MASTERPLAN
CURAÇAO INFORMATION SOCIETY

to become the leading information society in the Caribbean,
with a well-developed knowledge economy

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Internet Society

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PREFACE

After 50 years Martin Luther King Jr.'s famous 'I have a dream' speech still manages to move audiences and the simple yet convincing words President Obama recently spoke at its 50th anniversary were equally inspiring. He reminded us all that the work is far from over. Now of course you may wonder what Dr. King's dream has to do with innovation and ICT. At first glance, you would think that his famous speech was about racial equality in the United States, but it is about more than that. It is about us as a human kind not just striving to have more or to be better than our fellow man, but rather for humanity as a whole to become better at being humans. One day at a time. Basically, Martin Luther King was trying to innovate the society of his time.

And as President Obama put the challenges before us, I too strongly believe we can create the future, if we set our minds to it. We can do that by breaking up the bigger complex picture into small fragments.

The Knowlegde Platform Curaçao has expressed its vision – or dream, if you will – for Curaçao to become a proactive information society rather than merely an ICT consuming nation. The key essence of this proposed Masterplan is the notion of Curaçao as a future hub in the global value chain, benefiting socially and economically from a community wide proactive and innovative approach towards ICT. The Knowlegde Platform started in 2008, and since then we have been paving the road towards becoming the regionally integrated ICT-driven hub for knowledge, creativity and innovation in 2025. This deadline may seem far fetched, but just take a moment to think back twelve years, and realize what enormous transformations have taken place in the world's economic arena, and the impact thereof on our small but very internationally dependent society.

We need to ask ourselves what we as individuals and small teams can do to innovate the way we work and live. We can each start to innovate close to home, in our own little micro cosmos: our island, our work environment, our homes. In 2010, Curaçao became an autonomous nation in the Dutch Kingdom. We now have the room to work on our own micro cosmos and pave a clear path for Curaçao to regain and expand its strategic capacity on the macro level in the Caribbean and the Pan-American region.

Information and Communication Technology and solutions have come a long way over the past few decades and there are countless ways in which they can help us to break up the complex picture into manageable fragments. ICT offers countless opportunities for innovation of processes in every single field of our economy and society. It can make healthcare more efficient and more accurate. By saving time, manpower and money, healthcare becomes more accessible to everyone in our community. ICT can greatly improve the service level of our tourist industry, not only by automating processes such as order taking and billing, but also by creating pleasant environments, with the latest in communication and entertainment technology, for our guests to feel at home and to remain constantly connected with their home environment. ICT improves the

way we do business across the globe and specifically this continent. You no longer have to be physically present in a particular place to do your job and you can easily fly in from anywhere, have a quick meeting at the airport with your clients or partners and still run your business back home. But most of all, ICT will open doors to the development of industries that we never imagined possible. Having been a center of trade during several centuries and a key location for the oil-producing industry during the entire 20th century, Curaçao is now entering a next generation of visionary and sustainable development.

This Masterplan Curaçao Information Society is based on three key elements to help create a successful social and economic development. First, it is seeking growth of our economic relevance in the region. Second, it is seeking to provide jobs, education and intellectual stimulation. Third, it is changing the parameters of our current economic pillars, by diversifying our economic pillars from dependency on the hospitality industry and oil refinery towards a future with a more balanced and sustainable mix of industries for generations to come.

I believe knowledge is the key to innovation and creating value. I am convinced that becoming a successful Information Society is essential to creating social and economic prosperity. The Knowledge Platform Curaçao invites you to contribute with your ideas and experiences, to feed the flow and co-create the Information Society of Curaçao, to getting our 'brand' Curaçao ready for business, and to help shape our future.

Maurice Adriaens
Chairman of the Knowlegde Platform Curaçao

MANAGEMENTSUMMARY

Vision: a well-developed knowledge economy
Economies worldwide are becoming increasingly more knowledge-driven. A thorough understanding of the role of technologies that facilitate the accumulation, diffusion and absorption of knowledge is becoming more vital than ever for a country to be innovative. Knowledge has long been recognized as the prime condition for innovation and economic development and growth and academic analysis shows that a country's prosperity is proportional to its development as a knowledge economy.

Curaçao faces unique challenges regarding its ICT diffusion and use. For this reason, it is up to us to create our own ICT or Information Society Masterplan, setting an overall direction and parameters for different areas of activities to address the country's specific needs, identifying areas of priority and including measurable, quantitative results. This way our actions are focussed and there is a broader base for collaboration.

We made this masterplan with our combined vision to set the proposed goals, targets and approach. The Knowledge Platform Curaçao has expressed its vision for Curaçao to become a pro-active information society rather than a mere ICT consuming nation. Therefore, key element of this document is the concept of Curaçao as a future hub in the global value chains, benefiting socially and economically from a community wide pro-active and innovative approach towards ICT. This translates to the following vision on the Information Society:

"Develop Curaçao as an internationally competitive, leading, respected, creative and intelligent society, enabling us to play a leading role in the region. This translates in the goal: In 2019 Curaçao is the leading information society in the Caribbean, with a well-developed knowledge economy."

The Masterplan Information Society: the output of a periodic multi-stakeholder approach
The input for the Masterplan was obtained in several ways and based on a tradition of multi-stakeholder conference meetings:

- In 2009, celebrating "100 years of telecommunication", Bureau Telecommunicatie & Post worked together with the Knowledge Platform Curaçao to organize five open panel discussions (or "Plenchi Habri") followed by the Caribbean Telecommunication Union International Conference. The output of this conference was gathered in the first version of the Masterplan Curaçao Information Society.
- In 2011, Bureau Telecommunicatie en Post and the Knowledge Platform organized a conference named: The road to a successful information society, Connect & Co-operate. With the conclusions of this conference, together with up-to-date policy reports and facts and figures, this this second version of the Masterplan Curaçao Information Society was made.

- In 2013, Bureau Telecommunicatie en Post continued the tradition of organizing a conference program designed to educate and demonstrate the transformative power of ICTs for the development of a knowledge-based economy and society in the Caribbean. The theme, Harnessing the Power of Innovation - the engine for ICT-enabled development, is reflective of the objectives we are achieving. In this conference, held from 9-11 September 2013, highlights of this Masterplan were presented to the broad audience and a call for comments was made explicit to make it even sharper. With the comments that came in, the final version of the Masterplan Information Society v2.0 was drafted.

Scope of this Masterplan

The scope of this Masterplan addresses key areas in the information society. The Knowlegde Platform Curaçao has derived 12 goals in 4 key areas. The first key area is to be able to organize the development of the Information Society and sets a governance framework. Second, our telecommunications and internet infrastructure is recognized as the basis. Third, when we look at the E-persons perspective, we chose to select three major areas as we think these are the foundation blocks of a society: education, health and public services. In the fourth key area, we chose the subjects for a competitive society to let the current economical pillars of Curaçao flourish. This part is added by a rising economical pillar for Curaçao, which is the Content, Media & ICT industry.

Please see below for a summary of the different key areas, divided in four tracks in this Masterplan, with their respective goals. Each goal can be reached by performing the proposed actions that are stated in the different chapters of this Masterplan Information Society.

Track 1: Organizing the development of our information society

We want to bring focus and organize the development of our information society. Therefore, we need to be aware of the state of our Information Society. Next, we improve our information society continuously, structurally, in cycles.

Goals:

1. We are able to measure, calculate, rank and publish the state of the Information Society in Curaçao using the international measurement standard of the ICT Development Index (IDI) by end-of-year 2014 and other relevant international key-performance indicators.
2. We develop a Masterplan Information Society and update this masterplan every 3-4 years, in a multi-stakeholder model. Parties involved take ownership of the respective goals and actions when they fit within their tasks and responsibilities.
3. We are able to orchestrate and organize the development Information Society in Curaçao by founding the Council for the Information Society and the National ICT Institute. These organizations are connected to the sectors and different stakeholders, and fully aware of the needs and opportunities in society.

Track 2: Paving the road with a modern Telecoms and the internet infrastructure
Access to modern technology and infrastructure is a strength of Curaçao. However, the developments in the world in data consuming applications force s us to continue our efforts in organizing higher download speeds, affordable internet connectivity, IPv6 readiness and higher internet penetration. We further pave the digital roads and highways for further development.

Goals:

4. In 2015, 75% of households has broadband internet with at least 10 Mbps download speed. In 2020, the target will be to have 50% of households with 1 Gbps download speed. For mobile, we keep on par with international developments.
5. By 2014, the internet connectivity of Curaçao is IPv6 ready. The government is fully IPv6 capable and all operators of Curaçao can deliver IPv6 connectivity to their clients.

Track 3: Digital welfare in life and work
We can do better in the use of the internet for society purposes. Therefore, we need to address the supply of useful, accessible and available e-Services to attract Curaçao citizens to handle more public services online. Also, the use of ICTs for education and healthcare need to rise, to let our ICT-capabilities help us in our daily lives.

Goals:

6. Make the top-50 most requested government services available online by 2019.
7. Implement a national project to upgrade our education system to the 21st century, to educate the digital competences to the people of Curaçao, so that they can participate fully in the digitalized society.
8. Organize the aggregation of Healthcare Information, make systems work together, implement the Electronic Health Record.
9. Seek out eHealth opportunities with the sector.

Track 4: A competitive and collaborative society
We aim to be an internationally competitive society with help of technology. Therefore, we need to work together from the perspective of 'Curaçao N.V.' and organize our proposition as a country. That way, we will be able to be a competitive society and develop the economic success of our country.

Goals:

10. Get Curaçao on the world map as an ICT business location.
11. Manage the preconditions for e-Commerce, like a centralized and local online payment system, and updating of Curaçao's legal frameworks to support and facilitate the Information Society economy.
12. Have at least 10 percent employementshare of the working population in ICT and creative industries by 2019. That means we need to add 2350 high skilled technical and creative employees extra.

CONTENTS

1 INTRODUCTION

1.1 Process of development of this masterplan

The input for the Masterplan was obtained in several ways. In celebrating “100 years of telecommunication”, Bureau Telecommunicatie & Post worked together with the Knowledge Platform Curaçao to organize five open panel discussions (or “Plenchi Habri”). In October 2009 these parties organized, together with, among others, the Caribbean Telecommunication Union and Stimul-IT the International Conference in Curaçao Information Society, supported by UNA. During this three-day conference representatives of the local sectors Government, Economy & Tourism, Healthcare, Education, Finance/International Trade/Investment, ICT Industry and Telecommunication worked on their strategy, through the use of SWOT-analyses, and/or the formulation of a vision and mission and the inventory and prioritization of necessary activities for their respective sectors. The output of this conference was gathered in the first version of the Masterplan Curaçao Information Society.

In July 2011, Bureau Telecommunicatie en Post and the Knowledge Platform organized a conference named: The road to a successful information society, Connect & Co-operate. The main aim of this conference was to gather people working in various sectors in the community so they could share, discuss and consequently design a plan to make Curaçao an information society visible to all sectors in the community. The conference was divided in 4 sections, beginning with the introduction and opening of the ceremony. Various guests both national and international have given their collaboration trough speeches about their experiences with connectivity, access and content in other countries. Subsequently, people gathered in discussion groups in different tracks each with their own subject, bringing forth innovative and creative ideas on the discussed issues. Then the conference finished with a conclusion of the outcome of all the tracks. With these conclusions, together with up-to-date policy reports and facts and figures, this was the major trigger for the Knowlegde platform to make this next version of the Masterplan Curaçao Information Society.

In 2013, Bureau Telecommunicatie en Post continued the tradition of organizing a conference program designed to educate and demonstrate the transformative power of ICTs for the development of a knowledge-based economy and society in the Caribbean. The theme, Harnessing the Power of Innovation - the engine for ICT-enabled development, is reflective of the objectives we are achieving. In this conference, held from 9-11 September 2013, highlights of this Masterplan were presented to the broad audience and a call for comments was made explicit to make it even sharper.

1.2 Scope of this masterplan

The scope of this Masterplan addresses key areas in the information society. Our telecommunications and internet infrastructure is recognized as the basis. Next, when we look at the E-persons perspective, we chose to select three major areas as we think these are the foundation blocks of a society: education, health and public services. By selecting those, and not

others (like the justice system, or food industry), we try to bring focus in our approach. Next, we chose the subjects for a competitive society to let the current economical pillars of Curaçao flourish. This part is added by a rising economical pillar for Curaçao, which is the Content, Media & ICT industry.

1.3 Organizing vision to action

This Masterplan describes the vision and programme of the Knowlegde Platform, with information and input gathered from a broad, local audience. The Knowlegde Platform is a multi-stakeholder foundation in Curaçao, and an official chapter of the international cooperation of the 'Internet Society' ISOC, where a broad spectrum of businesses and public sector agencies are gathered, like government ministries and agencies, the university, private businesses and associations. In the appendix, all members are stated. In this multi-stakeholder environment, we orchestrate the different actions and work together with stakeholders to meet the goals stated in this masterplan.

1.4 Vision statement

In this Masterplan, we underline the vision for the country of Curaçao:

"By 2025, Curaçao is a country based on good governance, with high quality of life, sustainable socio-economic development and education that is motivating to all citizens to develop themselves and to contribute to the development of their country.".

In addition, the execution of this masterplan will contribute to the economic vision for Curaçao:

"That by 2025 Curaçao is an economy of wealth creators that continuously creates and delivers high value; that is recognized as an important hub in the global value chains; that acts as a multifaceted 'Portal' facilitating international trade; and that through this is able to sustain a high quality of life and collective well-being for its citizens".

This translates to the following vision on the Information Society:

"Develop Curaçao as an internationally competitive, leading, respected, creative and intelligent society, enabling us to play a leading role in the region. This translates in the goal: In 2019 Curaçao is the leading information society in the Caribbean, with a well-developed knowledge economy."

2 SETTING THE AGENDA

2.1 SWOT Analysis

In 2009, a SWOT analysis was performed and incorporated in the first version of the Masterplan Information Society. The input was drawn from monthly panel discussions with stakeholders in "Plenchi Habri", the Conference for the Information Society, and additional social media discussions. We have updated the SWOT analysis for 2013, which serves as a starting point for this document.

This SWOT analysis is used as background information in creating this masterplan:

Strengths	Weaknesses
In addition to the characteristics for Curaçao, namely a stable legal environment, being multi-lingual and our location in Caribbean, the strengths that were identified: • Geographic location giving access to both the Caribbean as Americas • the relatively advanced access to modern technology; • the telecommunication infrastructure and the the diversification of the telecommunication industry; • Number 1 in the region on average download speed • Multilingual community • the will to change and move forward.	As a weaknesses is mentioned: • The geographic location gives access to both the Caribbean as Americas, this is a strength. However, as an island we have to have connectivity to the mainland, especially Miami, United States, as this is the major internet hub. This will add to connectivity costs, as we need the fibre-seacables to Miami and are dependent on the IP transit costs of this connection. • The cost of energy is relatively high. • Curaçao has not enough available and suitably educated technical human resources. • As Curaçao has managed to obtain a modern infrastructure. However, it lacks e-Services in the public sector, healthcare and education to be cost-efficient and productive.
Opportunities	**Threats**
The opportunities focus on the ways ICT can contribute to our economy and society: • Curaçao has the opportunity to establish regional leadership in technology and content creation, and enter new markets, due to the presence of the Internet Exchange and our datacenters like CTEX and e-Commerce park, and a friendly tax regime (e-zones). • To upgrade the local telecommunication infrastructure to a Fiber-to-the-Home (FTTH) network, offering Next Generation services and data communication speeds of Gigabits per second.	• The current digital divide is identified as a threat. There are citizens on Curaçao that are not connected to the internet and therefore lack access to up-to-date knowledge; • Certain political aspects are also mentioned. Curaçao needs a stable government to bring continuity to big-impact and long-term projects. • Strong regional competition. Innovative services are a must to endure international competition. • To implement a timely and cost-efficient migration from IPv4 to IPv6. • Brain drain

2.2 Belief in market forces

The Knowlegde Platform believes in development of the society by market-forces. This adds to the principle used, that we need to organize getting the preconditions right for a booming private sector and hence a booming Information Society. For instance, fast and affordable connectivity and a firm legal system are examples of these preconditions. However, intervention is needed when market forces are not in position to 'upgrade' the situation, like in the public, education and healthcare sectors. These interventions are therefore stated separately (track 3) in this Masterplan Information Society.

2.3 Translating vision into action

We need to translate the Curaçao vision from chapter 1 and conclusions of the SWOT analysis into targets so we are eventually able to propose concrete actions. To cluster the different targets into a readable and understandable structure, we propose the following tracks. This Masterplan follows these tracks, so it consists of track 1 to 4:

1. Organizing the development of our information society.
2. Paving the road with a modern Telecoms and the internet infrastructure
3. Digital welfare in life and work.
4. A competitive and collaborative society

2.4 Track 1: Organizing the development of our information society

We want to bring focus and organize the development of our information society. Therefore, we need to be aware of the state of our Information Society. Next, we improve our information society continuously, structurally, in cycles.

We will discuss this in track 1 of this Masterplan.

2.5 Track 2: Paving the road with a modern Telecoms and the internet infrastructure

Access to modern technology and infrastructure is a strength of Curaçao. However, the developments in the world in data consuming applications force us to continue our efforts in organizing higher download speeds, affordable internet connectivity and higher internet penetration. We further pave the digital roads and highways for further development.

We will discuss this in track 2 of this Masterplan.

2.6 Track 3: Digital welfare in life and work.

We can do better in the use of the internet for society purposes. Therefore, we need to address the supply of useful, accessible and available e-Services to attract Curaçao citizens to handle more public services online. Also, the use of ICTs for education and healthcare need to rise, to let our ICT-capabilities help us in our daily lives.

We will discuss this track 3 of this Masterplan.

2.7 Track 4: A competitive and collaborative society

We aim to be an internationally competitive society with help of technology. Therefore, we need to work together from the perspective of 'Curaçao N.V.' and organize our proposition as a country. That way, we will be able to be a competitive society and develop the economic success of our country.

We will discuss this track 4 of this Masterplan.

2.8 Summary of tracks and targets

This table is a summary of all targets that are proposed. More details of each target, and our proposed actions to meet the targets, are stated in the parts/chapters of this Masterplan. Ofcourse, additional actions can be made which contribute to the realisation of the goals.

Note: All targets should be met by 2019, or otherwise when stated differently.

Track	Targets	Part	Chapter(s)
Track 1: Organizing the development of our information society.	1. We are able to measure, calculate, rank and publish the state of the Information Society in Curaçao using the international measurement standard of the ICT Development Index (IDI) by end-of-year 2014 and other relevant international key-performance indicators. 2. We develop a Masterplan Information Society and update this masterplan every 3-4 years, in a multi-stakeholder model. Parties involved take ownership of the respective goals and actions when they fit within their tasks and responsibilities. 3. We are able to orchestrate and organize the development Information Society in Curaçao by founding the Council for the Information Society and the National ICT Institute. These organizations are connected to the sectors and different stakeholders, and fully aware of the needs and opportunities in society.	1	2, 3, 4
Track 2: Paving the road with a modern	4. In 2015, 75% of households has broadband internet with at least 10	2	5, 6

Telecoms and the internet infrastructure	Mbps download speed. In 2020, the target will be to have 50% of households with 1 Gbps download speed. For mobile, we keep on par with international developments. 5. By 2014, the internet connectivity of Curaçao is IPv6 ready. The government is fully IPv6 capable and all operators of Curaçao can deliver IPv6 connectivity to their clients.		
Track 3: Digital welfare in life and work	6. Make the top-50 most requested government services available online by 2019. 7. Implement a national project to upgrade our education system to the 21st century, to educate the digital competences to the people of Curaçao, so that they can participate fully in the digitalized society. 8. Organize the aggregation of Healthcare Information, make systems work together, implement the EHR 9. Seek out eHealth opportunities with the sector.	3	7, 8, 9
Track 4: A competing society	10. Get Curaçao on the world map as an ICT business location. 11. Manage the preconditions for e-Commerce, like a centralized and local online payment system, and updating of Curaçao's legal frameworks to support and facilitate the Information Society economy. 12. Have at least 10 percent employementshare of the working population in ICT and creative industries by 2019. That means we need to add 2350 high skilled technical and creative employees extra.	4	10, 11, 12, 13

TRACK I: ORGANIZING THE DEVELOPMENT OF OUR INFORMATION SOCIETY

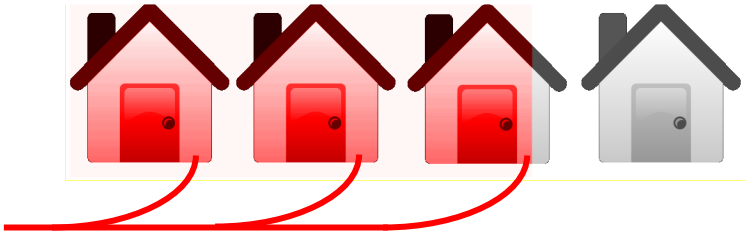
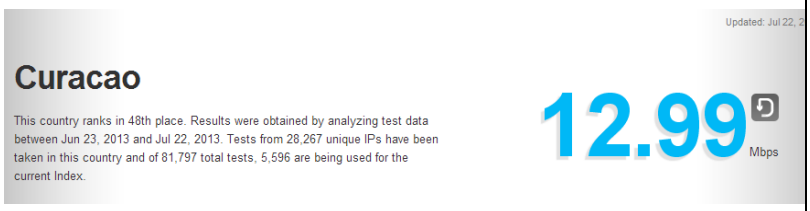
3 MEASURING AND MONITORING THE INFORMATION SOCIETY

3.1 The importance of statistics

According to a well-known World Bank econometrics analysis of 120 countries, for every 10-percentage-point increase in the penetration of broadband services, there is an increase in economic growth of 1.3 percentage points in GDP (Qiang 2009). These figures are averages and based in international analysis, however we need to know what this means for our environment. Since these and other statistics about ICT uptake are rare, it is crucial that we develop a set of standards and procedures based on international guidelines, that enables us to not only identify our relative position in the world, but also enables us to identify the results of our efforts in stimulating the development of Curaçao as an information society.

The question is: We want to be an information society, but how do we know we are one?

Currently known key indicators on the state of the information society are:

	As of end of year 2011, 69% of Households is connected to the internet.[1] The EOY 2011 OECD average of internet penetration in high-income countries was 74,9%[2]. The world average is 46,9%.[3]
	Actual measurements indicate an in average download speed of 13 Mbps. This will rank Curaçao in a top-3 position in the region of South America and the Caribbean, and 48th in the world and nearing the world average of 13,8 Mbps (July 2013). *Source: Ookla speedtest*

[1] Source: Curaçao fixed internet penetration indicators EOY 2011, Bureau Telecommunicatie en Post

[2] OECD, ICT database and Eurostat, Community Survey on ICT usage in households and by individuals, June 2012; and for non-OECD countries: International Telecommunication Union (ITU), World Telecommunication/ICT Indicators 2012 database, June 2012.

[3] ITU, Measuring the Information Society 2012, Annex 3: Access Indicators

Estimated Top-50 position in the World in Price index 'ICT Price Basket'	If we look at the costs of internet, estimates show that Curaçao will rank in a top-50 place in the World EOY 2012.[4]

The International Telecommunication Union (ITU) proposes the ICT Price Basket (IPB). This is a unique global benchmarking tool that provides insightful information on the cost and affordability of telecommunication and information and communication technology (ICT) services. The IPB is composed of three distinct prices – for fixed-telephone, mobile-cellular and fixed-broadband services – and computed as a percentage of countries' average gross national income (GNI) per capita. This puts prices into perspective, and makes it possible to monitor the affordability of ICT services. Prices are also presented in United States dollars (USD) and in purchasing power parity (PPP) terms, but countries are ranked on the basis of the relative cost (or affordability) of ICT services within the country, i.e. as a percentage of GNI per capita.

Recently organizations such as the Bureau Telecommunicatie & Post, the Central Bureau of Statistics and the Ministry of Economic Development through Stimul-IT have recognized the importance of measuring the Information Society and efforts are under way to do this on a regular basis.

3.2 International trends and best-practices

The international society has recognized the need for a reliable and comparable set of ICT indicators and a clear set of guidelines has been developed by, among others, the OECD, the ITU and the United Nations (UNCTAD). Next to current measurements on e.g. Broadband internet penetration, we are interested in ITU's ICT development Index (IDI). The ICT Development Index (IDI) is a composite index combining 11 indicators (in 3 groups), into one benchmark measure that serves to monitor and compare developments in information and communication technology (ICT) across countries:

- The development of ICT in countries and relative to other countries (i.e. track ICT progress over time).
- The level of advancement of ICT in all countries (i.e. the index should be global and reflect changes in both developed and developing worlds).
- The digital divide, i.e. differences among countries with different levels of ICT development.
- The development potential of ICT or the extent to which countries can make use of ICT to enhance growth and development, based on available capabilities and skills.

The ICT development index consists of the following groups (see figure 1).

[4] ICT Price Basket estimates 2012

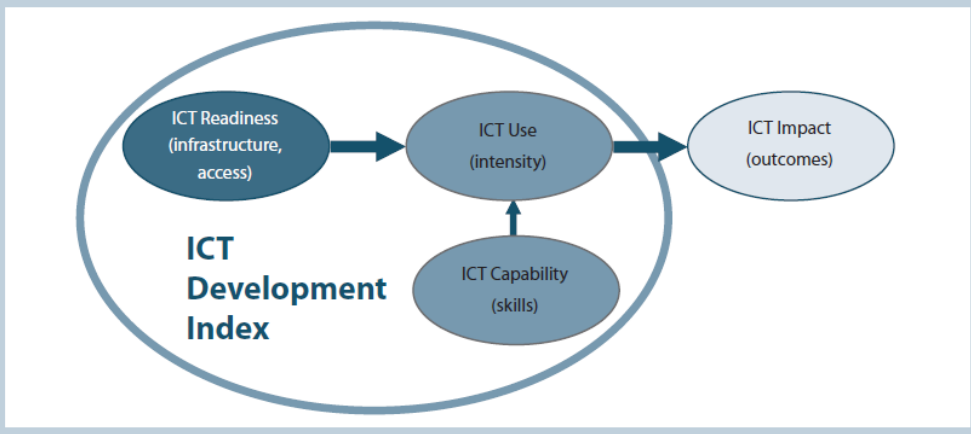


Figure 1: ICT Development Index

3.3 Current state of data collection

In 2010, the Knowledge Platform stated we need the processes and procedures to measure the progress for Curaçao as an Information Society to be in place, enabling strategic decision-making and identification of policy measures and ensuring comparability to international statistics. The measurement system will monitor the following parameters:

- Stage 1: ICT readiness, reflecting the level of networked infrastructure and access to ICT,
- Stage 2: ICT intensity, reflecting the level of use of ICTs in the society,
- Stage 3: ICT capability, reflecting the level of ICT skills in society, and
- Stage 4: ICT impact, reflecting the result of efficient and effective ICT use.

In 2012, BTP developed a standardized questionnaire for Telecom operators & ISP's, based on the input parameters of the IDI and started using this from 2013. Also, a cooperation has been started between the Bureau Telecommuncatie en Post and the Centraal Bureau Statistieken (CBS), to make sure the input parameters for in the IDI stages 1, 2 and 3 are measured. With these data points, the cooperation is able to calculate the IDI. In addition, the ITU will do this for Curaçao and rank us in a list of approximately 160 countries.

Next, Stimul-IT measures the ICT usage at companies every 2-3 years, as from 2002, according to international standards from ITU and UNCTAD, with support from CBS. Last time this measurement was performed was end-of-year 2009.

Looking at the current state of data collection, we made some progress from 2010, but still need to take important steps to measure the Information Society and integrate the measurement in our national system of statistical data collection.

3.4 Targets and actions

In this masterplan, we set the following targets and actions on the subject of Measuring the Information Society:

Id	Targets	Actions
1	We are able to measure, calculate, rank and publish the state of the Information Society in Curaçao using the international measurement standard of the ICT Development Index (IDI) by end-of-year 2014 and other relevant international key-performance indicators.	• Develop a set of basic indicators that will be measured once each year. • Measure the current levels of ICT use at businesses and individuals. • Determine and publish the IDI for Curaçao. • We integrate the measurement of the needed input parameters of the IDI in our national system of statistical data collection by 2015, to be able to follow progress.

4 ORGANIZING THE MULTI-STAKEHOLDER ENVIRONMENT OF THE INFORMATION SOCIETY

4.1 Continuous improvement

As this plan has a long timeframe, large scope and big impact, success can only be met by taking iterative steps. We propose the Deming circle approach, a four-step management method used in business for control and continuous improvement. See figure 2.

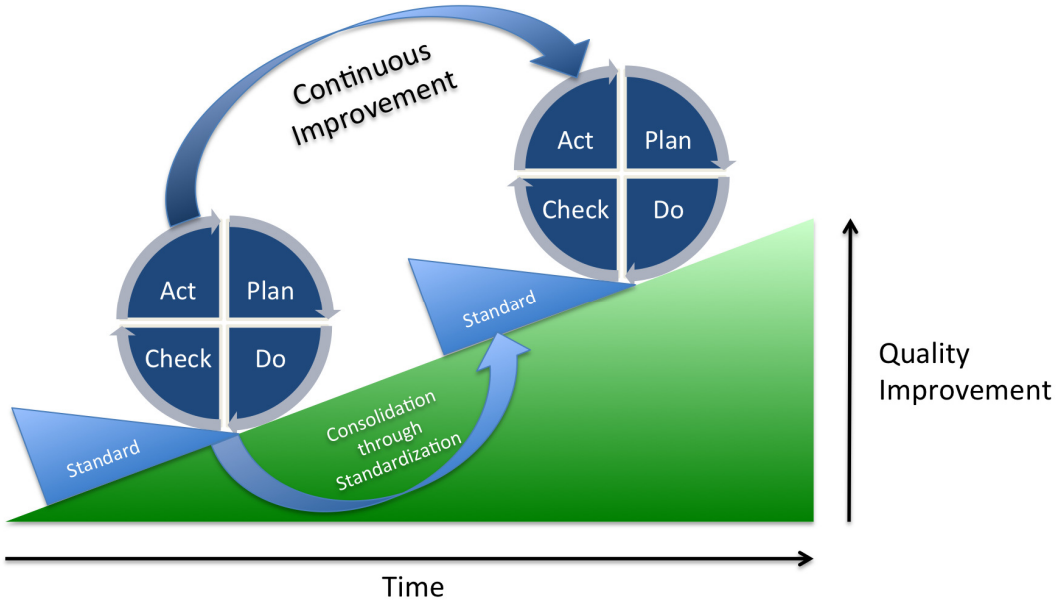


Figure 2: the Deming circle for continuous improvement. For more information visit http://en.wikipedia.org/wiki/PDCA. Picture: Wiki commons.

The Knowlegde Platform Curaçao updates the Masterplan Information Society every 3-4 years, in a multi-stakeholder model. This plan is already the second Masterplan Information Society, and therefore starting the second cycle in the deming circle. The next update is planned in 2016.

The consolidation of the Masterplan Information Society will be arranged by the parties involved, taking Board Level ownership of the respective goals and actions when they fit within their tasks and responsibilities. This Masterplan should also be acknowledged by the government of Curaçao to really fulfil its potential.

4.2 Orchestrating, working together and focus

The Information Society is a multi-stakeholder environment. In it, many players have their influence, like vendors, clients, policy makers, the regulator and government agencies. And ofcourse we have to take into account the different parties in all sectors like education and healthcare, finance. No party can develop the multi-stakeholder environment on its own. It is like

a big orchestra, and it needs some kind or organisation and someone to orchestrate the different musicians to make music. In this multi-stakeholder environment, we orchestrate the different actions and work together with stakeholders to meet the goals stated in this masterplan.

So we need to organize our efforts, so that we can share goals (like developing more e-Services), avoid re-inventing the wheel, and use our energy and money efficiently. But how to orchestrate this field with so many parties?

The Knowlegde Platform Curaçao believes in organising two different tasks and bodies to do this:

1. A Council for the Information Society / Raad voor de Informatiesamenleving
2. A National ICT Institute / Nationaal ICT Instituut

We will now go deeper into these two bodies.

4.3 Council for the Information Society

In other countries like Singapore and the Netherlands, national advisory bodies on the subject of the Information Society are established. In the Netherlands, this body is called 'The Platform voor de Informatiesamenleving'. These bodies are chaired by a person of stature. In the platform, knowlegde is shared and there is a strong cooperation between government, private sector and social organizations, with the goal to develop projects, research and debates. Next, it explains the function of ICTs development for society to the political agenda/area.

The Knowlegde Platform proposes to install an official Council for the Information Society / "Raad voor de Informatiesamenleving" for Curaçao. This proposed Council is an independent but government-recognized body that has a strong knowledge position in ICT and its tentacles spread wide and deep into the society, a rational non-policital local think tank that is able to look the (near) future, setting and reviewing the agenda, internationally connected, initiating multi-stakeholder projects, performing research and organizing debates. The council consists of members from different organizations and has a strong juridical basis. It will advise the Minister President on new developments, and supports where possible on forming of vision.

4.4 National ICT Institute

Within the government, centralised management of policy execution is crucial. As big impact ICT related projects often transcend the Ministerial level, we propose the installation of the National ICT Institute / "Nationaal ICT Instituut". This is a government body that is responsible for policy execution, in a position overlooking all ministries, responsible for the implementation of big-impact projects and programmes, a centralized body overseeing all ICT-developments within the government, performing ICT-governance tasks like demand-management, ICT-architecture, Cybersecurity and project-portfolio management. The chairman of the National ICT Institute is the Chief Information Officer for the country of Curaçao.

This professional organization has the task to propose and execute Information Policy, be responsible for programme management and managing the governance processes and information of these programmes. As technical expert, it will function as advisor and have an opinion on technical solutions, by for example publishing white papers.

Within the government, this institute will be the central point for Information policy. The Information Policy will be updated and sharpened on a regular basis. This will be done in dialogue with the Ministries involved in the policy. Facts, key-performance indicators and impulses from society are the basis of policy making and execution. These are collected and published on a regular basis in quarterly bulletin for the public, which forms the communication channel of the National ICT Institute.

4.5 Targets and actions

In this masterplan, we set the following targets and actions on the subject of organizing the multi-stakeholder environment of the Information Society:

Id	Targets	Actions
2	We develop a Masterplan Information Society and update this masterplan every 3-4 years, in a multi-stakeholder model. Parties involved take ownership of the respective goals and actions when they fit within their tasks and responsibilities.	• Parties involved take ownership of respective goals and actions on Board Level, as also on the level of the Government of Curaçao. • The next update of the Masterplan will be done in 2016.
3	We are able to orchestrate and organize the development Information Society in Curaçao by founding the Raad voor de Informatiesamenleving and het Nationaal ICT Instituut. These organizations are connected to the sectors and different stakeholders, and fully aware of the needs and opportunities in society.	• Installation of the Council for the Information Society • Installation of the National ICT Institute.

TRACK 2: PAVING THE ROAD – DEVELOPING OUR TELECOMS AND INTERNET INFRASTRUCTURE MARKET

For ages, roads and waterways are the most important infrastructure to develop societies by means of transportation and communication. Nowadays, cables and wireless connections are the pathways of the digital era. We need to constantly develop these pathways, as they form the pavement of ICT-enabled economies.

5 The growing potential of our ICT-infrastructure

5.1 Introduction

As enabling platform, broadband can facilitate economic growth and innovation, as vital input for other sectors and thus stimulate the economy as a whole. International studies (e.g. by the World Bank) support the theory that broadband increases productivity and competitiveness and thus contributes to economic growth. The World bank measured that an uptake of 10% extra broadband penetration will stimulate GDP growth by 1,38% (see figure 3). Broadband penetration is defined as the number of households with broadband internet access divided by the total of households in one country.

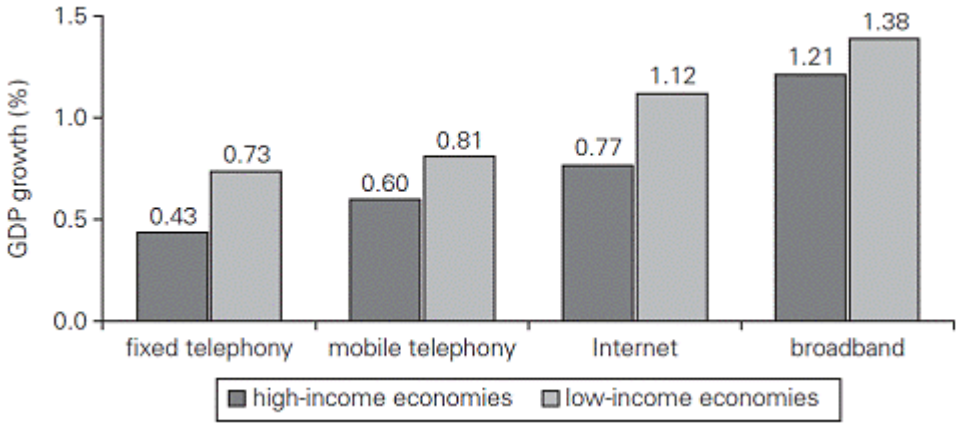


Figure 3. Source: World Bank, Extending Reach and Increasing Impact. Information & Communications Technology for Development, Qiang and Rossotto (2009). Effect of 10% broadband penetration on GDP growth.

Another interesting remark is the subject of job creation. Overall, an evaluation of multiple studies showed that, for every 1,000 additional broadband users, approximately 80 new jobs are created (Almqvist 2010). Broadband enables job creation through three main channels: (1) direct jobs created to deploy the broadband infrastructure, (2) indirect and induced jobs created from this activity, and (3) additional jobs created as a result of broadband network externalities and spillovers (Katz 2009). Each of these channels focuses on a different type of jobs: unskilled, skilled, and highly skilled. Direct jobs relate primarily to civil works and construction of broadband infrastructure, which involve more low-tech positions. Indirect and induced jobs require various levels of skilled workers. However, network effects (that is, spill over) jobs are mainly high-skill jobs requiring specific technical knowledge and education. Indeed, broadband spill over employment effects are not uniform. Instead, they tend to concentrate in service industries, such as financial services or health care. Broadband can also produce some effects in middle-skill jobs, such as in manufacturing, usually related to the use of ICT and requiring ICT skills.

Additionally, although broadband is likely to have overall positive effects on job growth, short-term job losses may result from broadband-enabled improvements in productivity due to process optimization and capital-labour substitution. However, countries have confirmed that broadband creates many more jobs than it displaces in the longer term. For example, a study commissioned by the European Commission found a positive impact on employment in 2006, with net creation of 105,000 jobs throughout Europe due to broadband deployment. (World Bank, Extending Reach and Increasing Impact. Information & Communications Technology for Development, Qiang and Rossotto, 2009)

5.2 Current state of the infrastructure market in Curaçao

The infrastructure in Curaçao consists of the following elements[5]:

1. Network infrastructure: fixed (fibre, adsl, cable), mobile (UMTS, LTE), and wireless (Wi-Fi, Wimax)
2. Access methods (methods of access to the infrastructure of other parties to reach more customers and stimulate competition)
3. Central facilities: datacentres, co-location facilities, internet services, security facilities
4. International connections en (submarine) fibre optic cables
5. Caribbean Internet eXchange (CAR-IX)

A recent report from BTP[6] states that Curaçao made great progress in developing an information society. It states that the infrastructure market is functioning properly. The report draws this conclusion from the fact that there are multiple companies delivering broadband to households, fixed and wireless. And from competition, dataspeeds are up dramatically, retail costs of broadband internet are down dramatically and the internet penetration rates are high: 69% of all households with more than half of the households having broadband internet connection (1,5 Mb/s or higher). If Curaçao will manage to maintain its competitive telecommunications market, this trend is expected to go on further.

The next step to develop Curaçao's infrastructure market is to embrace open access strategies. Because an estimated 50-80%[7] of infrastructure costs are due to passive components (like cables, towers and ducts), sharing these components with other operators can bring down costs dramatically. This is called an open access strategy. Also, with open access, operators have larger coverage area. This way people and businesses have more choices in operators, boosting competition. Enabling open access on fibre optics and last mile connections should be one of the main goals for coming years.

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[5] "De informatiemaatschappij en kenniseconomie van Curaçao", Bureau Telecommunicatie & Post, 2009.

[6] "Het ICT landschap op Curaçao 2012 en verder", Bureau Telecommunicatie & Post, 2012.

[7] Source: Bureau Telecommunicatie en Post. Estimate for France 50-80 %, Singapore 70-80 %

Curaçao is working hard on adding to its ICT-capabilities. With the upcoming CTEX datacenter, next to the existing E-Commerce park and CORE datacenters, Curaçao will have multiple options for e.g. datastorage, cloud solutions, server capacity, and backup-facilities. And with the landing of the new PCCS submarine cable, Curaçao has six (6) submarine cable connections with the Caribbean region and Americas adding to its international broadband capacity. The internet exchange facility AMS-IX Caribbean (recently renamed from CAR-IX) is functioning well, looking at its yearly average throughput of more than 1 GB/s (and rising), a peak throughput of more than 3 Gb/s[8], and caches of big content players like Akamai and Google. This is all good news, as traffic is kept local, cutting international bandwidth and peering costs and adding to a better internet experience for customers due to the lower latency.

5.3 Future demand

Internet access speeds have been raising tremendously, both the speeds required by the services and those delivered by the industry and the service providers. Bandwidth-intensive content and peer-to-peer applications consume the great majority of bandwidth in most broadband networks today. New broadband deployments are commonly justified primarily by today's applications rather than anticipated demands. Streaming video content is considered by many as the ultimate bandwidth-hungry application. When one adds the bandwidth requirements of one high-definition TV stream and Internet browsing, for instance, it may seem that 20- to 25-Mbps bandwidth is sufficient in the long term. But looking historically, the data and projections indicate long-term growth in bandwidth demand that is exponential. Indeed, there are some substantial deployments of 100-Mbps networks going on, and some service providers are already capable of offering 1-Gbps access to residential and business customers today.

The forecast growth in traffic is phenomenal – and it is to a large extent service-driven. Unlike the single-service telecommunications networks of the past, broadband networks provide more than a means of allowing different end users to communicate with each other. Broadband networks support the delivery of a wide range of 'over-the-top' (OTT) services such as on-demand video services, cloud computing or interactive gaming, and provide the conduit between the suppliers of such services and their customers.

In economic terms, this is an interesting and important difference: it is not only end customers but also OTT players who benefit from the connectivity provided by broadband networks, but only the former pay for broadband services whilst the latter do often not make any direct contribution towards the cost of providing the connectivity that allows them to reach their customers.

As shown in the figure 4 below, internet video is the major driver of the growth in consumer internet traffic. Broadband networks are increasingly used for the delivery of long-form video

[8] https://cw.ams-ix.net/technical--2/statistics, July 2013

provided by services such as Netflix rather than short-form Internet video traffic such as video clips on YouTube.

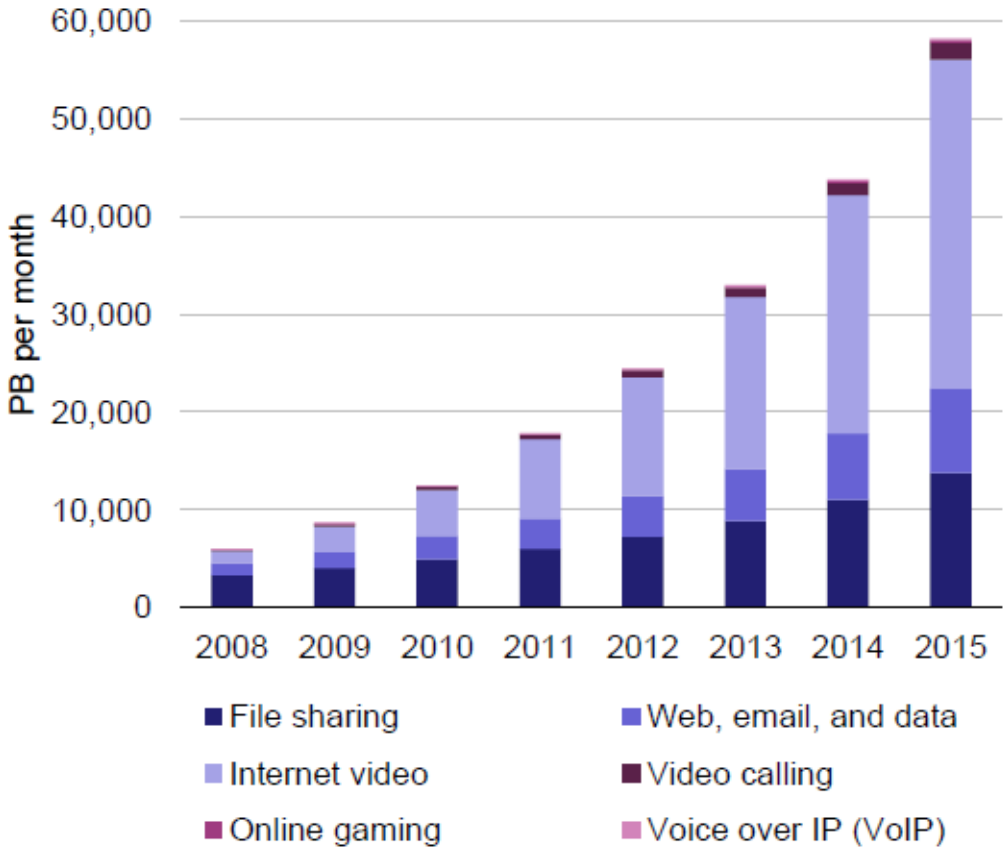

Figure 4: Worldwide Internet traffic generated by different consumer services

Mobile users will also increasingly require higher broadband speeds in order to make most of applications such as video-on-demand streaming, online gaming, cloud computing or other services. Consequently, the development of newer, faster mobile broadband technologies will be a predominant feature of future broadband markets.

Many of these services can now also be delivered over different types of wireless or mobile broadband networks, like LTE and WiMAX technologies driven by 3G and 4G standards. The past few years has been an extraordinary time for the development of information and communication technologies (ICTs) – and with the “mobile miracle” the local Telco’s have brought the benefits of ICTs within reach of every single citizen within our community.

As broadband is a field that’s growing very fast, we need to constantly build knowledge for our economy and society to thrive and evolve into the future. Furthermore, the broadband wireless networks play a vital role in providing high-capacity Broadband Internet access on the move for everyone, everywhere and at any time.

The recent launch of mobile broadband networks and subscribers is helping bring the experience of higher speed, broadband Internet to all corners of our island. The local growth in mobile broadband connections is however not the consequence of poor fixed network infrastructure. With the development of the online App world, changing usage patterns supported by mobile data cards and smartphones, and substantial improvements in mobile technology (most notably the shift towards 4G networks which offer substantially higher data rates) mean that mobile broadband is becoming a strong contender even in our society. See figure 5.

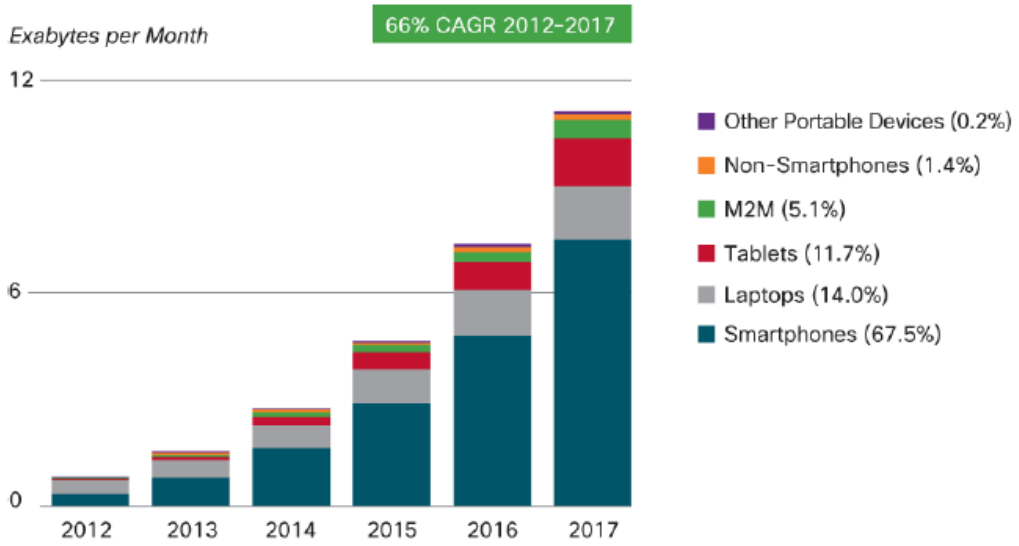

Figure 5: Predicted growth of mobile data traffic

5.4 Targets and actions

In this masterplan, we set the following targets and actions on the subject of developing our ICT-infrastructure

Id	Targets	Actions
4	In 2015, 75% of households has broadband internet with at least 10 Mbps download speed. In 2020, the target will be to have 50% of households with 1 Gbps download speed. For mobile, we keep on par with international developments. See paragraph 3.1 for currently known values.	• Maintain and develop Curaçao 's competitive telecommunications market • Realise open access policy on fibre optic infrastructure and last mile connections • Develop Fiber-to-the-Home(FTTH) networks • Implement 'Long Term Evolution' (4G) technology

6 National transition to IPv6

6.1 Introduction

Bureau Telecommunicatie en Post (BTP) has identified the urgency to address the introduction of Internet Protocol version 6 (IPv6) on a national level. Currently the addressing used in most of the global and local Internet and IP infrastructures is based on IPv4 (version 4). However the numbering capacity of IPv4 is limited to around 4 billion numbers, which although it seems a lot, is due to be exhausted in the coming years. Timely introduction of IPv6 and migration of IPv4 to IPv6 is important to prevent shortage of IPv4 addresses becoming a critical issue for the local economy. Besides providing the necessary address space to allow further growth of Internet connected devices IPv6 also offer functionality benefits for operators and users.

The BTP has developed a draft discussion document titled “A Practical approach for IPv6 Introduction and Migration” (August 2012). This document stipulates the necessary conditions and guidelines for a national transition from IPv4 to IPv6. The IPv6 policy is addressing the necessary steps to be taken by the Government, telecommunication operators and service providers, and local enterprises and organizations. An awareness program has been created consisting of conferences, workshops and consultations over the last few years with international assistance of leader organizations in the Internet domain and IP address management, like the Internet Society, LACNIC, ICANN, and the International Telecommunication Union (ITU). The BTP has created a dedicated portal on its website www.btnp.org with the necessary information and recommendations towards an effective and efficient IPv6 transition for all ICT related sectors of the economy.

6.2 Global developments

The exhaustion of the IPv4 address space has been on the agenda for a long period of time. Until now solutions have been found to reduce the use of Public IP numbers. One of the main mechanisms used has been Network Address Translation (NAT). This allows an Operator to have many subscribers connected on Private IP addresses while using only a few Public IP addresses to communicate with the “outside world”. A similar approach has also been taken in many Local Area Networks (LAN) of Government, Corporate and Business users. Since June 6th 2012 many of the major global websites started offering permanent and standard dual stack IPv4/IPv6 service.

Globally the IP addresses are allocated by the Internet Assigned Numbers Association (IANA). IANA allocates blocks of IP addresses and ASNs to the Regional Internet Registries (RIR’s). The RIR’s are independent, not-for-profit, membership organisations that support the infrastructure of the Internet. The RIR’s distribute the IP Addresses and AS Numbers to their members within their own specific service regions.

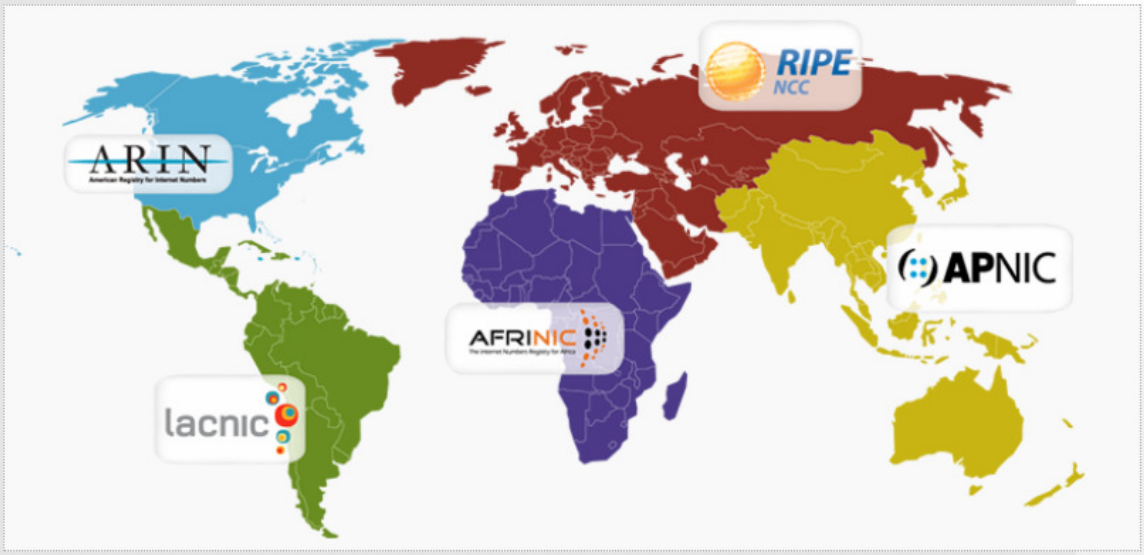

Figure 6: Regional Internet Registries Source: http://www.nro.net/about-the-nro/regional-internet-registries

Each RIR performs a range of critical functions including:

- The reliable and stable allocation of Internet number resources (IPv4, IPv6 and AS Number resources)
- The responsible storage and maintenance of this registration data
- The provision of an open, publicly accessible database where this data can be accessed
- A range of technical and coordination services for the Internet community

All the Regional Internet Registries have issued warnings that the IPv4 address space is due to be exhausted. Several measures are being taken to stimulate the timely deployment of IPv6 and to delay the actual moment of real exhaustion by various actions to recover unused, or inefficiently used, IPv4 address space. Early 2011 the last IPv4 blocks have been allocated by IANA to RIR's. Shortly afterwards also APNIC exhausted the IPv4 number blocks and in September 2012 RIPE was the next RIR to run out of IPv4 number blocks.

The Regional Internet Registry for Latin America and the Caribbean (LACNIC) reports the following depletion of the remaining IPv4 numbers (see figure below). A related analysis by the International Telecommunication Union (ITU) through their "IPv4 Exhaustion Counter" predicts depletion of IPv4 addresses in our region in the second quarter of 2015.

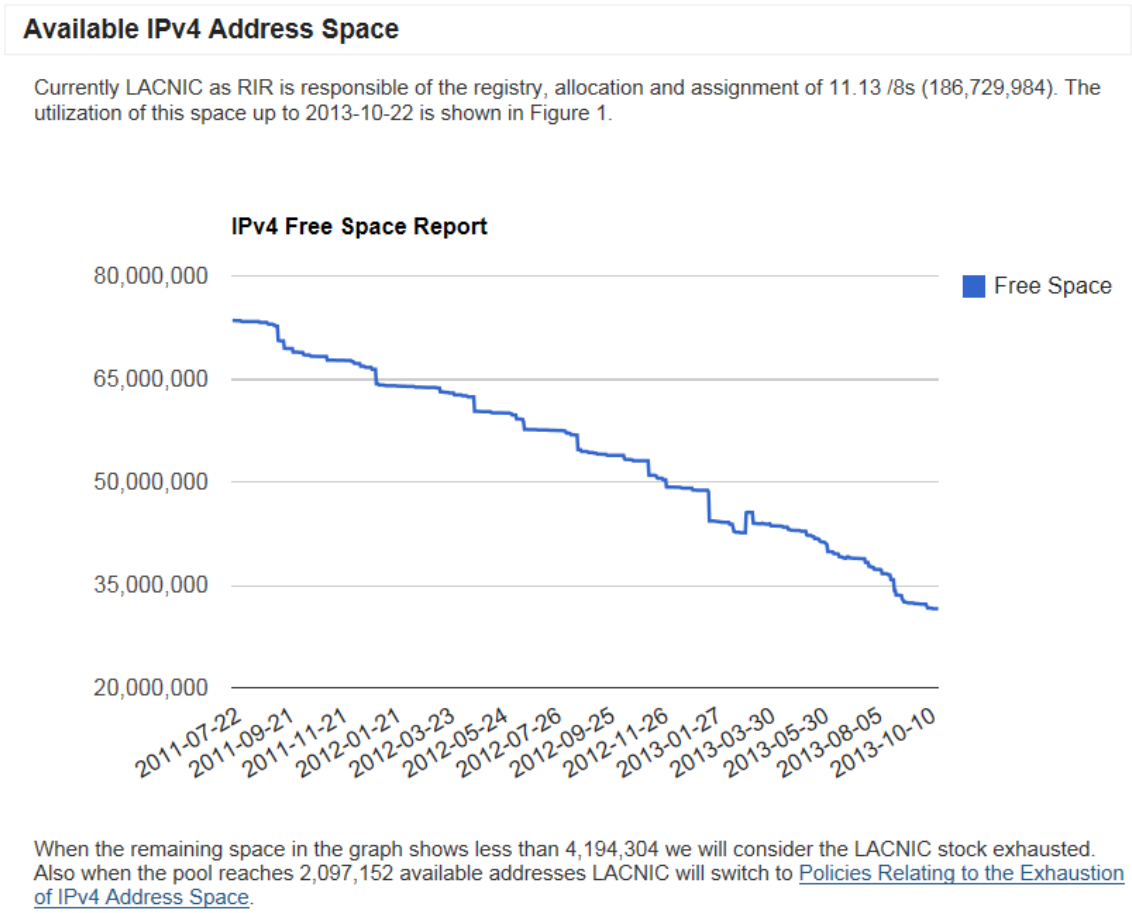

Figure 7: IPv4 depletion graph Source: http://portalipv6.lacnic.net/en/ipv4-depletion-report/

In the BTP report "A Practical approach for IPv6 Introduction and Migration" additional information can be found as a reference on IPv6 transition strategies by the Organisation for Economic Co-operation and Development (OECD), the United States Government, and the European Commission. The main conclusion of the aforementioned strategic approach is that governments should consider to conduct a timely deployment of IPv6 by:

1. Working with the private sector and other stakeholders to increase education and awareness and reduce bottlenecks;
2. Demonstrating Government commitment to adoption of IPv6 by setting the example in the first place. This is accomplished by issuing a Government mandate for all public Departments and Agencies;
3. Pursuing international co-operation and monitoring IPv6 deployment from leading organizations on IP address management.

6.3 Government role: Create awareness, set the example and accelerate IPv6 deployment

The Government, and in particular Bureau Telecommunicatie en Post, must play a major role in creating awareness for the IPv4 exhaustion and the need to deploy IPv6. The necessary steps to be taken are:

- Organise seminars and training programmes for the telecommunication and ICT industry about IPv6 and the need to deploy IPv6, including involvement of the academic world (UNA).

- Assessment of IPv6 readiness of the Operators:
    - Request for Information to all major Operators with respect to when they expect to run out of IPv4 addresses
    - Request for Information to all major Operators with respect to their IPv6 readiness
    - Request for Information with respect to their IPv6 deployment plans

  Based on the results of this information gathering process BTP can assess the readiness of the local telecommunication industry and decide upon the required next steps to prevent the exhaustion of IPv4 causing bottlenecks for the local ICT developments.

- Provide IPv6 information to users with substantial ICT networks:
    - Business users like banks, refinery and ICT companies
    - Government users, all departments, agencies and the education sector (including the University)
    - CICA, the association for ICT companies should play an important role in dissemination

The Government should set the example by becoming IPv6 ready and by providing all Government on-line services not only in IPv4 but also in IPv6. This should be triggered by declaring an official Government mandate to all its Departments and Agencies enforcing adoption of IPv6 technology for their networks, websites and services. Furthermore IPv6 should be considered in all Government framework contracts.

Recommended steps and roadmap to accelerate IPv6 deployment:

November 2013

- Assign an official to lead and coordinate agency planning,
- Complete an inventory of existing routers, switches, and hardware firewalls
- Begin an inventory of all other existing IP compliant devices and technologies

- Begin impact analysis to determine the deployment cost and the operational impacts and risks of migrating to IPv6.

March 2014

- Complete inventory of existing IP compliant devices and technologies not captured in first inventory, and
- Complete impact analysis of deployment costs and operational impacts and risks.
- Provide the completed IPv6 deployment and migration plan

June 2014

- All Departments and Agency infrastructures (network backbones) must be using and supporting IPv6. Agencies will include progress reports on meeting this target date as part of their IPv6 transition strategy

October 2014

- At least 50% of all Internet facing services and websites must be using and supporting IPv6

January 2015

- 100% of all Internet facing services and websites must be using and supporting IPv6
- The Government services should be fully available in IPv6, allowing for new Internet users connected solely by IPv6.

6.4 Operator role: Introduction of IPv6 and migration from IPv4 to IPv6

The telecommunication operators and Internet Service Providers (ISP) play a key role in the introduction of IPv6 in their networks and to offer IPv6 connectivity and services to their end customers.

Recommended steps and roadmap to accelerate IPv6 deployment:

November 2013

- Assign an official to lead and coordinate IPv6 deployment by the Operator
- Complete an inventory of existing routers, switches, and hardware firewalls
- Begin an inventory of all other existing IP compliant devices and technologies
- Begin impact analysis to determine the deployment cost and the operational impacts and risks of migrating to IPv6 and offering IPv6 services parallel to the existing IPv4 services.

March 2014

- Complete inventory of existing IP compliant devices and technologies not captured in first inventory, and
- Provide the completed plan for IPv6 deployment and IPv6 service introduction in 2014.

June 2014, at the latest

- The Operator should be offering initial IPv6 connectivity and services for their broadband access portfolio. This includes both dual-stack (IPv4 and IPv6) users and IPv6 only users

October 2014

- All Internet facing services and websites must be using and supporting IPv6

Current status for as far as known at the date of publication of this report:

- Previously at least two Operators indicated that they are piloting IPv6 and are planning to provide IPv6 services in line with LACNIC timetables for exhaustion of IPv4 numbers.
- The CAR-IX / AMS-IX has been prepared for IPv6 peering. Operators are encouraged to establish peering not only for IPv4 but also for IPv6 at the latest by 2014.

Priority issues for Operators are:

- Specify IPv6 capability in all purchases of ICT equipment and services
- Begin as soon as possible with dual stack CPE's
- Upgrade Operational Support Systems, Business Support Systems and other back office systems to handle both IPv4 and IPv6.
- Apply for IPv6 address space from LACNIC
- Start a pilot project

6.5 A practical approach for business users towards IPv6 implementation

Business users and other organizations should be included in the Government awareness program. Even though IPv6 promises innovations and business opportunities, adoption is still in its infancy. The key to driving adoption of IPv6 is to find new applications that are enabled by it and get businesses to see how these applications can benefit them. The new concept of the "Internet of Things" and "smart objects" brings countless new opportunities as end-to-end services (especially those with mobility features) are critically dependent on a dedicated IP address. The enhanced functionalities and performance characteristics of IPv6 can offer user experiences that are not possible with IPv4, including in the new cloud computing industry. The Government should encourage business users to start early and adopt IPv6 for their networks, ICT services and Internet facing websites, and to explore the new opportunities and value that this newly available standard can bring for them. As network design and IP management systems need to be relooked during the IPv6 transition, it presents a good opportunity for businesses to look out for a new and more efficient operation model.

Practical steps for business users with existing IPv4 numbers:

- Specify IPv6 capability in all purchases of ICT equipment and services
- Acquire IPv6 numbers from LACNIC
- Start a trial to gain experience with IPv6

- Use dual stack capable (IPv4/IPv6) servers
- Upgrade the applications to dual stack, starting with firewalls and network management. Also make sure the company websites are dual stack.
- Upgrade company IP network between locations
- Connect to IPv6 IP Transit/Internet connectivity:
    - Use a dual stack ISP
    - Tunnel (IPv6 over IPv4 tunnel) into a public IPv6 provider if the current ISP does not (yet) offer IPv6 capability.
- Migrate end-users to IPv6. The proxy firewall will have to implement NAT functionality to reach external IPv4 applications/websites.

6.6 Targets and actions

In this masterplan, we set the following targets and actions on the subject of developing our ICT-infrastructure

Id	Targets	Actions
5	By 2014, the internet connectivity of Curaçao is IPv6 ready. The government is fully IPv6 capable and all operators of Curaçao can deliver IPv6 connectivity to their clients.	<u>Government targets</u> • In June 2014, all governmental departments and agency infrastructures (network backbones) must be using and supporting IPv6. Agencies will include progress reports on meeting this target date as part of their IPv6 transition strategy. • In october 2014, at least 50% of all Internet facing services and websites must be using and supporting IPv6. • By January 2015, 100% of all Internet facing services and websites must be using and supporting IPv6. The Government services should be fully available in IPv6, allowing for new Internet users connected solely by IPv6.

		Telecom operator targets • June 2014, at the latest, operators should be offering initial IPv6 connectivity and services for their broadband access portfolio. This includes both dual-stack (IPv4 and IPv6) users and IPv6 only users • In October 2014, all Internet facing services and websites must be using and supporting IPv6.

TRACK 3: THE E-PERSONS PERSPECTIVE: DIGITAL WELFARE IN OUR LIFE AND WORK

In this part we look from a citizens perspective. What are the expectations, and individual challenges of the individual? We call this individual in a digital world: e-person.

7 PUBLIC SERVICES

7.1 Citizen expectations in the 21st century

These days we are all connected to each other by means of the internet, through for example social networks, e-mail, and VOIP solutions like Skype. This translates in the expectation that we also are connected to the public services we use. Especially after reading the vision for 2019 for the government of Curaçao :

“In 2019 the government of Curaçao will be a knowledge driven interconnected society which provides optimal service to its citizens and society as a whole, while serving as a role model and driver for sustainable continuous innovation and prosperity.”

As a citizen, we translate this into some implicit and explicit expectations, fuelled by international experiences and benchmarks. To name a top-5, we expect that:

1. The government uses digital tools and systems to provide online e-Services to citizens and businesses;
2. If the government asks for information, it will ask for it once (and use it multiple times internally when needed within legal boundaries;
3. The government takes serious effort on data protection, privacy and is on time with financial transactions;
4. The government stimulates entrepreneurship by publishing 'open data' on data it already harvests with public money, is not privacy sensible and is interesting for the public;
5. The government will strengthen democracy by being accountable and transparent, publishing it's actions and achievements, the spending of public money and embraces public participation in policy making processes.

The government is already trying to meet some of these expectations, for example in the project 'Stelsel van Kern- en Basisregistraties' and the foundation of the 'College Bescherming Persoonsgegevens'.

7.2 Giving priority on eGovernment in Curaçao

Worldwide, eGovernment is becoming more and more important in the interaction between citizens and governments. Mostly forced by citizens demand for quality, speed at lower costs, eGovernment can stimulate efficiency in working processes, shorten waiting times and human resources. Universal and clear access to the government is strengthened.

Giving priority to this subject is crucial to transform Curaçao to a mature Information Society. Therefore, Curaçao needs a national digital agenda (which this Masterplan can fulfil the basis), as are the installations of execution offices like the National ICT Institute to coordinate the different initiatives. The supply of eGovernment e-Services is still in its infancy, with the ambition to expand. For example:

"Bentana di informashon"
The information center of the Government of Curaçao is responsible for informing about government policy and be the central point for services and products from the Government. The possibility to make appointments for arranging services and products already exists by phone, however, full digitalisation of services is on the agenda, with the goal to efficiently supply services to citizens.

"Elektronisch vergunningenloket"
The digitalization of requests, approval and management for handing out permits is already on its way. Citizens and businesses will be able to electronically request a permit and receive one digitally. More and more permits will be available through this, eventually digital, front-office.

"Basisregistratie"
The "Ministerie van Bestuur, Planning & Dienstverlening" is working on a centralised digitalisation, interfacing and matching of government core data.

"Elektronische belastingaangifte"
The Ministry of Finance is working on a project to provide the possibility for digital declaration of taxes.

Other relevant projects in eGovernment are the "Intranet project", "Meldkamersysteem", "GIS projects" and the "Online cashregister". Although we applaud to these different examples of eGovernment rollouts, we think that most of these projects are bottum-up projects. Sometimes, the focus of projects is having the backoffice managed efficiently, instead of adding e-Services to citizens and businesses in the front-office. Furthermore, there is a need for government wide management of the different eGovernment projects. In our opinion, eGovernment could have an even more prominent place on the agenda. The government needs to lead by example.

7.3 Our proposal: an e-Services programme

The Government of Curaçao has launched a new website in the new top-domain of Curaçao, www.gobeirno.cw. On this site, only limited digital services are supplied. And those services which are supplied, give only information *about* the service (like *how* to arrange a change of address), but the actual e-Service is not supplied.

The digitalisation of services comes often with updating and digitalizing the processes in the back-office. Also on Curaçao, this issue is there and it cloud slow down the addition of front-office e-Services. The argument here is that if the government will digitalize the front-office, but not the back-office, there is no improvement in providing a service.

Although we can understand this argument, we believe we cannot wait any longer for e-Services. Firstly, because upgrading the back-office is not as visible as upgrading the front-office, and we believe in an incremental approach. Secondly, we see many services that do not stress the

upgrade of the back-office too much. As a figure of speech: If filling out a webform will lead to a print-out document with the necessary information for the back-office, and that can be handled in the 'old' back-office process, we see that as progress.

Therefore, we propose an incremental strategy for the addition of e-Services with a bottom-up approach. Specific existing services are being identified that can easily be digitalized as an e-Service. We accept that the back-office will not be optimized, and explain this to the user to sooth his or hers expectation. As the TAC report[9] states: "The Government must provide and explicit the overall long-term direction that the reform process aims at achieving, and must indicate what is the right level of ambition. It should be ready to adopt an incremental approach, and be able to implement very rapidly the parts of the reforms which have so-called « low hanging fruits », in order to build support for the whole long-term process."

In this e-Services programme, we look for governmental bodies where there is the will and momentum to digitally supply its service, to eventually reach the following results:

1. An individual digital environment for citizens and businesses, where governmental e-Services are provided;
2. From the website of the government (www.gobiernu.cw), products and services are being delivered online. The website will be an additional channel in interacting with citizens and businesses, next to the telephony channel and 'het loket';
3. Good candidates for digitalization are bulk, non-complex requests, like changing your street address, or a request for a new driver's license.
4. 80% of all digital requests should be handled by an automated, prescribed procedure, with a clear process, and within a prescribed timeframe (like 6 weeks).
5. When a citizen of business is using the e-Service, it will be clear what process will happen and when to expect an answer.

Starting point is that projects that have a direct positive impact on services to citizens and business, and improve customer experience, get priority. This way, money spent on ICTs has always a direct impact on the society. This asks from different government bodies to see take its output (product or service). Quality impulses always need to have a direct positive impact on the society of Curaçao.

The Knowlegde Platform proposes to digitalize the following e-Services:

- Insight in applicable 'Landsverordeningen'
- Making appointments with different government bodies, like Kranshi or 'Keurlokaal' of vehicles.
- Giving electronic status updates on procedures

[9] Strategies for sustainable long term economic cevelopment in Curaçao, Thierry Apoteker Consultancy (TAC)

- Immigration cards
- Paying road taxes online with the help of CRS and Nieuwe Post
- Prolongation of the driver's license
- Income tax
- Insight and application of SVB dossiers for businesses
- Application for permits

7.4 A near-future precondition for eGovernment: Digital Identification

In our vision, it is vital to start with a generic digital identification mechanism for citizens, to be able to identify themselves online at all governmental institutions. This governmental 'username and password', added with security measures, is a near-future precondition for transactional e-Services. Transactional e-Services are services where a citizen can make a fully-digital formal transaction with the government. Persons have to identify themselves online, as in 'real-life' they do with their passport or identification card. Our advice is to start investigating the introduction of such digital identification mechanism, to be aware of its costs, preconditions and implementation timeframe.

After having a digital identification mechanism, the website www.gobiernu.cw can really fulfil its potential to be a portal for the whole government, where more and more e-Services are being delivered.

7.5 Other important projects and initiatives for a modern government

We think the government should take action on the following other important projects:

1. Stelsel van Kern- en Basisregistraties: the government should be able to connect different databases, so it doesn't have to ask for information it already has.
2. By adding e-Services, there is more exposure to cyber safety incidents. There should be attention for cybersecurity, so both technical and organizational measures should be taken. A quickscan information security and the installation of a Chief Information Security Officer are good starting points for this.
3. Legal issues; especially on privacy and intellectual property. See paragraph 9.5.
4. Stimulate entrepreneurship by supplying Open data. This is public data that is not only interesting for the government. The creative sector may use GIS or meteorological data for example app building.
5. Strengthen democracy through ICT, starting with a dashboard for budget expenditure like the city of the Hague does here: www.ictdashboarddenhaag.nl or the Whitehouse does here: www.itdashboard.gov.

7.6 ICT Governance within the government

One of the leading forces behind ICT innovation and developments in many countries should be the government sector. The government of Curaçao is very well aware of the importance in reaching the status of Information Society. But in doing so, it requires some fundamental changes including transitioning into a more flexible entity with a proactive attitude towards change, but

mostly: organizing this change. With all the challenges that the government faces every day, the realization of an e-government policy will stimulate efficiency of their operations by reducing costs and improving service. ICT should be represented on all levels of the new government organization. We need at least the following functions in ICT-governance:

1. Policy (initiatives & debates, political action, policy proposal)
2. Project management (policy proposal, project plan, make-or-buy, implementation & end product)
3. ICT-management (end product, implementation in live environment)
4. ICT-application development (mostly outsourced to the market)

For more information how we see this, see paragraph 4.4.

7.7 Targets and actions

In this masterplan, we set the following targets and actions on the subject of public services:

Id	Targets	Actions
6	Make the top-50 most requested government services available online by 2019.	• Start a programme e-Services • Do research on how to implement a Digital ID for the Citizens of Curaçao , develop and implement this. • Implement other high impact eGovernment projects, like the project 'Basisregistraties'.

8 Education

8.1 The education system needs a full upgrade

The TAC rapport states regarding the social dimension of development, the [TAC] study confirms two well-known issues facing Curaçao:

- Significant brain drain of its qualified personnel and an expression of a desire to move abroad by a large part of the country's youth;
- Relatively high levels of youth unemployment, estimated in the vicinity of 25% of its youth working population.

These two critical social issues are directly related to low economic growth and inadequate functioning of the overall education and training system. This is also reflected by the parallel shortage of skilled labour. It is found also that despite relatively large spending on the education system, the drop-out rate from secondary school remains high. Overall, the education system is not responsive to the needs of the island in general and of employers in particular.

The TAC report gives the advice to renovate the education system, so as to ensure that all children are literate and sensitized to culture, all teenagers possess good analytical capacities and professional skills, are trained to be diligent, are sensitized to business culture and business administration, are fully proficient in at least three official languages, i.e., English, Dutch and Spanish, and develop strong emotional feelings for the art and culture of their country, the Caribbean and Latin American countries, as part of their heritage. Reforms should aim at substantially lowering the drop-out rate.

8.2 Digital literacy skills

Reading, writing and arithmetic were to yesterday's labour market what *digital literacy* is to todays. The young generation of Curaçao, but also workers and citizens, need to be able to equip themselves with the skills needed to meet 21st century challenges. We must update the learning tools that carried our system through the 20th century and get it up to par with the 21st.

But the integrated use of ICT in education is more than just the replacement of pen and paper. It offers the unique possibility to adapt itself to the needs and preferred learning styles of the students. ICT is a key lever to learn better and more efficiently, think creatively, innovate, engage with, and solve complex problems and access wider and up-to-date knowledge. ICT provides school pupils, university students, employees, professionals and life-long learners with accessible and flexible learning opportunities through rich learning experiences. This makes learning exciting. Also, this way it is empowering learners to manage their own way of learning, while providing organisations with better tools to integrate learning in work processes, and improve time to competency and faster time to market. ICT takes learning beyond the traditional classroom setting to online and mobile environments that are available 24/7.

8.3 Student profile and how they learn

The kids of nowadays are digital kids. It is the age of multi-everything (for example multifunctionality, multitasking etc.) and instant gratification. If you want information, you can just Google it. There is interaction all the time and everywhere. Knowledge is changing at a fast pace, not even textbooks can keep up. 1 week issues of New York Times contain a lifetime of information compared to the 18th century.

We see more and more that students have the opinion that “school is boring” and “school is not cool”. This mainly has to do with:

1. Dull pedagogy;
2. What is the relevance of the content?
3. What about skills and attitudes?

Furthermore, students tend to be more technology savvy then their teachers, while teachers struggle to find ways and connect to them and challenge them. The gap between a student’s daily life and the school environment is getting bigger every day.

8.4 International trends and best-practices

We identified some international trends during our conferences that we need to be aware of when shaping our education system. Education is already a global activity. Students will have the capacity to learn more outside of the school building itself. For example, there are free online colleges available from top-notch universities like Massachusetts Institute of Technology (MIT).

Internet will help teachers share different ways of teaching. Digitalized education will ensure that students receive the same or even better education then the traditional way. Examples of international trends:

1. Social learning. Social learning is learning about how to collaborate and share via social and new media. People learn through specialized platforms and communities like Wiki's, Weblogs, YouTube. Often this kind of learning is empathized by mobile devices like tablets and smartphones.
2. Video and 3D-movies will have a bigger role in the way kids are taught. For example, youngsters are making a movie on a particular subject and showcasing it to a group through YouTube, and the group will comment on the video giving the makers instant feedback.
3. Gamification in learning. In gamification, teachers add game elements like achievements, levels, badges and online leaderbords, to influence human behaviour to the benefit of learning. It uses psychological principles like rewards, curiosity, empathy and competition to add to the experience of learning.

Parents need to be able to supervise the behaviour and results of their children. As children live more and more in an online-community, parents still need a looking glass into this world and keep up with the digital world with all its opportunities and threats.

These trends do not mean the traditional way of learning must come to an end. We think learning will be a combination of formal (organised) and informal (self-study) learning, in a blend of 'with ICT' and 'without ICT', where we set the learning goals on a country-level. It does however mean that the formal education system should strive to incorporate digital education methods into the system. This will not only benefit the alignment with the interests of the students, it will also ensure a better alignment with the job market and ultimately also safe a considerable amount of money.

When we look at best-practices, we see in a country like Singapore that the curricula of schools and training of teachers are coordinated on a national level. This will lead to the integration of new information sources for the education system. Singapore's goal is to reduce workload for teachers, develop basic ICT skills for youngsters, and interact more between schools.

In Trinidad & Tobago, a Technology Center is deployed, that will facilitate trainees from different technological industries in combination with other youth development programmes from the government. Trainees have access to literature, laboratories, classrooms and a multi-purpose innovation hall.

In Curaçao several , mostly isolated, efforts have been made towards the introduction of ICT in the education system, for example:

- A pilot ran from 2010-2012 with the ‘One Laptop per Child’ Laptop on the Prins Bernhard School;
- The RKCS schoolboard has introduced digital whiteboards in all classrooms;
- The RKCS Schoolboard is currently preparing for the realization of a Digital Fabrication Lab;
- The “Grassroots Curaçao” project has published an “inspiration book” with examples of ICT projects and activities in the classrooms in Curaçao;
- the International School starts with iPad programs in the year 2013-2014 (see picture 6). We see this practice becoming more and more common internationally.

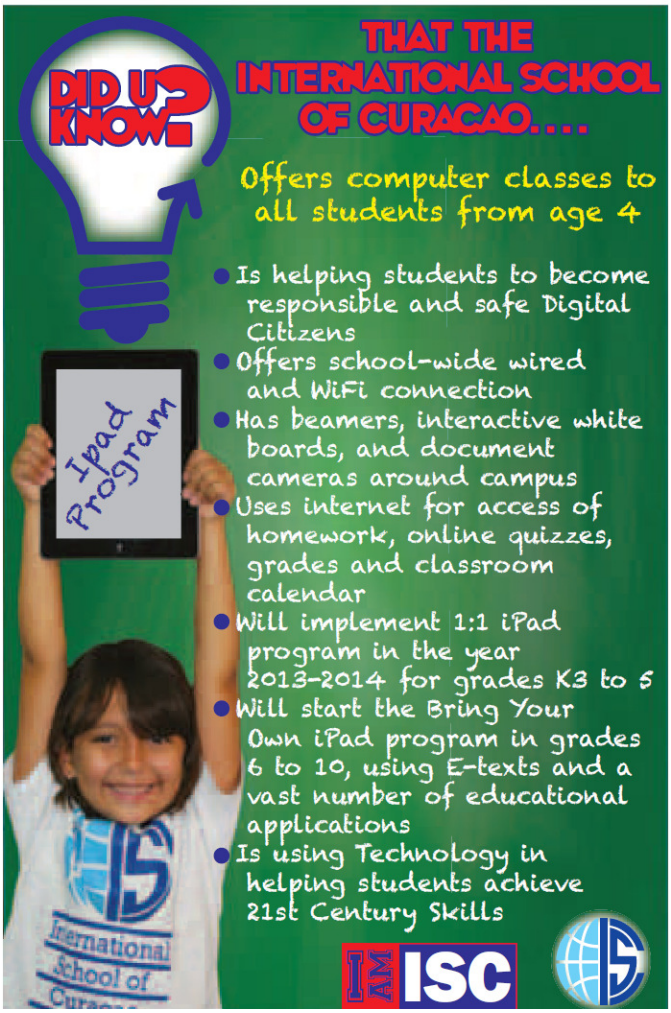

Figure 6: iPad programme on the International School of Curaçao.
Source: Advert, Antilliaans Dagblad

8.5 What we need to educate the next generation

In the European Union, digital competence has been acknowledged as one of the key competences for Lifelong Learning. The EU defines 'digital competence' as the confident, critical and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society. They see digital competence as a transversal key competence, which enables acquiring other key competences (e.g. language, mathematics, learning to learn, cultural awareness). It is related to many of the 21st Century skills, which should be acquired by all citizens, to ensure their active participation in society and the economy.

A recent and thorough EU report[10] proposes a framework of these digital competence skills:

Competence	Skills
1. Information	- Browsing, searching and filtering information - Evaluating Information - Storing and retrieving information
2. Communication	- Interacting through technologies - Sharing information and content - Engaging in online citizenship - Collaborating through digital channels - Netiquette - Managing digital identity
3. Content creation	- Developing content - Integrating and re-elaborating - Copyright and Licences - Programming
4. Safety	- Protecting devices - Protecting personal data - Protecting health - Protecting the environment
5. Problem solving	- Solving technical problems - Identifying needs and technological responses - Innovating and creatively using technology - Identifying digital competence gaps

We believe that we should adopt the European Union framework 'Digital Competence in Practice' and incorporate the following ICT competences in our learning system. In our opinion, these competences should be translated in a schoolboard independent curriculum that is given to all students in primary school. Please note that the “technical operation” of ICT tools and equipment is just one (small) area of these competences. Important competences are focusing on using, creating and sharing content. Some competences are most likely to be met by a mixture of 'learning by doing' and learning by the textbook, or from quality approved internet resources.

Also, what the teacher teaches in classrooms is heavily determined by what is stated in the curriculum (eindtermen) of every individual subject. To ensure a more effective use of the internet, digital competence should be included in the national curriculum. As a basis, the

[10] *From: DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe, Anusca Ferrari, European Commission Joint Research Centre Institute for Prospective Technological Studies, Augustus 2013*

International Computer Driver Licence (ICDL) could be a good curriculum. This is an internationally recognized curriculum and diploma, with implementations in more than 150 countries and a total of approximately 14 million certified people all over the world. With this diploma, these people have proven to meet the international standard on digital- and computer skills. This way, the social economical position of these people has been improved, while they are more productive and better changes on the labour market.

Next, a focus on ethics and responsibility competence may be important on subjects like bullying on the internet, privacy issues, to make children more defensible against bad influences. BT&P launched a website giving students and parents information on this subject in both Dutch and Papiamento. The website is called "Think, Click, Surf: Keeping Caribbean Kids Safe Online".

8.6 Teaching teachers

Future teachers must encourage their institutes to invest in a knowledge society by not ignoring the fact that our school system is moving towards a digital era. Teachers must find a way to convey messages to students without expanding the digital gap, which is already in place between the different age groups. This future teacher, a guide for many, must possess extra qualities to deal with all sorts of technological developments and also be able to see its opportunities.

Teachers need to be equipped to integrate the use of ICT in their curriculum and connect with today's student profile. UNESCO[11], in collaboration with Microsoft, Intel, Cisco and ISTE, has created an international benchmark, which sets out the skills required to teach effectively with ICT: “UNESCO's ICT Competency Framework for Teachers”. This framework emphasizes that it is not enough for teachers to have ICT skills and be able to teach them to their students. Teachers need to be able to help the students become collaborative, problem-solving, creative learners through using ICT so they will be effective citizens and members of the workforce. The framework therefore addresses all aspects of a teacher's work. In Curaçao , we need to incorporate all six aspects in our teacher training programmes and at the university, the UNA.

Aspect	Competences on level 2: Knowledge Deepening
1. Understanding policies on ICT in education	Teachers must have an in-depth knowledge of national policies and social priorities, and be able to design, modify, and implement classroom practices that support these policies.
2. Achieving current curriculum and assessment goals through ICT	The teacher identifies in this curriculum the key concepts and processes which can best be taught through using ICT; this refers not only to knowledge and understanding, but also to skills, procedures, values and attitudes. Next, the teacher decides how to use ICT in assessing students.

[11] Unesco ICT Competency Framework for Teachers (2012)

3. Designing and implementing collaborative, project based learning	The teacher devises a suitable project-based learning activity incorporating ICT, implements the learning activity and considers how effectively ICT was integrated into the activity. In this role, teachers must have the skills to help students create, implement, and monitor project plans and solutions. In addition, teachers need to use assessment for learning as a basic principle guiding their practice.
4. Using ICT to create and manage students' collaborative, project-based learning.	Teachers must be knowledgeable about a variety of subject-specific tools and applications and be able to flexibly use these in a variety of problem-based and project-based situations. Teachers should be able to use network resources to help students collaborate, access information and communicate with external experts in order to analyse and solve their selected problems. Teachers should also be able to use ICT to create and monitor individual and group student project plans.
5. Managing physical, human and time resources to integrate ICT into the learning environment	Teachers must be able to create flexible classroom learning environments. Within these environments, teachers must be able to integrate student-centred activities and flexibly apply technology to support collaboration.
6. Use digital resources and online collaboration for professional learning	To learn professionally the teacher finds, manages and uses digital resources, and collaborates with others in online communities

In our vision, we see that we target these 6 aspects from UNESCO in the curricula for our future and current teachers. We need to incorporate these competences in our study for all teachers at the University of the Netherlands Antilles (UNA), by translating them into different modules.

The UNA is already filling in some competences for their teachers. For example, the competence of " Use digital resources and online collaboration for professional learning " is filled by a digitalisation project, where learning material and literature is made available for teachers, which can also be shared with other teachers. Furthermore, the UNA is implementing education-on-a-distance, to be able to give education to other islands like Aruba and Bonaire. The university is reviewing what the complications are for teachers, when introducing this kind of education.

8.7 Equipping the teacher with the right digital toolset

In the contemporary teaching and learning environment, every teacher needs to be effective. This demands the tools and resources required to improve practice continuously. With effective learning management platforms, all teachers have the opportunity to expand access to professional development, reflect on their practice, and communicate with others, and the districts have tools to manage and track teachers' engagement and progress. Technology-based collaboration and collaborative tools are also part of the vision. Collaborative practice gives

teachers the ability to learn from one another, benefit from self- and peer-assessment, and to plan and build instructional strategies together.

Furthermore, a good source for the use of ICT in lessons is www.grassrootsCuraçao.com, where people can find inspiration in a set of 70 proposed lessons and practical workshops. Many of these can be plotted over the EU framework and so contribute to obtain the necessary competences.

8.8 Higher ICT-education

Apart from the curricula for youngsters and teachers, it is imperative that Curaçao is having a highly skilled ICT-workforce at Bachelor and Master level, as on a higher vocational level (SBO) level.

In overview, we need at least the following competences:

- ICT-policy advisory and management
- ICT-operations / network- and system engineers
- ICT-operations / application management / change management
- ICT-demand managers / functional ICT-operations / Service level managers
- Product specialists in mainstream enterprise applications/databases like Oracle, Microsoft products, SAP
- Project and programme managers
- Content management / website developers
- Security management
- Developers .NET, Java, C#, IOS, Android, COBOL

Currently there are only 7 ICT majors being offered in three different levels. Between 2008 and 2012, only 45 ICT-practitioners graduated at the UNA. Although we cannot quantify the exact need for ICT practitioners, this number is way too low. ICT practitioners are an essential pillar of the modern workforce and the economy of Curaçao as a whole. Our goal is to start to increase the supply of ICT practitioners by 2015, so as to ensure a sufficient number of them by 2019. A study from KBB gives an answer to the supply and demand of ICT practitioners in Curaçao. We expect the results within this year, so we can be more precise on the number of ICT practitioners we need.

Next to ICT practitioners, Curaçao also needs graduates in the content creation industries. These are:

- Arts and cultural heritage
- Motion picture, radio and television
- Publishing of newspapers, magazines, books and music
- Advertising
- Architecture
- Design and photography
- Printing and reproduction

Also, we need to inspire young women to get interested in pursuing ICT careers, since they are currently under-represented in the industry. This problem already starts in the education system where hardly any women enrol in technical education. This does not necessarily mean that women and girls are not interested in technology: in most countries, women and girls make more use of latest technologies than men. But it does indicate that there is a mismatch between the supply and demand of current technological education for women. Since the overall expectancy is that there is opportunity for growth in these areas, it will require additional efforts to inspire and enable women and girls to benefit from these opportunities. See figure 7.

Figure 7: "Tech needs Girls .. to invent the future" is one of the themes of the ITU initiative

8.9 Life long learning

As the economic visions for Curaçao illustrates, our labour force needs productive creators of value. This requires a mindshift from educating users of information, content and technology, to also becoming creators of information, content and technology. Whereas the aim of the schooling system should be to create "life long learners', this has not been the background of most of the adult population. The government of Curaçao is having this goal for its employees.

So far, the attention being paid to this has been bottom-up. A central goal in this regard has not been set. A comparison between international standards and our current situation will have to be performed to enable concrete goal setting and measuring progress.

In the meantime, we must also deal with the part of the adult population that is currently digitally illiterate, but wants to participate in the Information Society. For those, there are options available through organizations like the Medialab at the Library and at the Fablab at Stimul-IT. Seda, Pro-Alfa, Mi-Abilidat and Splikami are some organizations that offer training and/or coaching in this area. In addition, through neighbourhood organizations (Fuik for example) different options are offered to target groups that need special attention. Reda Sosial also supports training in the neighbourhoods.

In order to obtain a more structures approach organizations like Reda Sosial and Feffik will have to get involved, guided by clear goals and targets set in government policies. Feffik offers vocational training for the underprivileged and Reda Sosial supports neighbourhood improvements.

8.10 ICT-infrastructure at schools

If we are taking ICT in education seriously, we must make sure we meet the technical preconditions. Nowadays, these technical preconditions are at least:

Precondition	Details
Connectivity	Enough bandwidth for the whole school Appropriate internal network infrastructure
Presentation device in classes	One whiteboard for each class in school
Having access to a computing device, this can be a laptop, computer or tablet.	This is a client device, which could be used for content viewing, sharing and creating (e.g. online collaboration, making presentations). All licences for software should be included, if necessary.
ICT infrastructure should be available, secure and performing	Having at least one person responsible for ICT-operations in terms of availability and performance Providing care and maintenance for the computing devices and ICT-infrastructure, Provide replacement and security.

8.11 Digital learning materials

When it comes to educational content, much is already available on the internet. Digital content is for example available and searchable trough Kennisnet. Kennisnet is the public educational organization, which supports and inspires Dutch primary, secondary and vocational institutions in the effective use of ICT. They made webbased products where teachers and students can search for accurate and reliable courseware. In addition, we also need local educational content in Papiamento, as this is not only the way to communicate with children in their mother-tongue, but also one of the primary competencies (see paragraph 7.5). We must find the platform and entrepreneurial spirits to make and share this educational content, using the full-potential of organizations like Fundashon Material pa Skol for the creation of lesson material and the presence of the Internet Exchange, for the distribution of local content and lesson materials. We will also need to stimulate online collaboration to create and share content and lesson materials.

8.12 Organising ICT in Education on the long run

Kennisnet is stating that for the use of ICT for educational purposes, a balanced and coherent use of four building blocks is essential. These blocks are: vision, expertise, digital learning materials and ICT-infrastructure. Kennisnet facilitates the schools to achieve this. Barriers are removed and the strengths of the educational sector are bundled together.

We think Curaçao is ready for such a function for its own. As we need to make board-independent curricula, develop a countrywide policy on how to realise the coherent set of building blocks. We believe that the way to organise the implementation of the building blocks is through a project.

This project should take care of four targets:

1. The country needs an instance (paragraph 6.10) to develop a board-independent strategy and clear targets and goals for digital competencies for Educator, Students and adults.
2. Based on the above an ICT-curriculum for children, translated from the 21st century skills competences (paragraph 6.4) will need to be developed.
3. Teachers need to be equipped with the competencies to adopt ICT in their curriculum and connect with today's student profile.(paragraph 6.5).
4. The ICT-infrastructure on all schools is available and on spec (see paragraph 6.8) including the availability of a learning tool.
5. Local teachers have the ability to create, share and tap into accurate and reliable digital courseware (paragraph 6.9).

8.13 Targets and actions

In this masterplan, we set the following targets and actions on the subject of education:

Id	Targets	Actions
7	Implement a national project to upgrade our education system to the 21st century, to educate the digital competences to the people of Curaçao, so that they can participate fully in the digitalized society.	• Set up an organization to develop a board-independent competency based ICT-strategy for the integration of ICT in the education system • Set-up an ICT-curriculum for children based on international standards • Implement 21st century skills in the curriculum and the way students learn. • Teachers need to be equipped with the competences to adopt ICT in their curriculum • The ICT-infrastructure on all schools is available and on spec • Learning tools are available for every student • Local teachers have the ability to tap into accurate and reliable digital courseware • Give training to adults in the afternoon. Let them visit educational and important

		websites. Promote online learning. • Create the possibility to make use of internet at all “sentro di bario” • Involve community and barrio organizations to set-up and execute training programs for priority target groups

9 HEALTH

9.1 Our health needs the help of ICT

The healthcare sector is an information driven sector. That is why we see great opportunities for ICT in healthcare, to help patients, doctors and health service providers. Caring en curing should be evidence based on actual data. There are many reasons for adopting technology in healthcare. Digital technologies mean better and more efficient care for patients and healthcare providers, as it allows doctors to access patients' medical records more easily, get immediate access to test results from the laboratory, deliver prescriptions directly to pharmacists, making healthcare delivery faster and more efficient. For patients, eHealth technologies save lives - for example, patients with heart problems can carry monitors which alert their doctor if their condition changes.

Another big driver for ICT in Healthcare is costs. A recent report (2012) titled Zorgrekeningen Curaçao, 2008 – 2011 from Ronald H.E. Westerhof and Drs. Ing. Lamberto P. Felida of the Volksgezondheid Instutuut Curaçao mention alarming figures: Public health expenditure in Curaçao is rising every year due to the ageing population and other socio-economic and cultural factors. In 2011, the costs for health were NAF 900 million, that is 16,6% of the GDP, translating to NAF 500,- per capita per month. The rise of healthcare expenditures is estimated a 15% in the period 2008-2011, on average a 5% each year. In addition, due to the ageing population, the long term care expenditure projection would on average rise even more.

The impact of these changes is already being felt today and is particularly acute at a time of increased pressure on public budgets, higher incidence of chronic diseases and growing demands and expectations from citizens for higher quality services and social care. Deep-rooted structural reforms are needed to ensure the sustainability of the health systems while securing access to services for all citizens, probably with the strong use of ICTs.

9.2 International trends and best-practices

To fully understand and grasp the potential of technology in healthcare, often called eHealth, we need to define this subject in more detail so that we have a common idea and language. In short: eHealth is defined as the use of ICT to support and improve healthcare. The goal of eHealth is to contribute to affordable, accessible, high quality healthcare. We see three pillars in eHealth:

1. Supportive eHealth and the Electronic Health Record (EHR)
2. Telehealth
3. ePublic health

In the next three paragraphs we will go into these subjects in more detail.

Supportive eHealth and the Electronic Health Record

Supportive eHealth and the EHR are the technologies to support the healthcare providers to organize their job efficiently and effectively, like scheduling appointments, reporting in the electronic health records of patients, getting lab results and billing. Physicians report that electronic health records improve patient care in many ways. The prescribing component of EHRs helps avert known drug allergic reactions and potentially dangerous drug interactions, while facilitating the ordering of laboratory tests and reducing redundancy and errors. EHRs also provide easier access to critical laboratory information and enhance preventive care. Electronic health record systems have the potential to generate savings safety and efficiency gains. Potential savings from preventing disease and better managing chronic conditions could even double these gains.

The possibilities of telehealth

Telehealth enables the electronic exchange of information (data, video, images) in the practice of medicine and advanced analytics. This encompasses technologies that enable video consultation, remote monitoring, and high resolution image transmission over fixed or mobile networks (Mobile Health or mHealth). The mHealth field encompasses applications, devices and communications networks that allow clinicians and patients to give and receive care anywhere at any time.

Physicians download diagnostic data, lab results, images and drug information to handheld devices like PDAs and smartphones; emergency medical responders use field laptops to keep track of patient information and records; and patients use health monitoring devices and sensors that accompany them everywhere. Through capabilities like these, mobile health offers convenience critical to improving consumer engagement and clinician responsiveness.

Innovations in mobile medicine include new modalities of non-invasive sensors and body sensor networks, mobile sensors in the form of disposable bandages and ingestible pills relay real-time health data (e.g., vital signs, glucose levels, and medication compliance) over wireless connections, and sensors that help older adults live independently at home detect motion, sense mood changes and help prevent falls. Wireless body sensor networks reduce infection risk and increase patient mobility by eliminating cables; they also improve caregiver effectiveness. Each of these solutions is available today, albeit with varying degrees of adoption.

Mobile medicine takes remote monitoring to a new level. For example, today's mobile cardiovascular solutions allow a patient's heart rhythm to be monitored continuously regardless of the patient's whereabouts. Diabetics can receive continuous, flexible insulin delivery through real-time glucose monitoring sensors that transmit data to wearable insulin pumps.

ePublic Health

ePublic Health are the technologies to prevent health risks on the scale of a society. Its aim is to reduce the load on healthcare service providers by uplifting the well-being of citizens. Examples

are informative websites and smartphone apps on the subject of living healthier, like diet information, anti-smoke campaigns and family planning. Another good example is the preventive screening of all women in society from a certain age to screen for breast cancer developments at an early stage.

9.3 The need for an information overview

The fact that none of our healthcare data exists in any one place is a real challenge. Healthcare data is stored at the officinas, at general practitioners offices, the hospitals, insurance companies, botika's, dentists. We need to find a way to bring that together, make it much more usable and make it much more mobile than it is today.

When we look at information aggregation problems solved in many other industries like tourism, where well-informed hotels are connected to airplane transportation, insurance companies, car rentals (and so on) are digitally connected and have an overview of our stayover. We need to start solving the information aggregation problem in healthcare, as well-informed doctors are more able to find the right diagnose and treatment.

As we need to solve the problem of having patient data over different organizations and systems, 'middleware' comes into play. This is technology to interface different systems. Let's start talk about the idea of making an independent organization (possibly with a membership model) responsible for developing and implementing this technology. With the use of open-standards in Healthcare (like 'HL-7' for health information and 'Vecozo' for administrative information) we may be able to connect all healthcare related providers in Curaçao . Security and availability should be guaranteed at all times.

9.4 Information cockpit for doctors: the Electronic Health Record

In Curaçao, our biggest hospital operates without a hospital-wide EHR. When our clinicians come to our hospitals, they're sent back to essentially the 1980s in terms of their computing experience. We need to replicate the computer experience they have in other aspects of their life, drive mobility, drive interoperability of information, usability, and really revolutionize the footprint of our hospitals. In our opinion, acquiring and implementing an EHR should be in the priority list. Whatever system is used, the system needs to use open-standard interfaces (called 'interoperable') so that pharmacists, general practitioners and insurance companies can link their systems with it on a secure way and in line with privacy policies.

Also we see an opportunity for the EHR to be hosted and offered as a cloud solution for general practitioner officers ('officina di dokter'), so that the patients data is accessible on all locations if there is a doctor-patient treatment relationship. Hosted EHR solutions tend to be more affordable and easier-to-manage alternatives for small physician practices and clinics. In certain settings, they cost less than on-site solutions, reduce the need for internal IT expertise and provide timely updates to clinical decision-support tools (e.g., drug interaction references and recommended care guidelines).

9.5 Organizing the adoption of eHealth in Curaçao on the long run

As most things, we need to organize the adoption of eHealth in Curaçao . It won't come by itself. In the Netherlands, they founded the National ICT Instutuut in de Zorg (NICTIZ). Nictiz is the national knowledge centre for IT and innovation in the healthcare sector. In consultation with and at the request of the healthcare sector, Nictiz is continuously developing and refining national standards for electronic communications in healthcare. Furthermore, Nictiz supports the sector in developing functional IT solutions that can be used nationwide, and contributes to policy making on IT issues as they relate to healthcare on a national and international level. We think Curaçao is ready for such a function for its own, so we need to install such function officially.

9.6 Targets and actions

In this masterplan, we set the following targets and actions on the subject of Healthcare:

Id	Targets	Actions
8	Organize the aggregation of Healthcare Information, Make systems work together	• Implement EHR • Implement broker services ('Middleware')
9	Seek out eHealth opportunities with the sector	• Educate healthcare professionals about eHealth possibilities • Look for opportunities in mHealth and remote monitoring • Stimulate ePublic health initiatives

TRACK 4: COMPETITIVE AND COLLABORATIVE SOCIETY

In this track we look from the Curaçao N.V. perspective, having its current pillars of the economy in Tourism, Oil and Finance. We are now in the position to develop yet a new pillar: Content, Media & ICT.

10 A COMPETITIVE SOCIETY BY GETTING THE PRECONDITIONS RIGHT

10.1 Let the private sector flourish

The vision for Curaçao's Economy is as follows:

"That by 2025 Curaçao is an economy of wealth creators that continuously creates and delivers high value; that is recognized as an important hub in the global value chains; that acts as a multifaceted 'Portal' facilitating international trade; and that through this is able to sustain a high quality of life and collective well-being for its citizens".

This means we have to add value as a society, having the focus on our most value adding propositions: Tourism, Finance and, in our view, Content, Media and ICT. We will discuss this proposition in chapter 10. In this chapter we look at the generic issues for being a competitive society. Our workforce must have high productivity numbers, by being modern, motivated, internationally equipped. Next, our costs must be low: with an attractive tax regime, using the scalability of ICT and low on energy consumption. Surely our legal frameworks should create the right conditions for entrepreneurs to launch and grow sustainable business. Next, we need our propositions internationally marketed. This will eventually give us the prosperity and wealth we earned ourselves.

10.2 ICT as a driver for other sectors: Tourism and Finance

From discussions with local tourism bodies CHATA and Curaçao Tourist Board, ICT is known to have a growing impact on the promotion of tourism, marketing and sales (see figure 8). Hotels, and holiday accommodations in Curaçao are participating in the trend to market online, mostly in Europe and the America's.

Also the use of apps for tourism is widely adopted. Trough apps, tourists are informed both for attracting them to come to Curaçao, and next, give information during their stay. Also tourists buy more and more holiday services on the internet. Therefore, free Wi-Fi is most times complimentary at a stay in an accommodation. The tourism bodies are satisfied with the ICT workforce in Curaçao, and states they meet their demand in quality and creativity.

Ideas for further improvement are the use of an infrastructure to connect to multiple, privately owned IP-camera's to have a "net of security" around touristic places. Also, the public transport and taxis are mentioned to be upgraded with ICT's, as tourists are now uninformed about the possibilities and costs of the public transport. For business intelligence and management information purposes, a centralized, automated statistical system for the counting of day-of-stay is nowadays not available.

In the financial sector, ICT plays an important role in the operational processes. Big topics in this sector are security ICT, ICT for analysis of big data and monitoring and management software. A big challenge lies in having an online payment system for boosting e-commerce (see paragraph 9.5)

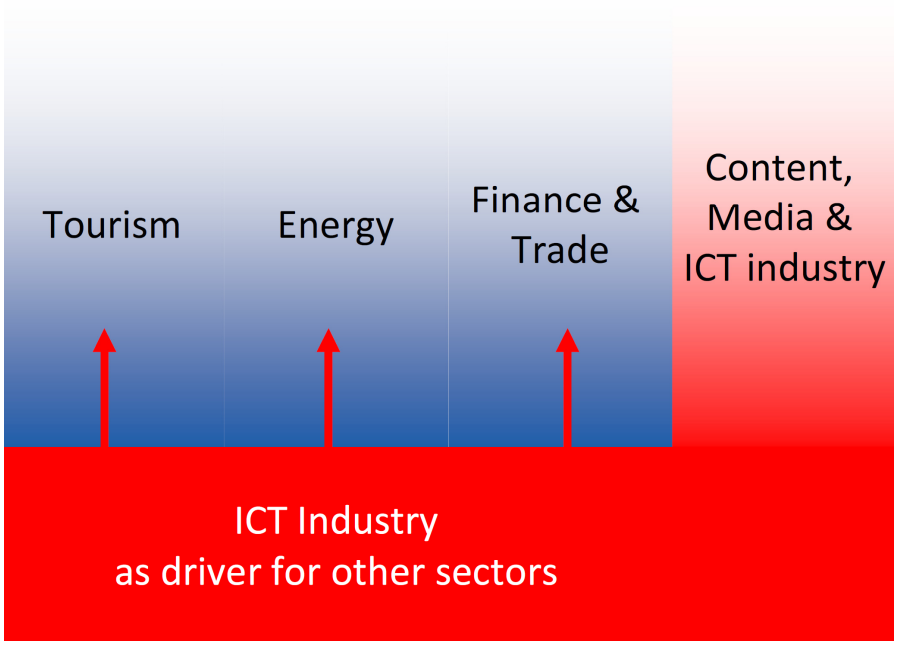

Figure 8: ICT as driver for other sectors

10.3 The need for a National Cyber Security Policy

The world is rapidly becoming dependent on the internet. Therefore, Information and communications technologies (ICT) have become indispensable to all levels of our society. We depend on Information and communication infrastructure in governing our societies, conducting business, and for our private and social life. Industrial Control Systems, used in vital sectors of our economy, are also often linked to the internet.

This adds new dimensions to the internet dependency: safety and security. A safe internet system is crucial for our economy and our society. We have to be resilient against cyber-attacks and cyber related incidents. This is a responsibility for the government, market parties and civilians. Together we will have to strive to keep the Caribbean Information and communication infrastructure safe from cyber incidents.

In the same way, we have become dependent on the information and communications infrastructure, the threats against its availability, integrity and confidentiality can now affect the functioning of the whole society. Every user of an information system affects the level of resistance of the national information infrastructure to cyber threats. This is why Curaçao needs a National Cyber Security Policy.

To be able to develop a National Cyber Security policy, we should start with:

1. Defining the National Critical infrastructures
2. Defining the National Cyber Security Strategy

Our modern societies rely more and more on so called "Critical Infrastructures", such as electricity, water, information and communication technologies (ICT), and more. The disruption of these infrastructures may have serious consequences for the economy and the well-being of the citizens. As these infrastructures are increasingly becoming interconnected, they are becoming critical and their protection goes beyond the responsibility of individual companies, sectors, and even nations. We are handling here with Critical Infrastructures protection. Critical infrastructure protection (CIP) is a national responsibility. In Curaçao the CIP is run by public and private companies. CIP is a mutual public-private responsibility.[12]

The Dutch "National Cyber Security Strategy (NCSS): Strength through cooperation[13] defines Cyber Security as follows:
'Cyber security is freedom from danger or damage due to the disruption, breakdown, or misuse of ICT. The danger or damage resulting from disruption, breakdown, or misuse may consist of limitations to the availability or reliability of ICT, breaches of the confidentiality of information stored on ICT media, or damage to the integrity of that information.'

The Dutch "National Cyber Security Strategy (NCSS): Strength through cooperation[12] defines National Cyber Security as:
''Security and trust in an open and free digital society:
The Strategy's goal is to strengthen the security of digital society in order to give individuals, businesses, and public bodies more confidence in the use of ICT. To this end, the responsible public bodies will work more effectively with other parties to ensure the safety and reliability of an open and free digital society. This will stimulate the economy and increase prosperity and well-being. It will ensure legal protection in the digital domain, prevent social disruption, and lead to appropriate action if things go wrong.'

It is important to understand that cyber security is not an isolated objective, but rather a system of safeguards and responsibilities to ensure the functioning of open and modern societies. Different competences (political, technological, legal, economic, managerial or military in nature) need to come together to define measures for National Cyber Security.

[12] RECIPE, Good practices manual for CIP policies; For policy makers in Europe (TNO 2011)

[13] Dutch Ministry of Security and Justice, 'The National Cyber Security Strategy (NCSS). Strength through Cooperation.'

10.4 Modern workforce

Curaçao needs to revitalize the workforce and combine the old with the new. In future, the conditions in which people work will change dramatically. The jobs for both the service sector as for production sector will be in the hands of our local workforce. But as for knowledge based jobs we must be able to compete on a global market taking into consideration that we are now trying to build Curaçao into an information society. The opportunity to start up your own business will be greater because we are now dealing with more professionals wanting to be entrepreneurs.

Some highlights of the proposed modern workforce of Curaçao:

- Work will not be bound to a specific place anymore. People will have the opportunity to choose where they want to work, where there is interaction with others and where they enjoy themselves. The distinction between working and being at home will become less apparent
- Access to broadband supports the growth of firms by lowering costs and raising productivity. Realizing these performance improvements, however, depends on firms' ability to integrate their technological, business, and organizational strategies.
- ICT is the foundation of this knowledge-based world. It allows economies to acquire and share ideas, expertise, services, and technologies locally, regionally, and across the world. It also contributes to making the global economy more integrated than ever before. ICT can help create and sustain new opportunities for economic development.
- The arrival of one or more industries or companies is of vital importance for the labour workforce of Curaçao.
- We must empower and teach the population of Curaçao the right skills so they can therefore have the abilities to compete on the global workforce market.

Curaçao has to train most of this workforce to be modern one (also see paragraph 7.5). However, we cannot wait until our own students reach the workforce, and therefore need to (re-)import high skilled labours. Here, a connection is made with the Labour Force Policy of Curaçao, which we believe is the right way. For ICT practitioners, a flexible permit system is vital, as is the speed of the process for applying.

10.5 Low cost climate

To be really competitive, companies must be sure to make the cost side for companies fairly low. Only that way, companies will settle in Curaçao. Although some cost components may be more expensive for being an island, the total of costs should be competitive. The TAC report states that Curaçao needs to reduce the prices of electricity, telecommunication and water. An urgent action plan should be established in this regard. Competition policy may help, but also adequate sectorial legislation. We will now focus on three cost components important for the ICT sector: tax, electricity and broadband connectivity.

<u>Tax climate: the E-zones</u>

"Economic zones" (e-zones) have the goal to stimulate the economy of Curaçao, by using Curaçao as international distribution center or center of international services. E-zones have positive impact on the tax incomes and employability. There are seven e-zones on Curaçao. They are being marked for export companies, and e-commerce companies may fall within this definition. Within e-zones, a friendly tax regime is in place. Attractive fiscal benefits are required to entice customers to move their IT assets to Curaçao. The Curaçao economic zones (e-zones) fulfil in this fiscal benefit. Simply put, this is a Customs port of entry, where foreign merchandise is considered to be in international commerce:

- Foreign merchandise may enter the zone without payment of customs duties
- No duties are paid on goods that are re-exported directly from the economic zone
- The corporate income tax rate on profits generated is only 2%
- Services via Internet, may be provided

It is our opinion that we should maintain this tax incentive, as it is important for a thriving e-Commerce environment.

Electricity

For companies with a lot of servers or data storage (like datacenters and big banks), we have to keep an eye on the local electric utility costs to become more competitive with surrounding jurisdictions. We need to get the price of electricity into the margin of 0,10 dollar cent to be competitive on this edge. Maybe we should also look at the efficiency of our energy consuming electronics. We see great benefits in green ICT, and the use of solar and wind.

Telecommunications and broadband connectivity

The entrepreneurs stated that the price of broadband internet was quiet expensive in Curaçao. It makes it very difficult to offer competitive rates due to the fact that the costs are relatively high. Last years, the competition between Internet Service Providers made dramatic declines in broadband connectivity prices happen. We are estimated a top-50 place in the world as it comes to communication prices (including internet). See paragraph 3.1 for the estimated ICT Price Basket figure for EOY 2011. Next, see track 2 for our proposed goals on prices for connectivity.

10.6 Online payment infrastructure

Curaçao is lacking an online payment infrastructure for webshops. That means that there is not an easy way to sell products online, and let the customer pay on a local account. Instead, workarounds must be placed like paying through a Paypal infrastructure. However, it is not possible to get the funds from Paypal to a local bank, due to a problem with clearing. So, secondly, a local entrepreneur needs for example an American bank account connected to an American address, to get to his revenues.

This is a major obstacle for local entrepreneurs. One solution the Knowlegde platform proposes is through a centralized payment infrastructure where all local banks participate. In the Netherlands, this is called 'iDeal betalingssysteem'. The heavily secured iDeal payment infrastructure used by multiple banks, so customers can pay online with their 'pin'. The transfer of money is real-time and cost-free for the entrepreneur. This is an enormous boost for e-commerce. In Curaçao, the Knowlegde platform sees a chance in upgrading the Pagamatico payment system to an online Pagamatico payment system.

Figure 9: schematic of iDeal payment infrastructure. Note: more banks are connected than visualised

10.7 Legal frameworks that stimulate entrepreneurship

A countries' legal and regulatory framework should support and facilitate the thriving of an Information Society. It ensures that any electronic commercial transaction is legally valid, binding and enforceable. Important legal issues include electronic contracting, consumer protection, privacy and data protection, cybercrime, jurisdiction and applicable law, intellectual property rights (including digital rights management), alternative and online dispute resolution and taxation.

On certain places, legal frameworks need to be updated to fully stimulate the Information Society. In the comprehensive legal study of mr. ir. H.W. Menckeberg (June 2012), "Onderzoeksrapport fase 3 Wet- en Regelgeving, Curaçao Information Society", eight legal domains were researched:

1. Fundamental rights
2. Electronic transactions
3. Electronic signatures
4. Consumer protection
5. Privacy and protection of personal data
6. Cybercrime or computer crimes
7. Intellectual Property
8. Domainnames

Menckeberg found two of these domains that need attention, these are: Privacy and protection of personal data, and Intellectual Property. In Privacy, the right procedure for becoming a law is not followed until the end, therefore leaving a gap in privacy laws. In Intellectual property, some important international treaties may or may not be acknowledged by the government of Curaçao. The exact analysis can be drawn from Menchebergs report, which can be asked from any Knowlegde Platform board member.

10.8 Local awareness of our ICT-capabilities

Curaçao has many ICT-capabilities, but they tend to be unknown for even locals. In certain areas of society, there is little awareness of various aspects of e-business and ICT, their benefits, legal and regulatory issues, best practices or technological solutions. Informing about the possibilities in the use of ICT and the Internet therefore should rank high on the agenda. Some lack of awareness is illustrated by the limited way in which ICT is being used by business owners. For several years the use of ICT has been limited to the standard use of e-mail, word processing and some administrative use. Nowadays, more and more companies also have an online presence.

We should market our own expertise to our representatives and political top. The aim of these efforts should be to create an e-business culture in the country, recognizing the role culture plays in the business environment; the change of mindset among entrepreneurs, managers and executives is as important as the technological change itself.

10.9 Internationally connected and marketed

As an island of 150.000 people, we need to be connected internationally to market our ICT-capabilities. Curaçao is virtually unknown in the potential market, as are our possible beneficiaries of the attractive investment climate created by our e-Zone legislation. Curaçao should be on the map as a viable and attractive location of establishing a company engaged in ICT-activities.

We think that a focused and consistent marketing effort should take care of this problem. This marketing effort may consist of:

- An attractive and comprehensive brochure (which our representatives can take with them when travelling abroad)
- Online marketing (e.g. Google Adwords)
- Showing our capabilities at pinpointed international conferences, with good return on investment possibilities, like the yearly 'webwinkelbeurs' in the Netherlands, Utrecht.

10.10 Targets and actions

In this masterplan, we set the following targets and actions on the subject of getting the preconditions right for a booming private sector:

Id	Targets	Actions
10	Get Curaçao on the world map as a ICT business location.	• Develop marketing materials for local awareness campaign and international marketing • Promote our ICT-capabilities locally and internationally. • Develop a National Cyber Security Policy
11	Manage the preconditions for e-Commerce, like a centralized and local online payment system, and updating of Curaçao's legal frameworks to support and facilitate the Information Society economy.	• Start a project for a centralized payment system, start with researching if the Pagamatico payment infrastructure can be upgraded to online Pagamatico. • Bring our costs for electricity down. • Important legal issues include privacy and data protection and intellectual property rights (including digital rights management).

11 Content, Media & ICT industry

11.1 Strengthening our strengths: the ICT industry

According to the TAC report, Curaçao remains competitively strong and that there are significant linkages with other sectors in Financial services, Tourism, Maritime, Airport, Transhipment & Vessel registration services, Back office services, Data center, IT & high tech services, and Clean energy services.

Global growth in ICT usage presents significant opportunities for a local industry that is globally focused. The importance of ICT has not been diminished by the market instabilities of the early years of this century. Deep usage of ICT across the whole economy continues to contribute to productivity growth. Local ICT capabilities remain vital. A local industry that is responsive to market demand for new products and services has the potential to make a significant contribution to the economy in its own right.

The transformation into a knowledge economy has brought significant economic growth. All sectors in the economy flourish thanks to the knowledge, thanks to a highly educated workforce and the scope for new markets and new services with the potential of online businesses. E-Commerce companies around the world have established themselves in Curaçao. They provide global Internet services and make use of local knowledge, ICT infrastructure and other incentives

The vision for the ICT sector is to create an innovative regional ICT cluster which is reliable, flexible to market conditions and fosters development of human capital driven by performance while complying and adhering to global standards and regulations. The performance of the ICT sector itself is dependent on ICT policy measures that address the particular needs of ICT sector firms and foster an enabling ICT environment. Policy measures can make an essential contribution to the national and international business environment, as well as to corporate strategies and enterprise performance, and hence the overall competitiveness of companies. If Governments define the enhancement of national software and IT services as a priority concern, the promotion of the ICT sector firms must also be a priority within the national Masterplan Information Society.

11.2 Boosting e-Commerce in Curaçao

The internet is one of the most important tools for business opportunities now a days. You can work seamless with colleagues in other locations by using a chat box, video or conference call. Moreover, has Curaçao the faster broadband service in the region which is an edge in the making of business.

Web entrepreneurs can have a major impact on the creation of high-quality jobs and growth in Curaçao. The "apps economy", for example, offers entrepreneurs completely new opportunities to start up their microenterprise. Running an online business is an increasingly attractive alternative to an office job, particularly for a new generation of young entrepreneurs. Supporting Curaçao 's best web entrepreneurs to launch and grow sustainable businesses should be high on the agenda. Stimul-IT is already doing great work in this area, inspiring and supporting people to work in the apps economy.

Next, we believe the following support should be organized:

- Creative, content creation and webentrepeneurs have the possibility to work in an inspiring, energetic location where they can meet other webentrepeneurs, find knowledge, and be social.
- We continue to offer an attractive tax climate, now called the E-zones, and guide entrepreneurs how to make use of this, see paragraph 9.4.
- We are able to finance these entrepreneurs to give them the time to start-up.

In our vision, the government deploys specific locations, where knowledge is concentrated, and (young) entrepreneurs gather and work. These locations are market as much as possible for information economy activities, where the e-zone legislation is in place to attract companies and incubator facilities are being deployed.

On the short term, Stimul-IT can help: they have the plan and location for incubator facilities, where a movement can be started. On the long term however, we think of another location for incubator facilities and the gathering of existing companies. The goal is to gather a broad and balanced representation of services, so that companies can help strengthen each other. Next to infrastructure and software companies, the place should also emphasize content creation. Existing activities with for example AMS-IX Caribbean, Google and Akamai will be placed here too.

In policy terms, we need to plan and execute these location in cooperation with the sectors Innovatie en Ondernemen from the Ministry of Economic Development, and also support home-grown Small and Medium Businesses.

We dream of a location, which needs to be renovated, like the "Quarantaine gebouw" or "the Scharloo werf", where young creative entrepreneurs can help renovating their own working environment. See figure 9 and 10.

Figure 9: the Quarantaine building, formerly build in 1856 as a military hospital

Figure 10: the Scharloo Werf, a central promising location

Financing small e-Commerce enterprises.

In Curaçao, microfinance for small enterprises is possible through "Mikrofiansa Granito", which delivers microfinance under Naf 5.000. The Ministry of Economic Development is also updating its approach for financing small enterprises and intends to come with Creditguarantee funding. The UNA gives courses on entrepreneurship and how to start up a new business.

11.3 Getting international ICT-companies to Curaçao: the one-stop-shop

We think we need to attract international ICT companies to really expand our ICT capabilities, and attract work from all over the world to our Island. For example, we may invite large software and hardware manufacturers/providers in the Netherlands (Dutch language) to become a multilingual beta tester environment for them in emerging technologies.

A lot of work should be done first in marketing Curaçao as an ICT-business destination. See paragraph 9.6. But this is not enough, as we need to 'close the deal' when businesses are interested to come to Curaçao . Where to go when you want to settle a new business in Curaçao and see if this is feasible? Businesses want an overview of all variables before deciding to settle, like legal issues, tax, hiring people, business locations. And more-over, when they decide to settle, they need a contact person to guide them to the process.

Next, we have to tackle the most important problem for companies to come to Curaçao : Bureaucracy. Of all the bottlenecks mentioned by current industry stakeholders, the bureaucracy is one that is mentioned most often. In this fast-pace industry, cumbersome paperwork and slow application procedures for an e-zone application is killing. We have signs that it takes between 3 to 6 months to obtain a 'Vestigingsvergunning' for the e-Zone.

Curaçao needs a 'catch all agency' for these type of businesses to establish themselves in Curaçao, guiding them all-the-way to the process. We call this the 'E-Commerce one-stop-shop'. This one-stop-shop is a liaison between the businesses and local agencies, directorates and government agencies. It uses online tracking so businesses can see the process ahead and see what kind of paperwork or activities are needed, and where they are in the process. Ofcourse, also local businesses may use the one-stop-shop guidance how they can be active in the region.

11.4 Curaçao as Cross Media en Content Hub

One of the directions in the vision for economic development in 2012, is the development of Curaçao as a regional hub, not limiting the sorts of hub Curaçao can be. In the vision of becoming a regional hub, firstly Curaçao concentrated on the airport and seaport hub function, and is now working on a spaceport hub function. With the AMS-IX Caribbean, a fourth hub function was created, a data port:

1. Seaport
2. Airport (see paragraph 10.5)
3. Spaceport (see paragraph 10.6)
4. Data port

Ad. 2: Curaçao Airport Holding (CAH) sees Curaçao International Airport as a 'Hub', connecting the Americas, transforming from an airstrip into an Airport City; a dynamic environment attracting aviation and non-aviation linked businesses of all types, stimulating and facilitating the increase of passengers and cargo traffic and creating a powerful engine for the necessary economic development of our island.

Ad. 3: A spaceport on Curaçao will create a lot of opportunities for the local community and economy. It will be a boost for the island tourism and will also attract a wide variety of businesses. That is why CAH wants a spaceport on Curaçao. CAH is providing the facilities to make this happen. It will influence Curaçao in a whole new way. CAH and Space Expedition Curaçao have agreed upon a partnership for the realization of this dream. CAH is considered mediator. XCOR has built a suborbital space plane that SXC is going to use.

Stimul-IT has the ambition add another 2 hub functions, to let Curaçao become the regional knowledge and services hub (see figure 10):

5. Content port en
6. eCommerce port

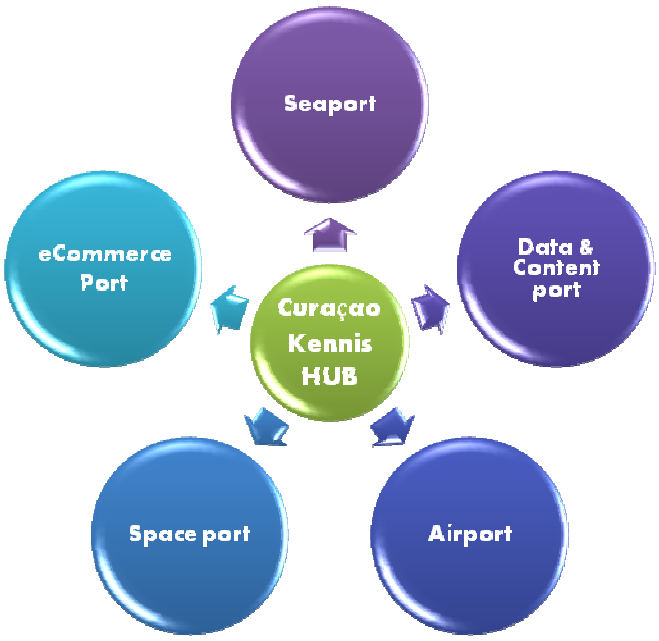

Figure 10: Curaçao Knowlegde hub

The Internet Exchange could play a major role in the dissemination of knowledge and the regional positioning of Curaçao as hub. This role can be fulfilled in two ways. One way, to be a crossroad for the distribution and supply of content that flows though Curaçao to other countries in the region. Second, to export content created on Curaçao to other countries. Stimul-IT deployed the Cross Media programme and App Development programme in 2012 to add to the ambition of becoming a content hub. And these projects have the ambition to have an even bigger impact on local economy than the ICT sector on its own.

A recent report from Stimul-IT by TNO, states that cross media is a combination of creative industries and ICT (see figure 11). Creative industries are specialized in the creation of media content, such as arts, newspapers, books, music, television, advertising, architecture, film,

games, and events. ICT is specialized in the digital creation and distribution of content and consist of telecommunications, computer and related services and printing. The cross cutting between creative industries and ICT is content. Cross media is highly influenced by the trend of digitalization; new ICT technologies foster new ways of organizing information and content. This leads to the convergence of ICT and creative industries. Companies do not stick to their traditional role in the value chain, but combine the creation, production and distribution of content.

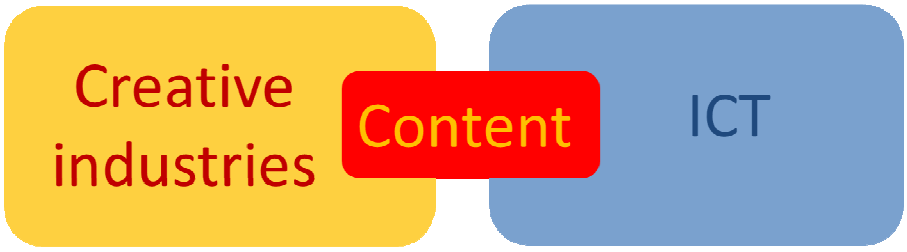

Figure 11: Creative industries & ICT create content, source: Cross Media Monitor Curaçao, TNO/Stimul-IT

Stimul-IT and TNO state furthermore, that ICT and creative industries are a relevant economic sector for the economy of Curaçao. The total value added by ICT and creative industries is 460 million Naf, 8.7 per cent of gross domestic product in 2010. In comparison with other economic sectors, ICT and creative industries is a mid-sized economic sector for Curaçao. The sector employs 3,850 people out of a total working population of 62 thousand people, and makes out 6.2 per cent of the total economy in 2011.

The ambition of Stimul-IT and the Knowlegde Platform to develop Curaçao as an internationally competitive, leading, respected, creative and intelligent society, enabling Curaçao to play a leading role in the region. ICT and creative industries can substantially foster sustainable growth and can contribute to the sustainable competitiveness. Data is probably the most important basic material for the creation of value in the next century. The ability to combine open, big and linked data into new products and services is a strong asset for any economy. ICTs enable the infrastructure, platforms and technology and creative industries enable the content and 'packaging' (visualization, design, interactivity) for common use.

The report of Stimul-IT further state: "the potential of future cross media professionals is also promising. Although the number of highly educated employees in general is currently not very high, the figures are still rising. And relevant studies for working in cross media (arts, informatics, economics), are quite popular amongst students at universities and higher vocational education institutes. Future growth potential for ICT and creative industries lie within both the domestic and international business-to-business market (B2B). The consumer market offers growth potential since household penetration of internet, and applications of mobile devices are still increasing. The development of international oriented cross-sector business-to-business markets however offers bigger opportunities. Curaçao already has a relatively well developed ICT and data infrastructure. For example, it has the fastest download speed in the Caribbean and Latin

America. The export potential of ICT and creative products and services in the Caribbean and Latin America is high, as shown by the market size of Columbia, Dominican Republic and Venezuela. Cross-overs can be made to other economic sectors such as logistics, tourism, financial sector and health care to enhance the added value propositions. Therefore, current local policies that focus on stimulating the use of this infrastructure by production and distribution of content make sense. These could be made more effective if they would incorporate activities that simulate the interaction with other strong sectors on the island, resulting in combined propositions.

The brain drain which currently affects the labour market in Curaçao is as a result of certain push factors, but mainly the result of the search for better job opportunities elsewhere (TAC, 2013). Approximately 300-400 students go abroad annually to pursue tertiary education, of which the majority opts to study in the Netherlands. After graduation, only a few of them return to seek/gain employment in Curaçao. As talents are attracted to locations where companies that have their interest are present, the presence of ICT and creative industries can help Curaçao to attract young, high skilled professionals and stimulate the remigration of talented high skilled labour.

The sector employs 3,850 people out of a total working population of 62 thousand people, and makes out 6.2 per cent of the total economy in 2011. It has a strong position in telecommunications and a good ICT infrastructure, built upon the start of the CAR-IX in 2009 (now AMS-IX Caribbean). Furthermore, there is a balanced and diverse supply of creative industries in Curaçao, mainly focused on business-to-consumer markets. Because of the growth of content that is made possible by technological innovations, the international trend is the converging of creative industries and ICT in more and new (consumer) content services. In comparison with the Netherlands, the maturity of the sector can be further improved by creating economies of scale in the ICT domain."
Source: Cross Media Monitor Curaçao, Stimul-IT/TNO.

The Knowlegde Platform sets the goal to have at least 10 percent employementshare of the working population in ICT and creative industries by 2019. Therefore, current local policies that focus on stimulating the use of this infrastructure by production and distribution of content make sense. These could be made more effective if they would incorporate activities that simulate the interaction with other strong sectors on the island, resulting in combined propositions.

11.5 Targets and Actions

Id	Targets	Actions
12	The Knowlegde Platform sets the goal to have at least 10 percent employementshare of the working population in ICT and creative industries by 2019. That means we need to add 2350 high skilled technical and creative employees extra.	Install policies that focus on stimulating the use of infrastructure by production and distribution of content.

CALL FOR COMMENTS

This version is the final version of the Masterplan Information Society v2.0. However, we invite anyone who is interested and want to give comments on this version. We encourage discussion on the contents of the Masterplan, as it again will add to the quality of this Masterplan. Feel free to comment to the 1st author and board members of the Knowlegde Platform by e-mail:

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Appendix A – Bibliography

Masterplan Information Society v1	Knowlegde Platform, December 2009
Connect & Cooperate reports	Knowlegde Platform, 2011
De informatiemaatschappij en kenniseconomie van Curaçao	Pim Schouten en Nico Scheper, on behalf of Bureau Telecommunciatie en Post, 24 april 2009
Het ICT landschap op Curaçao 2012 en verder	Pim Schouten, on behalf of Bureau Telecommunicatie & Post, 2012
Curaçao 3.0	Dr. Miguel Goede
Zorgrekeningen Curaçao, 2008 – 2011	Ronald H.E. Westerhof and Drs. Ing. Lamberto P. Felida of the Volksgezondheid Instutuut Curaçao Downloaded at www.vic.cw.
Strategies for sustainable long term economic cevelopment in Curaçao	TAC on behalf of Ministry of General Affairs, May 2013.
Cross Media Monitor Curaçao, Final concept	TNO on behalf of Stimul-IT, 1st of September 2013