towards a more comprehensive approach to ICT implementation in government, for example, through adhering to a common set of technical standards, establishing ICT expenditure categories that can be tracked, and monitoring and evaluating impact and results indicators.
- Recognize that ICT is a tool and that the benefits of ICT use in government (e.g. improvement in productivity, accountability, and transparency) can be maximized only when underlying business processes and people-centric processes such as consensus building and strategic thinking are transformed.
- Recognize IT-skilled human resource as a key driver for effective use of ICTs in government and change management as an integral part to enabling government employees to fully maximize and benefit from investments into ICTs.
- Formulate an ICT human resource strategy that sets clear goals in regards to training and capacity training for CIOs (Chief Information Officers), IT support staff, and end-users to help increase overall human resource capacity in government over the long-term.
- Identify high-impact and low-risk ICT investments to help prioritize and sequence ICT investments in areas that will bring significant efficiencies to administration processes and benefits to citizens.
- Require ICT projects to have clear results indicators to show the public value of ICT investments and to better demonstrate the achievement of objectives.

- Employ ICTs such as email, government Intranet, and electronic document exchange systems as tools to formalize and streamline administrative processes at various levels of government and for furthering the National Decentralization and De-concentration Program agenda.
- Hold consultation meetings with the IT industry to help ensure that appropriate technology and change management solutions are considered during ICT project preparation and build government capacity for implementing e-government PPPs.

II Introduction

An ongoing function of government is to look toward the future and find ways to transform into a more efficient and effective organization. Developed and developing country governments alike are harnessing advanced communication and computing technologies to modernize their administration functions and to better manage large volumes of data. Many governments, including that of Cambodia, are becoming more decentralized, and thus need effective means of communication between the national and sub-national offices. Computing technologies are increasingly playing a role in the management of various sectors – such as management of natural resources and facilitation of regional trade - as their contribution to the country’s economy grows. And electronic platforms such as the Internet and mobile phones are increasingly being used to deliver public services to citizens and businesses, bringing government closer to its people.

Well-functioning information systems are essential for modern governments to address these challenges and the Royal Government of Cambodia (the Government) has taken a number of initiatives regarding the streamlining of information and communication technologies (ICT) in administration functions and several core agencies have invested or are planning on investing in information systems, databases of various types, websites, communications networks etc. For example, the Ministry of Economy and Finance (MEF) is upgrading its information systems in order to generate advanced reports which will better guide policy makers on fiscal matters. The Council of Administration Reform (CAR) is preparing to implement a human resource management information system to handle payroll and human resource management for the government. The Ministry of Commerce (MOC) plans to integrate its information systems to pool trade-related data to provide comprehensive information to the various stakeholders. Further the National ICT Development Authority (NiDA) has drafted an ICT Policy to provide a general framework for ICT development which illustrates the Government’s vision to leverage ICTs in developing various segments of society including the government, private sector, and citizens.

Box 1. Core definitions used in this report

Information and Communication Technologies (ICTs) consist of hardware, software, networks and media for the collection, storage, processing, transmission and presentation of information (e.g., voice, data, text, and images), as well as related services. Communication technologies consist of a range of communication media and devices, including print, telephone, fax, radio, television, video, audio, computer and the Internet. ICT can be split into Information and Communication Infrastructure (ICI) and Information Technology (IT).

Information and Communication Infrastructure (ICI) refers to physical telecommunications systems and networks (e.g., cellular, broadcast, cable, satellite, and postal) and the services that utilize them (e.g., Internet, voice, data, mail, radio and television).

Information Technology (IT) refers to hardware and software used to collect, store, process and present information.

ICT applications, or e- applications, are hardware and software solutions that utilize ICTs to meet business, public administration, social and other needs. A new vocabulary is emerging with reference to the electronic character of applications using the prefix “e.” Examples of such applications include conducting business transactions on the Internet (e-commerce), using networked computers both as a general pedagogical tool and to impart the skills needed for successful ICT-enabled projects (e-education), providing information to health managers, health professionals and the general public (e-health), and using networked computing to increase a government’s transparency and effectiveness (e-government). While terms such as e-education, e-government, e-commerce, and e-health can refer to the applications themselves, they can also refer to the principles or strategies behind these applications.

Despite having taken significant steps to start a modernization process, the Government will need to consider how to address the challenges that are likely to arise from implementing ICTs in government. Based on international experience, some of these challenges include: (a) minimizing duplicate investments in common ICT needs; (b) implementation of diverse information systems that work together (i.e., interoperable); and (c) ensuring that the expected results such as increased efficiency and effectiveness are achieved. The key challenge is combining investment in ICT with effective and credible change management processes within the institutions concerned. Given that many of the ICT programs are supported by donors, coordination between donors will be important as Cambodia starts to roll-out major ICT applications (i.e., commerce and trade, education, and revenue collection).

In this context, and at the request of the MEF, the World Bank initiated this study which aims to review the existing ICT policies and approaches to investments in ICTs, advise on measures to improve the efficiency of ICT investments in government, to improve the approach to systems development, and to identify key elements for development of a framework policy for ICT use in Government. The study focuses on government uptake of ICTs – in the form of internal information systems, applications, and networks - as the Government is fast becoming the largest consumer of ICTs in the country, and government use of ICTs could potentially have a cross-cutting effect, impacting multiple

sectors and beneficiary groups. The study also examines the potential role of the private sector, specifically the emerging IT industry, and how it can support government by providing IT skilled workers, provision of IT services, and maintenance support.

The study is an attempt to capture a snapshot of the state of ICT development in the Government, looking not only at ICT projects, but also at the underlying capacity to manage implementation at the ministry and central government levels. The study explored the following issues:

- What kind of guidance does the Government provide (i.e., policy and legislation) and how effective is it?
- Who is responsible for managing the ICT infrastructure, information and data, and what is the extent or quality of the human resource capacity and how can these be improved?
- How are investments in ICTs planned? Are there opportunities for greater coordination of ICT investments across ministries?
- What kind of ICT infrastructure does the Ministry/Agency currently have in terms of IT applications, systems and connectivity?

This study is based on information that was gathered through a survey and interviews conducted with six government agencies, and interviews conducted with 15 IT companies and three IT schools in Phnom Penh. The objective was to better understand the current status of how ICT investments are managed in Cambodia. In addition, the Policy Note has benefitted from a study on e-Government (electronic government) Service Deployment Plan conducted by the National ICT Development Authority (NiDA) in collaboration with Japan International Cooperation Agency (JICA)¹. The e-Government study includes a comprehensive stock-take of ICTs in government and proposes a deployment strategy in seven phases, while this Policy Note focuses on the current capacity and approach to ICT implementation. The six agencies are:

1. Council of Administration Reform (CAR)
2. Ministry of Commerce (MOC)
3. Ministry of Economy and Finance (MEF)
4. Ministry of Post and Telecommunications of Cambodia (MPTC)
5. National ICT Development Authority (NiDA)
6. National Institute of Statistics, Ministry of Planning (MOP)

To provide a backdrop, the first section of this Policy Note briefly examines the general environment in which ICT investments are made within a government context. Then, based on the findings of the survey and interviews, and the e-government study conducted by NiDA and JICA, the second section examines the current approach to ICT implementation in the Government. The third section provides an overview of the local IT industry and the potential role the industry could play in supporting the Government in its ICT initiatives. And the last section presents recommendations on how to bring together key elements into an implementation framework to facilitate successful uptake

¹ NiDA, JICA. (2008) “The Study Report on e-Government Service Deployment Plan for Royal Government of Cambodia”

of ICTs by the Government.

II General Enabling Environment for ICT Implementation in Government

Lessons can be drawn globally as developed and developing country governments alike have been formulating and implementing e-government (electronic government) programs. A key lesson being that there be clarity in leadership and guiding policies for the ICT agenda in government. Coordinating sustained and uniform implementation of ICTs is an overwhelming task for all governments. Successful e-government programs have shown that clear leadership that is specific to the ICT agenda is critical to define the vision of how and within what timeframe the government intends to transform its employees and functions through the use of ICTs. In addition to the government's vision of how ICTs can facilitate modernization, ICT-specific policies and a legal framework are also important to provide guidance and support to implementing agencies. This section briefly examines these critical success factors.

Clear leadership and institutional arrangements are important to facilitate the shift from ad hoc implementation of ICTs in government agencies to a more coordinated effort that leads to a comprehensive ICT program (i.e., e-government) accepted and owned by all agencies in government. Key agencies can play a catalytic role in guiding overall investments in ICTs. Such oversight is critical to make sure that the appropriate technology is used to achieve the expected outcomes - such as for administration reforms or delivery of public services. Further, by taking a bird's eye point of view, these agencies can identify opportunities for economies of scale in ICT investments. **Table 1²** illustrates four models that governments have used to create a national institutions framework to lead the e-government agenda and fulfill the key functions of strategy and policy making, governance and coordination, and facilitation of implementation.

Table 1. Various e-Government Models

Model	Countries	Benefits	Drawbacks
1) Policy and investment coordination (cross-cutting ministry such as finance, treasury, economy, budget, or planning)	Australia, Brazil, Canada, Chile, China, Finland, France, Ireland, Israel, Japan, Rwanda, Sri Lanka, United Kingdom, United States	Has direct control over funds required by other ministries to implement e-government. Helps integrate e-government with overall economic management.	May lack the technical expertise required to coordinate e-government.
2) Administrative coordination (ministry of public administration, services, affairs, interior, state, or administrative reform)	Bulgaria, Egypt, Germany, Republic of Korea, Mexico, Slovenia, South Africa	Facilitates integration of e-government with administrative simplification and reforms.	May lack the technical expertise required to coordinate e-government.
3) Technical coordination (ministry)	Ghana, India, Jordan, Kenya, Pakistan,	Ensures that technical staff is available; eases	May be too focused on technology,

² The description of the four models is from Hanna et al. *National E-Government institutions: Functions, Models, and Trends*, Information and Communications Development Report 2009

of ICT, science and technology, or industry)	Romania, Singapore, Thailand, Vietnam	access to nongovernmental stakeholders (firms, NGOs, and academia)	telecommunications, or industry, and disconnected from administrative reform.
4) Shared or no coordination	Russia, Sweden, Tunisia	Least demanding and with little political sensitivity (does not challenge the existing institutional framework and responsibilities of ministries)	May lead to ministries, agencies setting up their own information systems and proprietary communications networks that impair information sharing. No cross-cutting perspective. Fails to exploit shared services and infrastructure and economies of scale.

Model 1: Policy and Investment Coordination. Working from the ministry of finance (or treasury, economy, budget, or planning) gives the entity responsible for governing and coordinating e-government activities direct access to the funding it needs. In addition, it enables easy control over funds required by other ministries in pursuing e-government goals set for them. It also facilitates integration of the e-government agenda with the overall economic development agenda.

Model 2: Administrative Coordination. Countries that adopt a model of e-government led by the ministry of public administration (or services, affairs, interior, state, or administrative reform) coordinate e-government with the framework of their good governance agendas. This model facilitates the integration of e-government efforts with administrative reform, simplification, and decentralization. It raises the visibility of the e-government agenda and encourages broad participation across agencies.

Model 3: Technical Coordination. Governing and coordinating e-government activities under a technical ministry such as the ministry of ICT (or science and technology or industry) ensures that specialized technical staff are available to address ICT issues. This approach may have the advantage of involving the private sector and other nongovernmental stakeholders more effectively in the e-government process and thus allow for innovative public-private partnerships. But if the technical ministry has limited leadership competencies, the e-government agenda remains outside broad public sector reform efforts and the core development agenda.

Model 4: Shared or No Coordination. In this model, e-government development and implementation functions are distributed among existing ministries. Thus each ministry is responsible for the part of the e-government strategy that falls within its field of expertise. This model does not involve any new coordination mechanisms and is the least politically demanding, making it easiest to adopt for the short term. Funding for e-government activities comes from the ministry's budgets. However, agencies set up their own information systems – and in some

cases, proprietary communications networks – leading to duplication and impairing information sharing. This approach is likely to result in uneven development across ministries and missed opportunities to leverage economies of scale in shared infrastructure, applications, and support services.

While leadership at the central government level will define the government’s vision as a whole, the Chief Information Officer will play a critical leadership role in guiding individual ministries through the implementation and integration of ICTs in individual ministries.

In many instances, the selection process of an IT solution is focused on the narrow task at hand and does not take into account related functions and workflows that are outside the department or ministry. A CIO’s primary role is to bridge this gap by taking into consideration the ICT needs for the entire ministry and the other related ministries. A CIO position would be filled by someone with knowledge of the ministry’s business processes and how they related to each other as well as some technical background. Other responsibilities of a CIO would include, ensuring that strategic objectives of the agency are supported by the appropriate technology solutions, ensuring that adequate training is provided for IT support staff and end-users, and monitoring and planning investments and recurring cost requirements. CIOs can take a long-term look at the ministry’s ICT needs accounting for budget and resource needed to sustain operation after donor-funded projects closes and ensure flexibility and scalability is built into the technological solution for future needs. Over time, the CIO position may become less relevant as top government decision makers become knowledgeable in what ICTs can do for their agency or ministry.

Today, there are several indexes that attempt to measure how receptive governments are to the use of ICTs to improve government functions. According to the United Nations e-Government Readiness Index, Cambodia slipped from 128 in 2005 to 139 in 2008 out of about 185 countries that were ranked. The index attempts to evaluate the use of ICTs by governments to ease transaction costs, recordkeeping and sharing of information among government agencies and between government, citizens and businesses. It includes three sub-indexes: web measure index (which examines the use of websites and online services by government), the telecommunication infrastructure index, and the human capital index. The following section examines the uptake of ICTs in government. Cambodia improved significantly in the area of infrastructure and to some extent in human capital; however its web measure index fell from 0.2308 in 2005 to 0.1973 in 2008 indicating that more effort is needed in improving delivery channels for public services to citizens and businesses. The United Nations illustrates government provision of online services in five stages according to their complexity. Most government websites in Cambodia, with exceptions as described in a later section, are at Stage One:

- Stage one, the *Emerging Web Presence*, provides static information on the government;
- Stage two, the *Enhanced Web Presence*, provides access to specific information that is regularly updated and to useful documents that can be downloaded;
- Stage three, the *Interactive Web Presence*, users can search specialized databases and forms can be downloaded and/or submitted online;

- Stage four, the *Transactional Web Presence*, provides the capacity to conduct complete and secure transactions online; and
- Stage five, the *Fully Integrated Web Presence*, provides all government services – including transactional services, through a single and central portal.

In general, the provision of public service through online applications aims to increase convenience and efficiencies for the end-user reducing transaction costs such as the number of trips made to a government office and costs paid for travel, and in certain cases bribes. Efficiencies can be gained by the agency providing the service as well. For example, convenient service can encourage tax payers to make payments in a timely manner, and information gathered through an online application will make it easier for the agency to track and analyze relevant information. **Annex A** illustrates common benefits gained through the use of IT applications in a number of countries.

ICT-specific policies and a legal framework are necessary to facilitate the transition from a paper-based to a digital environment. Detailed laws and decrees are necessary to establish secure digital environment in which public and private electronic resources are legitimized and protected. Some of these include³:

Electronic signature. Laws on the use of electronic signatures and providing for regulation of certification authorities are necessary to legitimize the electronic signature on an electronic document. Cambodia has a draft sub-decree on electronic transactions which is intended to formalize the use of electronic signatures to facilitate electronic communications and “to eliminate barriers to electronic commerce resulting from uncertainties over writing and signature requirements”; and “to facilitate electronic filing of documents with government agencies and statutory corporations, and to promote efficient delivery of government services by means of reliable electronic records”⁴.

In regards to electronic records, the Singapore government gives electronic documents and records the same legal standing as physical documents by declaring that the validity or enforceability of electronic versions cannot be denied their legal effect on the basis of being electronic. Official or legal recognition of electronic signatures and documents will be critical to foster an environment within the Government to automate and streamline administrative functions electronically.

Data protection and privacy. In most countries, protection of personal data and privacy is usually addressed on a constitutional level or to a varying extent, in laws governing industries dealing with sensitive information such as banking, insurance, medical and health industries. In the East Asia and Pacific region, the Republic of Korea is the only country that has adopted a comprehensive data protection law.

³ ESCAP (Economic and Social Commission for Asia and the Pacific. 2004. Harmonized Development of Legal and Regulatory Systems for E-Commerce in Asia and the Pacific: Current Challenges and Capacity-Building Needs.

⁴ Draft Sub-Decree on Electronic Transactions, Kingdom of Cambodia

Intellectual property. China and the Republic of Korea have laws that explicitly address issues of copyright, trademarks and database protection specifically for the online environment. Other countries such as Indonesia, Malaysia, and the Philippines have extended the applicability of laws governing copyright protection to the online environment. The Government will need to protect public databases and software as it creates an online environment for the Government and it will further need to ensure the protection of intellectual property of individuals and businesses that operate in the online environment. Therefore, Cambodia will need to decide on how it will apply existing laws on intellectual property in the overall online environment.

Cybercrime. Legislation addressing cybercrime are mostly concerned with the following offences: (i) access to and interference with systems; (ii) interception of and interference with data, (iii) obscene Internet content; (iv) electronic fraud; (v) electronic forgery; (vi) online trade mark infringement offences; and (vii) online copyright infringement offences. In most countries, generic regulations for similar acts are usually broad enough to cover equivalent crimes committed in the online environment. However, very few judicial decisions have been found to confirm the applicability of general legislation in the online environment and therefore further study on how Cambodia will address these issues will be necessary to ensure all offences are covered. For example, the India IT Act includes sections on specific offences that occur online such as hacking and tampering with computer source codes as punishable offences.

Linkages between the various policies related to ICT development have not been fully realized. A number of policies and sub-decrees have been drafted or enacted, but there has been little consideration for the common goals that have been set forth in the various documents. For example, the draft Universal Service Obligation Policy will set forth the government's goals to provide wider access to ICTs, particularly in rural and remote areas. This policy could be linked to some of the programs for equipping schools in rural areas with Internet access as described in the ICT4D National Education Policy.

III Current Status of ICT implementation in the Government

Based on the survey and interview findings, this section examines the current status of ICT uptake in the selected ministries of the RGC, including the (a) institutional arrangements for ICT implementation; (b) ICT-related human resource; (c) current approach to planning and coordinating ICT investments; (d) current and planned use of ICTs; and (e) Government guidance on ICT development.

A. Institutional arrangements for ICT implementation and ICT-related human resources

Two key agencies have been identified to lead in the ICT development effort. The draft ICT Policy calls for the MEF to coordinate with donors to better manage budget and

human resources for ICT development. The other agency, NiDA, was established in 2000 as the central agency responsible for formulating ICT policies and promoting ICT uptake in various segments of society, including the government. NiDA's role includes oversight of ICT investments in government and therefore may overlap with MEF's role. However, investments in ICTs are not systematically monitored at this time.

As the aforementioned, **Table 1** illustrates that institutional arrangements vary from country to country, and many countries are a hybrid of two or more Models. A potential model in Cambodia is a hybrid of Models 1 and 3, in which Model 1 is represented by the MEF and Model 3 represented by NiDA.

In a pure Model 1 approach, a cross-cutting ministry such as finance or treasury plays the key role in coordinating investments into ICTs. The benefit of this approach is that budget control is centralized making it easier to integrate ICT budget planning with overall economic management. The drawback is that the leading agency may not have the technical expertise to direct ICT investments. In Model 3, the coordination role is taken by the agency with the technical expertise. Major decisions for ICT investments are made based on technical requirements and therefore implementation may be disconnected with the strategic objectives of the government. Many countries work with hybrid models in order to minimize drawbacks.

Lack of coordination between key agencies is likely to result in Model 4 in which agencies implement their own IT systems and networks, without taking into account economies of scale and systems interoperability. Model 4 therefore does not challenge the existing institutional structure and responsibilities of ministries.

Despite having established a dedicated ICT agency, rigid institutional arrangements are hindering the success of ICT projects. Identifying the roles of key agencies in the government's ICT agenda is only the first step. The government's ICT strategy requires buy-in from the relevant government stakeholders. Without an ICT strategy, individual agencies will be unaware of how the government intends to use ICTs in achieving its higher-level strategic objectives. Further, without policy and technical guidance, individual agencies will continue to implement ICTs within silos, unaware of possible opportunities to leverage economies of scale and to improve communications and information sharing between related agencies (see discussion on IT applications). Many governments in both developed and developing countries now view ICTs as tools to transform the government, by making it more efficient, accountable, responsive and transparent – this requires a holistic examination of government functions and institutional arrangements.

Government officials interviewed for this study noted that chief information officers (CIO) will play an important role in the successful implementation of ICTs in their ministries. In many instances investment in ICTs is a component under a donor-funded project or program and therefore the ICT being implemented (e.g. database) may not be leveraged for use by other departments or agencies outside the scope of the project. The result often leads to multiple databases that are not fully utilized or not linked to related databases. The CIO's role would include addressing the ICT needs of the ministry as a whole and therefore would consider how a donor-funded project may fit into the broader

ICT agenda of the ministry. Only two out of the six ministries interviewed (MEF and MOP) have a CIO. In the other ministries, the Secretary of State or Deputy General of Administration has been taking on the role of CIO. Through the Public Financial Management Reform Program (PFMRP), the MEF has formed an ICT department headed by a CIO who will be reporting to the Minister of Economics and Finance, the General Secretary, or the Secretary of State depending on the reporting requirements. The MOP also has a CIO, and its request to establish an ICT department is pending approval. All agencies indicated that their leadership is proactive in promoting the uptake of ICTs in their ministry.

Low wages in government and better opportunities in the private sector are disincentives for recruitment and retention of ICT professionals in government.

Although the officials interviewed expressed eagerness to find better ways to provide IT support service to their staff, they noted that retaining IT staff is difficult. While an IT position in government pays an average monthly salary of around \$100, and a teaching position at a university around \$250, a starting salary for an IT position in the private sector ranges from \$250-\$400. The private sector provides opportunities for promotions and salary increases of up to \$800. In order to better ensure retention of IT staff, the MEF, under the PFMRP, plans to establish incentives for retaining staff with IT training. Those staff who will receive training for implementation of a major project such as IFMIS have been included in the Merit-Based Pay Supplement Initiative (MBPSI)⁵ framework. However, the MBPSI arrangement is coming to a close and an alternate incentive program has not been identified.

Table 2. Number of Existing IT Staff

Agency	Number of IT Management Staff	Number of Staff with IT degree/certificate
CAR	15	15
MEF	15	15
MPTC	36 Information Technology 53 Telecommunication	20 19
NIS	18	18

Timing and provision of targeted IT training is primarily based on the schedule of donor-funded projects. CAR, NiDA, MEF, and MOP reflected in the survey that the existing staff skills were insufficient to support the desired uptake of ICTs. A key success to ICT implementation is the uptake by the end-users, something that is often not considered adequately during project design or implementation. As shown in **Table 3**, only CAR provided training in basic computer use and data processing in the past two years.

Table 3. Number of Training during 2007-2008, by Course Type

⁵ The Government has issued a sub-decree to allow for merit-based pay supplement incentive (MBPSI) for civil servants who participate in various projects that are financed by donors to ensure coherence and responsiveness to priorities of the Government. The MBPSI is not considered as a salary for the civil servant and will end when financing of the project ceases.

Agency	Basic Computer Use, Data Processing	Web Development Training, Web Management	IT Support	Network Administration & Telecoms	IT Applications and Database Administration	IT Management and e-Government
CAR	6	5	3	1	1	8
MEF	-	2	-	8	4	1
MPTC	-	-	-	19	20	-
NIS	-	-	-	5	10	3

More recently, NiDA has hosted a series of high-level training courses for the Government Leadership in the area of e-Government. These courses include study tours to South Korea for CIOs of various ministries and will be extended to key IT officers from the provincial government level. Further, with the support of the United Nations, Asian and Pacific Training Centre for Information and Communication Technology, NiDA has set-up the Academy of ICT Essentials for Government Leaders in Phnom Penh. The Academy provides an eight module course on the following topics:

1. Linkage between ICT and Meaningful Development
2. ICT for Development Policy, Process and Governance
3. E-Government Applications
4. ICT Trends for Government Leaders
5. Network, Information Security and Privacy
6. Internet Governance
7. ICT Project Management in Theory and Practice
8. Options for Funding ICT for Development

B. Planning and coordination of ICT investments

Advanced planning and coordination can help to clarify ICT budget needs of individual agencies as well as for the government as a whole. The planning process will also better ensure that information stored and collected in databases and information systems in one office can be accessed, aggregated, and analyzed through other systems in related departments or agencies – subsequently facilitating a knowledge-based government institution. Coordination of ICT initiatives can increase connectivity between departments and agencies allowing for data and information to be exchanged – moving towards a more knowledge-based government. This section examines the way in which the agencies are planning their investments into ICTs.

Planning investments in ICTs

ICT investments are treated as one-time investments mainly because investments in ICTs are mostly made under donor-funded projects. Lack of planning is likely due to two main factors: (i) most of the investments in ICTs is funded through donor-projects and treated as a one-time investments; and (ii) there is, in general, limited awareness of the need to plan for costs associated with maintenance support – recurring costs, such as software license fees, and software and equipment upgrades. Currently, budget requests for maintenance or repair of IT systems are sent to the finance department in each agency and assessed on a case-by-case basis. Expenditure categories for ICT-related needs have not been defined and therefore they compete with other administration-related requests.

Lack of consideration for continued costs, especially after a donor project closes, has impacted the sustainability and full utilization of the information system put in place. In extreme cases – as shown in **Table 4** – efforts to establish IT systems have been abandoned altogether.

Table 4. List of Applications and Databases No Longer in Use⁶

Agency*	Information System	Functionalities	Reasons for Abandonment
OCM/CAR	WINDAW	Similar to HR MIS	MS platform was in French and it was hardware dependent – technology became obsolete
OCM/NiDA	Electronic Approval System (EAS)	Document sharing between individuals and offices	The consensus on using the same system across government could not be reached – after deployment
MOH	Network System	File sharing	The technology was too advanced for end-users
MOJ	Criminal record database	Record-keeping	A donor project installed one server and 10 computers
MOP/NIS	Data processing	Data processing	The system is not appropriate for new census and surveys approaches
MRD	Database	Road inventory	Data entry ceased after the transport project the system was set up for closed
MRD	Database	Library	System development was left incomplete when the donor project closed
MWRM	HRIS	Management of number of staff, positions and salaries	No sustaining budget to operate and upgrade system after donor project closed
SSCS	HRMIS	For printing payroll	HR function transferred to CAR
SSCA	FMIS	Manage Air Navigation fee (e.g. landing, transit)	No sustaining budget to further develop and maintain system after donor project closed

*Note: Refer to list of acronyms

Duplicate investments are being made in cross-cutting government applications.

Currently, the assessment of ICT needs in government and budget allocation is conducted within silos – namely, within a ministry or in some cases within a department. Consideration for linkages to other departments or ministries are overlooked during the planning stage of an ICT project. Most of the interviewed officials noted that their planned ICT investments would be part of a sector-specific donor project.

Some core processes such as procurement and staff payroll are functions conducted in all agencies. Therefore, a single IT application accessible by all agencies through an Intranet could prevent duplicate investments and provide the means to aggregate data through a shared application. Without an assessment to identify cross-cutting applications, agencies will continue to invest in standalone systems. **Table 5** shows that there are a significant number of agencies that have invested in or plans to invest in human resource related information systems.

⁶ NiDA, JICA (2008) “The Study Report on e-Government Service Deployment Plan for Royal Government of Cambodia”

Table 5. Agencies* with existing, planned, and failed HR applications⁷

Existing	Planned	Failed
1. CAR/OCM	1. MCFA	1. MWRM
2. MOH	2. MOEYS	2. SSCS
3. MOEYS	3. MFAIC	
4. SSCS	4. MOH	
	5. MoInfo	
	6. MPWT	
	7. MRD	
	8. MOSAVYR	
	9. MWA	
	10. SSCA	

*Note: Refer to list of acronyms

ICT is mostly being treated as tools to simply automate existing government business processes missing the opportunity to transform and improve the processes in terms of increasing productivity and effectiveness of government functions.

Automating existing business processes is likely to reinforce the existing inefficiencies and undesirable practices such as rent-seeking activities. Further, automating broken business delivery processes often yields disappointing results and marginal improvements because of inadequate attention to people, process, and technology management required for more than incremental or marginal differences in performance results. Change management and business process management (BPM) is yet to be made an integral part of the planning and preparation of government ICT projects. The use of tools like BPM can make it easier to examine underlying processes and to facilitate a shift to the use of real-time data so that officials are better informed to make decisions. Such approaches will require new types of management training and skills, including management of resistance to changes in the business processes.

Coordination of ICT initiatives

There may be missed opportunities due to the lack of consensus building on ICT initiatives. As aforementioned, individual ministries are developing their own management information systems with little coordination with other related ministries. This approach may be more efficient and expedient from an individual ministry’s perspective – however, it can lead to missed opportunities in sharing the costs of ICT investments and in transforming cross-cutting administrative processes. Furthermore, pursuing some of the national-level objectives may require the efforts of multiple ministries. Therefore, an additional step is needed in the planning process to link the objectives at the ministerial-level to that of the strategic objectives at the national level.

Little consideration has been given using ICTs to increase connectivity between related ministries and agencies. Although the survey responses showed that most of the agencies exchanged information with other ministries on a regular basis they were not using email to exchange information. Rather, reports are being printed out in hard copy

⁷ NiDA, JICA (2008) “The Study Report on e-Government Service Deployment Plan for Royal Government of Cambodia”

format and hand-carried to the related ministry for manual data input to the ministry's system. This is currently the case between the provincial government offices, the CAR and MEF, in which the monthly payroll data is manually inputted into a spreadsheet at least three times. This not only delays the process, but also increases chances for error.

According to the Cambodia Official Development Assistance database of the Council for the Development of Cambodia and Cambodian Rehabilitation and Development Board, the total donor investment committed to ICT projects from 2006 to 2008 totaled \$ 83.5 million⁸. However, this figure is likely to be much larger because the database does not include ICT components of sector-specific projects, such as in education and health. The problems with ICT budget planning across government are related to limited awareness of the opportunities for cutting ICT-related costs by identifying IT applications and infrastructure that can be shared across ministries. Investments into IT systems can be costly, but there are many ways to lower costs if major ICT initiatives are coordinated.

C. Current and planned use of ICTs

Computers and software

Although computer use is prevalent in the agencies that were interviewed, the e-Government Deployment study conducted by NiDA and JICA found that, across government, an average of 11 officers share a single computer. One possible explanation is that computer use is higher in offices that have been part of donor-funded projects with ICT components, which is the case for the agencies interviewed for this study. Low computer diffusion is likely being impacted by deterring factors such as slow and low bandwidth Internet connection and low ICT literacy. The e-Government Deployment study found that although 72 percent of head offices subscribe to the Internet, Internet was accessible only through 25 percent of computers. The estimated Internet speed is 13 Kbps per connection. Another factor noted in the study is that a significant percentage of government staff do not come to the office on a daily basis.

The six agencies interviewed for this study used proprietary operating systems such as Windows XP and Vista and software such as Norton Anti-Virus software which are preinstalled at the time of purchase. However, there is a general problem in the use of pirated software in various parts of government which is being ameliorated through agreements between government agencies and software distributors.

Many agencies have established Local Area Networks (LAN) but are not being fully utilized. The e-Government Deployment study found that out of the 25 agencies surveyed, 20 have established LANs. However, only 33 percent of computers are currently connected to a LAN. The LAN is mainly being used for sharing Internet connection rather than to increase connectivity and ease communications between departments and agencies. Because Internet connection is costly and bandwidth is limited

⁸ Three additional project costs were added to the list from the Cambodia ODA database: the Government Administration Information System and Provincial Administration Information System (\$50m) and the ongoing JICA TA to NiDA (\$1m).

(further discussed in this section), the number of computers with access to the Internet is being limited. Internet connection is often supported through donor-funded projects and therefore there can be several small LANs functioning independently within a single agency.

Many ministries use the Limon font for email and word processing which does not meet the Unicode standard. The Unicode standard is a computing industry standard allowing computers to consistently represent text expressed in most of the operating systems. Because the Khmer language was initially not included by the Unicode Consortium, based in the U.S., software developers in Cambodia developed Limon and other fonts to fill this gap about a decade ago. However, these fonts do not adhere to Unicode standards. Therefore, the text in emails and attachments becomes illegible once the receiver opens it in a system based on the Unicode standard such as Microsoft Office.

More recently, Khmer Unicode-based fonts have been developed and is the only globally standardized encoding of the Khmer script, and has been further developed for use in applications such as: OpenOffice (Word Processing), OpenSUSE (Linux-based Operation System), Khmer Email Application (Thunderbird-based email application), and Mekhala (FireFox-based Internet Browser). Transition from Limon to Khmer Unicode is being managed as new government systems are put in place and information in databases using Limon are migrated to new Khmer Unicode-based databases. Khmer Software Initiative (KhmerOS), a joint project between the NiDA and the Open Institute, has taken it onto further popularize its usage in both the government and business and individual use.

IT applications

Most of the agencies interviewed are moving forward to adopt an IT application for their ministry’s core functions. There are plans to establish information systems and to electronically streamline core functions of CAR, MEF (**Box 1**), and MOC (**Box 2**). For example, the CAR is preparing its Human Resource Management Information System (HRMIS) Phase II to improve its process in generating monthly payroll reports. Its current system is an ACCESS database which is used to process payroll information for over 160,000 civil servants on a monthly basis. While this has been sufficient for aggregating monthly reports, the new IT system will generate more complex reports that assimilate historical information and forecast data for making informed decisions.

Table 6. Services for Government, Selected Agencies

Ministry	Public Service for Citizens and Businesses
CAR	Monthly payroll reporting for all ministries
MEF	Various public financial transactions (i.e. budget bidding and requests, procurement, disbursements)
MOC	TRADE SWAp online database to track commerce/trade-related projects
NIS	Collection and dissemination of national statistics data

Box 1. Ministry of Economy and Finance (MEF)

As a core ministry, the MEF has a large number of services which it provides to government agencies, citizens and businesses. Services that are currently run manually require documents to be hand-carried to the relevant departments in the MEF. The MEF, through the Public Financial Management Reform Program (PFMRP), will install an integrated financial management information system (IFMIS) to improve efficiency in the public financial transactions related to revenue collection and budget allocation. Automating and electronically streamlining processes will make it easier to track and monitor the status of outstanding transactions, and can be electronically dated and recorded to confirm payment and retrievable for future reporting requirements.

The PFM was officially launched in December 2004 with the aim to improve the standards of management and accountability in the mobilization of all government current and capital resources and effectiveness.

Key objectives:

- More efficient transaction processing and control
- Improved classification, valuation, aggregation and consolidation
- Analysis for planning, budgeting, decision-making, monitoring, and reporting

Overview of FMIS software:

In support of the public financial management program FMIS will consist of various modules including General Ledger, Budget Preparation and Development, Procurement, Accounts Payable, Accounts Receivable, Asset and Liability Management, and Cash Management

Linkages and interfaces with other systems:

The FMIS Software will link to other internal and external systems including:

- Banking – National Bank of Cambodia
- Customs Department
- Taxation Department
- CAR payroll system
- Debt Management Information System
- Desktop Applications

Box 2. MOC

The Trade SWAp is a program of reform and modernization designed to promote economic growth in Cambodia with the direct objectives of reducing transaction costs associated with trade and investment, introducing transparency in investment processes and facilitating access of enterprises to export markets. MOC considers ICT as an essential tool in providing accurate and reliable trade and market information to its stakeholders as well as the public and private sectors. One of the components of the Trade Facilitation and Competitiveness project is the application of appropriate ICT to support the aforementioned objectives.

Two key developments initiated by MOC uses the Internet as a platform to disseminate, collect, and analyze data and information. One is the project monitoring TRADE SWAp database through which information on the objectives, status and evaluation of trade facilitation or commerce projects can be accessed by relevant stakeholders such as government and donor agencies. This provides a real-time information source that is pooled and updated by various stakeholders as the projects progresses. Also, information on new funding needs can be included in this database providing a forum to match donor support with new project concepts. Further to this, the Trade Information Website has been set up to provide a wide-variety of trade and commerce related information to the private sector. This website includes guiding documents such as the

Cambodia's commercial laws, Handbook on Export Procedures, lists of products that are eligible for trade in Cambodia, and trade statistics.

New systems development:

Working towards an integrated e-commerce platform will require phased approach to ICT development within MOC.

- Human Resource Information System MOC Intranet
- E-library (electronic document management system)
- Online registration and application form transaction capabilities
- Human resource information system
- Trade statistics database
- E-learning (translation/localization of online training materials)

NiDA has made attempts in rolling out an IT application that cut-across government. Under the Government Administration Information System (GAIS) project, NiDA developed the Electronic Approval System (EAS) for government-wide implementation. This system is designed to allow ministries to exchange documents electronically both internally and externally, and to provide an email platform for communication. However, consensus was not reached among key stakeholders in government. The EAS is currently being used to provide video-conferencing service which is primarily being used for meetings for the Council of Ministers and has been recently extended to include provincial governors and some military generals.

The other three applications rolled out at the municipal level under the GAIS project include:

- The Real Estate Registration keeps track of real estate transactions including prices and taxes paid.
- The Resident Registration keeps track of family composition and employment status of residents for the purpose of enforcing compulsory education for school age children and for collecting income tax.
- The Vehicle Registration keeps track of the vehicle ownership, tax paid and safety inspection. This system is subdivided into two subsystems, automobile and motorcycle.

Three of the surveyed agencies, the MEF, MOC, and MPTC have plans to develop IT applications to provide citizens and businesses access to public services through their websites. The ministries plan on providing the public services in **Table 7** through their websites. There are currently a number of public services that are available online but are targeted to non-Cambodian beneficiaries, such as business applications for foreign companies and visa applications for tourists.

Table 7. Public Services for Citizens and Businesses

Ministry	Public Service for Citizens and Businesses
MEF	Revenue collection (i.e. taxes, excise, customs), electronic procurement platform
MPTC	Licenses and permits for telecommunications operators and Internet cafes, collection of ICT sector data

Most of the websites of the agencies that were interviewed for this study are at stage one, providing static and sometimes outdated information. While moving to stage two would require more frequent updates on the agency's ongoing initiatives and posting of useful documents such as application forms through the website, moving to stage three will require linkages to databases and back-end systems that will enable the user to access limited data or documents. According to the Trade Information Website Study which was conducted for the Trade Facilitation and Competitiveness Project, some of the departments in MOC have websites that are interactive. For example, the Seftco system, funded by the Asian Development Bank, provides web enabled capabilities for users to create personal accounts and to file notices of security interest online. There are very few countries whose government websites are at stage five, however, many governments are moving towards having a single portal for all government services. In the meantime, websites of individual agencies and ministries are being consolidated for ease of access to comprehensive information regarding the agency or ministry.

Ministries are focused on electronically streamlining their in-house work processes and have yet to focus on how to use ICTs to deliver public services to the rural and poor population. As uptake of computers is likely to remain low in the medium to long-term, community Internet kiosks and mobile platforms could be considered for the delivery of public services to the masses. Public-private partnerships have been leveraged to operate Internet kiosks in rural India. For example, the eSeva program of the state government of Andhra Pradesh provides services through 46 e-Seva Internet kiosks. The kiosks offer capability to make transactions online and offer services including drivers license and vehicle registration, land registration and means to obtain birth and death certificates. Delivering services through the mobile phone could have significant impact. While personal computer penetration has been stagnant at 0.5 percent, there were an estimated 4 million mobile phone connections (i.e., number of SIM cards) at the beginning of 2009 and this figure is forecasted to double by the end of the year⁹. Further descriptions of how kiosks and mobile phones can be used are noted in **Annex B**.

ICT infrastructure

NiDA's initiative to extend the government fiber optic cable networks, the National Information Infrastructure (NII) project, is the first large-scale e-government initiative that focuses on connecting the main ministerial offices through a high-speed network. The specific objective of this project, which is a component of the GAIS project, is to connect all 27 ministries in Phnom Penh with a government-wide broadband network. The second phase, PAIS (Provincial Administrative Information System), will extend the infrastructure to government offices in nine provinces (Banteay Meanchey, Battambang, Kandal, Kampong Cham, Kampot, Siem Reap, Sihanoukville, Takeo, and Thom). A smaller-scale network, Local Area Network (LAN), is planned to be established at each government office location to ease data transfer capabilities within the ministry or local government offices. Plans under these two projects do not include all government offices and therefore additional efforts will be needed to provide the remaining offices with access to the high-speed network.

⁹ www.wirelessintelligence.com

GAIS and PAIS are being funded through a concession loan from the government of the Republic of Korea with counterpart funding from the Cambodian Government. Future funding resources will need to be identified to avoid jeopardizing NiDA's ongoing efforts in increasing connectivity within government. Maintaining momentum for the rollout of a government broadband network will minimize the digital divide within government.

Internet bandwidth available to government agencies has greatly improved which will ease attempts to move service delivery to the Internet. Annex C illustrates the various connection types and costs.

However, Internet bandwidth availability at the national level is still very limited and costly mainly which could hamper the uptake of ICT services by the general population. The mobile phone platform and the Internet are enabling many governments to cast a wider net and to deliver public services (i.e. vehicle registration, birth/death/marriage certificates, information on legal rights, and online tax payment system) to its citizens in spite of where they live (i.e. rural or remote locations). The use of the mobile phone platform is of particular relevance as mobile phone use spreads into the rural areas. The high costs are largely due to lack of Internet exchanges and need to pay access fees to use Telecom Cambodia's network for international traffic. This limits access to the Internet for individuals and businesses to access the Internet, and also decreases demand for and take-up of online government public services. The total Internet backbone capacity is about 550Mbps, 150Mbps via Satellite (connected to Singapore, the US, Hong Kong and Germany), and 400Mbps through optical fiber (IP transit connect to Vietnam and Thailand). All ISPs must pay access fees for Telecom Cambodia's network in order to connect to the international gateways, which results in high access cost and narrow bandwidth. The monthly cost for a leased line can go up to \$4000. Local ISPs have increased bandwidth capacity through an informal arrangement through which they carry domestic traffic within their networks.

D. Government guidance on ICT project development

There are a number of ICT-related policy documents including the draft ICT Policy (Annex D). The draft ICT Policy broadly defines how ICTs will be leveraged to achieve national socio-economic goals in various sectors. The draft ICT Policy developed by NiDA defines the government role to include: (i) providing the necessary regulatory framework for the ICT sector; (ii) using ICTs to further administrative reform programs; (iii) finding creative ways to use ICTs for the betterment of people's lives; and (iv) increasing access to ICTs in various segments of society through public-private partnerships. The Policy further illustrates the cross-cutting and ubiquitous nature of ICTs and calls for bilateral, regional and international cooperation to ensure that ICT development and regulation in Cambodia is in line with international practice.

As noted in the introduction, this Policy Note has benefitted from the study conducted by NiDA with the support of JICA, The Study Report on e-Government Service Deployment Plan for Royal Government of Cambodia (RGC). This study takes a comprehensive stock take of about 25 out of the 29 agencies and ministries of the Government. The stock take includes existing use of ICTs, planned use new ICTs including IT applications, and looks

at the reasons for limited uptake of ICTs in certain agencies. The study collates the findings and presents an e-Government framework (**Annex E**). Many governments start with this high-level framework which maps out their functions in terms of workflows, databases, systems, and applications or interfaces¹⁰. One of the key benefits to starting with this holistic approach is that common ICT needs can be identified. For example the ‘Common On-Line Application Interface’ in Annex E lists some of the IT applications that would provide for the entire government as most agencies will conduct functions such as authentication (i.e. electronic documents or signatures), online transactions capabilities, streamlining official approval processes electronically, and search functions for retrieving data from multiple government databases. As part of this study, a manual on how to develop an e-government plan has been prepared as a guide for individual agencies and ministries.

Further, the e-Commerce Law, drafted by the MOC and MPTC, includes elements such as a digital signature framework which are also critical building blocks for government ICT programs. A similar level of detailed guidance and standards is necessary to facilitate electronic transactions within government and to foster uptake of e-commerce in general. As a member of Association of Southeast Asian Nations (ASEAN), Cambodia will need to eventually align its policies and legislature to that of the e-ASEAN legislature. The legislature provides guidance on how to:

- a) Put in place national laws and policies relating to electronic commerce transactions based on international norms;
- b) Facilitate the establishment of mutual recognition of digital signature frameworks;
- c) Facilitate secure regional electronic transactions, payments and settlements, through mechanisms such as electronic gateways;
- d) Adopt measures to protect intellectual property rights arising from e-commerce;
- e) Take measures to promote personal data protection and consumer privacy; and
- f) Encourage the use of alternative dispute resolution mechanisms for online transactions.

However, what is lacking are the detailed policies, decrees and laws that are necessary to guide individual agencies in ICT implementation and uptake. Several officials pointed to the need for more systematic approaches within the government toward implementation of ICT projects and management of data and information systems. The officials interviewed for this study were aware of this and other ICT-related policies that have been drafted. But they said that there is no official guidance on detailed aspects of ICT implementation which would help to ensure compatibility and interoperability of systems, data and document sharing. Standards on technical

¹⁰ The United Kingdom’s e-Government Interoperability Framework (e-GIF) sets out the minimum technical policies and specifications for achieving IT interoperability across the public sector. The e-GIF emphasizes openness of the IT architecture including common specifications for establishing Web-based interconnectivity and the use of open-source software applications. Therefore, individual agencies are allowed to implement their own ICT plans as long as they meet the minimum requirements which are meant to ensure interoperability across agencies. The United States approach on the other hand (called the Federal Enterprise Architecture) takes a top-down approach, prescribing detailed specifications. All agencies (with the exception of the Department of Defense) are to adopt the specifications. The top-down approach is meant to achieve two other objectives apart from achieving interoperability. They are to improve strategic and daily decision making and to identify performance improvement opportunities at all levels of government.

specifications and data use and management would also provide the nuts and bolts to start building a seamless government.

IV Role of the Local IT Industry and IT Human Resources

Increasingly, governments in both developed and developing countries are looking to leverage expertise from the private sector to improve organizational performance. This section examines the ways in which it can support government by providing IT skilled workers, provision of IT services, and maintenance support. It further examines opportunities in public-private partnerships (PPP) and the role of government in facilitating IT industry growth. The status of IT human resource in Cambodia is also assessed in this section.

Role of the local IT Industry

Cambodia has a small but sophisticated local IT industry which has been established by foreign expatriates and Cambodians who are overseas or have returned from overseas. Most of the IT companies are currently operating in Phnom Penh and other town centers, providing services in computer retail and maintenance, internet cafés, and software solutions such as web design and small database systems. The IT companies cater mostly to foreign companies and the larger local establishments, and some have provided services to government agencies under donor projects. Some of the companies provide off-shore services in data entry and digitalization of documents for companies and universities located in France and the U.S. Although the Cambodian IT industry in terms of export-oriented hardware production and software development is at a nascent stage, 3 percent of Cambodia’s service exports consisted of communications, computer and information services in 2007¹¹.

Table 8 illustrates the size of the IT industry, although the table is likely not to capture companies that are not registered. **Annex F** provides a more detailed description of the three IT industry segments, the IT distribution, IT services and the IT-enabled services.

Table 8. Listings in IT-Related Categories in the Cambodia Yellow Pages, 2009

Category	Number
Internet Cafes	274
Computer – Equipment, Maintenance & Consultancy	231
Computer Schools & Training	122
Computer Networking & Security	120
Software - Computers	110
Web Design	107
Computer - Wholesalers	86

¹¹ ICT service exports include communications services (telecommunications, business network services, teleconferencing, support services, and postal services) and computer and information services (databases, data processing, software design and development, maintenance and repair, and news agency services). This is the balance of payment definition from the International Monetary Fund (IMF).

Information Technology and Consultants	82
Internet Service Providers & Consultants	74
Computer Programming Consultants	52
Project Management Consultants	25

Involvement of IT contractors in government ICT projects in Cambodia has been limited to technical support such as website design, installation of IT systems, and training on how to use and maintain the IT systems. The IT industry support can include design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware. Some of the basic services that are provided by the IT industry include:

- Installation of IT systems and user training
- Database, software and website development
- Migration of data from one system to another
- Support for transition from Limon to Khmer Unicode
- Ongoing operational and technical support
- Just-in-time training for specific user training needs

Yet the IT industry can provide experiences and business concepts that have made a tremendous difference in the private sector, such as reduced costs, streamlined processes, and increased customer satisfaction. ICT is a fast moving sector and new technology solutions will continue to evolve. Therefore, it will be to the benefit to governments to develop the IT industry that can support the Government's endeavors to use ICTs for administrative reform and modernization. There are three key elements that will be necessary to foster beneficial interactions between the Government and IT industry, they include: (i) clear guidelines for private-public partnerships; (ii) Government policies and programs to encourage investment in innovation and research and development (R&D); and (iii) continuous development of IT skills in the workforce.

Public-private partnerships in ICT

Public-private partnerships (PPP) are being used to deliver public services to rural and remote locations in countries such as India (Annex B). Private companies are being used increasingly to fund projects across the world, in part because of the increased demand for public services outstrips the ability for government to provide services. Internationally, however, there have not been a substantial number of PPPs in ICT and e-government projects, and there are risks that need to be considered in dealing with PPPs. Those risks include: (i) monopolistic opportunities for the IT contractor; (ii) abandonment of government projects by IT contractors; and (iii) increased vulnerability regarding data security protection. However, there are new approaches to PPPs that have yet to be explored – particularly in regard to the delivery of public services to rural and poor communities. In developing countries, PPPs in ICTs have been most successful when relatively small investments have been made at the local level that cater to the needs of rural and poor communities, which has reduced some of the aforementioned risks.

The experience of PPPs in telecommunications projects show that key factors in success are: (i) establishing a robust contract structure where there is appropriate risk transfer to the private contractor; (ii) designing an equitable termination and transfer provision; and (iii) ensuring that the performance measures for IT contractors are output driven rather than input driven, to ensure that the desired outcomes by the government are met. As the potential for engagements with IT companies increases in the ICT area, the government will need to develop the capacity to assess its ICT needs to identify appropriate IT contractors, and to clearly understand and monitor contractual terms and service agreements. Once the basic principles of PPPs are understood by all parties involved, the government will be better positioned to explore opportunities that are currently beyond its reach.

Some benefits of private participation in e-Government initiatives include:

- a) Increase in expansion of ICT & e-Government networks and services due to new, additional private sector financing and investments;
- b) Increase in public control over the delivery of public services and management decisions guided by legally enforceable contracts and clear technical performance by private contractors;
- c) Increase in revenue by contracting with the private sector to undertake cost-recovery projects (e.g. fee-based public service delivery, electronic tax systems);
- d) Technology transfer through access to cutting-edge, innovative technologies and work processes;
- e) Increase in quality and quantity of public services delivered through customer-centric ICT applications.

The Role of Government in the IT Industry

In many countries, the government is the largest consumer and user of ICTs. It is to the benefit of the government to ensure that there is a local IT industry that is able to provide the government with cutting-edge technical solutions and continuous support. In turn, the government as a consumer can trigger growth in the IT industry. The technological needs of government change over time, and technology itself is fast-changing. Therefore, moving toward a flexible interaction with the IT industry, which can stay abreast with these changes, will help to avoid the creation of legacy IT systems that become obsolete and need to be completely abandoned.

In addition to being the largest consumer of ICTs, the government can play a catalytic role in creating a favorable environment for the IT industry. The Government can provide a significant opportunity to use non-proprietary technologies to build a flexible and scalable ICT infrastructure for the Government – setting an example for other segments of society. Many government agencies – including NiDA – are moving away from proprietary technologies to open source software. The term open source refers to software whose source code — the medium in which programmers create and modify software — is freely available on the Internet; by contrast, the source code for proprietary commercial software is usually a closely guarded secret requiring royalty fees. NiDA has drafted a Master Plan for Implementation of FOSS (free and open source software), which aims to leverage two advantages of FOSS: (i) increased capability in

translating FOSS applications to the Khmer language; and (ii) no license fees. The local IT industry can also provide the government with a test bed for the use of open source software.

Some approaches that have been taken in other countries to specifically improve the IT business climate include:

- Providing a simplified institutional and implementation framework by centralizing policymaking and administration for the IT industry in a single ministry, office, or agency; allowing for MOU between government and IT businesses; and providing government services for businesses through a single-window (website).
- Elevating the status of the IT industry by defining it as an “essential service” that warrants special fast-track status and promotional programs.
- Encouraging research and development (R&D) support through incentive programs such as refund of VAT paid on sale of software products, grants and subsidies for high-end R&D projects, special R&D funds and facilities, and tax exemption on income from technology transfer.
- Enabling development of e-commerce and e-government through implementing the necessary framework – this would include creating digital certification acts and e-transactions and clarifying criminal sanctions for violations.
- Providing incubation facilities or IT parks supported by provincial/local government and academic institutions.
- Promoting growth and effectiveness of the industry association.

The government can also play a role in ensuring that PPP transactions are implemented successfully through a dedicated e-Government PPP cell.

Internationally, many countries first establish multi-sector PPP units to oversee PPPs across a range of infrastructure sectors, including transportation, energy, and public buildings. The Cambodia Investment Board, the executive arm of the Council for the Development of Cambodia, provides this function to facilitate foreign and private investment. However, PPPs pose some distinct challenges for the IT sector. For example, it is more difficult to define outputs given the fast pace of technological change. Similarly, given the high level of integration of IT infrastructure into the business systems of government entities, it becomes difficult to clearly assign areas of responsibility between the government agency and the private sector partner. There is also a lack of a market for third party finance in IT. Service level agreements, software licenses, and payment arrangements for each e-government PPP require a strong and technically experienced staff. PPP transactions for e-government services will likely differ from the traditional PPPs at each stage of the process (i.e. tendering, negotiating, contracting, and monitoring).

IT human resource

According to a survey undertaken in 2009 by the Center for Information Systems Training (CIST), Cambodia has about 32 IT-related Higher Education Institutions

that provide bachelor and associate degrees. The survey further found that there are about 1.6 times more IT graduates than there are IT jobs. Yet, the IT companies that were interviewed for this study said that there were not enough qualified IT graduates and that they often required additional on-the-job training, because the IT curriculum taught at schools was overly theoretical. In addition, there is a need for the IT curriculum to integrate other subjects – such as business management and English – so that graduates can more readily apply what they have learned at their jobs. Around 60 percent of Cambodia’s population is under the age of 35. Equipping the next generation with IT skills would likely have a significant impact on private sector development. An example curriculum from Norton University integrates technical courses with analytical courses such as statistical analysis and organizational behavior.

After access to high-bandwidth telecommunications infrastructure (to be discussed below), the availability of employable talent is the single most important determinant for long-term growth of the IT industry. Public education content is often divorced from the needs of the industry. Therefore, policies and institutional mechanisms for aligning skills development with the needs and requirements of the industry will be a key driver in ICT uptake. Growth in India and China’s IT and ITES markets are slowing down due to a shortage of IT skilled talent. For example, Ho Chi Minh City has the most demand for IT human resources in Vietnam. In 2008, the city had 25,000 IT workers – 10,000 in hardware and 15,000 in software and services. The demand is estimated to increase tenfold by 2010.

A shortage of IT skilled human resources is already an issue in Cambodia both in the private sector and government. Close cooperation between IT training institutions, businesses and government is the most viable solution to sustain the demand for IT human resources in both the public and private sectors, and to take advantage of the opportunities for outsourcing IT services to neighboring countries such as Vietnam. Some approaches that have been taken in other countries to develop IT Human resources include:

- Developing a private sector/academia curriculum which will identify the short and long-term training needs within both the public and private sectors – which are likely to be similar.
- Introducing courses on soft-skills to complement IT training for value-add skills in business management and organizational process transformation.
- Instituting certification programs for various IT skills at the national level.
- Providing training and skills support grants for company-specific training.
- Providing SME awareness of the beneficial impact ICTs can have on profitability.

On the last point, South Africa offers a training and skills support grant for the costs of company specific training up to \$1,700 per company. Under its Capacity Building Program, Sri Lanka offers grants to fund a portion of the training costs to IT services and ITES companies. Sri Lanka also offers grants of up to \$10,000 to bring in a specialized trainer from abroad under the “train the trainer” program. Singapore provides a national Skills Development Fund for upgrading worker skills to encourage companies to maintain their capabilities and manpower to develop and leverage new technologies.

V Recommendations

As the number of projects with ICT components increases in the Government, leadership and overall governance of ICT implementation will become increasingly important. Planning and coordination of government investments in ICTs within a defined framework will help to meet the challenges the Government is likely to face such as those mentioned in the Introduction: (a) minimizing duplicate investments in common ICT needs; (b) implementation of diverse information systems that work together (i.e., interoperability); and (c) ensuring that the expected results such as increased efficiency and effectiveness can be achieved. Based on the building blocks that already exist in Cambodia, this study concludes with the following eight recommendations on the next steps to take in hand some of the challenges.

(i) Systematic coordination of ICT investments within the Government may take some time to take place and therefore, in the interim, coordination of donor-funded ICT projects could provide the first step toward a more comprehensive approach to ICT implementation in government. Benefits of ICT use in government can be fully realized when economies of scale and network externalities are clearly defined. As many ICT projects are under donor-funded projects, identification of common objectives and ICT needs of donor-funded projects could be the first step towards a comprehensive approach to ICT implementation. The Government and donor community could define common requirements that ICT projects would need to adhere to, such as adherence to a set of technical standards, establishing ICT expenditure categories and tracking them, and monitoring of impact and results indicators. Coordination of existing projects will facilitate the shift to a longer-term view of how ICTs can reinforce the desired governance structure and will help guide disparate efforts to reach the goal of a seamless government.

(ii) ICT training and awareness building in government should target three groups: CIOs, IT support staff, and end-users. An ICT human resource strategy that sets clear goals in regard to training for CIOs, IT support staff, and end-users could increase overall human resource capacity in government over the long-term. The strategy will need to address training needs that goes beyond the scope of ongoing donor-funded projects and will need to consider ways to improve retention of IT support staff as MBPSI provides supplementary incentives only during project implementation. The shift from traditional work processes to automated processes requires changes not only on the technological front, but changes in the way government staff work. Therefore, going through an ICT transformation can be highly disruptive in the short-term. Change management processes and basic computer training can help to acclimatize government staff to changes at work and help ensure proper uptake of ICT that has been put in place. CIO training for change management should include how to: (i) overcome resistance to process and organizational changes; (ii) prioritize and manage complex investments; (iii) change skills and mindsets; (iv) avoid duplicate efforts; (v) leverage economies of scale; and (vi) maintain long-term vision of transformation while pursuing concrete short-term results¹².

¹² Hanna et al. "National E-Government institutions: Functions, Models, and Trends," in forthcoming Information and Communications Development Report 2009

(iii) The Government will need to formalize the draft ICT-related policies and to fill the policy gaps in the ICT implementation framework. Key elements of an ICT implementation framework include HR capacity, technical standards and specifications, data and information security, and rules and guidelines for an electronic environment (such as the recognition of digital signatures) will require detailed laws and decrees to ensure systematic and consistent implementation and use of ICTs. These policies should be complementary, providing the pillars for an ICT implementation framework to help maximize the benefits of ICT use at both the individual agency and central government levels.

(iv) Issuance of technical standards will help ensure that disparate information systems work together (i.e., interoperable). Many ICT projects will be agency-specific and thus continue to remain under the management of individual agencies. Therefore, the Government's decision to adopt standards would allow agencies to implement ICTs that work interchangeably and that can be plugged into the Government's ICT architecture. Standard requirements can be grouped into four broad categories:

- **Interconnection:** Covers standards related to networks and system development. This layer enables communications between systems
- **Data integration:** Contains standards for the description of data that enables exchange between disparate systems
- **Information access and presentation:** Refers to the presentation of data to the user in various means of access to e-government services
- **Content management and metadata:** Pertains to the standards for retrieving and managing government information

(v) The Government may need to reassess demand for Internet bandwidth as connectivity and Internet usage increases within government. A number of interviews conducted for this Policy Note brought to surface concerns regarding limited bandwidth offered through NiDA's infrastructure. The Government therefore may need to explore options for provision of broadband Internet service such as through outsourcing of ISP functions to private providers. MPTC will need to continue addressing regulatory bottlenecks in the telecommunications sector in order to increase provision of high bandwidth broadband infrastructure at the national level. Regulatory issues such as, clear spectrum allocation and interconnection arrangements between telecommunications operators and ISPs will need to be addressed to create a level-playing field to encourage competition and innovation in the sector. Further, there is a need to establish domestic Internet exchanges to ease domestic Internet traffic and to provide secure the internet access to local ISPs.

(vi) Identification of high impact ICT investments can help sequence ICT projects in government. High impact investments can be defined as investments that impact a large number of beneficiaries (i.e., citizens, businesses and government), involve large volumes of transactions (i.e., monthly payroll and procurement tenders), or that leads to significant economies of scale. For example, the Government of Pakistan plans to sequence ICT investments in citizen-centric government services based on a citizen survey which identifies the top 20 government services that are in most demand. Services identified include: utility bill payment, land registration, healthcare services, school

enrollment, and issuance of national identification cards. Government can also prioritize ICT investments in areas that will bring significant efficiencies to administration processes such as a common electronic procurement application to be used by all agencies. Identification of ICT infrastructure and services that can be shared among multiple government agencies will significantly reduce costs both in terms of the initial investment and recurring costs.

(vii) ICT projects should have clear results indicators and account for implementation risks – to help ensure successful implementation. Investments in ICTs should be clearly linked to targeted results such as improved services to citizens, increased transparency in government, and organizational efficiency and effectiveness. Monitoring and evaluating ICT projects based on the results achieved will increase accountability of the implementing agencies and help the Government demonstrate the public value of ICT investments. Investment in ICTs tend to be complex and costly and costs for failed projects not only include monetary loss but costs in terms of reputation of the implementing agency or donor, and diminished incentives for future attempts in using ICTs. Therefore risk assessments (e.g. institutional constraints, evolving technological needs) and ease of implementation should be also taken into account during identification of ICT projects.

(viii) ICTs can provide useful tools to facilitate the National Decentralization and De-Concentration Program (NCDDP). ICTs can be considered as tools to facilitate the de-concentration agenda by easing communication and information flows between the central government and the local government. Email, government Intranet, and document exchange systems are all tools that can be used to formalize and streamline administrative processes at various levels of government. With adequate coordination, ICTs can be used for a more inclusive approach to government modernization – limiting the digital divide within government. Further, ICTs can be tailored to encourage participatory processes at the local level. For example, in Bolivia, the government Internet portal provides targeted and timely content for the general public interested in issues of municipal and local development, including a comprehensive list of elected mayors since 2004, as well as the most recent socio-economic and human development data on all the municipalities. Under the same initiative, a weekly program - broadcasted through traditional radio broadcasting and the Internet – were used to provide a forum in which the public could interact with policy makers and become aware of government programs. The traditional radio broadcast allowed for wide access to the programs, while the Internet provided a means to archive the programs and provide related information and documents.

(ix) Consultations with the IT industry can provide valuable inputs for designing appropriate technology solutions to address the ICT needs of the Government. Consultations with the IT industry during project preparation can provide an opportunity to discuss technology trends and emerging challenges, and to ensure that the appropriate technology solution is selected for the government. This has become common practice in many countries including Vietnam where IT companies are invited to comment on Government decisions such as on the use of Open Source software. The Government-Private Sector Forum could provide for such a platform in Cambodia. Consultations at the community level could be used to identify the needs and expectations of specific groups and communities and the appropriate delivery channel (i.e. community Internet

kiosk, mobile phone) for the service in demand. Private sector business models can propel a project beyond the pilot project stage and achieve sustainability. For instance, in the case of community Internet kiosks over time subsidies may be removed and user fees used to cover operating costs. Further, consideration for increasing capacity to handle e-government PPPs would benefit ongoing and future ICT projects in government. Capacity building could be provided to the existing team in the Cambodia Investment Board or a dedicated e-government PPP cell that would focus on government implementation of ICTs. In many countries, the PPP cell is located in the ministry of finance or the agency responsible for e-government oversight.

ANNEX A – Impact of IT Applications for Public Services, Selected Countries

Country	Application	Before	After
Brazil	Registration of 29 documents	Several days	20 to 30 minutes per document, one day for business licenses
Chile	Taxes online	25 days	12 hours
Guatemala	Banca SAT E-Procurement	30 days 5 hours	6 hours On line
China	Online application for 32 business services	2-3 months for business license Several visits to multiple offices for filings	10-15 days for business license Several seconds for routine filing for companies
India, Andhra Pradesh	Valuation of property, Land registration	Few days 7-15 days	10 minutes 5 minutes
India, Karnataka	Updating Land Registration Obtaining Land Title Certificate	1-2 years 3-30 days	30 days for approval, request completed on demand 5-30 minutes
India, Gujarat	Interstate Check Posts for Trucks	30 minutes	2 minutes
Jamaica	Customs Online	2-3 day for brokers to process entry	3-4 hours
Mexico	Access of Public Information	60 days	3 days
Philippines	Customs Online	8 days to release cargo	4 hours – 2 days to release cargo
Singapore	Issue of Tax assessments	12-18 months	3-5 months
Venezuela	Judicial Case Management System Speed up commercial cases	800 days in debt collection 400 days in Leasing	250 days – initiation to termination 150 days

ANNEX B – ICT Delivery Channels (mobile phone and Internet Kiosks)

Mobile phones are less expensive than computers. Basic GSM models designed for developing countries are as low as \$30, and half that price for second-hand handsets. Costly monthly subscriptions can be avoided by purchasing prepaid cards. This provides for an affordable business model for low-income consumers. The mobile platform provides two channels for delivery of services, text messaging and access to the Internet. Text messaging services are the cheapest and fastest to rollout, but technology is evolving toward mobile access to Internet – which is already how most people in the Philippines access the Internet. Some of the mobile operators in Cambodia introduced Internet roaming services in 2009. However, they do not carry websites in Khmer as of now. There are numerous examples of public services such as commodity prices that are delivered via text message or the Internet to farmers and entrepreneurs. A personal digital assistant (PDA) or handheld computer can be used by health practitioners to collect data in rural areas. According to The UNDP report on ICT solutions for the agriculture and fishery sectors¹³, some of the advantages of mobile phones include:

- Battery powered – low equipment and service cost;
- Numeric keypad that reduces literacy and localization requirements;
- Text messaging provides offline delivery channel;
- Camera function provides use of paper-based record keeping;
- Audio feedback (microphone/speaker) provides opportunity for dialogue; and
- The small screen streamlines sequential interaction, which simplifies the decision making process.

Some of the mobile operators in Cambodia introduced Internet roaming services in 2009, although they do not carry websites in Khmer as of now. Services being delivered in other countries include: (i) information useful for farmers and fishermen; (ii) information on health care for rural households; and (iii) notices for job opportunities in cities and town centers. Delivering public services that would have a high impact using ICTs would bring government closer to the citizens, especially in rural areas.

The mobile platform provides two channels for delivery of services, through text messaging and access to the Internet. While some mobile operators in Cambodia started offering Internet roaming services in 2009, they do not carry websites in Khmer as of now. Text messaging will likely remain the cheapest and most effective way to rollout services in the medium-term. Text messaging service is already being used in Cambodia to provide mobile banking services which allow low-income customers to make transactions in small units. Currently, mobile banking services are focused on providing a safe, affordable and expedient way to transfer money for example, to relatives in rural areas who rely on this remittance flow for education, housing and other staples. Other common services seen in countries in Africa and South Asia include prices for agricultural commodities, and notices for job opportunities in various parts of the country for seasonal workers.

Mobile communication offers an effective means of bringing various services to citizens and improving the responsiveness of governments in times of national emergencies. With

¹³ UNDP. (2007) “A Pre-investment Feasibility Study on ICT solutions for Private Sector Development in the Agricultural and Fishery Sectors.

low-cost handsets and the penetration of mobile phone networks citizens that never had regular access to a fixed-line telephone or computer now use mobile devices as daily tools for communication and data transfer. There are a plethora of examples from other countries in which governments are providing public services to its citizens through the mobile phone. These areas include:

Mobile Agriculture: When information is limited or costly, agents are unable to engage in optimal arbitrage. Information technologies may improve market performance and increase welfare. For example, between 1997 and 2001, mobile phone service was introduced throughout Kerala, a state in India with a large fishing industry. Studies have shown that the adoption of mobile phones by fishermen and wholesalers was associated with a dramatic reduction in price. Both consumer and producer welfare increased.

Mobile Health: A growing number of developing countries are using mobile technology such as PDAs (personal digital assistant) and mobile phones to address health needs. A United Nations Foundation study on 51 mobile health programs in developing countries identified the following key applications of ICTs: (i) education and awareness; (ii) remote data collection; (iii) remote monitoring of patients; (iv) communication and training for healthcare workers; (v) disease and epidemic outbreak tracking; and (vi) diagnostic and treatment support. Some illustrative examples include:

- In South Africa, Project Masiluleke's text message campaign promoting HIV/AIDS awareness resulted in nearly a tripling of call volume to a local HIV/AIDS helpline.
- In Uganda, Text to Change's SMS-based HIV/AIDS awareness quiz led to an increase of nearly 40% in the number of people coming in for free HIV/AIDS testing.
- In Peru, the Cell-Preven program Health workers use mobile phones to send SMS messages with real-time data on symptoms experienced by clinical trial participants. Enables immediate response to adverse symptoms.
- In the Philippines, Phoned Pill Reminders for TB Treatment. TB patients were given mobile phones and called daily with reminder to take their TB medication—90% did.

Mobile Humanitarian Assistance: Early warning systems involving mobile phones—both cell broadcast and text messaging alerts—are being considered or implemented in various countries. Because it can quickly and informally disseminate information from person to person, mobile communication is a good medium for information sharing both during and in the aftermath of a disaster. The case study on the World Food Programme's use of text messaging to inform Iraqi refugees of food shipments illustrates the opportunities of text alerts. A 2005 Groupe Spéciale Mobile Association (GSMA) study found that in the immediate aftermath of a disaster the speed with which mobile networks can recover from damage—often within hours—plays a critical role in relief supply management and economic recovery. Rapid restoration of networks is essential in the critical period right after a disaster.

However, not many countries have succeeded in developing mobile applications that have been taken up by large sections of society – and handsets that are available in

developing countries cannot easily accommodate web-enabled applications. Therefore, in countries such as India, public services to rural areas are delivered through Internet kiosks and centers. These centers provide computer and Internet access at the village level to provide services, information and means for communications aimed at the rural market. In India, a survey of 18 projects dealing with local and community access facilities showed that PPPs were considered to be a significant factor in the success of community access facilities. Many projects that involved the private sector showed positive indicators for their financial sustainability, because the risk of cost recovery was placed on the private contractor. The business model for establishing an Internet kiosk or center requires two to three layers:

1. The top layer is comprised of a contractor that provides equipment, training and support services, and is responsible for regulatory and connectivity issues;
2. The middle layer is comprised of a local service provider that is responsible for marketing, payment collection and providing dispute mechanisms; and
3. The last layer is comprised of entrepreneurs at the village level, who run the kiosks or centers.

Business models have incorporated cost-recovery mechanisms while providing key services for free. Furthermore, the survey found that these ICT projects provided an integrated but varied range of information services in areas such as e-government, education, agricultural information, trade, health, and entertainment, in conjunction with general communications. Take-up of the information and communications services is triggered when content is tailored toward the interests and needs of the rural community.

KINGDOM OF CAMBODIA
NATION RELIGION KING

National Information Communications
Technology Development Authority

From 01-01-2010 To 26-01-2010

List of Internet Usages

Nº	Ministries/Institutions	Bandwidth Allocated	Actual Use
1	Senate	4 Mbps	1,096.822Kbps
2	National Assembly	4 Mbps	121.067Kbps
3	Office of the Council of Ministers	12 Mbps	6,245.840Kbps
4	Ministry of Rural Development	4 Mbps	1,023.248Kbps
5	Ministry of National Defense	4 Mbps	711.807Kbps
6	Ministry of Labor and Vocational Training	2 Mbps	28.402Kbps
7	Ministry of Health	2 Mbps	184.103Kbps
8	Ministry of Education Youth and Sports	4 Mbps	3.392Kbps
9	Ministry of Culture and Fine Arts	4 Mbps	69.828Kbps
10	Ministry of Agriculture Forestry and Fisheries	4 Mbps	11.597Kbps
11	Ministry of Interior	2 Mbps	1.392Kbps
12	Ministry of Planning	2 Mbps	356.513Kbps
13	Secretariat of Public Service	1 Mbps	576.695Kbps
14	Ministry of Land Management, Urban Planning & Construction	1 Mbps	2.932Kbps
15	Ministry of Social Affairs Veteran and Youth Rehabilitation	2 Mbps	62.181Kbps
16	Ministry of Foreign Affairs and International Cooperation	10 Mbps	939.334Kbps
17	Ministry of Environment	2 Mbps	370.045Kbps
18	Ministry of Religions and Cults	4 Mbps	842.667Kbps
19	Ministry of Justice	2 Mbps	17.074Kbps
20	Ministry of Royal Palace	4 Mbps	40.894Kbps
21	Ministry of Parliamentary Affairs and Inspection	2 Mbps	2.392Kbps
22	Ministry of Water Resources and Meteorology	2 Mbps	445.888Kbps
23	Ministry of Industry Mines and Energy	2 Mbps	830.177Kbps
24	Municipality of Phnom Penh	4 Mbps	901.042Kbps
25	Ministry of Information	2 Mbps	5.322Kbps
26	Ministry of Economy and Finance	12 Mbps	1,087.852Kbps
27	Ministry of Public Works and Transport	4 Mbps	209.768Kbps
28	Royal University of Phnom Penh	1 Mbps	130.515Kbps
29	Royal Academic School	4 Mbps	724.721Kbps
30	Dang Kor District	1 Mbps	17.253Kbps
31	Toul Kor District	1 Mbps	1.063Kbps
32	Royal School of Administration	2 Mbps	259.144Kbps

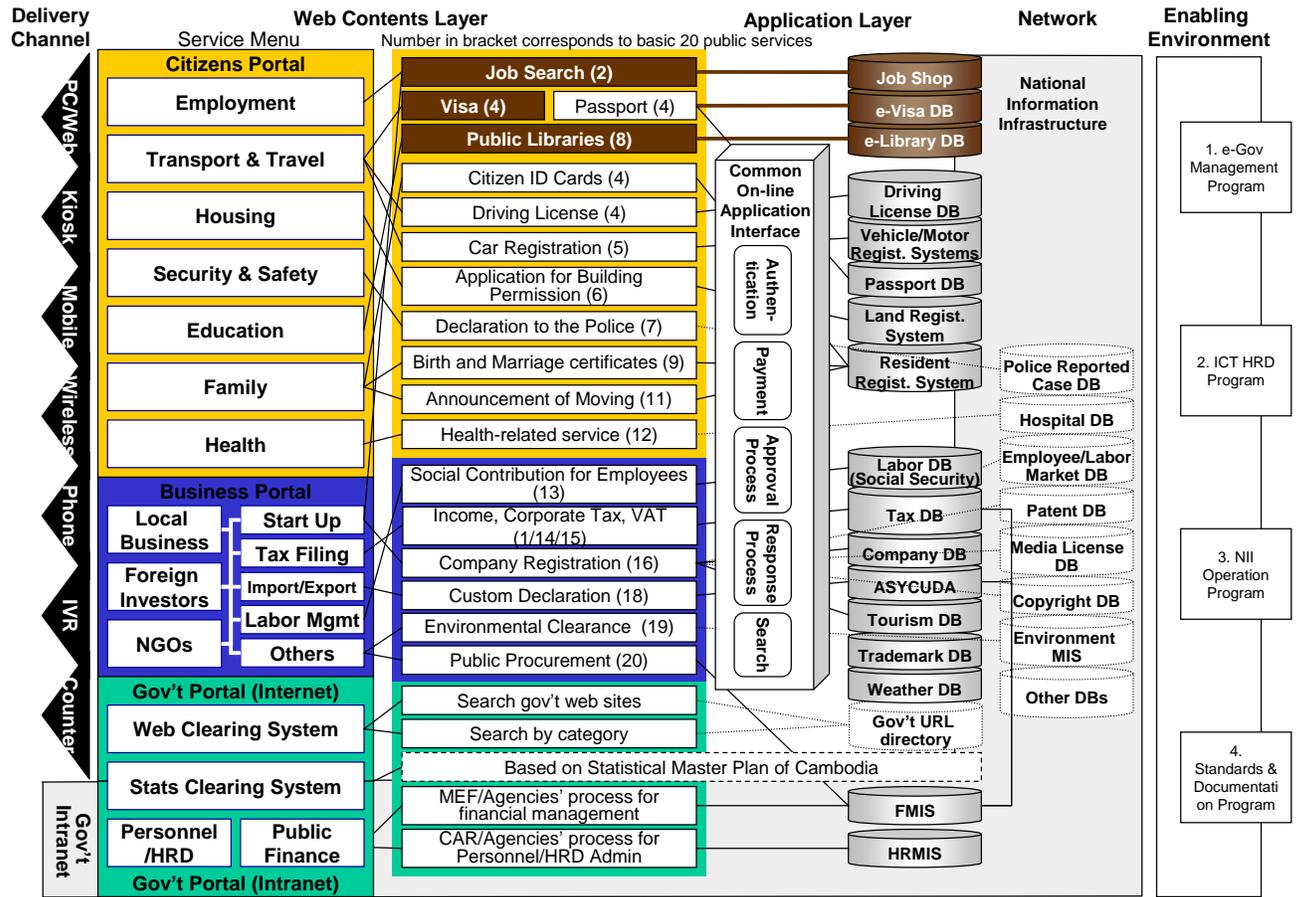
33	Mean Chey District	2 Mbps	2.515Kbps
34	Chamkamon District	1 Mbps	2.398Kbps
35	Secretariat of Civil Aviation	2 Mbps	124.280Kbps
36	Institute of Economy and Finance	2 Mbps	323.781Kbps
37	Daun Penh District	1 Mbps	2.542Kbps
38	Phnom Penh Police Headquarter	2 Mbps	7.718Kbps
39	General Department of Public Works and Transport	2 Mbps	69.594Kbps
40	National Information Communications Technology Development Authority	6 Mbps	1,090.192Kbps
41	Office of the Council of Ministers (Former Khemra Hotel)	4 Mbps	191.286Kbps
42	Government Administration Information System	2 Mbps	330.445Kbps
43	Battambang Province	2 Mbps	362.109Kbps
44	Sihanouk Province	2 Mbps	344.852Kbps
45	Siem Reap Province	2 Mbps	244.852Kbps
46	Takeo Province	2 Mbps	58.169Kbps
47	Kandal Province	2 Mbps	162.665Kbps
48	Kampong Cham Province	2 Mbps	64.130Kbps
49	Banteay Meanchey Province	2 Mbps	81.726Kbps
50	Kampong Thom Province	2 Mbps	262.616Kbps
51	Kampot Province	2 Mbps	213.467Kbps
TOTAL			21.260Mbps

ANNEX D – Existing ICT Policy Documents

Law/Decree	Status	Description	Agency
National Strategic Development (NSDP) 2006-2010	Enacted	One of the four strategic objectives of the National Program for Administration Reform (NPAR) is to promote the use ICT. To enhance the quality and transparency of public services through the gradual automation of management and service delivery processes through information technology.	RGC
Royal Decree on the establishment of NiDA	Enacted	NiDA is was established as the central ICT agency in 2000, tasked in formulating IT promotion and development policy for the short, medium and long term; (ii) in charge of IT policy implementation to ensure maximum economic growth; (iii) monitor and audit all IT related projects in the Kingdom of Cambodia.	NiDA
ICT Policy	Draft	The draft ICT Policy, developed with the support of UNDP and APDID, addresses the following areas: ICT leadership and national commitment; legal and regulatory frameworks; human capacity; digital content; information infrastructure; and enterprises development.	NiDA
ICT4D National Education Policy	Enacted	The policy prioritizes ICT-based information management at various levels in academia as part of the decentralization process. Access and quality improvement will be supported by ICT-based distance learning opportunities (e.g. distance Masters, teacher development), selective introduction of computer awareness programs into upper-secondary schools and post-secondary institutions.	MOEYS
e-Commerce Law	Draft	The draft e-Commerce law provides broad guidelines on regional electronic payments arrangements, taxation and other cross-border jurisdiction issues, a digital signature law, cybercrime prevention law, intellectual property rights protection law, and consumer protection law which incorporate online Acceptable Dispute Resolution (ADR) mechanism, and other privacy and personal data protection.	MOC
e-Transaction decree	Draft	There is currently a draft sub-decree on electronic transactions that defines the rules for electronic signatures and certification.	MOC, MPTC
Telecommunications Law	Draft	The draft Telecommunications Bill addresses the lack of comprehensive law governing the telecommunications sector. A key objective in the Bill is to separate the regulatory and policy making functions of the MPTC. The separate regulatory authority is to assume traditional roles of license issuance, spectrum management, interconnection regulation, universal access, and numbering.	MPTC
Universal Service Obligation Policy	Draft	The draft policy includes government objectives to promote rapid and equitable expansion of ICTs for the purpose of national economic and social development and reduction of poverty.	MPTC
Sub-Decree on Establishment of Universal Telecom Services	Draft	The draft sub-decree calls for the establishment of universal telecommunications strategy, a Universal Telecommunications Council, and a universal telecommunications fund.	MPTC
Law on Marks, Trade Names and Acts of Unfair Competition	Enacted	Under this law, it is stipulated that the exclusive right to trade marks shall be acquired by registration and the right of priority in the mark registration shall be granted if the applicant attaches to the application the declaration	MCFA

		claiming the priority of an earlier national or regional application filed by the applicant or his predecessor in any member country of the Paris Convention.	
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ANNEX E – e-Government Organization Architecture, NiDA/JICA¹⁴



¹⁴ NiDA, JICA.(2008) “The Study Report on e-Government Service Deployment Plan for Royal Government of Cambodia”

ANNEX F – Overview of Local IT Industry

The IT industry can be sliced in many ways but is typically grouped into three broad categories. The first is the IT distributors, which import and distribute equipment and off-the-shelf software, and often provide technical and maintenance support. The second is the IT service companies, which offer ‘back-office’ type services – namely, application development, systems integration, IT consulting, R&D, and engineering services. The third is the IT-enabled services (ITES) companies, which provide services which can be delivered remotely over communications networks. These range from basic services in data processing and technical support to value-added services in accounting, data computing, and electronic transaction services. The business process outsourcing (BPO) services that made Ireland and India leaders in IT service exports are in this third category.

This section provides an overview of the local IT industry and examines the status of the IT human resource and the IT Industry in Cambodia.

a) IT Distributors

As of mid-2009, Cambodia had around 86 registered computer wholesale companies. The IT distribution market is highly fragmented. It is dominated by a limited number of companies, which cater to government, foreign companies, donor organizations and NGOs. The majority of distributors are very small-scale unregistered businesses that cater to individual customers and local SMEs. Due to the high cost of importing equipment, the small IT distributors have difficulty paying taxes. Therefore they choose to operate within the informal market.

The uptake of IT equipment and solutions among SMEs in Cambodia has picked-up markedly in the past few years. For example, restaurants and family businesses are using PDAs (personal digital assistant) and POS (point of sale) systems to speed-up service delivery as well as cash and credit card transactions. Still, outside of Phnom Penh and some town centers, there is limited awareness of how IT solutions could benefit SMEs in improving business operations and profitability.

According to a survey undertaken in 2006 by the Center for Information Systems Training (CIST), IT distributors experienced a 5% growth in sales. The estimated value of the IT distribution market was \$25-65 million¹⁵. However, because the larger distributors are foreign-owned, the bulk of the profits flow out of Cambodia. The larger distributors have been trying to diversify their products – some are starting to provide IT services, such as web design and database development. The CIST survey found that about 1,200 people were employed in this market segment – 50% of these employees had an IT background, namely a bachelor degree in IT.

The retail market has become highly price-sensitive. Distorting activities, such as the uptake of piracy software, are keeping costs for software, service and equipment high. A

¹⁵ The range for this figure is wide due to difficulties in estimating the size of the formal and informal markets.

law on intellectual property rights (IPR) exists in Cambodia, but is not being adequately enforced in regard to proprietary software. Steps taken to ameliorate this situation include the formation of the Inter-Ministerial Coordinating Committee on Intellectual Property Rights and MOUs between government agencies and IT distributors. Import tariffs on IT equipment have been reduced from about 35% to 15%. Recognizing that this is a barrier for IT use, the government has drafted a sub-decree to further reduce tariffs. This sub-decree is aligned to the e-ASEAN agreement for each member to reduce the import tariff to 0% by 2012.

(b) IT Service Companies

IT services typically include IT systems and network administration. The sophistication of the services can vary (Annex A). As of 2009, there were 254 IT service companies (i.e. computer networking and security, IT consulting, computer programming). The CIST 2006 survey found that 100-300 employees worked in the network integration service segment, and 200-300 employees in the applications development segment. These companies mainly addressed the local market. They saw an estimated \$5-10 million profit in 2006. Their larger customers include banks, telecommunications operators and government agencies. Also, there are a number of individual freelance IT consultants and companies that are formed on one-contract basis.

As aforementioned, many of these companies are run by expatriates or Cambodians who have returned from overseas. Through their efforts, knowledge is being transferred in the areas of IT and business management. IT companies are finding that without the knowledge in business management, their employees are not able to provide value-added inputs as demand for expertise in customization of applications and business process engineering increases. Some of the IT companies are training their staff in progressive IT and business concepts.

For example, Capability Maturity Model Integration (CMMI)¹⁶ is integral to the training plan at Yellow Pages Cambodia. CMMI provides guidance on improving and managing work processes, so that organizations can aim to reach various levels of maturity. Currently, there are no CMMI certification programs in Cambodia, although such a program would encourage the recognition of value-add IT skills.

The IT service segment provides young people with an opportunity to have salaried jobs with opportunities for promotions and salary raises. This has had a significant impact in India, where many young employees working in call centers have been the first ones in their household to open a savings account and to own a debit account.

Socially Responsible IT Service Providers

CIST (Center for Information Systems Training) aims to provide practical IT systems training to a large number of disadvantaged students. CIST works with a number of NGOs to recruit

¹⁶ The main sponsors of the CMMI project in 2002 was the U.S. Secretary of Defense (OSD) and the National Defense Industrial Association but today, there are a variety of CMMI models and software that can be applied to a range of organizations helping them integrate traditionally separate organizational functions.

disadvantaged students from high schools in poor areas across the country. CIST studies the demand of the fast-changing local IT market and provides practical training so that students can find jobs upon graduation.

Digital Data Divide is a non-profit social venture that provides data processing services. It has offices located in Cambodia and Lao PDR. Its primary mission objective is to provide quality and timely digitalization services – such as digital libraries, media, and legal services – as well as research, surveys, and form processing services. Its secondary mission is to facilitate human development by providing fair wages and career advancement opportunities. Employees not only receive salaries that are well above the local standard, but also receive health benefits and scholarships for continued education.

Open Institute is a non-governmental and not-for-profit organization that presently runs six programs: (i) KhmerOS (in collaboration with NiDA); (ii) Women Empowerment for Social Change; (iii) Open-learning; (iv) Open Schools; (v) Publications; and (vi) Lexicography. The Women's Empowerment for Social Change program encourages women to hold IT positions by designating certain job opportunities which come with training in website and content management.

Yejj is a social enterprise that provides skills training in various disciplines to persons from underprivileged backgrounds so that they can contribute as productive individuals in society and the workplace. The Yejj eAcademy provides training in Microsoft Office (ICDL), Cisco networking and English. IT companies normally try to retain their technically skilled staff, but employees of Yejj move onto other positions after a few years so that new trainees can have access to the same opportunity.

c) ITES Companies

At first glance, Cambodia may not seem to be well-positioned to export IT services. Although the Cambodian IT industry in terms of export-oriented hardware production and software development is at a nascent stage, 3% of Cambodia's service exports consisted of communications, computer and information services in 2007¹⁷. In the same year, the East Asia and Pacific regional average was 5%. Indonesia had the highest percentage in the region at 11%. Among the services being exported are web development, data processing and digitalization of documents creating online archives and libraries. Overseas clients are mostly in France and the U.S. Opportunities for Cambodian software developers and programmers to provide services regionally are likely to grow as countries such as Vietnam start experiencing shortages in IT-skilled workers.

The impact of IT/ITES in some developing countries has been striking. In India, IT service export revenues amounted to \$40.4 billion (5.5% of GDP) and the IT industry employed a total of 2.01 million people during 2007-2008. The Philippines saw its IT/ITES revenues increase from \$100 million in 2001 to nearly \$7 billion in 2008, and salaries for IT/ITES jobs are 50-100% more than other jobs in the services sector. Low-

¹⁷ ICT service exports include communications services (telecommunications, business network services, teleconferencing, support services, and postal services) and computer and information services (databases, data processing, software design and development, maintenance and repair, and news agency services). This is the balance of payment definition from the International Monetary Fund (IMF).

income countries such as Bangladesh and Pakistan are also joining the bandwagon, gearing-up to claim the addressable IT/ITES global market of around \$475 billion – of which only 14% had been realized by 2007.