Brief Overview of Cape Verde Digital Strategy

Cape Verde's Digital Strategy (EDCV), being implemented and summarized below, is aligned with the vision adopted in the Government Program for the IX Legislature (2016-2021), [1]:

> *"A connected Cape Verde, with itself and with the world, developed, inclusive, democratic, open to the world, modern, safe, where full employment and full freedom prevail "*

This overview is based on a set of driving factors:

a) political stability, reliability and legal certainty of business activities
b) Participation in the CPLP (people Community) and ECOWAS (regional market)
c) Central position in the Atlantic, at the crossroads of sea and air routes
d) Integrated diaspora in four continents of the Atlantic shores
e) Traditional maker of bridges for the world
f) Growing tourist notoriety
g) Vibrant cultural diversity
h) Ambitious and eager-of-knowledge youth

There are also factors blocking this vision, which should be taken into account in an analysis of Strengths, Weaknesses, Opportunities and Threats (SWOT).

The main instrument of the current government, the Economic Plan for Sustainable Development (PEDS) proposes the establishment of a new model of economic growth based on the concept of "country platform" capable of building in Cape Verde a 'circulating economy, "open to the world and fully inserted in the World Economic System (WES) [2].

The EDCV reassesses the seven "action pillars" of the Strategic Plan for the Information Society (PESI) approved in 2005 by the government of VIII Legislature and in the light of a broader and more updated context, stablishes four strategic axis acting in line with the Cape Verde vision to build a Regional ICT HUB in Cabo Verde [2]:

I. Connectivity
II. Capacity
III. Marketplace
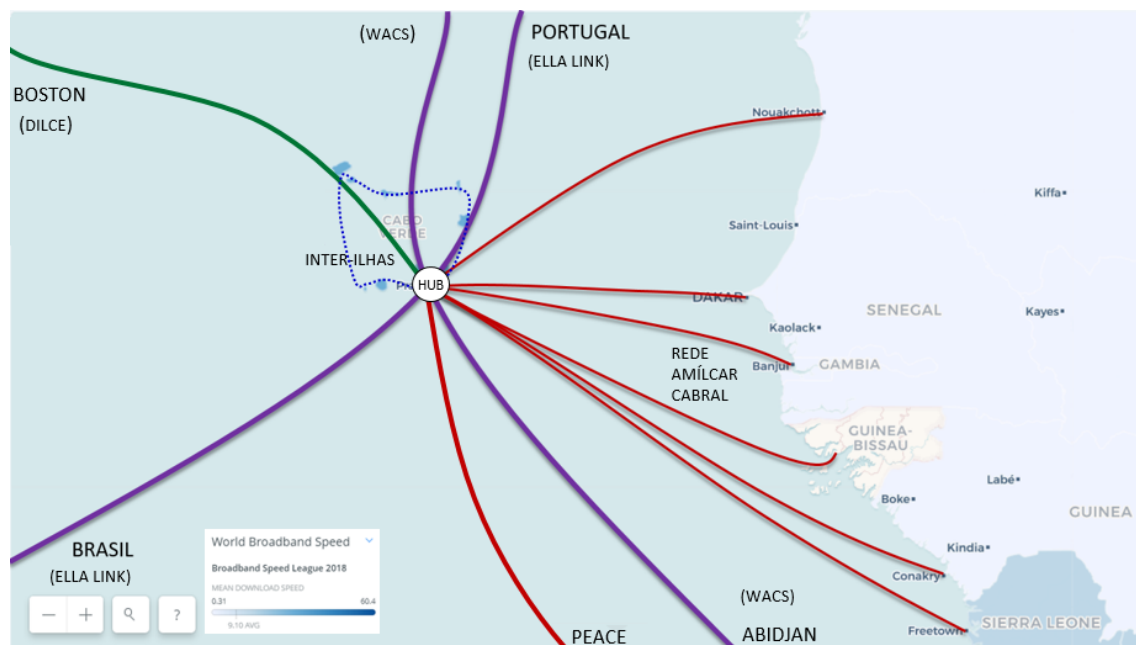IV. Governance

CAPE VERDE AS A REGIONAL ICT HUB

I. CONNECTIVITY

(Fernandes Antonio J - jan2019)

Cape Verde aims to set up a communication network (Internet), consisting of submarine fiber optic cable linking the shores of the Atlantic, with enough bandwidth to support supply of:

a) communication services with the same technological and service level as that the tourist-emitting countries and the countries-recipients of the diaspora;
b) Cloud Services from the Data Centers installed in the country, "infrastructure-as-a-service" (IAAS), "Platform-as-a-service" (PAAS), "software-as-a-service" (SAAS) and "streaming" content "live or on-demand", multi-tenant and high-availability;
c) IP connectivity services to an increasing number of sensors and autonomous communication devices from the IOT
d) Services (wholesale) international connection from and to the capitals of the sub region
e) Securization and redundancy connectivity to "inland" countries in the sub region
f) National and regional IXP installation
g) Internet "peering"

To achieve this goal Cape Verde is preparing to promote Direct Private Sector Investment (IDE) and Public-Private Partnership (PPP) mechanisms in stablishing, exploring and maintaining:

a) Launch of fiber optical cable "Europe Link to Latin America" (EllaLink);
b) Launch of the network "Amílcar Cabral" consisting of fiber optic cables for sub-regional capitals: Nouakchott, Dakar, Banjul, Bissau, Conakry, Freetown and Monrovia (ECOWAS);
c) Connection to the fiber optic cable PEACE, through South Africa and Mozambique (CPLP);
d) Launch of fiber optic cable DILCE between Cape Verde and the United States (Boston);
e) Renewal and implementation of "sub-loops" on the network of fiber-optic inter-island;
f) Building the Data Center of Mindelo (DC3);
g) Data Center Expansion Beach (DC2).

II. TRAINING

(Fernandes Antonio J - jan2019)

"A Cape Verdean citizen of the world "

In the axis of training, the discovery, strengthening and reproduction of talents, strengthening professional skills, research and development of innovative solutions are organized into four phases, to create an increasing sequence of opportunities throughout the delivery cycle of a professional of digital technologies:

a) Technological initiation (IT)
b) Employment and Entrepreneurship (EE)
c) Professional Certification (PC)
d) Research and development (ID)

Research & Development (ID)

"Creating innovative solutions"
Investigate open and non-proprietary technologies and develop innovative solutions desired by regional and global markets

Jobs & Entrepreneurship (EE)

"Land a job or create a business"
Gain professional skills in specific technologies that enhance employability and entrepreneurship (incubators and startup accelerator)

Certification Professional (CP)

"Gurus of technology"
Deepen professional skills in niche technologies to provide expert advice service at the regional and global market

Initiation Technology (IT)

"Changes in this generation "
Start at na early age to use the latest digital technologies, gaining competence and discovering talents

Cape Verde aims to provoke changes in this generation in learning "basic skills" in the field of digital tools with a view to its use in economic and social activities: basic setup and use of technological devices like wearables, smartphones, tablets, laptops, computers, internet, use of social networks and search engines fundamentals, web and mobile coding, robotics, "white hacking" and cybersecurity.

Technological Initiation programs (IT):

- Weblab [13], launched in August 2018 in 44 secondary schools in the country, currently has approximately 6,000 students enrolled in three technology modules.
- Weblab extension to primary schools
- Weblab export to countries of the sub region

Cape Verde aims to develop a critical mass of professional skills in digital technologies, in partnership with manufacturers of technologies, enhancing the professional activity in national and regional emerging market of ICT in the areas of:

a) Installation and maintenance of converged communication networks
b) Data Center management and maintenance

c) System administration, Platforms and Cloud computing
d) Building development platforms, software and mobile applications
e) Cybersecurity

Employment Programs & Entrepreneurship (EE)

- Professional Internship Program for Technology Innovation (PEPIT) [15]
- Startup Incubation Program and Acceleration (PIAS)
- Conversion Professional program for ICT (RPTIC)

Cape Verde aims to ensure a critical mass of professionals in digital technologies in order to transmit the necessary confidence to a national and regional emerging ICT market and put together in partnership with manufacturers of technologies, a Digital Certification and Competence Center (CCCD) to offer the certification service at national and regional professional market

Professional Certification Program (CP)

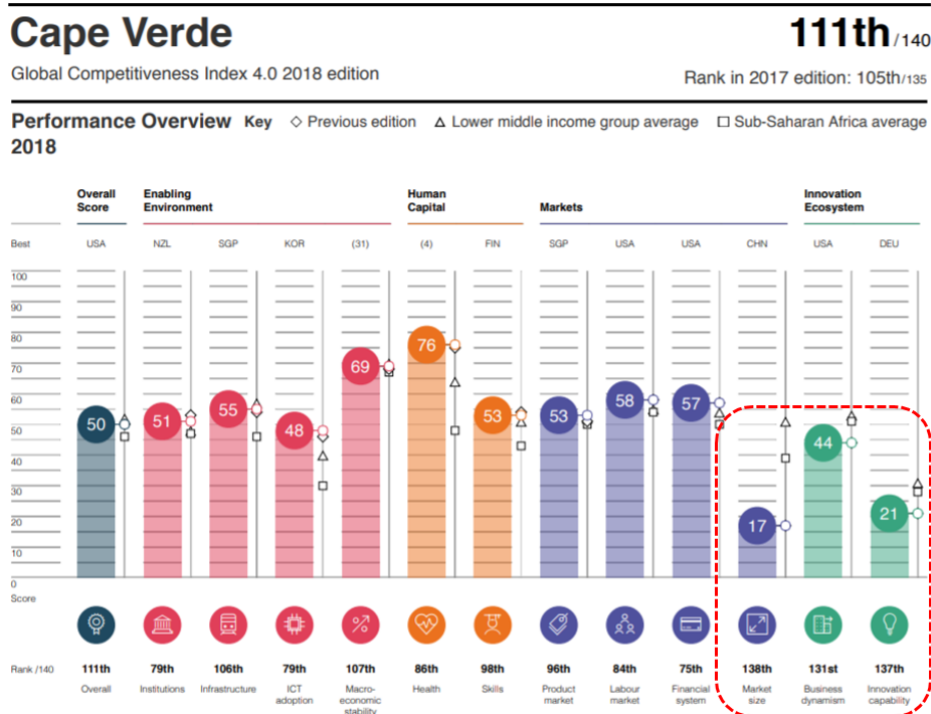- Competence Center for Digital Certification (CCCD)

Cape Verde aims to streamline a critical mass of researchers in open technologies (non-proprietary, open source and open code), in order to create affordable and sustainable alternative solutions to the national and regional markets, and set up in partnership with the academies, a Center Research on open technologies (CITA) to boost research, development and practical application of digital technologies open, looking for innovation and the creation of endogenous capacity in ICT

Research & Development Programs (ID)

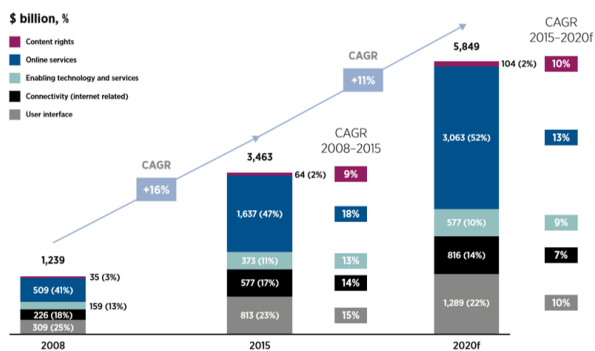- Research Center for Open Technologies (CITA)

III. MARKETPLACE

The size of the domestic market is the main factor that limits the competitiveness of Cape Verde and causes a low economic dynamism and innovation capacity [5] resulting in a high youth unemployment rate. [4]
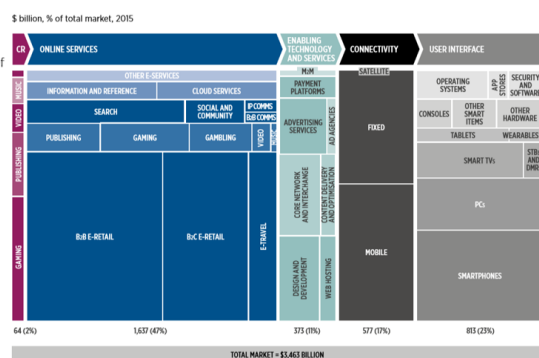

The value of the global ICT market grew from 1.24 in 2008 to 3.5 in 2015 and is estimated at 5.9 trillion USD in 2020, in five distinct segments. [6]

The global ICT market is led by innovation that takes place in the United States, China and some European countries.

The markets of other countries, particularly the national and regional market, are dragged and often "overwhelmed" by the technological dependence and the rentier interests of the main global players in this market.

In Cape Verde, to the size of the domestic ICT market, must be added the market for tourists and the regional market potential (wholesale)[1].

The market for tourists, although relatively small, requires a quality of service, and investments in technology, comparable to that of countries-issuers of tourists, and as such is an important "driver" for the quality of the supply.

The regional market (wholesale) has great potential for growth as the internet penetration rate is still low (average is 17% in 2016), but business risks are high.

Comparing the structure of the value chain in the global ICT market with the Cape Verde market, we can detect strong distortion caused by over 20 years of dominance of one Telco operator (incumbent), resulting in an almost inexisting offer for value added products:
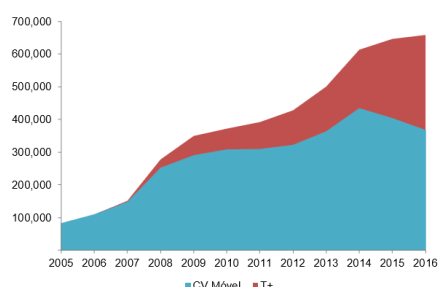
Item	Segmentos da cadeia de valor do mercado das TIC	global TIC	local TIC
1	Serviços online (e-retail, gaming, gambling …)	47%	0%
2	Venda de interfaces de utilizadores (smartphones, PC …)	23%	7%
3	Conectividade (móvel, Internet …)	17%	85%
4	Plataformas (pagamentos, webhosting …)	11%	6%
5	Conteúdo (jogos, video, música …)	2%	2%

It appears that in Cape Verde, there is almost no market for ICT beyond Telecom (ex-Telecom ICT)!

The State Data Center (and DC2 and DC3 under construction) and Private Network State Telecommunications (ComSec), managed by NOSi under Decree-Law 19/2010 of 14 June [8] and the

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[1] Estimation of the local market dimension of ICT service delivery [7]:

Telecom, with two operators, one of the dealership state of the core network assets:

*Source: Calculation of Dr Hern based on data from PTV and ANAC, **RH-5, RH-7, RH-21**.*

- Internal connectivity: 500,000 x (1.3 activity rate) = 650,000 user (permanent assets without "churning")
- Connectivity Tourist: 700,000 tourists x (6.2 days average duration stay / 365 days a year) = 12,000 user
- Regional Connectivity: 6.57 million people x (0.25 wholesale activity rate) = 1,642,500 user

As a precaution it is estimated only the number of people in the regional capital, but the "l'arrière-pays" is 5 x higher

The Average Revenue Per User (ARPU) Average annual estimated at 120 USD for the domestic and tourist market and 25 USD for regional wholesale [7]

CVM Historical Average Revenue per User (CVE/month)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ARPU	2,856	2,571	1,911	1,318	1,123	1,103	1,114	1,062	871	746

*Source: Calculations of Dr Hern based on data from PTV, **RH-21**.*

The total market ICT (annual) is estimated at 140 million USD / year

- online services - incipient
- sale interfaces - 10 million USD / year
- connectivity - 120 million USD / year (Telecom / internal data 80 million USD and 40 million USD Regional wholesale)
- platforms (GovTech and FinTech) - 8 million USD (GovTech 4 million and 3 million FinTech, 1 several commercial)
- content - 2 million USD / year with high potential

The market share of GovTech is ~ 4% breaking the myth that electronic governance "occupies the entire ICT market"

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Provision of Service Protocol [9], are probably best managed within the scope of the new state telecomunications assets to be conceded to the incumbent operator[2].

The capacity of the NOSi-EPE, with an experience of 20 years of work in the niche of electronic governance (added value), will be used to "drive" the creation of ICT market ex-Telecom, together with the private sector, in the following five added value segments:

a) e-Government
b) Cloud
c) Support
d) Online
e) Content

CLOUD
Cloud provider of IAAS and PAAS
Ensure supply of servers (IAAS), Platforms and Content Delivery (PAAS) to support the upgrade, the export of e-GOV, the national startup movement and the provision of content

ONLINE
Web & Mobile Start-ups
Create "channels" to boost startups activity and create a vibrant online "marketplace" segment

E-GOV
Upgrade SAAS e-GOV
Public bid the upgrade of about 100 e-GOV application, using the Builder IGRPweb and interoperability platform PDEX

SUPPORT
Support and Change Management
Ensure support of the e-GOV based customers IGRPweb / PDEX and ongoing training for change management

CONTENT
African culture for a global audience
Boost the market of "ethnic" content production for the Diaspora and the African content market for global audience

Accepting the integration of the Data Center and ComSec in the assets of the new concession of Telecom, there are three scenarios that can be adopted for the use of aggregate experience of NOSi in the ex-Telecom segments:

1. Support employees in startups creation (of time) and the appropriate spin-off of the same, with the gradual "decommissioning" of NOSi;
2. Privatize NOSi as a whole, giving the possibility and supporting workers in the acquisition of up to 49% of the company started to operate only in the segments of e-GOV, Cloud, Support and online.
3. Breakup NOSi in three companies: NOSiCloud, NOSiApps and NOSiAkademia, operating respectively in the segments of the Cloud, e-GOV and online and Support and supporting workers in the acquisition of up to 49% of the company

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[2] Currently the iNOS pay the state an annual income of 1 million USD for lease (concession) of the Data Center and the assets of RTPE network.
The passage of the rental agreement (lease) to another entity, does not affect any of the iNOS activity because it can buy the Hosting and Housing services to the new entity, or rent the Cloud. The assets of the Data Center and ComSec should, however, be passed Dickey with the employment contract of the employees.

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Programs in e-GOV segment:

- Program to Upgrade Applications of electronic Governance (eGAUP) aims to (1) complete the development of IGRPweb [10], to ensure their interoperability and safety and training of private sector players in their use, (2) construction of an API platform store (PDEX) for secure and seamless transaction between database and a visibility repository of state data (OpenData), and (3) to launch public tenders for the upgrade, based on IGRPweb, of about 100 developed electronic governance applications the last 20 years, and new ones:
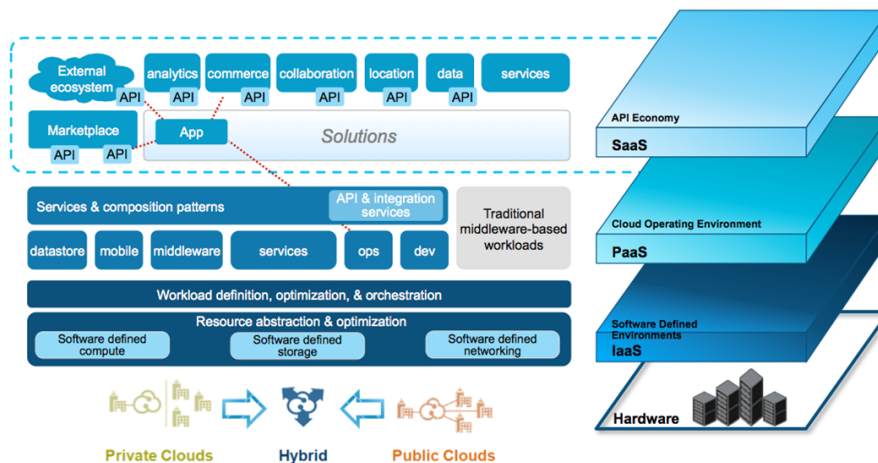

Programs in CLOUD segment:

- NOSICloud project has been maturing within the NOSi and has achieved significant results in the implementation of "containers" in the new infrastructure eGov2, implementation of servers "Kriol" and the passage of "streaming" of the videos of the RTC from the Data Center [14], but still needs consolidation in architecture "Software Defined Environment - SDE":

Programs in Support segment:

- The TICSEED program aims to expand the market ICT for the sub-region, implanting young (seeds) already trained in the Diaspora (host families), to develop the "desire" in customers for the Cloud services, and on-site support.

Programs in On-line segment:

- Incubation programs and Acceleration Startups (PIAS)
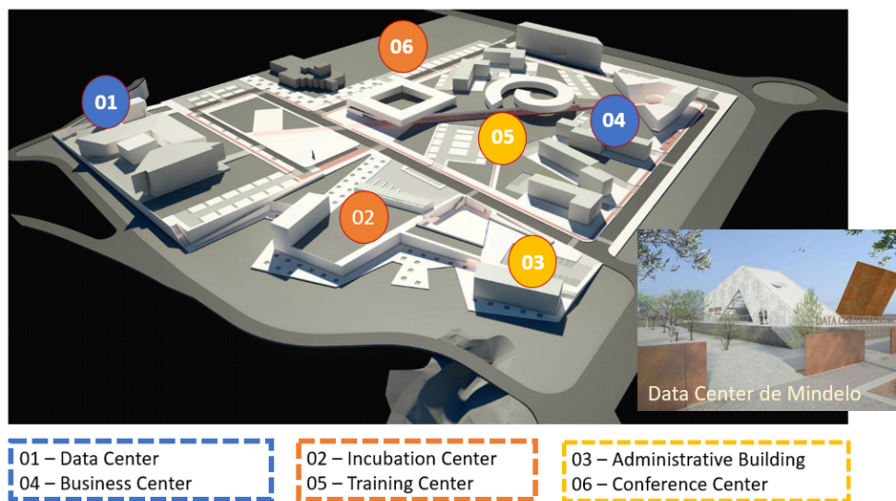
Programs in Content segment:

- content production programs (Rift Valley and Green Studio, Muska, ...)

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IV. GOVERNANCE

The most relevant entities and the important role they play in relation to the ICT market are:

a) **Innovation Directorate General of Telecommunications and** (DNIT) - Contract and supervision of the concession of the Basic Network Assets, Technology Park or other state assets that are keys to the purpose of the implementation of the Cape Verde Digital Strategy, Coordination of National Cybersecurity and implementation of the national CERT [20];

b) **Multisectoral Regulatory Agency for the Economy** (ARME) - Independent Regulatory, Infrastructure Public Key (Root Certification) and management of domain .CV

c) **Technology Park Management Entity** (EGPT) - Promoting and revitalizing programs II and III of training and market, bringing together international partners in new models of financing and public-private partnerships, for "*instead of making, make happen*", in a kind of management of "specialized condominium " where the actors are not part of the Park's management, but they feel good in the Park because they have a" good ecosystem " in which to play their role. [16]

Data Center de Mindelo

| 01 – Data Center | 02 – Incubation Center | 03 – Administrative Building |
| 04 – Business Center | 05 – Training Center | 06 – Conference Center |

The role of the EGPT has been assumed by the NOSi which was also designated as Technological Park Execution Agency (construction), by Resolution No. 22/2016 of March 7 [19], but will gradually move to the new entity as soon as constituted.

The initial sustainability of the Park was ensured through the "Castelon Vale - Brain estate to real estate" program - 42 hectares of contiguous land adjacent to the Technological Park (preventing post-park real estate speculation) and agreement with Camara Municipal da Praia for sale of the Lots and the deposit of the resulting amounts in the account of the Technological Park opened in the Treasury / BCV.

Some projects of the Park were designed and others even started before the end of the construction phase of the Technological Park, in order to guarantee the fluidity of the actions in the "day-after" construction:

- Weblab - Joint Project Technological Park - Ministry of Education
- Castelon Vale - Joint Project Technological Park - Camara Municipal da Praia
- NOSiAkademia - Joint Project of the Technological Park - NOSi
- TICSEED - Joint Technology Park Project – NOSi

Companies created in the process of "decommissioning" of NOSi will be "housed" in the Park at low rental cost. There is also the alternative of NOSiAkademia itself be transformed into the Park Management Entity, with some initial international partnership (coaching).

[END]

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