DIGITAL FOR CARIBBEAN DEVELOPMENT

A Discussion Paper

#D4CD

CARIBBEAN DEVELOPMENT BANK

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ABBREVIATIONS

4IR	Fourth Industrial Revolution
AI	Artificial Intelligence
AML/CFT	Anti-Money Laundering and Counter Terrorism Financing
AR	Augmented Reality
ASYCUDA	Automated Systems for Customs Data
BMC	Borrowing Member Country
CAPE	Caribbean Advanced Proficiency Examinations
CARCIP	Caribbean Regional Communications Infrastructure Programme
CARICOM	Caribbean Community
CDB	Caribbean Development Bank
CSEC	Caribbean Secondary Education Certificate
CXC	Caribbean Examinations Council
DEWA	Dubai Electricity and Water Authority
DFS	Digital Financial Services
DXCD	Digital Eastern Caribbean Dollar
ECCB	Eastern Caribbean Central Bank
ECCU	Eastern Caribbean Currency Union
ECTEL	Eastern Caribbean Telecommunications Authority
EGDI	E-Government Development Index
EGRIP	Electronic Government Regional Integration Project
Findex	Financial Index
FINTECH	Financial Technology
G2P	Government-to-Person
GATS	General Agreement on Trade in Services
GATTS	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GNI	Gross National Income
GOJ	Government of Jamaica
GWAN	Government Wide Area Network
HIPCAR	Harmonisation of ICT Policies, Legislation and Regulatory Procedures
ICT	Information and Communications Technologies
IDB	Inter-American Development Bank
IDI	ICT Development Index
IoT	Internet of Things
ITU	International Telecommunications Union
KYC	Know Your Customer
LTE	Long Term Evolution
M2M	Machine-to-machine
Mbps	Megabits per second
NASA	National Aeronautics and Space Administration
OECS	Organisation of Eastern Caribbean States
OOP	Only-once principle
p.c.	Per Capita
PATH	Programme of Advancement through Health and Education
PSMP	Public Sector Modernisation Programme
RTA	Regional Trade Agreement
SDGs	Sustainable Development Goals
UNCITRAL	United Nations Commission on International Trade Law
UNCTAD	United Nations Conference on Trade and Development
UN DESA	United Nations Department of Economic and Social Affairs
UNVR	United Nations Virtual Reality
VR	Virtual Reality
WIPO	World Intellectual Property Organisation
WTO	World Trade Organisation
XCD	Eastern Caribbean Dollar

QUICK FACTS

Geography
19 countries
Scattered across the Caribbean, and Central and South America

Population
17+ million people
of which 11 million are in Haiti

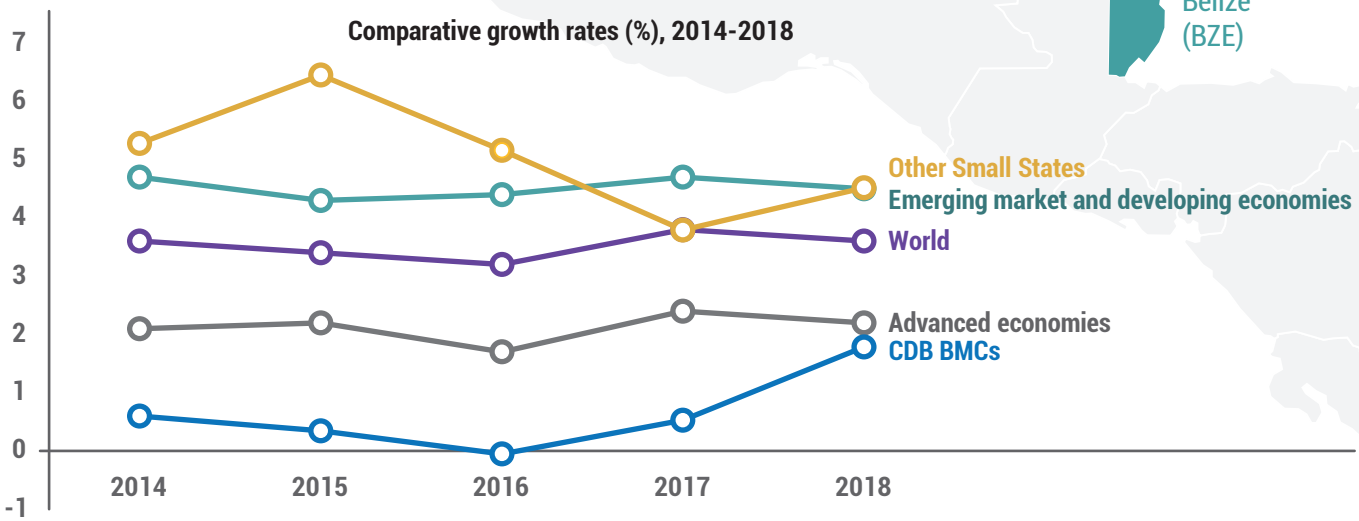
Languages
3 official languages
Dutch, English and French

Human Development
Ranks between 54 and 168
Out of 189 countries in the 2018 HDI

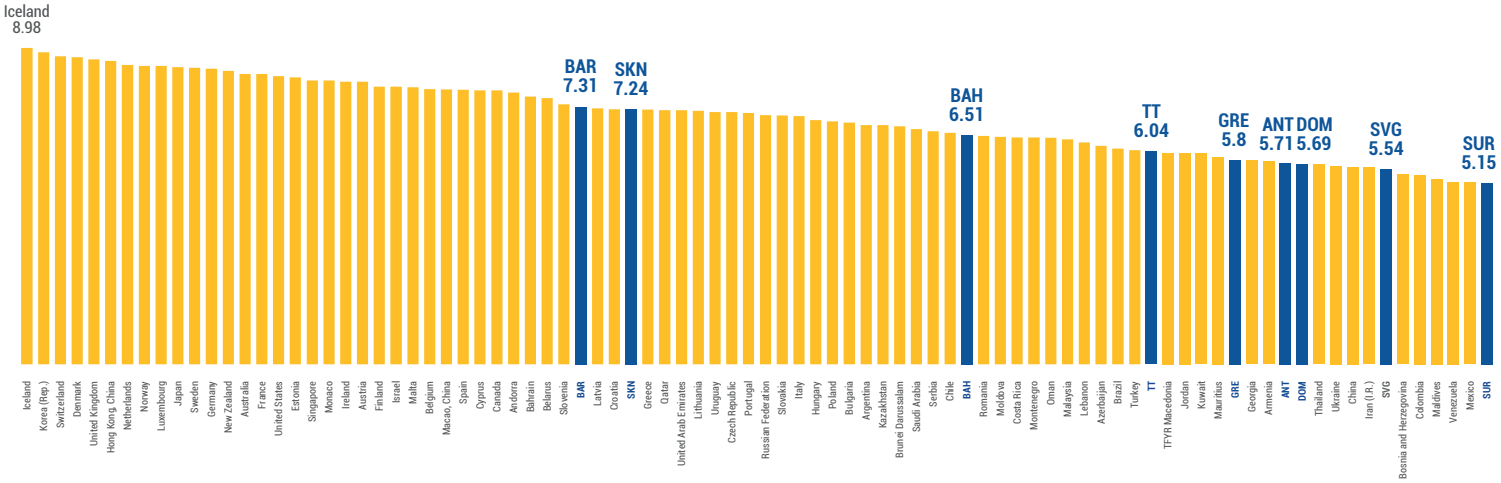
ECONOMIC CONTEXT

The BMCs are economically diverse with a mix of service-based providers to commodity exporters. The economies are open and vulnerable to environmental and global economic shocks.

Belize (BZE)



COMPARABLE ICT DEVELOPMENT | ICT DEVELOPMENT INDEX 2017



CDB'S BORROWING MEMBER COUNTRIES

Commonwealth of the Bahamas (BAH)

Turks and Caicos Islands (TCI)

Cayman Islands (CAY)

British Virgin Islands (BVI)

Anguilla (ANG)

Jamaica (JAM)

Haiti (HAI)

St. Kitts and Nevis (SKN)

Antigua and Barbuda (ANT)

Montserrat (MON)

Dominica (DOM)

Saint Lucia (SLU)

St. Vincent and the Granadines (SVG)

Barbados (BAR)

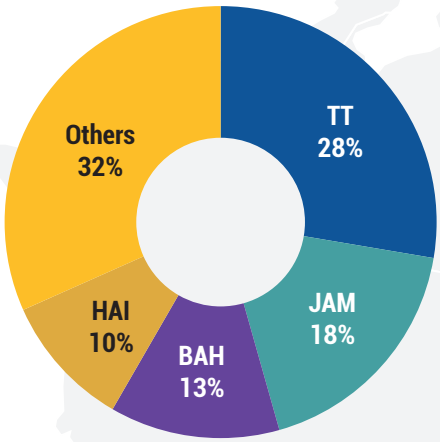
Grenada (GRN)

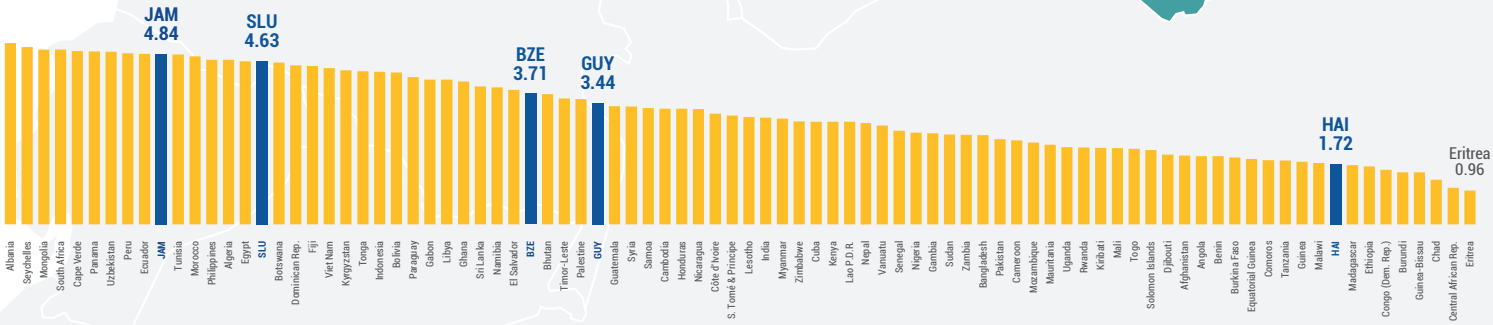
Trinidad and Tobago (TT)

Guyana (GUY)

Suriname (SUR)

Share of regional economic output





EXECUTIVE **SUMMARY**

Digital Transformation can be viewed as an imperative for economic, social, and business growth. Developed countries and leading businesses around the world are in the process of adjusting – if they have not already done so – policies and strategies to guide their participation in what is known as the Fourth Industrial Revolution (4IR). Preparations for and adaptations to the increasingly digital present and future will determine the rate at which Borrowing Member Countries (BMCs) of the Caribbean Development Bank (CDB) will be able to benefit from opportunities that digital transformation present for inclusive growth and sustainable development.

This paper looks at the current digital infrastructure and ecosystems in BMCs and indicates potential for development in the areas of: electronic-government, digital skills and literacy, disaster risk management, finance, trade and renewable energy. Along with the incorporation of recent discussions on the topic, included in this paper are case studies and policy recommendations.

New and emerging technologies, driven by the race for innovation and profit, are heralded as the solution to growth through increased output and productivity. Access to broadband is a critical input and fundamental to discussions about digital transformation with in the Caribbean. A 10% increase in penetration of broadband services in Latin America and the Caribbean is expected to contribute to an average increase of 3.2% in Gross Domestic Product and approximately 2.6 percentage points increase in productivity (IDB, 2018).

Despite an increase in the average use of the internet in BMCs from 24% to 59% between 2005 and 2016 (ITU, 2017), distribution and access remain uneven. BMCs rank low on the Information Communication and Technologies (ICT) Development Index (IDI[1]), and it would take deliberate and considerable investment to grow the skills and build the infrastructure required to nudge BMCs up the scale.

Advancing the digital agenda will require a collaborative effort among countries, in partnership with local and international investors as well as civil society. Among the immediate steps should be expanding the availability and affordability of broadband access, while prodding increased use of ICTs and digital technologies. Amended or updated regulation will be necessary to create the framework to address delimiting factors such as, cross border data flows, security, and consumer protection.

This paper signals CDB's intention to explore the field of digital transformation, working with BMCs to navigate this disruptive game changer.

1 Measuring the Information Society Report 2017.

DIGITAL **TECHNOLOGIES**

The categories, types, and uses of digital technologies are expanding rapidly, driven by innovation, research, market demand and the continuous pursuit of profitability and growth. The broad applicability of new technology has implications for all aspects of life including, finance, agriculture, healthcare, education, entertainment, employment, accessing social services and outcomes of national elections.

Outlined below are some categories of new and emerging technology.

TECHNOLOGY	DESCRIPTION	GLOBAL DEVELOPMENT APPLICATIONS
3D Printing/ Additive	Technologies that build solid 3D objects by adding successive layers of a material	Health: Use of 3D printed objects to replace human organs, expensive implants, or surgical devices. E.g.: In remote locations or disaster zones, such as Kathmandu in 2015, Field Ready printed critical medical supplies.
Artificial Intelligence (AI)	The ability of machines or computer programmes to learn, think, problem solve, and plan	Trade: Use of AI to analyse economic trajectories of trade partners when negotiating deals, including scenario outcomes analysis. E.g.: Being explored by Brazil's Intelligent Tech & Trade Initiative.
Augmented Reality (AR) and Virtual Reality (VR)	AR: Interactive display that integrates computer-generated sensory information with the user's real-world environment. VR: A computer-generated environment where the user is fully immersed	Storytelling: Use of VR to share immersive experiences from the perspective of those most affected by global issues. E.g.: United Nations use of VR videos to explore experiences of Syrians in refugee camps in Jordan.
Big Data	High volume, varied, and high-velocity data that can be both structured and unstructured	Disaster Management: Use of Big Data analytics (and often social media data mining) to better predict social unrest or natural disasters, or to improve response effectiveness and to reduce economic, environmental and social impact. E.g.: Haiti earthquake in 2010, Digicel Haiti, Flowminder, and other organisations analysed movements of 2 million anonymous mobile phones to help direct relief agencies to large groups of displaced persons.

TECHNOLOGY	DESCRIPTION	GLOBAL DEVELOPMENT APPLICATIONS
Blockchain	A distributed, decentralized public record of transactions between multiple parties in a peer-to-peer network	Identity Management: Use of Blockchain to create and manage a decentralized national identity system. Once a digital identity is created, authorized users can update with biometric, academic, health, finance, and other KYC/personal data. E.g.: Estonians use secure digital identities to access most public services.
Cloud Computing	The variable use of a remote network of servers on the internet to store, manage, and process data	Disaster Management: Use of cloud storage infrastructure to improve the resilience of many government systems by replicating data across multiple geographic locations. E.g.: World Bank is working with the OECS on a cloud-based solution to store data from the national statistical offices.
Cyber Security	Digital strategies used to protect information from being stolen, compromised, or attacked	Health: Use of cyber security strategies to protect the rightful access to personal health records. Around the world, there have been increased cyber-attacks on the healthcare industry as more records are digitised.
Internet of Things (IoT)	The network of all identifiable, internet-enabled devices that collect and share data	Public Services: Use of a smart network of sensors and devices to monitor public safety and the use (or misuse) of public services.
Robotics	The study of robots which incorporates mechanical, electrical, computer and other engineering	Manufacturing: Robotics contributed to the automation of manufacturing which has enabled mass production and reduced risks to humans in environments that could otherwise have been high-risk. Robots are also being used in homes and are seen in some countries as part of the solution to the economic and social impact of aging.
Simulation	Use of a computer to replicate a real-world process or system	Education: Simulating real world activities in the teaching and learning process.
Systems Integration	The process of joining different processes or components (physical and virtual)	Energy: Use of vertically integrated energy systems (including various sensors and meters) to monitor and control energy generation, storage, distribution, and retail supply while monitoring and responding to demand fluctuations. E.g.: Several development organisations have piloted micro grids in Haiti using smart grid technologies to monitor grid performance, detect thefts, and process payments.

Sources: CDB, Techopedia, Brookings, UNVR, Flowminder, World Bank, OECS, U.S. Office of Energy Efficiency and Renewable Energy, DEWA, ElectriFI, NASA

INTRODUCTION

Digital transformation is the use of digital technology to solve traditional problems. The results create new, or modify existing business processes, culture, and customer experiences to meet changing business and market requirements. The transformation process involves both digitisation (the process of converting information from an analogue to a digital/computer-readable format) and digitalisation (the adoption of digital or computer technology when changing processes or models in a company, industry, or country).

Despite significant progress on human development, the Caribbean region is challenged by a number of macroeconomic, social and environmental issues. The increase in GDP per capita[2] over the past two decades (from an average of USD7,626 in 1996 to USD15,761 in 2017), does not reflect the unique challenges related to high levels of poverty and unemployment, particularly youth unemployment. At least one-fifth of the population of the Borrowing Member Countries (BMCs) of the Caribbean Development Bank (CDB) remains in

[2] GDP per capita at purchasing power parity.

poverty. Similarly, youth unemployment remains high at approximately 25% with at least one in every four young persons being unemployed at the end of 2018.

The major obstacles that confront the Region can be classified under four pillars of macroeconomic, productivity and competitiveness, human development and environmental challenges, (CDB, 2018). Some of the impediments to development are also cross cutting across sectors and agencies. These include low implementation rates and the limited progress on implementing regional solutions to shared challenges. GDP growth in BMCs continue to lag other Small Island States, averaging less than 1% over the past decade. High fiscal deficits and increased debt levels have also constrained public sector investments. These challenges are compounded by the Region's vulnerability to climate change and natural disasters, with significant debt build up being related to reconstruction and rebuilding following the passage of natural disasters. Competitiveness, measured by the ease of doing business rankings, reflects a sharp decline in rankings from an average of 81 in 2009 to 126 in 2019.

Transformation towards a resilient Caribbean requires targeted policy interventions and reforms. This includes cross-cutting interventions that foster regional integration, gender equality, statistics and data analytics, an improvement in implementation rates and digital transformation, (CDB, 2018). Digital transformation is the use of digital technology to solve traditional problems. It includes the invention of new technology such as the Internet of Things (IoT), robotics, artificial intelligence, 3D printing, blockchain, machine learning, big data and cloud computing.

The results create new, or modify existing business processes, culture, and customer experiences to meet changing business and market requirements. The transformation process involves both digitisation (the process of converting information from an analogue to a digital/ computer-readable format) and digitalisation (the adoption of digital or computer technology when changing processes or models in a company, industry, or country).

Digital transformation can help drive progress towards addressing some of the developmental challenges in the Region, and by extension attainment of the sustainable development goals (SDGs). The breadth and depth of 4IR extend beyond the traditional notions of industry, affects almost every area of daily life, and is relevant to government, business, social contracts, and human behaviour. This revolution has brought significant efficiency gains across economic sectors, improved the ease of doing business, fostered higher levels of transparency and trust; and facilitated linkages between businesses and consumers. The relatively small size and remoteness of some islands in the Region present inherent challenges which have hindered ICT development, particularly in relation to connectivity and access. The infrastructure investment costs in remote and small islands make broadband expensive for consumers. Other challenges are in the areas of skills and capacity; regulatory frameworks; consumer protection; data privacy and digital security.

Within the last two decades, the infrastructure, affordability, uptake, and use of both ICTs and the internet have improved due to liberalisation, increased competition, and enactment of enabling regulation (particularly those applicable to the telecommunications industry.) However, regulators must keep abreast of and plan ahead for the ongoing advances in technology in order to provide the framework to govern their use and application within Caribbean countries. This ability to keep abreast; not only among regulators but also among the private sector, tertiary institutions, and other parts of government; will help unlock faster and more inclusive sustainable growth.

This paper – "Digital for Caribbean Development", focuses on an emerging and cross-cutting theme – digital transformation. With the rapid growth in digital technologies, opportunities exist for the Region to address some critical challenges, particularly competitiveness and youth engagement. This paper is a first step in scoping the level of digital readiness of the BMCs, and potential opportunities for this Region. The paper highlights some of the key challenges to greater levels of digitalization in the Region, but also identifies which sectors could be explored for future development. Some of these include government productivity through e-Government, improving skills via digital education and enhanced skills, improving competitiveness through Fintech, digital trade facilitation, digitalization of renewable energy contracts and applications to disaster risk management.

Advancing the digital agenda requires the collaborative effort of all stakeholders including the government, the private sector and civil society. Government policies and strategies should seek to increase the availability and affordability of broadband, while facilitating the increased use of ICTs and digital technologies. This would ensure that, when digitalized, critical public services remain accessible to all citizens. Regulatory frameworks must support strategies adopted and promote investment in the infrastructure required and secure the information that they hold. Regional approaches to ICT development may address the challenges related to the regulatory environment, infrastructure deficits, cross border data flows, security, and consumer protection. These strategies would help improve digital skills needed to create a digitally literate and productive labour force. The business environment should also encourage and incentivise digital entrepreneurship.

This paper is structured as follows:

CHAPTER 1

An overview of the Region's readiness in terms of: infrastructure and technologies, regulation and policies, and human capital and skills.

CHAPTER 2

Sector specific analyses utilising case studies to showcase how emerging technologies are being used to advance development across the world. This section explores two areas in particular: first – core enablers of digital transformation in Government Operations, e-Government, Education and Disaster Risk Management; and second, Productivity and Competitiveness with special focus on Finance, Trade and Renewable Energy.

CHAPTER 3

A high level Roadmap to digital transformation and areas for which CDB could provide financial and technical support.

CHAPTER 1: THE STATE OF THE DIGITAL ECOSYSTEM IN THE CARIBBEAN

In order to envision the Region's future, it is necessary to evaluate its current circumstances. Within the last two decades, there have been significant strides in all three components of the Caribbean's digital ecosystem:

i. Infrastructure and technologies
ii. Regulation and policies
iii. Human capacity and skills

As a result, ICTs have become accessible and affordable; major investment has been made in infrastructure; policies and regulations have been drafted; and the workforce can be described as having basic computer literacy skills. However, this state is still insufficient to usher in effective large-scale digital transformation of Caribbean economies.

1.1 The Digital Ecosystem as a Foundation for Transformation

In this paper, and for the purpose of assessing Caribbean countries, a digital ecosystem is the product of three components:

1. Technologies and their enabling infrastructure
2. Policies and regulation
3. Capacity and skills of the workforce and the potential user groups

Developing all three components of the digital ecosystem positions a country for economic transformation. A robust ecosystem enables digital strategies that can "contribute to the economic strength, societal well-being, and effective governance of a nation."[3] Digital technologies can accelerate innovation and improve productivity in other sectors, thus stimulating economic growth both directly and indirectly. Effective policies and regulation can encourage market participation, while minimizing possible negative outcomes. A broad range and deep pool of digital and entrepreneurial skills in the population can equip citizens to first harness, then create digital transformation[4] opportunities.

Conversely, an underdeveloped digital ecosystem can undermine economic transformation efforts. For example, slow and unreliable internet connections would frustrate would-be digital entrepreneurs, as

[3] Strategy&, PWC, 2012.
[4] "Digital transformation" is a broad transformation of business activities, competencies, and their societal impact. This is distinct from both digitisation (the process of converting information from an analogue to a digital/ computer-readable format) and digitalisation (the adoption of digital or computer technology when changing processes or models in a company, industry, or country). Ram, et al. 2018.

well as businesses hoping to leverage internet-based solutions for their operations and service delivery. Low ICT coverage or adoption would prevent underserved segments of the population from accessing digitised public services. Unregulated and unsecure health record systems would expose private records to potential cyber threats. Without appropriate reskilling, many classes of existing workers would be unemployed due to automation or changing job expectations. Each component of the ecosystem is critical for equitable and sustainable economic growth.

The digital ecosystem also needs an enabling environment for doing business. Just as in the non-digital realm, investments in digital businesses are influenced by economic stability, financing, corporate taxation, competition, infrastructure, and labour markets. In addition to these, digital ecosystem clusters can help new businesses to innovate and thrive. As evidenced by Silicon Valley, strong local or regional networks can provide a platform for faster knowledge sharing and skills transfer.

1.2 The State of the Regional Digital Ecosystem

The state of the Regional Digital Ecosystem is evaluated under three components: (1) infrastructure and technologies, (2) regulation and policies, and (3) human capital and skills.

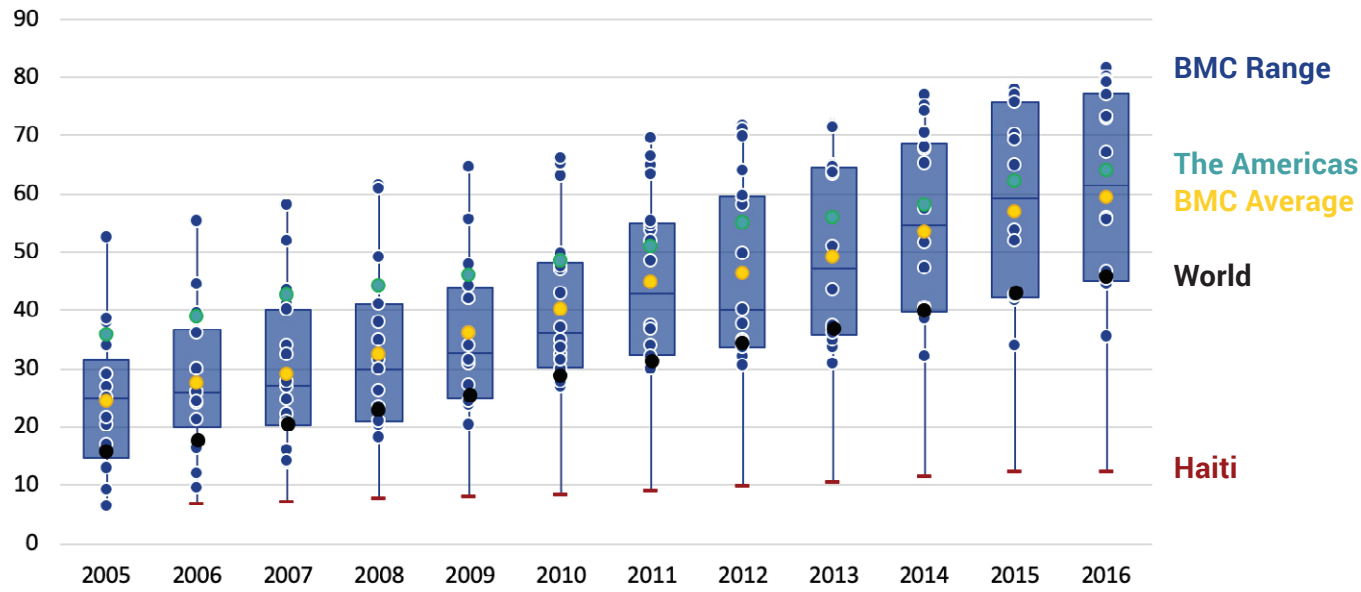
1.2.1 Infrastructure and Technologies in the Digital Ecosystem

Access to and adoption of core ICT services[5] have been evolving over the past two decades. The Caribbean is still years away from deploying the latest generation networks and infrastructure and most counties lag behind other regions in the adoption of more advanced services.

ICT Access and Adoption

Penetration rates for mobile telephone and broadband have improved. With the exclusion of Haiti, the share of individuals using the internet in BMCs grew from 27% to 53% between 2008 and 2016 (Figure 01). The average

FIGURE 01: PERCENTAGE OF INDIVIDUALS USING THE INTERNET (%)



Source: ITU (2017)

[5] Core ICT services refer to telephone and broadband/internet. On one hand, these services can be fixed, i.e., transmitted to a static location, such as a home or business, using wired technologies such as TN, cable, DSL, and FiOS. On the other hand, they can be mobile and transmitted to mobile devices using cellular technologies.

BMC mobile cellular penetration rate is higher than 110% – indicating that in many countries there are more mobile subscriptions than people. In all BMCs, except Haiti, more than half of the population has an active mobile internet subscription.[6]

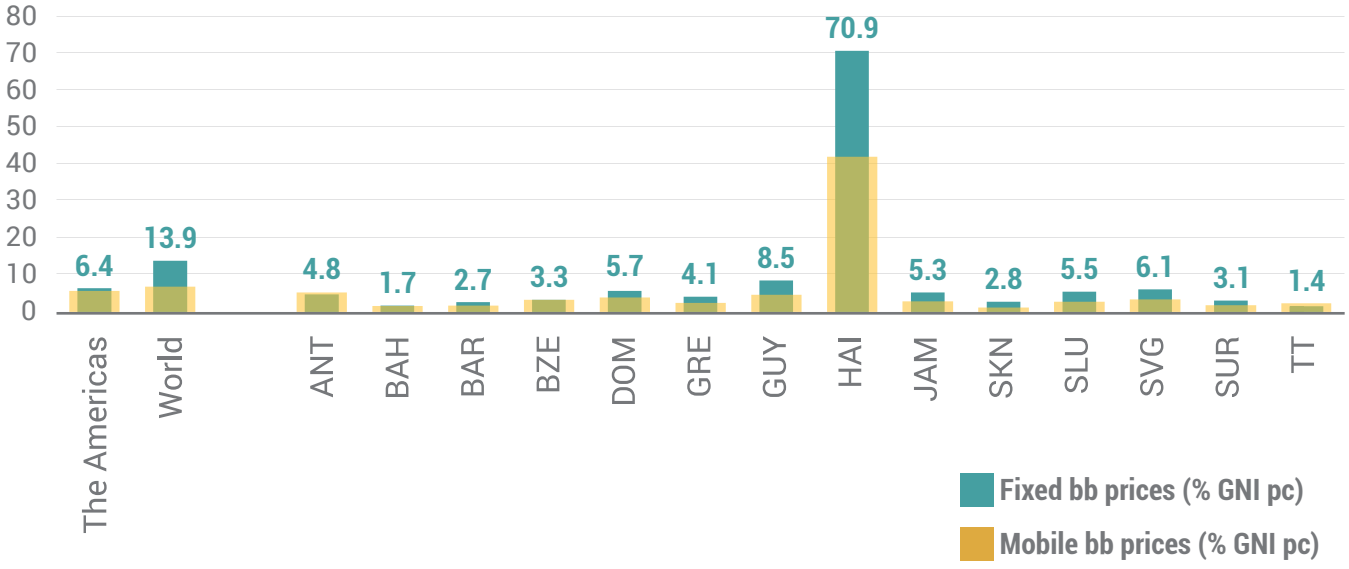
Fixed broadband internet coverage and adoption are not extensive. In 2016, the average share of households with internet access in BMCs was just under 50%.[7] The highest access rates were recorded in St. Kitts and Nevis (82.6%) and in Trinidad and Tobago (70.9%). At the other end of the spectrum, fewer than 5% of Haitian households had access. While it was also low in Guyana (28.2%) and Belize (30.2%), most other BMCs had household internet access rates above 40%. These rates drastically contrast to mobile broadband internet rates – but this is not surprising as developing countries around the world are "bypassing landlines in favour of mobile phones".[8]

In most BMCs, falling ICT service costs have improved affordability and adoption. For all, with the exception of Haiti, the cost of accessing both fixed and mobile broadband (in terms of share of gross national income per capita [GNI p.c.]) is below the average cost globally and in The Americas (Figure 2). Many BMCs are close to achieving a global development target [9] of having basic broadband services at less than 2% of monthly GNI p.c.

However, in Haiti, access is often cost-prohibitive. While the actual price of broadband packages may be comparable with the rest of the Region, the cost-to-income ratio is high. For example, an annual 1GB mobile broadband subscription can cost over 40% of Haiti's gross per capita income.[10] A fixed broadband package can run up to 70% of this average national income. Therefore, even for the 57% of the population covered by a mobile broadband network, subscribing to a broadband internet package remains a luxury. As a result, the share of the population using the internet increased from 6% to only 12% between 2005 and 2016.

The availability and affordability of more advanced ICT services vary markedly across BMCs. For example, in terms of high-speed broadband, 10 BMCs offered

FIGURE 02: ESTIMATED BROADBAND ACCESS COSTS IN 2016, % GROSS NATIONAL INCOME PER CAPITA



Source: ITU (2017)

[6] Global Digital Report 2018.
[7] Measuring the Information Society 2018.
[8] Munford, 2010.
[9] In 2018, the Broadband Commission for Sustainable Development launched a new set of broadband goals, Targets 2025, which seek to "expand broadband infrastructure and Internet access and use by populations around the world". Broadband Commission for Sustainable Development.
[10] ITU, Measuring the Information Society, 2018.

packages with download speeds that were 100 megabits per second (Mbps) or faster[11]. Those speeds can facilitate heavy internet usage, such as sharing large files online (in businesses) or simultaneous online multi-player gaming and high quality or live video streaming (in homes). On the flipside, the fastest speeds in Belize (16Mbps), Guyana (10Mbps), and Suriname (6Mbps) are only sufficient for single users or for simple tasks, such as email and web browsing.

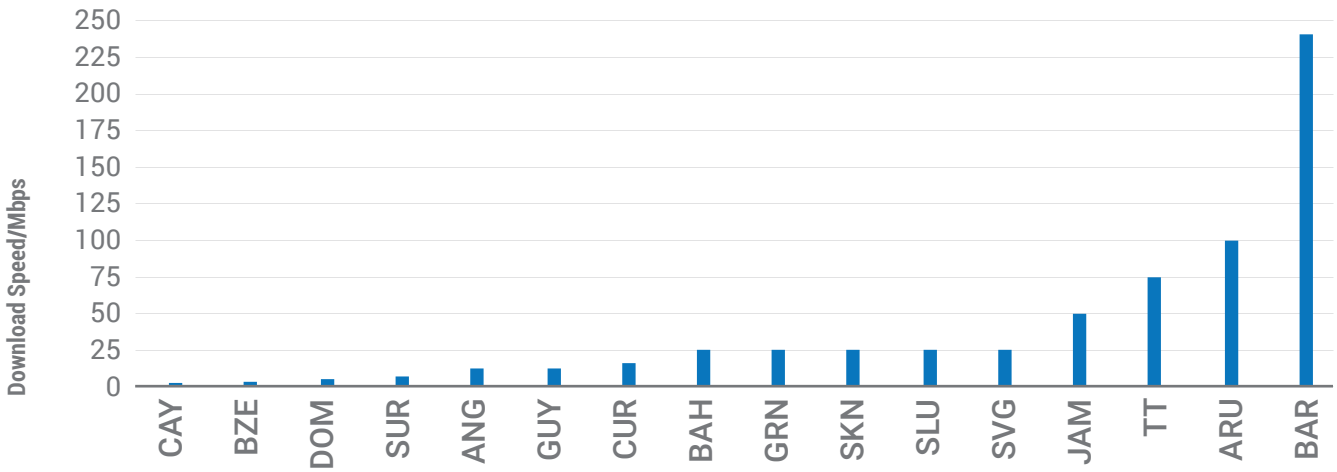
The cost-effectiveness of ICT services also varies widely. Of the Caribbean countries evaluated by ICT Pulse, Barbados and Trinidad and Tobago broadband subscribers appear to get the best value for money. When searching for a package under USD60 in 2018, providers in Barbados offered the fastest download speeds (240Mbps), while those in the Cayman Islands offered the slowest (under 1Mbps) (Figure 03).

Infrastructure and Technologies

Infrastructure investments in the Caribbean are largely motivated by demand and competition, enabled by regulation. ITU (2018) notes that in developing countries, telecommunications capital spending is mainly driven by data demand[12]. Additionally, the Region has benefitted from market liberalisation[13]. Competition between the dominant regional telecommunications service providers (Digicel Group and Liberty Latin America – the parent company of Flow), and also with smaller, local operators, resulted in consumers receiving more options in service packages, faster speeds, and better rates. Achieving this was possible following investment in modernizing the infrastructure.

Large scale infrastructure investments have expanded geographical access and improved ICT quality. For example, in more than 10 BMCs, 3G[14] networks cover 90% or more of the population (ITU, 2017). While data On 4G access is less available[15], investment has been made to transition to 4G coverage. In 2016, Long Term Evolution (LTE) coverage was over 90% in The Bahamas and Jamaica, but less than 30% in Barbados and Trinidad

FIGURE 03: FASTEST BROADBAND PACKAGE BY ADVERTISED DOWNLOAD SPEED FOR UNDER USD60 IN SELECT CARIBBEAN COUNTRIES



Source: ITC Pulse (2018)

[11] BMCs with broadband packages 100Mbps and faster are: Anguilla, The Bahamas, Barbados, British Virgin Islands, Cayman Islands, Grenada, Jamaica, Saint Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago. ICT Pulse 2018.
[12] Measuring the Information Society 2018.
[13] ICT infrastructure and wholesale ICT services of host operators are at least partially state-owned in a few BMCs, including Antigua and Barbuda, Belize, Suriname, and Trinidad and Tobago.
[14] 2G, the second generation of mobile phone communications standards, offered internet services and SMS text messaging when they were introduced globally in 1992. In 2006, 3G networks offered faster data transfer rates than their predecessor; thus enabling video streaming and calling. 4G networks further increased service speeds and quality. (Techopedia).
[15] Although LTE is faster than 3G, it does not meet the official standards for 4G although it is often branded as such by some providers in the Caribbean. This adds to the difficulty of assessing 4G coverage in the Region. Advanced LTE (or LTE-A) is considered 4G.

and Tobago. Since then, some providers have increased investments in 4G networks to meet rising broadband demands and to diversify their service offerings. For example in 2018, Digicel either introduced or expanded 4G LTE-Advanced coverage in several markets, including St. Vincent and the Grenadines, Saint Lucia, and Trinidad and Tobago.

It will be several years before the next generation of networks (5G) is deployed in the Caribbean. The world is excited about this latest evolution which will offer faster speeds and lower latency that would enable users to, for example, download a full-length movie in seconds or use augmented and virtual reality more seamlessly[16]. However, it is important to note that 5G deployment is still in its infancy with phased rollout in China, Japan, South Korea, United Kingdom, and the United States. Manufacturers are also slowly rolling out 5G devices. Wider deployments in other emerging or developed countries are not likely before 2020. While mobile service providers based in the Caribbean are still heavily investing in LTE/4G networks, forays in 5G are being explored. Two of the region's major players, Digicel and Flow, have parent companies in the UK where 5G services are expected to be piloted in a few cities in 2020. Developing countries are still grappling with the costs and infrastructure to make the service widely available, (World Economic Forum, 2018).

The Eastern Caribbean has employed a "shared learning" approach to testing and rolling out cutting-edge infrastructure and technologies. In collaboration with the World Bank and Amazon Web Services (a leading global cloud services provider), the Organisation of Eastern Caribbean States (OECS) launched the Cloud for Development pilot in 2017. The pilot aims to test a cloud computing solution to build resilience against massive data losses that occur when local IT infrastructure are damaged during natural disasters[17,18]. Also in the Eastern Caribbean, the governments of Grenada, Saint Lucia, and St. Vincent and the Grenadines have entered into an agreement with Digicel to deliver "future-proofed"[19] fibre optic network infrastructure connecting all government buildings (see Chapter 2). This paves the way for advanced e-Government services such as Smart Cities, Connected Health, and Advanced Learning.[20]

1.2.2 Regulation and Policies for the Digital Ecosystem

While many regional institutions and governments have developed policy and regulatory frameworks to advance the ICT sector, progress on both fronts is insufficient. For example, while telecommunications is a regulated utility in all BMCs, most legal systems do not explicitly regulate and protect data on digital platforms. Similarly, many BMC governments have developed ICT sector strategies, but few have articulated broader digital transformation and innovation strategies.

Regulation

Collaboration and support from development institutions have helped BMCs strengthen ICT regulation within the last decade. Most national regulators have developed frameworks based on guidance and recommendations from ITU, the Caribbean Telecommunications Union, and the Inter-American Telecommunication Commission. In 2000, five countries collaborated to form the Eastern Caribbean Telecommunications Authority (ECTEL)[21]. While each member state has its own local commission, ECTEL advises members on the creation and implementation of policies and regulation for the telecommunications sector.

Because of these collaborative efforts, many BMCs are building a "more inclusive and forward-looking" regulatory framework. This is evident in the improved scores for all BMCs in ITU's ICT Regulatory Tracker. The Tracker assesses sector regulation on four factors:

[16] McGarry 2019.
[17] Lokshin 2017.
[18] A regional workshop launching the initiative was held in Saint Lucia in November 2017. Since then, progress has been slow and uptake by the national statistical offices (NSOs) has been low. Going forward, OECS and AWS are planning for a more targeted approach, working with selected NSOs to migrate or replicate their databases in the cloud as a proof of concept.
[19] "Future-proofing" involves designing a product, service or system in a way that anticipates technological advances and demand shifts. Therefore "future-proofed" network infrastructure is unlikely to become obsolete or require significant updating.
[20] MarketWatch 2018.
[21] The five ECTEL members are Dominica, Grenada, St. Kitts and Nevis, Saint Lucia, and St. Vincent and the Grenadines.

1. Regulatory Authority (existence and power of an independent telecom/ICT regulator);
2. Regulatory Mandate (identifying who regulates what);
3. Regulatory Regime (existence of regulation in major areas); and
4. Competition Framework (level of competition in main market segments).

Over the last decade, all BMCs in the analysis moved closer to global-recognized best practices for these factors. In 2007, the BMCs included in the Regulatory Tracker scored 36.91 on average (out of 100). By 2017, this improved to 68.92, with Dominica and Belize making the most rapid progress since the preceding decade. Dominica experienced the most progress in its Competition Framework and Regulatory Regime, while Belize's most progressed factors were its Regulatory Regime and Regulatory Mandate. In some BMCs, the legal and regulatory frameworks have successfully matured to global best practices, such as The Bahamas in its Regulatory Authority; and Saint Lucia, St. Vincent and the Grenadines, and Jamaica in their Competition Frameworks.

Despite the improved scores for all BMCs, when matched against 190 countries, the average BMC rank is currently at 106. In particular, the breadth of regulatory regimes was below global standards in Antigua and Barbuda, Guyana, and Haiti. Low levels of ICT competition in Belize, Guyana and Haiti, contributed to lower scores. Clarification of the regulatory mandate is needed, even where there are stronger regulatory frameworks, such as those in Barbados and Jamaica.

In some BMCs, regulation specific to the global technology sector is needed to govern areas such as e-commerce, digital security, and data protection.

Table 2: National ICT and Digital Legislation and Policies in the BMCs[22]

BMC	IDI ICT Regulatory Tracker Score (100)		Progress with Select ICT-specific Legislation Legislation; Draft/Partial Legislation; No Legislation			
	2007	2017	Electronic Transactions	Consumer Protection	Privacy and Data Protection	Cybercrime
ANT	20.83	42.83				
BAH	39.17	88.83				
BAR	61.50	68.50				
BZE	6.50	63.83				
DOM	4.50	72.50				
GRE	41.50	74.00				
GUY	41.83	45.83				
HAI	23.67	49.83				
JAM	65.50	78.50				
SKN	*Not rated*					
SLU	50.33	86.00				
SVG	72.00	82.00				
SUR	9.50	58.00				
TT	43.00	85.33				

Sources: ITU, UNCTAD, national and regional regulatory authorities

[22] Anguilla, British Virgin Islands, Cayman Islands, Montserrat, St. Kitts and Nevis, and Turks and Caicos Islands were not included in the ITU's assessment of ICT regulation.

Neither Guyana nor Suriname has enacted legislation for e-commerce[23], while other countries, including Trinidad and Tobago and Antigua and Barbuda, have laws which govern electronic transactions and consumer protection.

There are some exceptions where legislators are proactively drafting and testing regulation for future oversight needs. In 2018, the Central Bank of Barbados and the Financial Services Commission launched a regulatory sandbox to provide a testing environment for a digital version of the Barbadian dollar (discussed in Chapter 2). ECTEL has also been instrumental in guiding the local regulatory commissions of its members to keep pace with evolving market dynamics. Among its initiatives has been the drafting of an Electronic Communications Bill to be presented to legislators in its five member states[24]. The Bill addresses the shift in demand from traditional telephony services to over-the-top internet-based services.

Policies

Most BMC governments have articulated strategic plans and policies for the ICT sector. In 2006, both Grenada and St. Kitts and Nevis published a progressive National ICT Strategic Plan which highlights the role of ICT as an enabler of other sectors[25]. Ten years later, Saint Lucia published a draft ICT Policy for the Education System.

The most ambitious vision for regional digital transformation is the Single ICT Space proposed by the Caribbean Community (CARICOM) Secretariat. CARICOM Heads of Government approved a road map for the strategy in 2017 since it forms part of the Community's overarching Digital Agenda 2025. Once executed, the Single ICT Space will act as a "digital layer of the CARICOM Single Market and Economy"[26], potentially revolutionising regional trade, travel, and other engagements. Highlight #1 depicts the opportunities and challenges to the strategy.

BMCs are at various stages of implementing national plans and strategies, with some focusing on fundamentals such as ICT access and market liberalization. The awareness, interest and appreciation of the importance of this development priority are evident in the efforts made to draft and enact regulation. However, steady and deliberate actions are necessary to realise the goals laid out in the strategies.

The Single ICT Space will act as a "digital layer of the CARICOM Single Market and Economy", potentially revolutionising regional trade, travel, and other engagements.

1.2.3 Human Capacity and Skills for the Digital Ecosystem

ICTs, and in particular the associated digital skills, have the potential to fuel economic growth through fostering a more efficient and enabling business environment. One of the strongest indicators of digital skills is the level of educational attainment, (ITU, 2017). The higher the level of educational attainment, the higher the probability of ICT skills. Hence, ITU's index of digital literacy assumes that countries with high levels of tertiary education attainment also have higher skill levels, including digital literacy. The ICT Development Index uses a weighted index of tertiary, and secondary gross enrolment ratios in addition to adult literacy.

For the Region, the ICT skills index averages 6.0, with countries such as Grenada, Barbados, Bahamas and St. Kitts and Nevis scoring relatively high. The tertiary gross enrolment ratios include universities (particularly offshore in the case of Dominica, St. Kitts and Grenada) which could have contributed to the ranking. Further, high emigration rates are likely to affect the talent pool in country. Emigration of educated workers was cited by 65% of Caribbean firms as a critical causal factor for the levels of skills shortages being experienced, (IDB, 2017)[27, 28].

[23] U.S. Department of Commerce – International Trade Administration 2018.
[24] St. Kitts and Nevis Government Information Service 2017.
[25] St. Kitts and Nevis national Information and Communications Technology Strategic Plan 2006.
[26] "Single ICT Space, Cyber Security for Discussion at ICT Officials' Meeting." Media Centre, CARICOM, 6 June 2018.
[27] IDB, 2017, "Engine of Growth, The Caribbean Private Sector Needs More than an Oil Change.
[28] In calculating the number of Caribbean workers working in the OECD, it was determined that on average, only 6%of the labour force with a primary education had migrated, 34%for secondary-educated workers, and 68%for workers with a tertiary education, (IDB, 2017).

Highlight #1: The Vision for CARICOM Single ICT Space

The Why, What, and How of the CARICOM single ICT space

The Vision

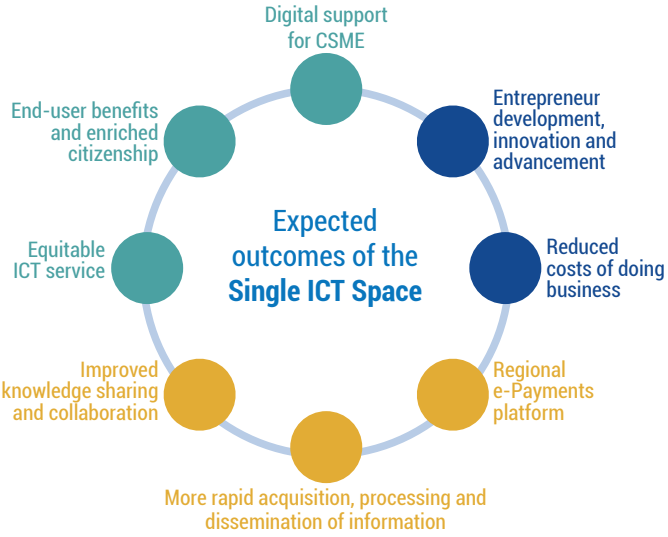
"An ICT-enabled, borderless space that fosters economic, social, and cultural integration for the betterment of Caribbean citizens"

Characteristics

- **Harmonized regimes** for ICT policy and regulation
- **Robust infrastructure** nationally and regionally
- **Common frameworks** for governments, ICT SPs and consumers
- **Technology and management systems** that are effective and secure

Benefits

Doing business · Regional Integration · Governance



The Roadmap

01 - GAINING GOVERNMENT BUY-IN
The CARICOM Heads of Government (HOG) approved the roadmap at the 28th HOG meeting in February 2017, and the draft work plan in July 2017.

02 - PLANNING AND NEGOTIATION
Stage 2 pushes the dialogue from the Big Picture towards comprehensive work programme. A detailed gap analysis will support further consultations, negotiations, and planning and budgeting for the implementation stage.

03 - IMPLEMENTATION, ADVOCACY AND LEGISLATION
At stage 3 the focus is on public awareness. Following an education campaign, CARICOM will support efforts to harmonize policies, legislation and regulation - all of which are necessary for a seamless regional ICT environment.

04 - IMPLEMENTATION: DELIVERY
For some countries, this will require an extension of broadband infrastructure. Other activities may include establishing GovNets and connecting them regionally; launching or expanding e-Delivery of government services, and encouraging greater civic engagement.

By the numbers

15 Member states and 5 Associate Members including all 19 CDB BMCs

Roadmap is endorsed by all **19** of CDB BMCs

Active mobile broadband subscriptions per 100 inhabitants range from: **0.2** in Guyana to: **89** in Jamaica

The ICT sector's direct GDP contribution ranges from: **2%** GRE to **7%** BZE

26.5 USD MILLION Estimated budget for planning and implementing a CARICOM Single ICT Space

Which is expected to be fully ratified by: **2022**

Key Challenges

TIGHT TIMETABLE
Aligning 15 fragmented ICT spaces is already ambitious. Additionally, ICT4D needs input from all CARICOM agencies. Coordinating efforts is necessary, but time-consuming.

RESOURCE LIMITS
It has been challenging to secure and dedicated personal "on-the-ground" within the public sector. Despite the top-level buy-in, there is some reluctance at other levels.

Sources: CDB; CTU secretariat's *Vision and Roadmap for a CARICOM Single ICT Space*, CARICOM ICT *Statistics and Indicators 2011-2017*.

Table 3: Comparable Education Indicators in the IDI, 2017

	IDI Skills Index	Mean Years of Schooling	Secondary Gross Enrolment Ratio[29]	Tertiary Gross Enrolment Ratio
ANT	6.2	9.2	102.7	23.5
BAH	7.4	10.9	92.6	57.1
BAR	7.9	10.5	109.3	65.4
BEL	5.8	10.5	80.8	23.3
DOM	6.2	7.9	100.5	34.2
GRE	8.3	8.6	99.2	91.2
GUY	5.3	8.4	89.3	12.5
JAM	5.8	9.6	82.1	27.2
SKB	7.5	8.4	90.4	79.6
SLU	5.5	9.3	85.1	16.8
SVG	5.9	8.6	106.4	18.2
SUR	5.0	8.3	81.1	12.7
TT	5.7	10.9	85.5	12.0
Average	**6.3**	**9.3**	**92.7**	**36.4**

Source: ITU, 2017

Notwithstanding, the education system in the region shows signs of increased focus on Information Technology (IT) studies. At the secondary school level, the average number of registrants in Information Technology[30] has increased from less than 1% in 2007 to approximately 10% annually (2010-2017), out of a student population of about 230,000 who register for five or more Caribbean Secondary Education Certificate (CSEC) subjects per year. However, the rate of specialization in Information Technology and Computer Science at the Caribbean Advanced Proficiency Examination (CAPE) declines significantly. Students registered for CAPE Computer Science and Information Technology is approximately 3.0% of the CAPE student population.[31] Despite efforts to fill the gaps with Technical Vocational Education Skills, there is still a void in ensuring a smooth transition across higher levels of training and development. The Region's ability to benefit from the digital economy is highly dependent on training and retaining a strong cadre of persons with the right competencies.

[29] The gross enrolment ratio is the total enrolment in a specific level of education, regardless of age, expressed as a percentage of the eligible official school-age population corresponding to the same level of education in a given school-year, (UNESCO Institute for Statistics).
[30] Data from the Caribbean Examinations Council (CXC®).
[31] CXC 2018.

1.3 Regional Readiness

With respect to digitalisation, many countries in the Region are still not "future-ready". To be well-positioned for the digital future, a country must have (1) cutting-edge infrastructure, (2) comprehensive regulation, and (3) a workforce with sophisticated digital skills. While it is clear that ICT access and uptake have improved for most of the Region, the use of the technologies is generally limited to consumption of personal entertainment and content generation rather than for productive activities. Consequently, the impact of ICTs on the countries' economic and social development has been limited. The cost of some advanced ICT services is still prohibitive for some entrepreneurs and micro, small and medium sized businesses. Many strategies remain fixed on achieving basic "computer literacy" in a world that increasingly requires a much broader set of skills or "digital literacy" to prepare them for life and work of the future. Additionally, there are gaps in the regulation for digital services, in areas such as digital privacy and data protection.

Large scale digitalisation signifies considerable potential benefits to the adopters, but if it is not well managed, segments of the population could be further marginalized. Among the risk factors is the exclusion of vulnerable groups, low-skilled workers and new security threats.

Digital exclusion of vulnerable groups

If adequate consideration is not given to vulnerable groups in a digital transformation process, inequalities will likely increase and further hinder individuals' access not just to ICT, but essential services. This could exacerbate adverse social and economic issues already present in the Caribbean.

Job losses for low skilled workers

Rapid and unmanaged digital transformation can displace low skilled workers. Jobs with routine and repetitive tasks are among the most vulnerable to automation and robotisation[32]. Many of the new jobs of the fourth industrial revolution or the digital economy will be knowledge-intensive, with many job descriptions requiring increasingly complex digital skills. As such, without appropriate upskilling, these workers may be pushed out of the formal labour market.

[32] "Which occupations are at highest risk of being automated?" UK Office for National Statistics 2019.

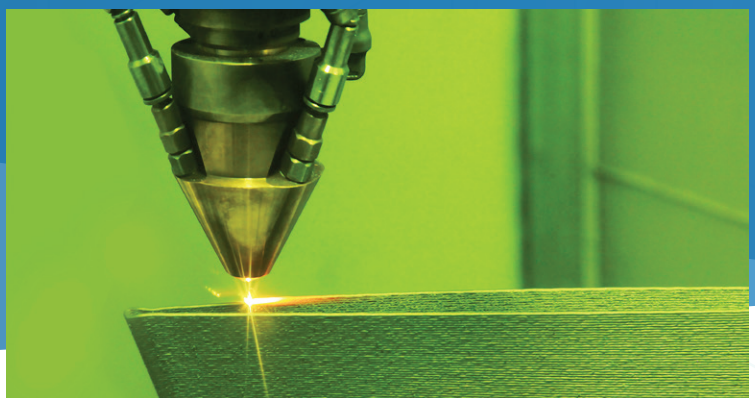
New security threats

Digital technologies can increase the entry points for criminal activity. Cyber threats can deter individuals and businesses from doing business and other engagements online. Furthermore, attacks on critical networks, systems, and data can jeopardize overall national security.

Addressing these issues require a holistic approach to building resilient societies. Recognizing that the lives of citizens in the Region are becoming increasingly digital-dependent, the creation of an enabling environment and responding to changing demands for more digitised public services must be prioritised. Governments and development partners can be guided by this paradigm shift by leveraging the same technologies to more effectively and transparently encourage and implement policies and reforms. These are discussed further in Chapter 3.

CHAPTER 2: DIGITAL SOLUTIONS FOR DEVELOPMENT

This chapter is divided into two sections: building resilient societies, and productivity and competitiveness. It identifies key issues constraining growth and competitiveness across key areas in Government, Education, Trade, Disaster Management, Energy and Finance. In all sectors, the enablers are related to policy and regulation, skills development and capacity, data governance and enabling environments for innovation and entrepreneurship. Around the world, digital technologies are positively disrupting business-as-usual in government and across the private sector. Regional policy-makers have an opportunity to harness this disruption for more inclusive and sustainable growth.



Section 1

Digitalisation presents opportunities to build more resilient societies through the delivery of public services, reducing vulnerabilities and ensuring that no one is left behind. The demand for efficient and more transparent services is helping to generate urgency around the establishment of e-Government. This chapter assesses the pace of e-Government development and digital skills and literacy as strategies for building resilient societies and ensuring that citizens can be participants in that digital economy. The chapter also briefly assesses disaster risk management, given the extreme vulnerabilities of the Region to natural disasters, and the threats of natural disasters to sustainable development.

Section 2.1: Building Resilient Societies

2.1.1 Introduction

Emerging technologies, particularly in government services, are being used to improve the lives of citizens. e-Government has grown rapidly over time, with many positive trends being observed, (UN, 2018). Provision of government services online has been one of the main areas of focus and progress with an estimated 194 countries having established some online presence within the past two decades (UN, 2018). The UN E-Government Development Index (EGDI) places countries such as Denmark, Australia, and the Republic of Korea as leaders in providing government services and information online. Accordingly, the most commonly used online services in 2018 were utilities payments, submission of income taxes and registration of new businesses (UN, 2018).

In spite of the progress, barriers related to access and inclusion still remain in some parts of the world. With the rapid pace of innovation, issues related to security and data protection will continue to challenge policy makers who are charged with the roles of regulating, protecting and facilitating.

In the Region, conducting government transactions is considered time consuming and cumbersome. Satisfying mandatory requirements sometimes require standing in line, filling out forms, and essentially visiting multiple departments or locations for the finalisation of a single transaction. It is estimated that it takes an average of 5.4 hours to complete a government transaction in the Caribbean with 90% of transactions done face to face and 4% able to be completed online (IDB, 2018[33]).

Digital solutions for government services are not merely a means to an end. Government has a dual responsibility to be efficient, agile and responsive to the needs of citizens, while also providing the enabling environment for participation in the digital transformation of the economy. Citizens must be able to access public services through the provision of adequate connectivity, legal identification, and financial inclusion (IDB, 2018). In addition, education services must meet present and future needs by ensuring that citizens are adequately trained and skilled to actively contribute to and participate in the digital economy.

This section discusses the status and role of Government in building resilient societies through e-Government and digital skills and literacy. e-Government progress is aligned to three sub-domains of e-Government, with emphasis on technology applications. This is followed by a discussion on the role of government in creating digital citizens through education and skills development. The section ends with a brief feature on disaster risk management.

2.1.2 Enabling e-Government in the Region

Digitalisation can potentially address the concern that government is too costly, too inefficient, and too ineffective (e-administration, including e-procurement); too self-serving and too inconvenient (e-citizens and e-services); and too insular (e-society) (see Fig. 04). The main purpose of e-administration is to improve the internal workings of the public sector by cutting costs, streamlining processes, improving performance, mapping strategic connections among government bodies, and empowering citizens. Shortening the lead time for passport applications from two weeks to one day would be an example of e-administration at work. E-service initiatives focus mainly on improving service and communication between government and citizens. An example of e-service in practice is the ability to apply for business licenses via a government website. E-Society initiatives build on previous e-services domains by focusing on institutional stakeholders, such as private sector service providers, other public agencies, and not-for-profit and community organisations. It fosters long term partnerships and social/economical communities. An example of e-Society is the community around and interaction via the creation of a business community portal.

Facilitating e-Administration

E-Administration Systems in the Region have focused Public Sector Modernization Programmes (PSMP) on financial management information, tax administration, and customs management systems. The most common of these systems include SmartStream, Sigtas and ASYCUDA. However, some countries have not been able to fully leverage these systems, due, in part, to costs, low adaptation rates, maintenance of and rapid pace at which these systems are upgraded. In addition to in-country initiatives, a number of e-Government programmes have been undertaken at a regional level, including the Electronic Government Regional Integration Project (EGRIP), Caribbean Regional Communications Infrastructure Programme (CARCIP), and CARICOM Travel Card (Caripass). See Figure 05 for more details.

Fostering e-Citizen and e-Services Participation

The Region's progress on the UN's E-Government Development Index (EGDI) is a reflection of countries'

[33] Wait No More: Citizens, Red Tape, and Digital Government. IDB 2018.

FIGURE 04: MAIN DOMAINS OF E-GOVERNMENT

Source: Adapted from Ntiro, S. (2000) e-Government in Eastern Africa, KPMG, Dar-es-Salaam

efforts towards digitalisation. The EGDI assesses countries' relative e-Government performance and provides new analysis and evidence to further utilize the potential of e-Government to support the 2030 Agenda. Despite higher scores on the EGDI in 2018 compared to 2016, the Region still ranks relatively low with an average score of 0.54[34] on the e-Government index. Approximately half of the BMCs which were surveyed, fall within the bottom half of the EGDI. Barbados is the highest ranked country at number 46, followed by St. Kitts and Nevis at 71. All BMCs (except Haiti), scored higher in the Human Capital sub-index, which covers matters related to education, a proxy for the ability of citizens to adequately utilise e-Government systems (discussed in Chapter 1).

The actual deployment of e-Government services, as represented by the ranking, may be overstated because the EGDI is based on metrics that are not directly related to the implementation of e-Government initiatives. Scores on the online

[34] EGDI is a composite index with normalized scores between 0 and 1. A score of 1 is most desirable.

FIGURE 05: E-ADMINISTRATION PROGRAMMES IN THE CARIBBEAN

ELECTRONIC GOVERNMENT REGIONAL INTEGRATION PROJECT (EGRIP)
EGRIP was a World Bank and CDB-funded project which brought together the governments of Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, Saint Lucia, and St. Vincent & the Grenadines to promote greater efficiency, quality, and transparency in public services through the delivery of regionally integrated e-Government applications.

CARIBBEAN REGIONAL COMMUNICATIONS INFRASTRUCTURE PROJECT (CARCIP)
This is a project initiated by the World Bank and coordinated by the Caribbean Telecommunications Union (CTU). CARCIP is designed to bridge the gaps in the Region's Information and Communication Technologies (ICT) infrastructure with the aim of fostering development, improving public service efficiency and enabling ICT innovation in participating countries, which currently include St. Vincent & the Grenadines, St. Lucia and Grenada.

CARICOM TRAVEL CARD (CARIPASS)
This is conceived as a travel card program based on swipe-and-go technology, approved by CARICOM Heads of Government in July 2008. It is expected to provide secure, simple border crossing for citizens and legal residents of 10 CARICOM nations. With the introduction of CARIPASS, participating governments aim to enhance regional security and support expedited travel throughout the member states.

Antigua and Barbuda, Barbados, Dominica, Grenada, Guyana, Jamaica, Saint Lucia, St. Kitts and Nevis, St. Vincent & the Grenadines, and Trinidad and Tobago.

Source: CDB

service index (OSI) metric, which track actual performance in deploying effective systems for e-Government averaged 0.48. Bahamas scored the highest on the OSI, due in part, to their ambitious e-Government reform agenda of the last two years.

In 2017, it was estimated that only 16.8 % of services in Jamaica, and 2.8% in Bahamas could have been completed online (IDB, 2018). The e-Government Portal Services have been the entry point for many countries however, progress is mixed even with regional initiatives such as the OECS Regional project, (see Highlight #2). Governments have also focused heavily on education, particularly ICT skills and improving health information systems.

Building an e-Society

The ultimate aim of digitalisation is to develop e-Societies, i.e. communities where most transactions can be executed digitally. An e-Society utilizes digital technologies in governance at all levels. The Region is still a long way away from developing an e-Society

Box 2.1: e-Procurement in the Public Sector

Public procurement is worth an estimated USD450 billion (29.8% of general government expenditure) in Latin American and Caribbean countries (IDB, 2018). Emerging technologies can help improve the efficiency and transparency of public procurement. e-Procurement utilises ICTs to better connect customers and suppliers, and can take various forms, including electronic notice boards, comprehensive e-tendering and contract management systems and e-catalogues.

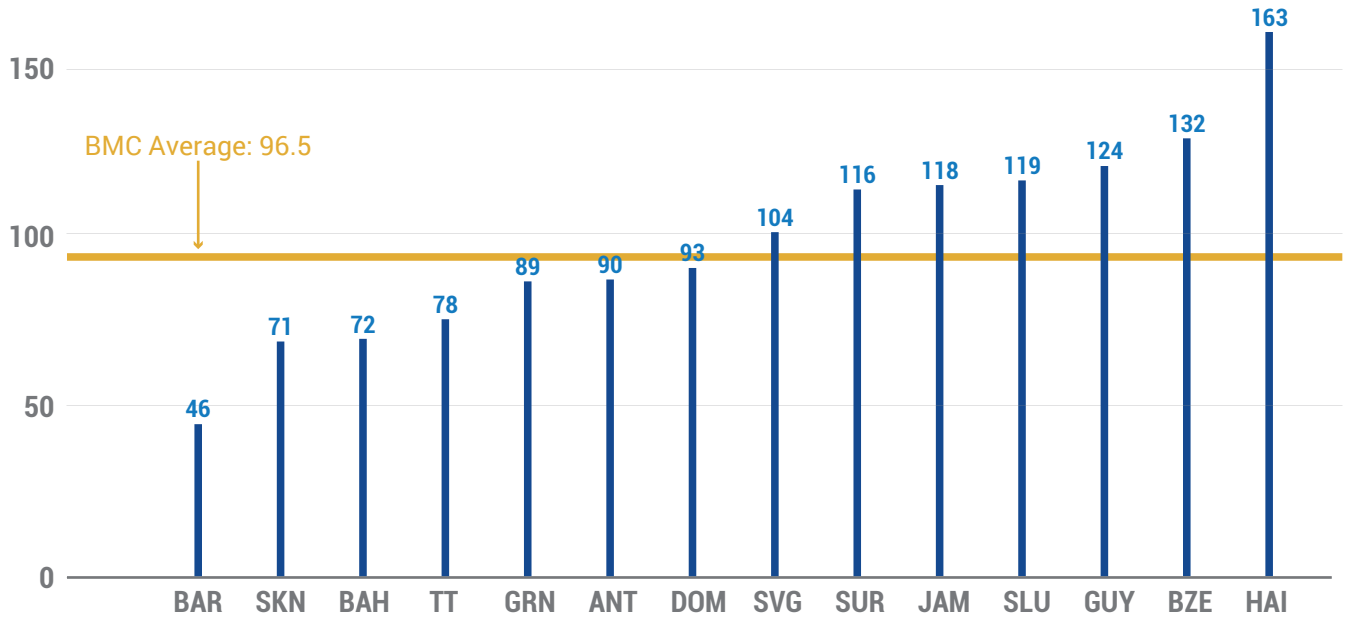
The Caribbean has lagged in public sector procurement reform (Schrouder, 2011), including in e-Procurement, with notable exceptions being, the Bahamas, Cayman, and Jamaica. Recently steps toward regional procurement reform, particularly in Trinidad and Tobago and the OECS sub-Region, could expedite the transition to e-Procurement. Public sector e-Procurement has also been facilitated by regional economic unions. CARICOM is working on establishing a regional public procurement regime, and has so far established an electronic tender notice board[36].

Digitisation of the procurement process contributes to a reduction in transaction costs for buyers and sellers as processes become automated and generally more efficient. This can take various forms including digitising standalone tendering processes and creating e-catalogues for regular, low value requirements. Automation also helps increase government's buying power by consolidating requirements and preventing fragmented and unregulated procurement practices. This was one of the motivations for procurement reform in Bahamas where it was estimated that the Ministry of Works was paying 15.3% higher than the Ministry of Education for the same product, (IDB, 2018). The Cayman Islands reported almost USD5 million of initial savings as a result of e-Procurement consolidating contracts while Jamaica is seeking to realise 2% savings upon the rollout out of their e-Procurement system.

The cost of purchasing and implementing e-Procurement technology is also falling with the greater value available on cloud based systems rather than in acquiring costly and cumbersome ICT infrastructure. In the last four years, the Cayman Islands and Monserrat have adopted "off-the-shelf" cloud-based systems. Reverse e-auctions, where bidders compete on an online platform over a defined period of time to offer the lowest price, is another innovation which helps lower costs. The Cayman Islands was an early adopter of this technology, which enabled the government to realise savings of approximately USD5.2 million (20% savings) between 2016 and 2017. Added benefits of e-Procurement systems are in the collection of data, analysis of spend as well as monitoring and evaluation of the critical contract management phase.

[35] (CARICOM Procurement Notices, 2018)

FIGURE 06: EGDI RANKINGS FOR CDB BMCs 2018



Source: UN-DESA, 2018

but some key achievements in online banking, exam administration (Caribbean Examination Council), e-litigation (the Eastern Caribbean Supreme Court), and finance demonstrate the possibilities. Similarly, some countries (Jamaica and The Bahamas) have embarked upon ambitious digital economy projects which are expected to contribute to building an e-Society. The Republic of Estonia is being heralded for successfully pioneering an e-Society (See Box 2.2). This case study looks at how they have achieved this. It should be noted that arriving to this point took almost 25 years.

2.1.3 Digital Skills and Literacy

The ability of citizens to take advantage of online services heavily depends on the capacity to use a computer (or a smartphone), navigate the internet and fill out the forms necessary for the transactions. These capabilities are referred to as digital skills and literacy, which contribute to enhanced inclusion and participation in the digital economy and are not limited to access but equally to employment.

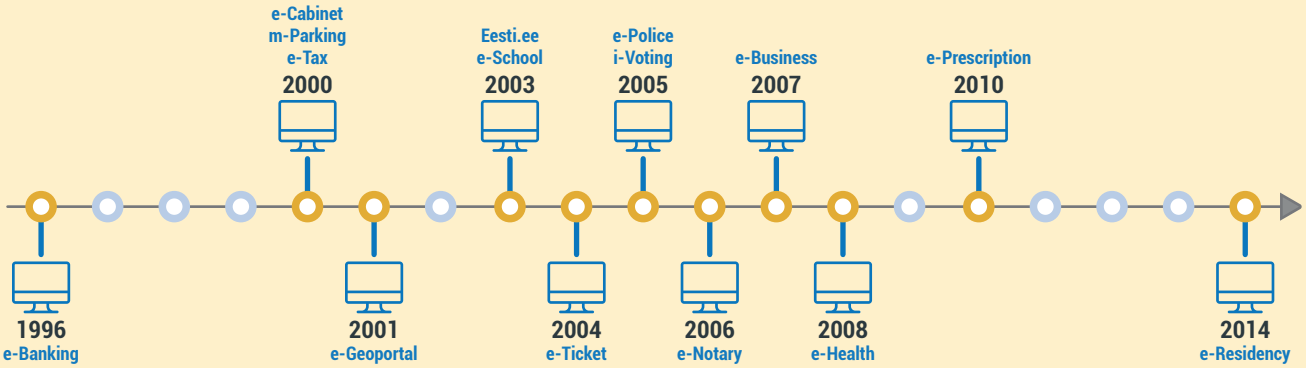
An estimated 65% of current primary school students [by the time they reach to working age] are expected to be engaged in jobs which currently do not exist (World Bank, 2018), see Table 4. Similarly, the World Economic Forum estimates that at least 133 million new roles will be generated due to technology and the incorporation of machines and algorithms in the workforce as early as 2022. Technical skills, particularly in programming, application development, and data analytics, will be in high demand. Non-programmable skills, such as creative thinking, problem solving and negotiating, will be even more important in a digital economy. Efforts to update the current curricula and utilize emerging technologies to more effectively align and prepare students for the changing work environment should be supported with adequate resources.

[36] CARICOM Procurement Notices, 2018.

Box 2.2: e-Estonia

The Republic of Estonia, a member of the European Union, has a population of 1.3 million. The country is ranked first in OECD tax competitiveness, twelfth in the World Bank's Ease of Doing Business index and second on the EU Digital Economy and Society Index. Majority of services (99%) are available online except marriages, divorces, and selling of property. The internet is considered a social right and every Estonian citizen has an electronic ID.

Since launching the first free public WiFi in Estonia's capital Tallin in 2005, WiFi is now freely available across most of the country, including forests and beaches. E-governance is a strategic direction for Estonia in improving competitiveness and well-being of its people.



Investments in technology, infrastructure, legislation and security have been key to the success of Estonia's e-services development. The infrastructure backbone is built on X-Road, through which different services are orchestrated (ibid.). The success of Estonia's digital journey is attributed to strong leadership, trust and transparency. This is perhaps one of the most important requirements for any substantial digital transformation, as key reforms related to the legislative framework have to be championed by a strong leader. The legislative framework provides a platform to support and enable infrastructure development, security and private sector participation. The Government of Estonia facilitated and enabled the digital transformation in consultation with the private sector and citizens. Recognizing the rapid pace of technological development and innovation, the Government of Estonia has maintained flexibility and focused on continuous improvement, particularly as it relates to security.

In February 2019, the president of Estonia, Her Excellency Kersti Kaljulaideads was a guest at the 30th Inter-Sessional Meeting of the Conference of Heads of Government of the Caribbean Community (CARICOM). An outcome of that meeting was agreement between CARICOM and the Government of Estonia to cooperate "in order to advance the digital development of the Community and to promote the collective approach to the CARICOM Single ICT Space and the 'CARICOM Digital Agenda 2025' initiative."

Source: CARICOM https://caricom.org/media-center/communications/press-releases/caricom-heads-engage-the-president-of-estonia-at-their-30th-inter-sessional-meeting.

Highlight #2: OECS Electronic Government Regional Integration Project

The Why, What, and How of the ELECTRONIC GOVERNMENT REGIONAL INTEGRATION PROJECT

The Vision

"Efficient, high quality, and transparent public services delivered through regionally integrated e-Government applications that take advantage of economies of scale."

CHARACTERISTICS

COUNTRIES

Implementation

Implemented by the regional e-Government Unit of the Organisation of Eastern Caribbean States (OECS)

Partnership

Financed by soft loans from the World Bank and a grant from CDB

IDA

KEY GOVERNMENT SERVICES TARGETED

IDENTIFICATION

Creating a national, multi-purpose electronic ID (e-ID) system to aggregate 5+ identifiers, including voter IDs, tax IDs and drivers licenses.

PROCUREMENT

Compiling tenders and supplier bids, aggregating national pharmaceutical needs, and converting requisition orders to purchase orders for a regional, pooled pharmaceutical e-Procurement.

TAX ADMINISTRATION

Accepting VAT filings online through a tax e-filing system, rather than manually and in-person.

EGRIP ALSO SUPPORTS OTHER ICT PROJECTS AND INITIATIVES AT THE NATIONAL AND REGIONAL LEVELS.

By the numbers

6 Governments, who are member states of both OECS and CDB

Over **14** Government applications created and/or upgraded

Across all countries

5,300+ citizens were registered for eIDs by early 2016

Average time to complete VAT filing fell

from 1 day to 30 minutes

Average time to process pharmaceutical procurement requisition order reduced

from 5 days to 20 minutes

Partnership financing:

IDA **USD 9.6 Million in Credits**

USD 2 Million Grant

Sources: World Bank, OECS

Emerging Technologies for Digital Skills

Digital skills or ICT Literacy, according to the World Economic Forum is a '21st century skill'. 21st century skills are grouped under three pillars: Foundational skills, Competencies, and Character Qualities, (World Economic Forum, 2017). Digital Skills/Literacy skills fall under the Foundational category, which highlights the intrinsic link between digital skills and other competencies.

A number of initiatives can be used to prepare citizens for basic and lifelong skills. Growth in educational technologies provides new means of instruction. The use of 'non-physical' methodologies such as virtual learning, online classrooms, adaptive learning, self-paced study and the delivery of education services through mobile and computer-based applications are growing rapidly. Online platforms and virtual campuses, provide opportunities to retool, reskill and upgrade the skills of different groups of the population; particularly the working population. The University of the West Indies Open Campus is one such example of the benefits of online platforms. Platforms such as EdX and Coursera, which are free in some cases, provide opportunities for persons to access training from universities around the world.

Table 4: Examples of new and redundant roles

New Roles	Redundant Roles
Big Data Specialists	Data Entry Clerks
Digital Transformation Specialists	Accountants and Auditors
Ecommerce and Social Media Specialists	Financial Analysts
Innovation Professionals	Telemarketers
Robotics Specialists and Engineers	Bank Tellers and Ticket Clerks
People and Culture Specialists	Lawyers
Service and Solution Designers	Assembly and Factory Workers
AI and Machine Learning Specialists	Statistical, Finance and Insurance Clerks

Source: Adapted from World Economic Forum, Future of Jobs Report 2018

Bridging the gaps in literacy and access to literacy, especially where there are geographical and gender barriers, is possible. Virtual classrooms, for example could serve remote communities and persons who are not able to attend or learn in traditional classroom settings. Some of the new digital trends which are transforming the education sector are highlighted.

Enabling Digital Skills and Literacy in the Region

Policy interventions for training and skills development are necessary in order to prepare employees for the future of work. The importance of being able to navigate the internet for a range of educational, work, and social purposes, highlights the need for targeted programmes to train citizens either in the general use of computers and the internet, or the specific use of digital services. More strategic interventions, addressing curriculum development, national human resource development and training, including public sector training, should be undertaken in a more holistic manner for long term sustainability. Given the depth of the challenges a collaborative approach amongst policy makers, educators and the private sector will be required. The key policy recommendations are: (i) ICT in Education Policy Development; (ii) access and connectivity; and (iii) curriculum development and teacher training.

Key policy recommendations:

ICT in Education Policy Development

Most of the Region has not integrated ICTs in their Education Policy. Out of 12 countries surveyed in 2015, five (The Bahamas, Barbados, Grenada, St. Kitts and Nevis and St. Vincent and The Grenadines) had national ICT in Education policies while two others referred to ICT in Education in separate documents (Commonwealth of Learning, 2015). Several others have national ICT policies dating back to the 1990s, which at the time were geared toward building infrastructure capacity. According to the Commonwealth of Learning (2015), human resource development lagged behind equipment acquisition in many countries.

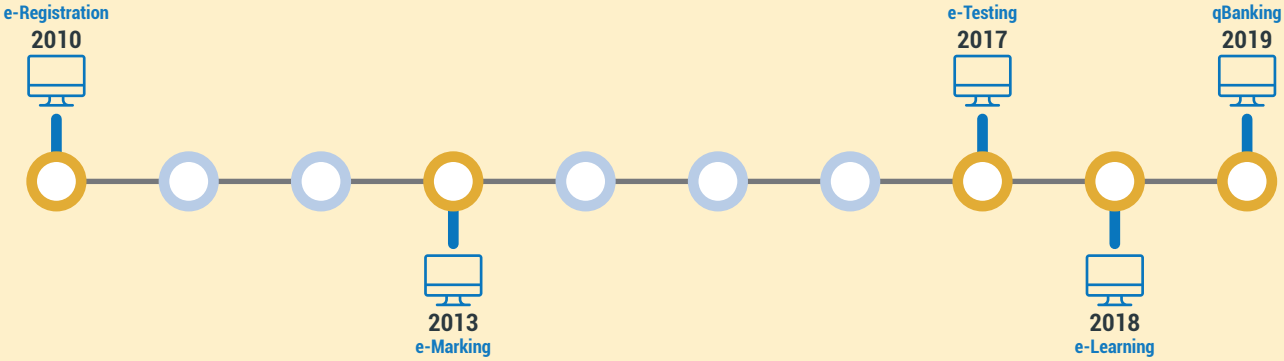
FIGURE 07: DIGITAL TRENDS IN EDUCATION

Source: Forbes' Digital Trends in Education

Box 2.3: Digital Transformation in the Region – The case of the Caribbean Examinations Council

The Caribbean Examinations Council (CXC) has been at the forefront of digitalisation in the education sector beginning with a process of transitioning from a primarily paper-based system in 2010 to an e-Institution (Figure 8). This digital transition incorporates exam testing and grading, and eventually enable e-certification.

FIGURE 08: TIMELINE OF CXC'S DIGITAL TRANSFORMATION



Full e-platforms will require considerable investment. CXC's digital transformation can be the impetus for strategic investments in technology that will enable students, administrators and teachers to interact across platforms. In addition, the supporting infrastructure must be readily available and easily accessible for this platform to be effective.

Access and Connectivity

Reliability, speed and affordability will determine the pace at which the education system can leverage digital platforms. It is anticipated that cost of equipment, software, devices and internet service could be a formidable challenge to both users and education service providers. In addition, there is a need to ensure that facilities and tools are in place for vulnerable, at-risk and differently abled groups.

Curriculum Development and Teacher Training

Curriculum development improvements are necessary for schools, teacher training institutions, and education planning units, (Commonwealth of Learning, 2015). Training and retraining of teachers and administrators is necessary to enable them to identify, use and adapt to current and emerging technology. Training in materials development, integration of ICTs in curricula and delivery of learning via virtual and distance platforms will also be integral to ensuring quality.

2.1.4 Disaster Risk Reduction-e-Resilience

The Caribbean is one of the most vulnerable geographic to natural hazards, particularly tropical cyclones (Rasmussen, 2004). Over the period 2000-2018, approximately 280 disaster events affected 37 million and accounted for over USD 125 billion in economic damages in the Region (CRED, 2019).

ICT and digital technologies have become essential tools over all phases of a disaster risk and crisis management. ICT and digital technologies that are being used in the management of disasters include remote sensing via satellites, radar, telemetry and meteorology, satellite M2M sensing technologies, alerts distributed via broadcasting or mobile technology, radio and television broadcasting, amateur radio, satellite, mobile telephone, the internet, cloud storage, simulations, system integration, big data, artificial intelligence, temporary base stations and portable emergency systems (ITU, 2017).

The Region should seek to develop or review comprehensive national and regional disaster communications plans or frameworks to include the

Box 2.4: The Case of SONAR in Disaster Management

The SONAR platform provides a centrally managed communication point for the interchange of data and information in national disaster management. The platform is geared towards channelling information between agencies and the general public. The platform is designed to be flexible and modular to facilitate quick dissemination and the integration of strategic partners.

Sonar finds its relevance due to the current inefficiencies within the existing disaster communication and information dissemination frameworks across the Caribbean. These communication challenges have caused many complications for the coordination of disaster management efforts as well as for the deployment of aid and emergency services.

As such, Sonar represents a new opportunity to facilitate disaster management interactions and communications using common and ubiquitous mediums for all phases of disaster management. Sonar has been deployed and is currently being piloted in two Caribbean territories using a mobile application. The platform allows for the receipt and initiation of real time advisories and notifications and facilitates content related to shelter management, event management, tips for survival, geolocation functionalities as well as search and rescue and relief management functionalities.

https://www.kairos.com/sonar

deployment and use of ICTs before, during and after events. Measures to build resilience and redundancy in ICT infrastructure, inclusive of minimum climate resiliency standards for ICT infrastructure should also be adopted. Further, training among disaster and emergency staff and volunteers would be a proactive move; along with seeking and securing partnerships which will allow for both access to training and use of equipment if needed at short notice.

Section 2.2: Competitiveness and Productivity

Digital technologies are driving competitiveness and productivity at a rapid pace. This section assesses the potential of digitalisation in three key sectors namely, finance, trade and renewable energy. Enablers are identified in each sector to accelerate innovation and growth. Key strategies are in line with the findings discussed in Chapter 1 pertaining to investment in infrastructure, regulation and policy and human capacity development.

2.2.1 Introduction

Digital technologies are driving growth in key industries such as finance, energy, and trade. Digital transformation presents an opportunity for improving productivity growth by enabling innovation and reducing the costs of a range of business processes (OECD, 2019). In the Region, these technologies have become the new cornerstone of more competitive business models and are enabling entry into the market at little to no cost. Moreover, transformative developments in the financial services industry are increasing formalization and financial inclusion (Ketterer, 2017), while also making access to financing more available to commercial and personal banking customers.

An overarching challenge of the Region has been tackling growth, competitiveness and productivity. The business environment is characterised as one where the cost and ease of doing business is relatively prohibitive and bureaucratic (The World Bank, 2019). Furthermore, new technologies and advances in innovation have not been sufficiently leveraged to effectively drive productivity and growth as a strategy out of the "middle income trap" (Ram, et al., 2018).

An emerging paradigm shift is evident with the advancement of the 4IR. Over the past 2-3 years, the Region has witnessed the emergence of a number of entities and business models that have been challenging longstanding incumbents and governments to deliver greater value to citizens. These developments have focused largely on financial technologies as well as trade, and energy.

This section highlights the use of digital technologies to enhance competitiveness and productivity in the areas of finance, trade, and renewable energy. The Regional context is reviewed with some insights for advancing these areas.

2.2.2 Digital Finance and Financial Inclusion

Digital finance is "financial services delivered over digital infrastructure—including mobile and internet—with low

use of cash and traditional bank branches" (McKinsey & Company, 2016). Mobile phones, computers or cards used over point-of-sale (POS) devices connect individuals and businesses to payment infrastructure, within countries and to participating countries around the world. The combination of financial services with technological developments (FINTECH/Digital Finance) has opened opportunities for financial institutions to expand their base by diversifying their services. Banks are looking to digital service for growth as they transition from traditional brick and mortar modalities of delivering services to online banking. Some demographic groups, which were outside of the formal financial system, can choose to participate, whereas before, the option was unavailable due to inability to meet requirements for initiating and maintaining bank accounts.

Widespread adoption and use of digital finance could increase GDP of all developing/emerging economies by as much as 6% of GDP by 2025, (McKinsey Global Institute[37]). This would be a change from an environment characterised in part by high fees; fledgling credit score systems; insufficient collateral, unfavourable interest rates, complex procedures and bureaucracy. (WB Global FINDEX Report 2017, IMF 2018).

Financial inclusion in the Caribbean tends to be mixed, with 55% of the population having an account with a financial institution. In some countries, such as Trinidad and Tobago, 81% of the adult population have a formal financial account while in Haiti, that number is 35%. Cash is still the dominant and preferred form of payment and, while many people have debit cards, actual usage is low. For example, in 2014, 11% of persons in Haiti held debit cards but only 4% had made used them to make purchases. Similarly, 61% in Trinidad and Tobago owned a debit card but only 38% used the card for a purchase (McKinsey Global Institute, 2016).

Relatively high mobile penetration rates bode well for countries to develop digital financial solutions to reach the underbanked. Driven by mobile technology, big data, Blockchain (distributed ledger technology), cloud computing, and artificial intelligence, digital ecosystems are budding in some countries. Micro, small, and medium sized enterprises (MSMEs), and rural and agriculture related small businesses are some of the key economic agents through which digital finance could enhance competitiveness.

Enabling Financial Inclusion in the Region

Drawing on the lessons learnt from some other countries at different developmental stages, the Caribbean could construct the main pillars of a digital financial eco-system which would enhance other strategies geared toward economic and social transformation. These pillars include, but are not limited to, digital identification, digital payments, digitised government payments and flexible regulatory approaches.

Digital Identification

A robust Digital Identification (ID) system is central to successful digital finance adoption (AFI, 2018). According to the World Bank's Identity for Development (ID4D) initiative launched in 2014, a lack of identification is a barrier to financial access particularly in the context of international standards (AML-CFT) for customer identity and due diligence. The 2017 Global FINDEX Database highlighted that 19% of the unbanked cited a lack of required documentation as the main reason, while a 2012 (Maurice McNaughton, 2012) study endorsed by the Jamaica Deposit Insurance Company found identification as the second most common cause.

In line with the recommendations for building an e-Society (Section 1), digital ID, beyond the proof of identity allows a person or MSME to open accounts and initiate transactions across digital platforms without having to present themselves in person. The 2018 ID4D Global Database showed that 161 countries now have some sort of identification system using digital technology. For example, India's Aadhaar system, a national system, digitally stores biometric identification and is used to access government services, social benefits, banking and insurance among others.

Digital ID technology provides the Region with an opportunity to build the financial market infrastructure necessary to balance market integrity, financial inclusion

[37] McKinsey Global Institute: Digital Finance for All – Powering Inclusive Growth in Emerging Economies, September 2016.

and economic growth while meeting international standards such set by the BASEL Commission, the Financial Action Taskforce (FATF) as well as, the United Nations' Sustainable development Goals. When information such as taxes, address and next of kin are digitalised and available via central database, it becomes easier to verify identities and meet other conditions which satisfy Know Your Customer (KYC) and Anti-Money Laundering (AML) requirements. Digital ID for individuals and legal entities, combined with e-KYC systems could bolster BMCs as they continue to contend with the impact of the loss of correspondent banking services and mitigate against some of the risks which have triggered the aggressive de-risking policies of major international banks.

Box 2.5: Digitising Fiat Currencies in the Caribbean

Barbados and the Eastern Caribbean

In 2017, Bitt, a Barbadian start-up, introduced mMoney, a Blockchain-based electronic mobile wallet which allows locals to send money to other users and purchase products and services from registered mMoney merchants via their smartphones. The application also allows users to send funds to other mMoney users. The future forward service company plans to satisfy AML and KYC compliance concerns via machine learning and biometrics.

As at September 2018, mMoney supported a network of 300 merchants across Barbados including gas stations, restaurants and select supermarkets and entertainment hotspots. The technological solution is cheaper to use, more secure and more traceable than cash.

Bitt has signed a contract with the Eastern Caribbean Central Bank (ECCB) to pilot and test compliance and transaction monitoring system for KYC, AML and Countering Financing of Terrorism (CFT). The ECCB also collaborated with Bitt to test a Blockchain-issued digital Eastern Caribbean dollar (DXCD). This ECCB pilot will involve a securely minted and issued digital version of the XCD which will be distributed and used by Licensed Financial Institutions and Non-Bank Financial Institutions in the ECCU. The DXCD will be negotiable via smart devices and accepted within all ECCU participating member countries.

Viewed as a frontrunner in the Caribbean's embryonic digital finance ecosystem, Bitt has begun to work with governments and financial institutions on a settlement network to facilitate cross-border payments in the Caribbean.

The Bahamas

In March 2019, the Central Bank of The Bahamas announced its intention to create a digital fiat currency system called Project Sand Dollar. The project is aimed at improving access and cost of financial services across all the islands of The Bahamas but will pilot on the island of Exuma. The central bank will develop and pilot a general purpose, digital version of the Bahamian dollar — that is, with both wholesale and retail applications. Project Sand Dollar will also enhance the digital system before it is deployed nationally.

The digital representation of the Bahamian dollar will be identical to, and not a separate version of the currency. It will align with all of the statutory rules that govern existing liabilities of the Central Bank. The design will also incorporate the best international practices around AML and CFT risks. Anonymity is not a feature. This framework will rely intimately on the national identify infrastructure, when permitting users to hold and exchange digital money. At the onset, it will use KYC and identity features incorporated into the system design, and adopt the wider public identity system as it becomes available.

Sources: Bitt Central Bank Meets Blockchain Conferences (September 2017 and 2018); Invest Barbados 2018; Central Bank of The Bahamas (March 2019)

Digital Payment Infrastructure – Mobile Money

Traditional payment systems pose a challenge to financial inclusion in the Caribbean. According to Li and Wong (2018), challenges to financial inclusion in the Region include physical barriers (distance to a bank branch, poor transportation), eligibility barriers (documentation requirements and literacy) and affordability (minimum balances and fees). Digital finance services enable individuals to use their mobile phones to pay bills, remit funds, deposit cash and make withdrawals, using electronic money.

As at December 2018, at least 10 digital financial services (DFS) were operating across CARICOM (IDB, 2019), either within or outside of the traditional banking system. Several of the DFS' offer mobile wallets services targeting merchant payments, people to people (P2P) transfers and remittances. While there is strong interest in the facility, the Region is still in the infant stage of DFS adoption. Pioneering markets have had to contend with: expensive research and development; nudging central banks and financial regulators to develop policy and supervisory framework; negotiating terms with telecom companies on whose platforms the service depends, but which are also competitors in the space; and planting the seeds of awareness and behaviour change in a population which still prefers to transact with cash. Current policy has retained some cumbersome KYC requirements which reinstate some of the barriers the DFS' are designed to overcome.

Digitisation of Government-to-Person (G2P) Payments

While DFS' are being developed to facilitate commercial activity, governments are also exploring their application to social services. With government as the largest employer in many BMCs, there are efficiencies and savings to be gained by digitisation of government payments such as salaries and social service benefits. The experience of Jamaica in exploring the use of Government-2-Person payments is highlighted in this paper.

Box 2.6: Digitisation of PATH Payments in Jamaica

The Programme of Advancement through Health and Education (PATH) is a Conditional Cash Transfer (CCT) facility established by the Government of Jamaica to assist eligible beneficiaries with healthcare and education. Funds are disbursed bi-monthly to beneficiaries via cheques, distributed by the Ministry of Social Services through the Postal Service and Debit cards administered by the National Commercial Bank (NCB). Of the 375,000 beneficiaries, 91% receive cheques while 9% use debit cards.

Both the GOJ and NCB identified that the process of delivering the payments was inefficient and expensive. The GOJ disclosed that 40 members of staff worked additional hours, six-times per year, for at least seven days. Relatedly, NCB found reconciling the large volume of cheques to be an operational challenge. This is particularly stark in an environment where use of cheques for day to day, small, personal transactions has been on the decline. (Bank of Jamaica). A study conducted by the Caribbean Policy Research Institute (CAPRI) entitled, "Mobile PATH Payments" (2016), highlighted that the per unit cost under a mobile financial payment system was estimated to be 36% cheaper compared to the cheque delivery method. The study also estimated that the investment in the mobile payments infrastructure yielded an operational cost saving of 25% annually, versus savings of 15% based on a debit card payment method. For the service provider, use of the mobile channel for the delivery of PATH benefits increases the bank's customer base.

A pilot was conducted in 2016 using NCB's QUISK mobile money service and in November 2018 the GOJ issued an invitation to service providers to bid for the delivery of electronic payments to PATH beneficiaries.

Sources: Mobile PATH Payments (2016), Jamaica Information Service, Jamaica Gleaner and Advanced Integrated System

Box 2.7: The Barbados Regulatory Sandbox

In October 2018, the Government of Barbados announced the establishment of a regulatory sandbox framework. The nation's two financial regulators, The Central Bank of Barbados (CBB) and the Financial Services Commission (FSC), established the Regulatory Sandbox for financial sector entities to do live testing of their products and services while observing their interaction with the market and guiding its own development of attendant regulations and policies. The ultimate aim is to promote innovation while ensuring the protection of stakeholders and the financial system.

In 2018, Bitt was the first entity recognized and supervised in the sandbox to test their mobile money product, which enables users to send, receive and store digital dollars in registered mMoney merchants (See Bitt Case Study).

This collaboration between the authorities and the private sector is hoped to raise Barbados' international profile as an innovation hub and is likely to attract foreign direct investment in innovative technologies.

Flexible regulatory approaches and policy environment

Growth in digital financial services globally has also brought a series of challenges to regulators and financial supervisors tasked with reducing uncertainty and perceived risks with the adoption of the technology, (IDB, 2018). In response, several countries have opted to create regulatory sandboxes, a tool to mitigate regulatory uncertainty by providing a controlled environment where companies can test their services under the supervision of the regulator. In return, the applicant will incorporate appropriate safeguards.

Sandboxes play two important roles: first, to send a signal that the regulator (and/or country) is open to innovation and, second to provide a forum for regulators to interface with and learn from start-ups especially within an innovation hub, (Alliance for Financial Inclusion, 2018). For Singapore and the UK, established regulatory sandboxes helped them learn and react as technologies evolve[38]. In Japan, the regulatory sandbox under the Ministry of Economy, Trade and Industry (METI) is used to conduct demonstration tests and pilot projects for new technologies and business models that were not envisaged under existing regulations[39].

2.2.3 Digital Technologies and Trade

The digital revolution is impacting the speed, scope, and scale of international trade. It is estimated that digital technologies[40] will add 34 percentage points to trade growth by 2030 on account of lower costs and higher productivity (WTO, 2018). Digital technologies are transforming the way we trade, who trades and what is traded (WTO, 2018). Some of these changes are fuelling growth in e-commerce, led by or the result of consumer habits, improved internet access, new technology, innovation, processes and lower costs. The World Trade Organisation (WTO) estimated that advances in technology have accounted for a 15% reduction in international trade costs between 1996 and 2014. This applies to all trade segments, including MSMEs.

Associated with new technology are challenges and disruptions, including the need for amendments to the regulation of cross-border transactions, measurement and taxation of digital trade.

[38] Regulatory Sandboxes in Latin America and the Caribbean for the Fintech ecosystem and the financial system.
[39] Raffone, Maurizio, Japan's Regulatory Sandbox; medium.com/@maurizio.raffone/japans-regulatory-sandbox-8b552bae889f.
[40] Internet of Things, artificial intelligence, 3D printing and Blockchain.

Box 2.8: A Digital Caribbean Settlements Network

CARICOM Member States do not share a common currency and the fragmented currencies that exist cannot be exchanged directly with one another. This reality results in increased costs related to the settlement of payments for trade. The Multilateral Clearing Facility of the 1970s was an attempt to provide a direct solution to settling trade balance differences between various CARICOM members.

The array of pegged and floating currencies also complicate trade denominated in the various CARICOM currencies. However, the lessons of the failed 1970 multilateral clearing facility suggest that the inner-workings of the solution and strong political-will are key to developing a modern solution that could fulfil this need and assist in creating a less challenging business environment while decreasing the demand for foreign currency to settle trade between member states.

The creation of a single CARICOM currency does not appear to be forthcoming in the immediate future. However, digital technologies may be the source of a solution to the challenge of facilitating currency convertibility in the Caribbean. With digital financial technologies and a multidisciplinary team, a working group committed to spearheading the introduction of a digital multilateral clearing house was launched on April 25, 2019.

The Caribbean Settlement Network (CSN) is a concept based on smart contracts and blockchain technologies. The solution is being engineered to acknowledge the strengths of CARICOM, the diversity of the various currency systems and the richness of the existing trade associations. CSN will be a single network where consumers and financial institutions could clear and settle in local dollars, without having to move hard currencies. Such a solution could also bring additional benefits and facilitate greater integration between CARICOM member states. For example, CSN could assist in providing a missing part of the institutional architecture towards achieving the free movement of capital within the Region.

Source: The Caribbean Settlement Network Working Group (2019): The Proposed Caribbean Settlement Network

Digital trade transactions are broadly categorized according to the nature of these transactions but the measurement of digital trade, still in the infancy stages in many countries, is expected to be influenced by classifications, technology and systems for data sharing and data capture. Hence, the availability of e-commerce statistics varies widely across countries and regions. Global e-commerce is estimated to have reached USD27.7 trillion in 2016, a 43.5% increase from 2012 levels (WTO, 2018). Of this, USD23.9 trillion was business-to-business e-commerce transactions.

Enabling Digital Trade in the Region

Harnessing the benefits of digital trade will require close monitoring and policy responses across areas related to cybersecurity, data and consumer privacy and protection. Difficulties in capturing and measuring digital trade could limit the efficiency and effectiveness of policy design. The main recommendations for advancing digital trade in the Region are related to fostering an environment for innovation and entrepreneurship by: (a) developing regulation and policy; (b) encouraging e-commerce; (c) facilitating digital finance and (d) embedding training in digital skills and literacy. A focused and co-ordinated digital trade agenda at the national and regional levels is needed to comprehensively address issues related to cyber security, fraud and privacy breaches. Other issues related to competition and intellectual property will also have to be addressed. And, addressing these is an imperative for growth as the WTO 2018 report estimates that by investing in ICTs, amending

trade regulations and updating relevant agreements, developing countries' share in global trade could grow from 46% in 2015 to 57% by 2030.

Regulating Digital Trade

Trade rules must be adapted to maximize opportunities and mitigate risks. To date, although there is ongoing work and agreements that are relevant to digital trade, there is no comprehensive agreement at the WTO[41]. More substantive disciplines affecting trade in digital services and goods can be found in the WTO's General Agreement on Trade in Services (GATS); the General Agreement on Tariffs and Trade (GATT); and the Agreement on Trade Related Aspects of Intellectual Property (TRIPS). Other bodies such as WIPO[42] and UNCITRAL[43] have been harmonizing standards in order to facilitate digital trade globally. The UNCITRAL Model Law on Electronic Commerce (MLEC) creates internationally acceptable rules aimed at removing legal obstacles and increasing legal predictability for e-commerce.

At the bilateral and regional levels, rules governing digital trade have advanced faster. This has been achieved through the negotiation of dedicated 'E-Commerce' or 'Digital Trade' chapters in regional trade agreements (RTA). As of May 2017, there were seventy-five notified RTAs – among developed and developing countries – containing explicit e-commerce provisions.[44] Although the precise rules differ, there is convergence around provisions on customs duties elimination, consumer protection, electronic authentication and paperless trading.[45] Rules on data localisation, source codes and cross-border data flows, feature less frequently. At the CARICOM level, including an 'E-Commerce' chapter in an updated Revised Treaty of Chaguaramas will help to advance the discussions on a regional level. Regulatory coherence and integration of regional digital markets for scale optimisation could contribute to reduction in transactions costs.

E-Commerce Development

The Region's readiness for e-commerce is still nascent. Three BMCs were ranked in the 2017 UNCTAD's e-commerce index[46]; Jamaica (53); Trinidad and Tobago (67)[47]; and Haiti (134). Most BMCs have electronic transactions legislation[48], but other factors related to infrastructure, finance, concerns for data security, and technical capacity have contributed in part, to low levels of online transactions. Digital technology usage varies across firms and countries in the Caribbean. Most businesses, particularly micro and small businesses tend to use social media, websites and email for marketing and customer relations. However infrastructure for conducting full end-to-end transactions online remains underdeveloped. Intra-regional e-commerce is also exceedingly low despite new technological developments that create potential for a digital regional settlement network which could make e-payments across the Region less cumbersome, time consuming and costly (See Case Study – A Digital Caribbean Settlement Network, Box 2.6). Digital technologies (discussed in Finance above) can provide innovative solutions to the Region's challenges.

2.2.4 Digital Technologies and Renewable Energy

A doubling of the production of renewable energy by 2030, has the potential to raise global GDP by over one percent, or approximately USD1.3 trillion[49]. This is premised on the ability of digital solutions to improve safety, increase productivity, efficiency, and sustainability of energy systems. As such, Sustainable

[41] The WTO is the multilateral organisation that regulates trade in goods and services for its 164 Members.
[42] Fefer, R. Akhtar, and Morrison, "Digital Trade and U.S. Trade Policy", May 2019.
[43] UNCITRAL, *The Model Law on Electronic Commerce (1996)*, www.uncitral.com.
[44] Jose-Antonio Monteiro and Robert Teh, "Provisions on Electronic Commerce in Regional Trade Agreements," WTO Staff Working Paper, no. ERSD-2017-11 (2017): 4, doi:10.2139/ssrn.3005148.
[45] ICTSD, Updating the Multilateral Rule Book on e-Commerce, (Geneva: International Centre for Trade and Sustainable Development (ICTSD), 2018).
[46] The index measures the readiness of countries to engage in online commerce. This is measured by four indicators related to facilitating the online transaction: internet use penetration, credit card penetration, secure servers per one million inhabitants, and a postal reliability score.
[47] 2016 rank.
[48] Only Suriname and Guyana do not have e-commerce legislation.
[49] IEA, Digitalisation and Energy, 2017.

Development Goal 7, has as its aim, providing universal access to energy by making it more affordable, improving energy efficiency through technology and increasing the share of renewable energy in the global energy mix by 2030. Some countries, such as Denmark, are at the forefront of the transition to green energy, with 43.4% of its energy generated by wind and a target of 50% coverage of energy needs by renewable energy by 2030.[50]

Enabling Digital Innovation in Renewable Energy

According to IDB (2016), smart technologies could lead to about 2.7 million barrels of oil being displaced per year in the Eastern Caribbean alone. However, the competitiveness of the Region continues to be impeded by high energy costs associated with a heavy reliance on imported fuels. Digitalisation presents opportunities to rapidly move to the technological frontier but will require outlay costs that could be a challenge to struggling utility service providers and governments. Nevertheless, there is rewarding return on investment in green energy with the savings to be made in the medium term, and the long term benefits to the environment. With the Region's vulnerabilities to climate change, prioritising digital adoption in the energy sector is crucial. Again, forays will need to be supported by new and amended legislation, regulations and standards.

Regulation, Legislation and Standards

The Caribbean Centre for Renewable Energy and Energy Efficiency (CREE) was established on the recognition that a regional approach to tackling the energy vulnerabilities and competitiveness issues was the most effective way forward. It identifies the inadequacy of current legislative frameworks which are designed for traditional fossil fuels and within its mandate, is addressing: weak execution of sustainable energy policy commitments (e.g. laws, standards, incentives); and developing standard procedures to guide the involvement of Independent Power Producers (IPPs) or Public Private Partnerships (PPPs).

There have been instances of delays in investments and development. In the case of the Geothermal, digital connection project for the Leeward Islands, there is a need for reforms in licencing regimes to allow third parties to sell to power; tariffs, rights to geothermal resources, and land rights for development of geothermal energy. This project also includes a digital component of installing optical fibres to create a network infrastructure among the islands.[51]

Determine an Optimal Innovation Mix

With the abundance of sun, wind, hydro and geothermal power in the Region, regional governments have written strategies and policies aimed at decreasing dependence on fossil fuels (IMF 2016) [52]. While trudging on toward realising these goals, incorporating digital transformation as part of the solution will be necessary. The use of large scale information sets or Big Data to manage energy assets, and advances in and the expansion of the Internet of Things (IoT) increase the ability of energy systems to guide decisions around acquisition of new equipment and software, as well as how to plan for precise and efficient matching of energy supply and demand.

Enhance power-system integration

This new way of organising energy production and distribution, potentially creates better matching between supply and demand. Players in the energy sector have shifted from mostly government control to include, private investors and individuals who return solar generated power to the national grid. With greater connectivity and the potential proliferation of individual energy suppliers, such as consumers with wind farms and rooftop solar systems, the distinction between the traditional energy supplier and the conventional energy consumer will become increasingly blurred (EC, 2018). This phenomenon can encourage increased trade in energy and grid services within and between Caribbean countries.

[50] Danish Ministry of Energy, Utilities and Climate, *Denmark: energy and climate pioneer: Status of the green transition*, 2018.
[51] "Eastern Caribbean: Project Seeks to Develop the Geothermal Potential of the Leeward Islands" http://geothermalresourcescouncil.blogspot.com/2018/10/eastern-caribbean-geothermal.html.
[52] McIntyre, Arnold, El-Ashram, A et al, *Caribbean Energy: Macro-Related Challenges*, IMF Working Paper WP/16/53; March 2016.

Encourage Innovation

With the cost of solar energy equipment becoming cheaper and less risky as an investment, digitalisation can further reduce costs across the solar value chain while fostering greater innovation and entrepreneurship. Satellite mapping and remote design software lowers the cost and decreased the costs and time necessary for customer acquisition and installation design of rooftop solar[53] (EC, 2018). New business models, including peer-to-peer sharing could be encouraged as "a mechanism for growth in the micro and small business sectors."

[53] Ibid, pg 48.

CHAPTER 3: A ROADMAP FOR THE REGION

The digital economy requires a deliberate strategy and action at the national and regional levels. This chapter examines some of the key enablers which could facilitate faster digital transformation in the Region. Policy makers should focus on developing broader strategies and linkages that go beyond ICTs to transitioning towards a more digitally inclusive society. The key recommendations are:

1. Promote digital skills and literacy to ensure that citizens can participate in the digital economy
2. Enhance infrastructure development
3. Strengthen legislation, regulation and data governance
4. Expedite digitalisation of government services

3.1 Introduction

The pace of adaptation and policy responses to the digital revolution will determine the countries which advance or lag behind in the pursuit of digital transformation. The potential benefits of digital transformation are not constrained by the commercial industries which drive local economies, but rather the speed of adoption and adaption of new technologies. Technologies have pervaded every aspect of human economic and social interaction. In many respects, access to internet services has become a basic need and right. For the Region to advance its economic and social development goals, digital transformation has to be embedded within strategies and policies.

Advancement of the digital agenda requires deliberate action plans to allow, at the national and regional levels, integration of systems and programmes which would further strengthen single market and economy objectives. ICT systems that support a single digital identity and secure cross border data flows designed to manage the seamless flow of people, goods, services and information, could accelerate integration and economic efficiencies.

Advancing a national or regional digital transformation agenda is a massive undertaking. Lessons learnt from Regional e-Government initiatives, ongoing for close to two decades, is indicative of the type of effort required. Given the capacity and financial constraints, regional government should, supported by the private sector, development agencies, and industry leaders, seek to share experiences, learn from best practice and collaborate. Participation of wider civil society - NGOs, professional associations, academic and research institutions – are equally important.

The digital revolution is expected to cause widespread disruptions. The regional business landscape,

particularly in commerce and finance, is changing with the adoption of digital platforms. Similarly, the sharing economy creates new opportunities but also pose challenges related to security, standards, and taxation. Job security is among the most imminent at-risk areas. It is estimated that approximately half of all paid activities globally could become automated using robotics and artificial intelligence, (McKinsey Global Institute, 2018). Recognizing the opportunities and threats which new technologies pose, the Region needs to adequately prepare its people and infrastructure while also developing the policy and legislation that will both facilitate and regulate digital transformation.

Given these developments, the discussion needs to broaden, moving away from ICT strategies and platforms, to engage with citizens and stakeholders on a wider, regional digital strategy. That discussion should provide a vision beyond the national to a regional agenda. The strategy requires a triple helix approach of technological integration led by three main change agents:

i. government
ii. industry
iii. academia

If the triple helix is to function effectively, timely and reliable data and analysis, as well as integration of activities across all change agents, are a must to ensure robust policies and evidence-based decision making.

The growth of technological applications in the Region requires that governments strengthen their role as regulators while maintaining their responsibility to supervise the system and enforce legislation and act on any noticed infringements. For industry, as the main agents of production in the economic system, digital transformation is not just about introducing new technology but also redefining the production process. Lastly, academia's role is to generate knowledge and lay the foundation for the transformation agenda. The knowledge generated from academia provides the basis for adopting new technologies through extensive research and evaluation. Academia will also play the critical role of training and skills development of the workforce to enable their participation in the changing labour market.

A coherent approach whereby sector policies, legislation and regulation are aligned with national and regional policies will be important. Some of the immediate areas which should be addressed in a digital strategy include:

1. Digital skills and literacy
2. Infrastructure
3. Legislation, regulation and data governance policy
4. e-Government

3.2 Digital Skills and Literacy

Digital literacy goes beyond internet access and computer literacy to concepts related to network, information, and social media literacy such that digital tools can be used to improve their circumstances. Regionally such initiatives warrant comprehensive education reform which targets: changes to the curriculum from early childhood to tertiary, teacher training, and greater focus on non-traditional, technology-based education. Digital literacy skills among the working population are necessary to ensure an agile and adaptable labour market. Some of the top digital skills and competencies which have been identified for the Region include programming, mobile application development, cybersecurity, big data, and artificial intelligence. Investments and targeted policies should also focus on encouraging greater innovation to help facilitate a digitally induced entrepreneurship culture.

A digital skills toolkit, developed by ITU (2018)[54] outlines a comprehensive roadmap to accelerate digital skills development. The roadmap is divided in two distinct stages of preparing 'getting ready' and implementation of the strategy. Some key elements of the roadmap highlight the need for an integrated approach to national development planning. For instance, defining the main categories of digital skills that the strategy will seek to develop or enhance is premised on the needs that are being addressed. Recognizing that digital skills exist

[54] ITU, 2018, "Digital Skills Toolkit".

on a spectrum from basic, intermediate to advanced; the skills gaps and future expectations in relation to demographic, business and industrial as well as technological trends have to be assessed. For example, the envisioned economic structure for the next 10 to 15 years will determine the type of education and training activities best suited to achieve these objectives in the short to long term.

While a holistic digital skills strategy would take time to be fully realised, immediate considerations could be centred on existing programmes and policies to:

1. Incorporate ICT in the education curriculum from the earliest stages of education and across learning platforms including vocational training and tertiary education;
2. Develop, adapt and deliver literacy programmes targeted towards different groups of workers, and citizens;
3. Provide avenues and incentives for worker retraining and upskilling through financing, public education, and partnerships with the private sector;
4. Facilitate opportunities for innovation and entrepreneurship.

3.3 Infrastructure

Despite advances made in infrastructure development, mobile penetration rates highlight the challenges which still exist in the Region. Some are related to the technology, with large variations in broadband speeds and access cost. Network reliability is important for speed and efficiency of services and businesses, particularly where systems are integrated.

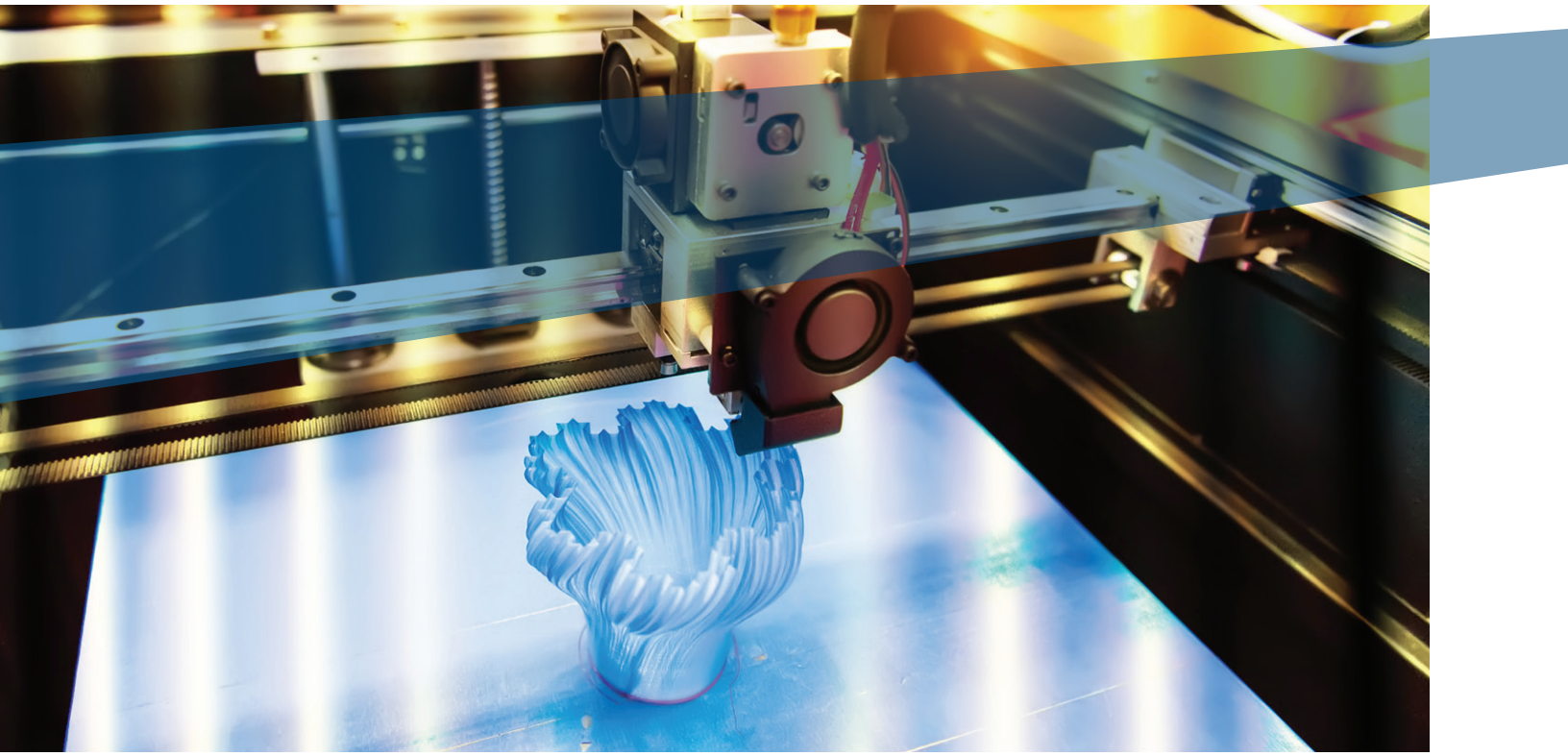
Integration and interoperability among different ministries, departments and agencies will determine effectiveness of e-Government platforms. Affordability of data and electronic devices could be deterrents which could have broader implications for social inclusion. Obtaining services, particularly government services may be hindered if the most vulnerable segments of the population are not in a position to afford basic data services. These factors, could stymie digital transformation.

There is no single best practice or solution to building infrastructure for the digital economy. Infrastructural development issues facing the Region have to be addressed in a focused and strategic manner. These issues are even more acute with considerations for building resilience to climate change, costs, and existing gaps in overall infrastructure development.

According to the CDB (2014) the quality of infrastructure in the Caribbean is inadequate due to aging infrastructure, poor quality of construction, under-investments and poor maintenance over time. Infrastructure rehabilitation and upgrading, while necessary for long term growth and competitiveness, provide an opportunity for policy makers to integrate new and emerging ICT infrastructure into wider infrastructural development plans. The CARCIP Project, supported by the World Bank and in partnership with Digicel, presents an example of how infrastructure development can address the issues of resilience and the growth of the digital economy. The Governments of Saint Vincent and the Grenadines, Saint Lucia, and Grenada have signed contracts with Digicel for the construction of new Government Wide Area Networks (GWANs), educational networks for schools, libraries, and community centres; and a new submarine cable connecting the islands for greater resilience. The system is expected to enable inoperability and connection across homes, schools, government offices, and businesses to each other and the rest of the world by 2020.

As the pace of people and business online connectivity increases and the demand for digital services (including cloud services, machine-to-machine communications (M2M) and the Internet of Things) grows, the volume of digital traffic will exponentially continue to grow. Here are three key recommendations for the adoption of strategic approaches to support this growth are:

1. Foresight, planning, investment and innovation to integrate ICT infrastructure and the digital economy into more comprehensive infrastructure and national development plans;



2. Removal of impediments to the expansion of digital infrastructure; these include the modernization of policies and regulations to encourage investment and innovation throughout the internet ecosystem;

3. Encouragement of public-private partnerships and innovative financing modalities that will foster efficient and expedient infrastructure deployment partnerships.

3.4 Regulation, Legislation and Data Governance

Although there has been progress, the regional regulatory environment remains underdeveloped. Many countries adopt policies but do not fully enforce the required legislation to protect investors and citizens. In some instances, regulation is lagging behind the pace of global technology and business, particularly in areas of e-commerce, finance, digital security, and data protection. Legislative frameworks and policies, across regions, agencies, and departments should foster greater integration; free flow of information; and coherency in treating with issues such as security and data privacy.

Recognising that many Caribbean nations do not have data protection laws, a concerted effort is required to address the need for an enabling environment for the digital economy, particularly in conducting business online. Priority should be given to consumer protection, data protection, cybersecurity, and electronic transactions. Broadening the work that has been done at the regional level on regulation and legislation will contribute to the speed and efficiency of regulating the digital economy. Deloitte, 2018[55] provides key principles to set the foundation for rapid technological change in a timelier manner:

1. Adaptive regulation that responds to a rapidly changing environment through trial and error and co-design mechanism;

2. Regulatory sandboxes or accelerators which allow innovators to experiment with new products and services or new business models without having to follow all standard regulations. This approach is

[55] Deloitte Insights, The Future of Regulation, 2018.

expected to help regulators better understand new technologies and work collaboratively with industry players to develop appropriate rules and regulations for emerging products;

3. Collaborative regulation: Similar to the approach used under the HIPCAR project, multi-stakeholder meetings and interest groups could help with policy guidance, voluntary standards, and regulation which could be adapted easily.

3.5 e-Government

The initiative which is likely to most advance the digital transformation agenda is public sector transformation. In many instances, making it easier for citizens to interface with Government would result in a number of cascading benefits. Improving the business environment and competiveness using digital solutions, such as the electronic single window, e-registration of property, getting permits, and paying taxes, are a few benefits of e-Government. A combination of deliberate policy interventions, perhaps utilizing current e-Government strategies, could contribute to immediate benefits.

Digital identity, similar to the European Union Once Only Principle, promises to be the most significant innovation for regional governments. Electronic identification systems could contribute to more seamless interactions and efficiencies in the provision of government services. But a single digital common identity at the national level and, recognized within the CARICOM space will further strengthen ongoing regional integration efforts.

The once-only principle (OOP) in the CARICOM context is an opportunity for advancing regional integration and the single market. The OOP provides a platform from which citizens and businesses provide diverse data only once to public administrations. Through a well-designed and protected data sharing mechanism, public administration bodies are able to internally share and reuse these data – even across borders. The OOP also has potential to reduce administrative costs. It reduces the transaction costs on both ends as customers spend less time conducting transactions and public entities reform internal processes towards greater efficiency and productivity. Implementation of the OOP across borders is an important component of a forward looking CARICOM strategy towards the realisation of the Digital Single Market.

The Region stands to benefit from adopting a common approach to address specific issues related to the Digital economy. A regional approach could contribute to greater economies of scale and scope from sharing resources and minimising duplication of effort. However, such an approach requires coordination, collaboration, and commitment to realise the desired outcomes.

Further, Caribbean societies should make deliberate efforts to move beyond primarily entertainment and consumption of online content to nurture an entrepreneurship culture that capitalises on the economic benefits of the Internet. These opportunities are however, premised on addressing affordability and access issues and particularly, the digital divide.

Delays in planning, preparing and adapting could have far reaching implications for the Region's competitiveness with potential deleterious impacts on economic and social development.

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