Project Document

Strategies for measuring the knowledge economy in the Caribbean

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Abstract

This report explores the status of the knowledge economy in the Caribbean. Initiatives that have shaped the development of Information and Communications Technology for Development (ICT4D) and the knowledge economy are reviewed. The regional situation is then analysed with regard to measurement of the knowledge economy and the development of Information and Communications Technology (ICT) policy and strategy in the region. These policies and strategies are analysed in the context of the World Summit of the Information Society (WSIS) lines of action. The World Bank Knowledge Assessment Methodology (KAM) is reviewed and evaluated as a tool to assist in monitoring the development of the knowledge economy in the Caribbean. Based on these reviews and analyses, a set of recommendations is produced to guide the development of ICT and knowledge economy in the region.

I. Introduction

Chen and Dahlman define a knowledge economy as:

> *"... one that utilizes knowledge as the key engine of economic growth. It is an economy where knowledge is acquired, created, disseminated and used effectively to enhance economic development."* (2005, p. 4)

This definition emphasises the fact that benefit lies in the use of knowledge and information to impact development and quality of life, rather than in the mere access to them. This is particularly critical given the risks posed by increased access to information and communication technology (ICT), including:

- Reinforcement of the asymmetry of information flows
- Increased consumption of exogenous knowledge embodied in consumer goods and services, rather than the consumption of knowledge and information to produce endogenous solutions for local use and marketing internationally
- Reinforcement of the dominant position of foreign cultural products over local ones.

Furthermore, Powell and Snellman (2004) argue that in such an economy, there is a shift from physical inputs and natural resources to a reliance on intellectual capabilities, and the introduction of innovative processes as a result of research and development. The effect is that the intangible capital assumes greater prominence in the gross domestic product of a country.

More specifically, knowledge economies exhibit several key characteristics. These include an emphasis on the generation of knowledge and information; significant importance is attached to knowledge and information from internal and external sources; and there is a noted exploitation of knowledge and information from both internal and external sources for development and delivery on a sustainable basis of a desired quality of life.

While ICT is clearly critical to the knowledge economy, this should be viewed as being largely infrastructural. ICT provides a tool to facilitate access to and management of knowledge and information. As a result, the non-ICT activities of knowledge and information generation and their use to deliver value are also important in fostering a knowledge-based economy.

ICT for development (ICT4D) is the application of ICT to achieve development. The challenge for ICT4D is to harness ICT to support the development of the knowledge economy. As noted in Chen and Dahlman:

> *"... the concept of the Knowledge Economy does not necessarily revolve around high technology or information technology. For example, the application of new techniques to subsistence farming can increase yields significantly or the use of modern logistical services can enable traditional craft sectors to serve broader markets than before."* (2005, p. 4)

Thus ICT4D must focus on facilitating the use of information to achieve development goals rather than on the technology itself. This report will focus on the contribution that ICT4D can make to the development of knowledge economies in the Caribbean, and how that contribution can be measured.

The developmental opportunities offered by the knowledge economy go beyond the economic sphere. Knowledge economies and ICT4D undergird the potential to refine the region's relationship with information, knowledge and technology. Historically, the people of the Caribbean have applied exogenous information and technology, doing so at considerable expense and often principally for the benefit of others. They have been servants of technology, not its masters and this has shaped their image of themselves and narrowly circumscribed the futures they could perceive.

ICT4D and knowledge economies are fundamentally about taking information and technology and bending them to one's will, mastering them and creating them. In so doing, the Caribbean can address the deficiencies and challenges of its material circumstances. A number of initiatives have shaped the development of ICT4D and knowledge economy, globally and in the Caribbean, over the last decade. Some of these are discussed in the following sections, and set the contextual framework.

A. World Summit on the Information Society

At the global level, the World Summit on the Information Society (WSIS) was held in Geneva in 2003 and Tunis in 2005. Several countries of the Caribbean participated in WSIS, including Barbados, Cuba, Dominican Republic, Haiti, Jamaica, St. Kitts and Nevis, Saint Lucia, Suriname and Trinidad and Tobago. Additionally, the CARICOM Secretariat and the Caribbean Development Bank were invited to participate as Intergovernmental Organizations. Out of these, the WSIS Declaration of Principles, (WSIS, 2003b), located ICT4D in the context of United Nations Millennium Development Goals (MDG) (UNDP, 2008), which focus on poverty eradication, education, health, gender equality, environmental sustainability and global partnership. In this regard, the declaration seeks to harness the potential of information and communication technology to advance the development goals of the Millennium Declaration (WSIS, 2003b).

Further, the WSIS declaration elaborates 11 principles in the following areas:

(i) The role of governments and all stakeholders in the promotion of ICTs for development

(ii) Information and communication infrastructure: an essential foundation for an inclusive information society

(iii) Access to information and knowledge

(iv) Capacity building

(v) Building confidence and security in the use of ICTs

(vi) Enabling environment

(vii) ICT applications: benefits in all aspects of life

(viii) Cultural diversity and identity, linguistic diversity and local content

(ix) Media

(x) Ethical dimensions of the information society

(xi) International and regional cooperation.

These principles summarised and structured the ICT4D discussion to that time and formed the basis of the WSIS Plan of Action, WSIS (2003a), and listed 10 indicative targets to be achieved by 2015.

B. Regional Action Plan for the Information Society in Latin America and the Caribbean (eLAC)

The Regional Action Plan for the Information Society in Latin America and the Caribbean (eLAC) identifies short term actions for the countries of the region. These actions are tailored to the needs and priorities of the region, in the longer term contexts established by the WSIS and MDG. Two phases of eLAC, eLAC2007 and eLAC2010 have been completed. The third phase, eLAC2015 (ECLAC, 2010), identifies 10 lines of action as follows:

A. Achieving access for all

B. Treating e-government as an obligation of governments towards their citizens

C. Promoting the use of ICT to mitigate the impact of climate change and broadening the use of technologies for natural disaster and emergency prevention, mitigation and response

D. Promoting the use of ICT for inclusive social security

E.1. Driving research, technological development and innovation in the region

E.2. Helping to close the digital divide between large enterprises and micro, small and medium-sized enterprises

F.1. Crafting a legal environment that facilitates the development of the information and knowledge society

F.2. Moving towards the implementation of policies that facilitate the development of the information and knowledge society

G. Developing and implementing ICT for an inclusive education

H. Promoting coordination at the national level.

C. CARICOM draft regional ICT4D plan

At the subregional level, the countries of the Caribbean have for some time recognised the importance of information and ICT in development. In the Georgetown Declaration on Information and Communication Technology (ICT) Development (CARICOM, 2003), Caribbean Community (CARICOM) ministers responsible for ICT agreed to pursue a coordinated approach in the development of ICT policies, and to adopt policies which would foster wider access to information and communication technology by the region. This declaration and the regional commitment to WSIS and eLAC have led to the development of the CARICOM draft regional ICT4D strategy (CARICOM, 2010), which include the following strategic objectives:

- Fully establishing a modern regional regulatory and open telecommunications infrastructures where affordable and ubiquitous access are provided through networks which use converged technologies
- Build a digital community culture, so as to provide the framework within which the economic value and number of trained ICT workforce of the region can be increased and result in improved life styles for the peoples of the region
- Demonstrate good governance and increased operational efficiency through the use of ICT
- Enable sustainable production of regional digital goods and services through the establishment of a culture of innovation and quality, with particular emphasis on ensuring that priority is given to fostering the development of cultural industries and incorporating local content
- Use ICT for sustainable growth and the support of social development objectives through partnerships that utilize networked technologies.

D. National ICT plans and strategies in the Caribbean

The period since the WSIS has seen Caribbean governments developing national ICT strategies and policies. It has also been marked by changes in the telecommunications subsector of the ICT sector, with voice, particularly mobile, and internet service becoming much more widely available and affordable, as a direct result of the liberalization of the subsector. Some countries have also embarked on e-government, e-education and e-health initiatives.

Within this context, this study, therefore, reviews Caribbean responses to ICT4D as a foundation for fostering knowledge economies and the issues of measurement of knowledge economies in the region. It also discusses the World Bank Knowledge Assessment Methodology (KAM), and the results of its application to the States of the region considered. Based on these sections, policy recommendations are advanced.

E. Summary of recommendations

This report advances a number of recommendations. Firstly, ICT for Development and the emergence of the knowledge economy must be integrated into and play a prominent role in the broader national development agendas of the Caribbean. As a key agent of development, a holistic approach must be adopted towards ICT for Development, to ensure that the elements of planning, regulation and management of ICT are incorporated into the national development plans. This, therefore, requires that ICT is viewed as an economic sector in its own right. In this regard, governments must implement programmes of incentives to stimulate the required private sector participation in the ICT services sector. Additionally, it is critical that national ICT plans maintain compatibility with the regional approach to ICT for Development. While this would create an opportunity for countries to develop areas of competence in a coordinated manner, ensuring compatibility in policy, strategies and standards, would also allow the Caribbean region then becomes more attractive to foreign ICT investors. Finally, there is need to improve the ICT measurement regime, and to incorporate the Knowledge Assessment Methodology into that regime. This will allow for better planning and assessment of the evolution of the knowledge economy in the Caribbean.

II. Situation analysis

There are three components to the knowledge economy. These are: (1) access to information and knowledge, (2) creation of new information and knowledge, and (3) use of information and knowledge. It is within this context that States and societies can use information and knowledge to advance their development and deliver on a sustainable basis the quality of life they desire. This represents a great opportunity for the Caribbean, as information and knowledge has never been as accessible as it is today. Further, the means now exist to make information and knowledge as accessible in the region as it is anywhere else.

However, this brings the real challenge of knowledge economy in focus. With information available to all, sustainable development and competitiveness will depend not on access to information, but on how effectively information is used. Effectiveness, efficiency, innovation, competition and examination of the issues related to knowledge economy must always keep this in focus.

A. Measurement

The Partnership on Measuring ICT for Development (ITU, 2010) has developed a set of ICT indicators, which are categorized along the following thematic areas:

- ICT infrastructure and access
- Access to, and use of, ICT by households and individuals
- Use of ICT by businesses
- ICT (producing) sector
- International trade in ICT goods
- ICT in education.

This instrument establishes the framework for internationally comparable and reliable ICT statistics. In the Caribbean subregion, core indicators for ICT infrastructure and access are generally available. The latest data available is typically in the range of 2004 to 2006. However, data is almost totally absent for the other groups of core indicators (with the exception of ICT in education, which was introduced in the 2010 set of core indicators).

B. Caribbean ICT policy and strategy documents

As articulated in their ICT policy and strategy documents, Caribbean States seek to harness ICT for national development. In some cases, mention is made of developing the local ICT sector and of the role of ICT in supporting the development of key economic sectors such as tourism and agriculture. However these references do not typically include qualitative or quantitative goals for the ICT sector.

Table 1 presents the major themes of Caribbean ICT policy and strategy documents.

TABLE 1
MAJOR THEMES OF CARIBBEAN ICT POLICY AND STRATEGY DOCUMENTS

Major Theme	Contribution to National Development
Participation in the Information Society	The idea of participation by national populations in the global information society appears in all the documents. This involves providing affordable universal access to the Internet and to ICT, and development of the populations' ICT literacy. This participation seeks to support both the general development of the society, and national economic development.
Telecommunication Regulation	The documents emphasize development of independent telecommunication regulation regimes.
ICT in Education	ICT is to be incorporated into teaching and learning at all levels of the national education system to enhance education and develop familiarity and facility with ICT tools. There is less emphasis on education of ICT professionals.
e-Government	All the documents seek to use ICT to enhance the effectiveness of government and to deliver services and information.
ICT Legislation	The documents propose the development of legislation and regulation to govern ICT.
Small, Medium and Micro Enterprises (SMMEs)	The Small, Medium and Micro Enterprise (SMME) sector is identified as critical to economic development and ICT is proposed to enhance the effectiveness and competitiveness of SMMEs.
Indigenous/Local Content	The importance of indigenous and local content is recognised to preserve the native character of the local societies and to take advantage of the international marketability of the local cultures.

Source**:** Authors' thematic analysis of Caribbean ICT policy and strategy documents.

III. Analysis of policy responses in the Caribbean to ICT for Development

A. Caribbean progress with WSIS lines of action

Considering the lines of action identified in WSIS (2003a), Caribbean efforts to develop knowledge economies have been as follows:

1. The role of governments and all stakeholders in the promotion of ICTs for development

ICT policies and strategies have been developed, but implementation has lagged. Development of mechanisms such as incubators, venture capital and funding for SMMEs has been very limited. Support for research and development has also been very limited. These deficiencies militate against the capacity to develop new knowledge and the ability to use knowledge for development and to deliver quality of life, two of the three key components of knowledge economy.

Implementation plans must be developed for ICT4D with governance structures and resources put in place to activate them. They must address the role to be played by SMMEs and deliver focused support to give effect to that role. National research agendas must also be established and resources dedicated to supporting the conduct of this research by indigenous public, academic and private research organizations.

2. Information and communication infrastructure: an essential foundation for the Information Society

There has been substantial development of ICT infrastructure, particularly mobile telephony and Internet service. This has been driven by developments in telecommunications regulation and the establishment of competition in that sector. There has been significant connection of educational institutions to the Internet, usually via broadband connections. Community access points have also been established. Penetration of broadband in the region is low. There has been very little encouragement of indigenous development of ICT products.

Of the three key components of the knowledge economy, the Caribbean is best placed in terms of access to information and knowledge. However, there is much still to be done to realise the eLAC2015 priority of universal broadband access, in terms of both availability and affordability. The indigenous production of ICT products and services can make a substantial

contribution to the generation and exploitation of knowledge. It can provide for the enhancement of processes across the spectrum of economic activity, as well as providing an avenue for employment and the production of products and services for sale on the international market.

3. Access to information and knowledge

E-government initiatives have begun to make information available via government websites. However, as Lawton (2010) states, these websites reflect a fairly early stage of e-government development, with minimal interactive or transactional capacity.

Delivery of real value begins with development to the interactive and transactional levels. Governments will then enhance the access to and effectiveness of government services, allowing government, the economy and social infrastructure to function more effectively.

4. Capacity-building

ICT has been introduced into the education system in the region. However it is mainly used to support e-literacy, information access and students of ICT. It has not yet been fully integrated into the curriculum or the management of education services. There are public and private sector programmes for e-literacy and training in ICT. ICT supports distance learning in the region, although mainly at the tertiary level.

The knowledge economy requires a fundamental shift to a more innovation and entrepreneurship oriented posture. This is necessary if the region is to develop value through the exploitation of information and knowledge. The education system has a key role to play in this, moving away from its focus on examination and certification to one of equipping students with knowledge and skills; and the confidence and attitude to use them to deliver value to their societies and themselves. ICT4D must be an integral component of this change.

5. Building confidence and security in the use of ICTs

ICT legislation is in various stages of development and enactment in the region. There has been some progress towards the establishment of cybercrime emergency response teams (CERT) in the region, as evidenced by the presence of the regional CARICOM Implementation Agency for Crime and Security (IMPACS)[1] and national institutions such as the Special Anti-Crime Unit of Trinidad and Tobago. However much more needs to be done.

As organizations and societies become more dependent on their information and ICT resources they need to become more proactive at protecting and securing them. Cybercrime is an international challenge and an inescapable adjunct of the information age. It involves a spectrum of States and non-State agents with a range of agendas. Caribbean States must participate fully in the global efforts to confront this scourge. They must also develop independent capabilities in this area rather than basing their information security on an unquestioning belief in the benevolence of those whose interests will not always align with their own.

6. Enabling environment

Caribbean governments have not widely adopted e-commerce. This has been cited as a factor in the slow development of e-commerce in the region. Some countries, like the British Virgin Islands, Curaçao and Grenada, have established Internet exchange points (IXP).

As the Caribbean moves to the knowledge economy, seeking value from the use of information and knowledge, the ability to transact business electronically is critical. Given

[1] CARICOM IMPACS provides strategic research, programme and project implementation, evaluation, analysis and mobilization of resources to support the collective fight against serious crime and to counter other security threats in the region.

their central role in the economies of the region, Caribbean governments must lead the way in the implementation of e-commerce. Additionally, the region must transform its posture from being a passenger on the information superhighway to one in which it participates in Internet development, including the extent to which it seeks to own and operate key components of infrastructure to secure its own interests.

7. ICT applications: benefits in all aspects of life

While there have been developments in e-government and e-learning, ICT has had minimal impact on the health services, agriculture and the environment. There has been little development of e-business and e-employment.

The Caribbean is a group of islands and coastal States whose economies depend on agriculture and tourism, and therefore on the environment. These sectors must be at the forefront of ICT4D and the development of the knowledge economy. Additionally, Caribbean States must exploit the opportunities offered by ICT to overcome their small size and the water that separates them.

8. Cultural diversity and identity, linguistic diversity and local content

While there are initiatives like the Digital Library of the Caribbean, progress in the development of local content and the preservation and archiving of regional culture has been limited. There is a low level of popular awareness of these initiatives, and much still needs to be done in this area.

The Caribbean has long punched way above its weight in its cultural contributions and impact in the world. ICT provides the means to expand the reach of Caribbean culture and to more fully embrace Caribbean Diaspora. However, it also provides an avenue for external cultures to swamp its own. A strategic approach is required to the archiving of Caribbean cultural heritage, the development of cultural content and the Caribbean's interface with and engagement with the wider world.

9. Media

The region has a vibrant, independent media sector. ICT4D will allow for further development and provide the means for an ever wider range of thoughts and perspectives to come to the fore.

10. Ethical dimensions of the Information Society

The ethical issues involved with ICT4D and the knowledge economy have not received much attention to date. Governments and civil society need to engage these issues, identify their implications in the Caribbean context and formulate approaches to secure the interests of Caribbean citizens.

11. International and regional cooperation

The draft Regional Information and Communication Technology (ICT) for Development Strategy (CARICOM 2010) represents a significant effort in promoting a regional approach to ICT development. Caribbean participation in entities such as the Observatory for the Information Society in Latin America and the Caribbean (OSILAC) and support for eLAC also demonstrate this. Support for these regional initiatives will both further the development of the knowledge economy and deepen and strengthen regional integration.

Lawton (2010) also presents an assessment of the progress of the Caribbean in achieving the eLAC goals, based on the six thematic areas of eLAC2010.

B. Discussion of ICT4D in the Caribbean

While Caribbean States have formulated ICT strategies and policies, implementation has lagged. In some cases the plans are still at draft stage, others are undergoing review, while still others are undergoing revision. In many cases there have been no implementation plans. Even more often, adequate resources and governance structures for implementation have not been put in place.

Another challenge is that throughout the region States have not developed a holistic approach to ICT and ICT4D. In spite of the recognition of the convergence in the ICT sector, distinct ministries and government agencies are responsible for the ICT subsectors of telecommunications, broadcasting and computing. For example a ministry of communication and works might have responsibility for telecommunication, while e-government is the responsibility of the ministry of public administration.

Also, it is commonplace that no ministry or government agency has responsibility for ICT as an economic sector and nowhere is there a coordinating entity presenting a holistic view of ICT and ICT4D. The Government of Antigua and Barbuda provides an example of an integrated approach, with the Ministry of Information, Broadcasting, Telecommunications, Science and Technology which is headed by a minister of State attached to the Office of the Prime Minister.

In spite of its mention in the national ICT policies and strategies of the Caribbean States, there is very little emphasis among the governments on ICT as an economic sector. As a result there is very little information on the size of the sector, in terms of numbers of employees and companies, and its contribution to the economy. There is also very little information about the composition of the sector, in terms of the mix of micro, small, medium and large companies involved, the range of products and services provided and the skills and capabilities of the sector.

Additionally there are no quantified targets for the sector, in terms of desired levels of employment and economic contribution. Also, there is no clearly articulated position of which areas of the ICT sector should receive the highest priority for development. In the absence of this information and strategic thinking, it is not possible to formulate and implement the policies that will guide the human resource development, investment and growth required to produce a vibrant and sustainable ICT sector.

The result is what is currently observed in the region:

- No measurement of the sector as a whole
- No vibrant national or regional private sector bodies to advocate for ICT and participate in the national and regional developmental agendas
- No funding and other business development support for ICT sector businesses
- A highly fragmented industry
- Very little development of ICT products, services, innovations or local content.

Within this context, ICT is also not very well integrated into the major economic sectors of the region, particularly those of agriculture and tourism.

In agriculture, ICT can be used to improve farmers' access to technical assistance, including remote diagnosis of crop, livestock, irrigation and other issues. This would provide a quicker response and enhance the effectiveness of agricultural extension staff. The marketing of agricultural products often disadvantages the farmer or fisherman. The role that ICT can play in redressing this imbalance is often cited. Also, much agricultural production in the Caribbean involves small holdings. ICT can be used to assist in aggregating their production, improving their bargaining power in the market.

ICT can play a key role as Caribbean States compete in the tourism market with other destinations. Among the contributions it could make are integrating the region as a single destination and strengthening the linkages between the agricultural and tourism sectors.

IV. Application of the World Bank measurement framework

A. Knowledge Assessment Methodology

Formulation of ICT4D policies and strategies to support the development of the knowledge economy, and their implementation, monitoring and adjustment require effective measurement of the development of the knowledge economy. The Knowledge Assessment Methodology (KAM) developed by the World Bank (Chen and Dahlman, 2005) is an interactive, Internet-based diagnostic and benchmarking tool for doing this. It provides a ranking of States based on a knowledge economy index and a knowledge index.

The KAM is based on four knowledge economy 'pillars':

- An economic incentive and institutional regime
- Educated and skilled workers
- An effective innovation system
- A modern and adequate information infrastructure.

Within these four pillars, over 100 variables have been selected to measure the performance of countries. Further, these pillars and variables show strong support for 8 of the 11 principles in the WSIS Declaration of Principles as shown in Table 2 below:

TABLE 2
MAP BETWEEN KAM AND WSIS DECLARATION OF PRINCIPLES

KAM Knowledge Economy Pillar	WSIS Declaration of Principles	
Economic incentive and institutional regime	Principle 1:	The role of governments and all stakeholders in the promotion of ICTs for development
	Principle 5:	Building confidence and security in the use of ICTs
	Principle 6:	Enabling environment
	Principle 11:	International and regional cooperation
Educated and skilled workers	Principle 4:	Capacity building
Effective innovation system	Principle 3:	Access to information and knowledge
	Principle 7:	ICT applications: benefits in all aspects of life
Modern and adequate information infrastructure	Principle 2:	Information and communication infrastructure: an essential foundation for an inclusive
Not specifically addressed	Principle 9:	Media
	Principle 8:	Cultural diversity and identity, linguistic diversity and local content
	Principle 10:	Ethical dimensions of the Information Society

Source**:** Authors' comparative analysis of the World Bank Knowledge Assessment Methodology and the WSIS Declaration of Principles.

B. Evaluation of the KAM

1. Basis for assessment of knowledge economy monitoring instruments

The following characteristics form a basis for assessment of a monitoring instrument for the knowledge economy:

- **Completeness.** The instrument must cover the three aspects of the knowledge economy: access, creation and use of information and ICT. It must not exclude any major determinant of knowledge economy progress
- **Validity.** The assumptions on which the instrument is based must be valid, both generally as well as in terms of their suitability to each particular State to which they are applied. Another aspect of validity is the extent to which the rankings produced by the instrument correspond to the observed differences in the knowledge economy progress of States
- **Diagnosis.** The instrument must provide an understanding of the aspects of a State's knowledge economy development that requires attention so that strategic and policy decisions can be made to direct progress
- **Practicality.** It must be possible and practical to apply the instrument. The instrument must also support a range of different, but relevant, foci and applications
- **Visualisation.** The instrument must facilitate understanding and communication of the knowledge economy status and comparisons.

2. Evaluation

The four pillars of KAM cover the information access, creation and use dimensions of the knowledge economy. Three of the pillars have a strong emphasis on measurement of inputs. The innovation system measures outputs in the form of scientific publications, patents and technology and capital goods exports. However, where the products of innovation are services or the efficient and

competitive production of low-tech products, KAM might under report the level of knowledge economy development. It should be noted that a knowledge economy index and a knowledge index are based on a somewhat narrower set of output variables. However, it is commendable that the outputs covered are not confined to ICT outputs.

The selection of variables is grounded in established research into the factors that conduce to the development of a knowledge economy. Given the low levels of innovation that characterize the Caribbean, ICT access may not indicate the levels of entrepreneurship and productive use of ICT that might be assumed. Notwithstanding this consideration, the assumptions underlying the selection of variables should be broadly valid for the region. The comparative rankings produced by KAM are also generally consistent with other indications of relative knowledge economy development both internationally and within the region.

The KAM provides for diagnosis of the level of knowledge economy development through the comparisons inherent in its design, its normalisation of variables, and their weighting by population to cater for economy of scale effects. Diagnosis can be conducted by comparisons among States and groups of States and among the variables associated with a particular State.

The greatest challenge to the practicality of KAM is the challenge of measurement which has been discussed elsewhere and which is common to other monitoring instruments. KAM is very flexible, especially given the ability to produce custom score sheets and comparisons. The tools provided for visualisation of the results also contribute to the effectiveness of KAM.

C. Caribbean States in KAM

While the KAM has been applied to 146 countries, only 8 of the 16 Caribbean member States of ECLAC and one of its eight Caribbean associate members are represented. Inclusion is dependent on the availability of data. This highlights one of the challenges of measuring the knowledge economy in the Caribbean, the scarcity of data. Unfortunately, information on the data deficiencies that preclude the inclusion of the other ECLAC members is not available.

Table 3 shows a knowledge economy index, a knowledge index and pillar indices for the available Caribbean States:

TABLE 3
KAM INDICES FOR CARIBBEAN STATES

Rank	Change in Rank from 2000	Country	Missing Data	Knowledge Economy Index	Knowledge Index	Economic Incentive Regime	Innovation	Education	ICT
39	107	Aruba	X	7.38	7.26	7.74	7.73	7.03	7.01
41	-4	Barbados	X	7.16	7.58	5.92	7.63	8.09	7
55	-10	Dominica	X	5.65	5.47	6.19	3.67	6.4	6.34
57	2	Trinidad and Tobago	X	5.59	5.49	5.88	6.1	4.43	5.95
74	-12	Jamaica		4.9	5.19	4.01	5.03	4.13	6.41
80	-4	Guyana		4.57	4.97	3.34	4.78	5.94	4.21
83	4	Cuba	X	4.36	5.37	1.31	5.14	8.36	2.61

(continued)

Rank	Change in Rank from 2000	Country	Missing Data	Knowledge Economy Index	Knowledge Index	Economic Incentive Regime	Innovation	Education	ICT
96	-8	Dominican Republic		3.85	3.77	4.09	2.91	4.39	4.03
146	-10	Haiti	X	n/a	n/a	2.41	1.54	n/a	3.16

Source**:** World Bank, "KEI and KI Indexes (KAM 2009)", [online], Washington, D. C, [date of reference: 02 July 2011] < http://info.worldbank.org/etools/kam2/KAM_page5.asp>, 2009.

The measure of a knowledge economy is the extent to which it provides development and a desired quality of life on a sustainable basis by accessing, developing and using knowledge and information. The Caribbean States that appear in KAM show that the region ranks in the lower half of the second quartile in a knowledge economy index, a knowledge index and the four pillar indices. This suggests that the States of the region are not yet knowledge economies. KAM suggests that Aruba and Barbados are the most advanced, with Dominica and Trinidad and Tobago some way behind and the rest even further behind. The apparent dramatic rise in Aruba's ranking is because this is its first appearance in KAM.

Further, as table 4 shows, the assessment of the Caribbean States by KAM is consistent with other measures of development, such as the human development index (HDI) (UNDP, 2010) and the digital opportunity index (DOI) (ITU/UNCTAD, 2007), and with widely held opinions of the levels of development in the region.

TABLE 4
COMPARISON OF THE KAM WITH OTHER DEVELOPMENT MEASURES

Country	Knowledge Economy Index Rank	Knowledge Economy Index	HDI Rank 2010 (out of 169)	HDI 2010	DOI Rank 2005/06 (out of 181)	DOI Index 2005/06
Aruba	39	7.38			0	0
Barbados	41	7.16	42	0.788	27	0.64
Dominica	55	5.65			56	0.51
Trinidad and Tobago	57	5.59	59	0.736	59	0.5
Jamaica	74	4.9	80	0.688	55	0.51
Guyana	80	4.57	104	0.611	118	0.33
Cuba	83	4.36			129	0.28
Dominican Republic	96	3.85	88	0.663	85	0.42
Haiti	146	n/a	145	0.404	160	0.15

Source: World Bank, "KEI and KI Indexes (KAM 2009)", [online], Washington, D.C. [date of reference: 02 July 2011] <http://info.worldbank.org/etools/kam2/KAM_page5.asp>, United Nations Development Programme "Human Development Report 2010 —20th Anniversary Edition, The Real Wealth of Nations: Pathways to Human Development", New York, [date of reference: 15 July 2011] <http://hdr.undp.org/en/media/HDR_2010_EN_Complete_reprint.pdf>, International Telecommunication Union / United Nations Conference on Trade and Development, "World Information Society Report 2007: Beyond WSIS", Geneva.

It is instructive to note the consistency in terms of both the rankings of the Caribbean States relative to one another, and of the general position of the States in the overall global rankings. Based on these considerations, KAM appears to be a suitable and useful, if not perfect, instrument to use for monitoring the development of knowledge economy in the Caribbean. Further, these measurements suggest that the Caribbean States are not yet knowledge economies.

V. Exploration of the challenges to knowledge economy measurement in the region

The primary challenge to knowledge economy measurement in the region is the lack of data. This challenge is not unique to the area of ICT for Development, and reflects the systemic gaps which exist in the data collection processes in the subregion. As alluded to previously, this appears to have had a negative impact on the ranking of the Caribbean in KAM. Additionally, similar gaps are also evident in the core ICT indicators defined by the Partnership on Measuring ICT for Development. As Table 5 shows, the coverage for the 'ICT Infrastructure and Access' indicators is fair. However, the coverage in the other groups is very poor, with many countries not having any indicators to report. In the context of the knowledge economy, this shows that while there is good coverage for measurements related to information access, there is limited data on the use of ICT.

TABLE 5
AVAILABILITY OF CORE ICT INDICATORS

Member States	ICT infrastructure and access	Access to, and use of, ICT by households and individuals	Use of ICT by businesses	ICT sector and trade in ICT goods
Member States				
Number of Indicators	14	14	12	4
Antigua and Barbuda	10	0	0	2
Bahamas	11	0	0	0
Barbados	10	0	0	2
Belize	10	0	0	2
Cuba	10	13	9	4
Dominica	9	0	0	2
Dominican Republic	13	13	0	0
Grenada	8	0	0	2
Guyana	11	0	0	2

(continued)

Member States	ICT infrastructure and access	Access to, and use of, ICT by households and individuals	Use of ICT by businesses	ICT sector and trade in ICT goods
Haiti	10	0	0	0
Jamaica	10	0	0	2
Saint Kitts and Nevis	8	0	0	2
Saint Lucia	9	0	0	2
Saint Vincent and the Grenadines	12	0	0	2
Suriname	10	0	0	1
Trinidad and Tobago	10	0	0	2
Associate Members				
Number of Indicators	14	14	12	4
Anguilla	5	0	0	2
Aruba	7	0	0	2
British Virgin Islands	2	0	0	0
Cayman Islands	4	0	0	0
Montserrat	3	0	0	2
Puerto Rico	6	5	0	0
Turks and Caicos Islands	4	0	0	2
United States Virgin Islands	5	0	0	0

Source: ECLAC, "The global information society: a statistical view", 2008.

On the issue of data availability, ITU (2008) asserts that data on ICT infrastructure and access is primarily collected from three sources, namely, telecommunications authorities, ministries of telecommunication and ICT, and some operators. Additionally, ITU (2008) also collates, additional data obtained from reports of telecommunication regulatory authorities, ministries and operators, and from ITU staff reports. The fact that the data arises out of ongoing administrative and regulatory functions accounts for the high level of availability.

In the case of the indicators on access to and use of ICT by households and individuals, data collection is based on surveys conducted by national statistical offices (NSOs). The low availability in this group of indicators reveals the challenges here. ITU (2008) notes that in these surveys, ICT access and use may be one of several topics, or may be a component of a broader theme, such as surveys of labour force. OSILAC (2010) indicates that there has been an increase in the incorporation of ICT measurement in the regular survey programmes of Caribbean NSOs in 2009 and 2010. However, ICT measurement remains at a lower level in the Caribbean than it does in Latin America. The report also shows a lower level of importance attached to ICT data by Caribbean NSOs (OSILAC, 2010). There is also a much lower level of information about the country's digital policy. It is also suggested that budget constraints and shortage of skilled resources limit the ability of Caribbean NSOs in the conduct to ICT measurement.

No indicators on the use of ICT by businesses were available from any Caribbean country apart from Cuba. Again, these indicators would be produced from surveys and so would face the same challenges as the previous group.

The group of indicators for the ICT sector and trade in ICT goods also shows low availability. These indicators are usually compiled from sectoral surveys. Among the challenges here is the lack of focus on ICT as an economic sector.

VI. Recommendations

This report has identified several issues which are critical to the measuring the emerging knowledge economy in the Caribbean. These include:

- ICT strategies and policies which are not oriented towards implementation
- The disconnect between ICT and key economic activities
- The limited emphasis on ICT as an economic sector, the lack of support for the development of SMME ICT businesses and the limited production of ICT products and services, including local content
- The scarcity of data which hampers attempts to measure the knowledge economy in the Caribbean.

Within this context, the application of ICT4D to support the evolution to the knowledge economy represents a significant developmental opportunity for Caribbean States. ICT4D is a critical enabler of all three components of the knowledge economy. Therefore, the recommendations in this document seek to deliver ICT4D support to the knowledge economy on a sustainable basis in the context of broader national developmental agendas.

A. Summary of Issues

1. The knowledge economy and the national development agenda

In establishing their national developmental agendas, States must define the roles to be played by information and knowledge. In the context of this definition, they must determine what the knowledge economy means to them and how to proceed with their own evolution towards the knowledge economy.

Discussions of ICT4D and the knowledge economy tend to be vague, and require greater detail and clarity. As a consequence there is no basis on which to develop and implement targeted action plans. National development agendas must define:

- The economic sectors on which national development is to focus

- The basis for sustainable contribution of these sectors to national development and quality of life
- The economic contributions that these sectors are to make in terms of revenue, employment and linkages to other sectors of the economy and aspects of society.
- The information and knowledge requirements for the sustainable effectiveness of these sectors, including:
    - The ICT requirements – Internet access and bandwidth, ICT services, skills and information
    - Research and Development (R&D) requirements – information and knowledge to be discovered, created and developed

On the basis of the developmental agendas, implementation projects must be developed, resourced and executed, including:

- Infrastructure development projects
- Human resource development projects targeted at supplying the developmental agenda with the identified skills on a sustainable basis
- R&D projects to develop the information and knowledge required. In addition to the substantive R&D results, these projects must also contribute to developing the R&D capability and culture of the local public and private sectors and academia. They must also develop the national R&D management and governance capability.

An integral part of these projects must be the measurement of their outputs and of their impacts on the national development agenda and the development of the knowledge economy.

2. A holistic approach to ICT4D

Caribbean States must adopt a holistic approach to ICT and ICT4D. This approach must take cognisance of the convergence that has occurred in ICT technology and the ICT industry. The approach must also recognise that in addition to its infrastructural role, ICT is a key agent of development. Therefore planning, regulation and management of ICT must include this development dimension. A major aspect of this holistic approach is that a single senior minister of government should have responsibility for ICT. This responsibility must include oversight of major ICT initiatives in other ministries like education and health to ensure maximum synergy, adherence to standards, and seamless integration with the rest of the country's ICT portfolio and with other initiatives.

3. ICT as an economic sector

In addition to its infrastructural role and its role as an enabler of other economic activity, ICT is an economic sector in its own right. Caribbean States must plan the development of their ICT sectors. At a minimum, this would require the following specific interventions:

- Identifying and selecting the subsectors and niches on which to focus
- Building capacity in ICT services capabilities
- Building capacity in software development capabilities, including, applications for the Internet and mobile platforms
- Establishing independent local information and ICT security capabilities
- Building capacity in hardware development capabilities, particularly development of embedded systems designed to address unique data acquisition, information processing and system management and control requirements.

As an essential component of this plan, the government must also develop and implement programmes of incentives and other measures to stimulate the required private sector participation in the ICT services sector.

A key component of the development of the ICT sector is the development of the highly skilled human resources required. Caribbean governments must collaborate with the private sector, and academia to define skill requirements and to design and deliver appropriate curricula to produce these skills in the required numbers, with the required quality and on a sustainable basis.

Small medium and micro enterprises (SMMEs) will also play a major role in the ICT sector. Therefore Caribbean States must focus on the support and development of SMMEs, and make particular provisions for ICT small medium and micro enterprises. Among the aspects of this must be:

- Collaboration with the financial sector to ensure the availability of financial instruments appropriate to the needs of ICT SMMEs.
- Establishment of incubators with linkages to academia to facilitate the commercialisation of R&D outputs. A major component of these must be support for the protection and commercialisation of intellectual property.
- Design of government procurement policies to ensure opportunities for SMMEs to supply products and services to the public sector. This includes participation in State-funded R&D projects. These policies must be designed to encourage the success and growth of small medium and micro enterprises, but must not compromise transparency, the quality of the products and services received or the effectiveness of the procurement process.

4. A regional approach

A regional approach should be adapted to ICT4D to address limitations of scale and scope and to synergise efforts across the region. The Draft Regional Information and Communication Technology (ICT) for Development Strategy (CARICOM, 2010) represents a sound platform on which this regional ICT4D approach should be based.

The regional approach should include coordinated development of policy, strategies and standards. Focus areas should be identified for the development of competence. Areas of collaboration should also be identified through which the limited resources of the region could be coordinated and aligned. These would include areas of technology, such as information security as well as application areas such as e-education, e-health, e-agriculture, e-tourism and application of ICT to disaster response. These appear to be natural areas of collaboration and will also serve to deepen regional integration. There will also be areas of competition among Caribbean States and this will promote the development of the region's ICT sector.

5. Measurement and incorporation of Knowledge Assessment Methodology

Measurement is critical to planning ICT4D and the progress toward the knowledge economy. Caribbean States should implement systematic measurement of ICT, based on the work of the Observatory for the Information Society in Latin America and the Caribbean. KAM should also be included as a component of this measurement regime. In particular, it should be used to monitor absolute and relative progress towards the knowledge economy. Custom score sheets should also be used as diagnostic tools to focus on specific issues and identify priority areas for interventions. KAM should also be used to communicate with the public and with other stakeholders about progress toward the knowledge economy.

The knowledge economy seeks to place the use and creation of information at the heart of development and economic and societal activity. ICT4D is necessarily a critical component of this, but it is only one component. Also critical is the development of knowledge-oriented attitudes, practices and systems and a commitment to innovation and development. This is the context in which recommendations on the role of ICT4D must be located.

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Annexes

Annex 1
Caribbean States

The Caribbean comprises the following member States and associate members of ECLAC, and other territories:

Member States:

Antigua and Barbuda, Bahamas, Barbados, Belize, Cuba, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago.

Associate Members:

Anguilla, Aruba, British Virgin Islands, Cayman Islands, Montserrat, Puerto Rico, Turks and Caicos Islands, United States Virgin Islands

Other Territories:

Bonaire, Saint Eustatius and Saba, Curaçao, Guadeloupe, Martinique, Saint-Barthélemy, Saint Martin (French part), Sint Maarten (Dutch part).

Annex 2
Caribbean ICT Policy and Strategy Documents

TABLE 6
CARIBBEAN ICT POLICY AND STRATEGY DOCUMENTS

	Date	Awaiting Approval	Participation in the Information Society	Telecom. Regulation	ICT in Education	e-Government	ICT Legislation	SMMEs	Local Content	Development of the Local ICT Sector
MEMBER STATES										
Antigua and Barbuda	2005-09	✓	✓	✓	✓	✓	✓			✓
Bahamas	2009-10-07		✓			✓	✓		✓	✓
Barbados	2005-08-19, 2009-05,		✓	✓	✓	✓	✓	✓	✓	✓
Dominica	2010-02	✓	✓	✓	✓	✓	✓	✓	✓	
Grenada	2006	✓a	✓	✓	✓	✓	✓	✓	✓	✓
Guyana	2006-04		✓	✓	✓	✓	✓	✓	✓	✓
Jamaica	2009-12, 2007-12, 2007-06	✓a	✓	✓	✓	✓	✓	✓	✓	✓
St. Kitts and Nevis	2006-11		✓	✓	✓	✓	✓	✓	✓	
St. Lucia	2009-11	✓	✓		✓	✓	✓	✓	✓	✓
St. Vincent and the Grenadines	2007									✓
Trinidad and Tobago	2003	✓a	✓	✓	✓	✓	✓	✓		✓
CARICOM	2010	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cayman Islands	1999-04-07, 2004-04		✓	✓	✓	✓	✓			✓
Montserrat	2010			✓	✓		✓			

Notes:

a. Policy undergoing review or revision.

b. The data only covers Suriname and the English-speaking Caribbean, except the British Virgin Islands and United States Virgin Islands. The states missing from the table reflects a poor response rate to requests for information.

Annex 3
World Bank Knowledge Assessment Methodology

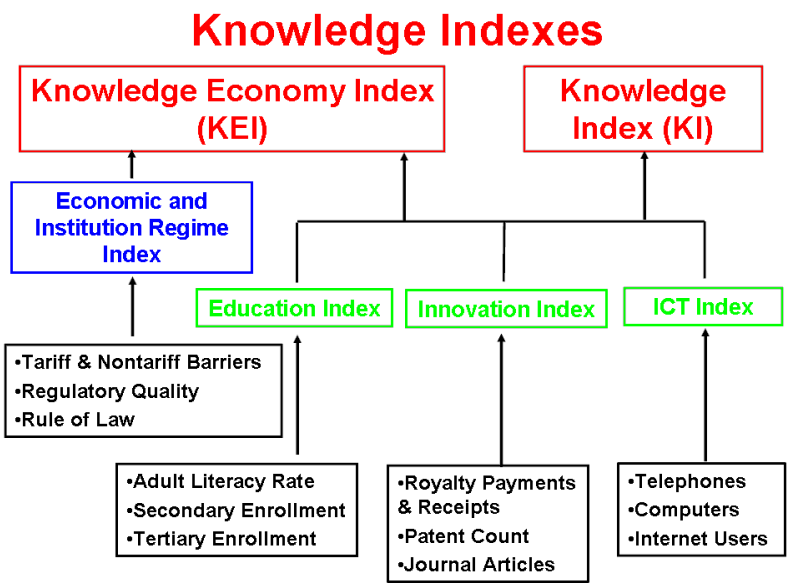
Formulation of ICT4D policies and strategies to support the development of the knowledge economy, and their implementation, monitoring and adjustment require effective measurement of the development of the knowledge economy. The Knowledge Assessment Methodology (KAM), developed by the World Bank is an interactive, Internet-based diagnostic and benchmarking tool for doing this. The KAM is based on four knowledge economy 'pillars':

> - "An *economic incentive and institutional regime* that provides good economic policies and institutions that permit efficient mobilization and allocation of resources and stimulate creativity and incentives for the efficient creation, dissemination, and use of existing knowledge
> - *Educated and skilled workers* who can continuously upgrade and adapt their skills to efficiently create and use knowledge
> - An *effective innovation system* of firms, research centres, universities, consultants, and other organizations that can keep up with the knowledge revolution and tap into the growing stock of global knowledge and assimilate and adapt it to local needs
> - A *modern and adequate information infrastructure* that can facilitate the effective communication, dissemination, and processing of information and knowledge." (Chen and Dahlman, 2005, p. 4)

109 variables have been selected to measure the performance of countries on the knowledge economy pillars. These variables are normalised on a scale of 0 to 10 and are used in computing KAMs outputs:

- **Basic scorecard** – provides an overview of performance based on two performance indicators and 12 knowledge indicators, three from each of the four knowledge economy pillars. The basic scorecard can be used to view the performance of a country or a region
- **Knowledge economy index** – average of the 12 knowledge indicators of the basic scorecard, summarising the performance over the four knowledge economy pillars. "It is an aggregate index that represents the overall level of development of a country or region towards the Knowledge Economy" (Chen and Dahlman, 2005, p. 12)
- **Knowledge index –** indicates the overall knowledge development of a given country by measuring its ability to generate, adopt and diffuse knowledge
- **Custom scorecards –** permit the selection of any combination of variables to analyse the performance of a country or region.

FIGURE 1
STRUCTURE OF KAM INDICES



Source: World Bank, "KI and KEI Indexes", [online], Washington, D.C., [date of reference: 02 July 2011] <http://web.worldbank.org/WBSITE/EXTERNAL/WBI/WBIPROGRAMS/KFDLP/EXTUNIKAM/0,,contentMDK:20584278~menuPK:1433216~pagePK:64168445~piPK:64168309~theSitePK:1414721,00.html>, 2009.

KAM variables are weighted by population, to take into account the economies of scale associated with the production of knowledge. They are also available un-weighted.