

RECOMMENDATIONS FOR FINTECH SECTOR DEVELOPMENT AND LEVERAGING ARTIFICIAL INTELLIGENCE AND BLOCKCHAIN TECHNOLOGY IN ARUBA

Dale Alexander
Kwesi Prescod



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Dale Alexander
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Glossary

5G	Fifth Generation Mobile Technology
ABA	Aruba Bankers Association
AFTA	Aruba Fair Trade Authority
AI	Artificial Intelligence
AIA	Aruba Insurance Association
AML/ CFT	Anti-Money Laundering/ Countering Financing of Terrorism
CBA	Central Bank of Aruba
CBDC	Central Bank Development Currency
CCOE	Cybercrime Centre of Excellence Limited
CERT	Computer Emergency Response Team
CRW	Consensus Kingdom Act on Data Protection
DEZHI	Department of Economic Affairs, Trade and Industry
DLT	Distributed Ledger Technology
DTZ	Department of Telecommunications
EU	European Union
FATCA	Foreign Account Tax Compliance Act (USA)
FATF	Financial Action Task Force
GDPR	General Data Privacy Rules
GDP	Gross Domestic Product

GFDD	Global Financial Development Database
HIPCAR	Harmonization of ICT Policies, Legislation and Regulatory Procedures for the Caribbean
ICT	Information and Communication Technology
KYC	Know Your Customer
LAC	Latin America and the Caribbean
LEO	Low Earth Orbit
ML	Machine Learning
OECD	Organization for Economic Co-operation and Development
PESTL	Political/ Economic/ Social/ Technological/ Legal
PwC	Price Waterhouse Coopers
SDG	Sustainable Development Goals
SIDS	Small Island Developing States
SME	Small and Medium Enterprises
STEM	Science, Technology, Engineering and Mathematics
SWOT	Strengths/ Weaknesses/ Opportunity/ Threats
UN	United Nations
UNCITRAL	United Nations Commission on International Trade Law
WDI	World Development Index

Introduction

This report culminates a qualitative study into the feasibility of the establishment of a fintech Sector, with associated development in Artificial Intelligence (AI) and Distributed Ledger Technologies (DLT), in Aruba. This report follows previous reports:

Trends in fintech sector This report culminates a qualitative study into the feasibility of the establishment of a fintech Sector, with associated development in Artificial Intelligence (AI) and Distributed Ledger Technologies (DLT), in Aruba. This report follows previous reports:

- Trends in fintech sector development in OECD and SIDS.
- Overview of the fintech regulatory environment in Aruba.
- Stakeholder perspectives of opportunities and risks for the use of fintech and blockchain in Aruba.

The first of these prior reports established a platform, based on the review of both academic scholarship and international best practices, by which the current state of the Aruba environment can be evaluated. Key among these findings was the importance of both ICT and Financial Sector readiness as a starting point to encouraging fintech development.

The second of these reports provided the results of a study, based on desktop reviews and feedback from stakeholders, of the regulatory environment in relation to the ICT and Financial Sectors in Aruba.

The third of these reports provided the result of extensive consultations with stakeholders in Aruba on the challenges they experience interacting with fintechs at home and abroad, and entering the fintech market, as well as their perspectives on where fintechs, AI, and DLTs can be leveraged to improve the competitiveness of the Aruban economy.

This report starts by undertaking a comparative assessment of Aruba in the spheres of ICT and Financial Sector readiness. This analysis is based on publicly available data sourced from, among others, the World Bank and United Nations agencies. In each instance, Aruba's report on key indicators is compared against regional counterparts, including Curaçao, Jamaica, Trinidad and Tobago, and the Netherlands. In this way, this analysis not only provides insight into whether there is objective viability to pursue a fintech sector but also considers the competitive position of Aruba to its neighbours, critically evaluating which factor inputs are strategically advantageous to Aruba to exploit and develop.

Thereafter, the report summarises all the findings of the Overview, the Stakeholder Perspective Reports as well as the Comparative analysis into a SWOT analysis – evaluating the Aruban environment strategically. However, mindful of the specific pre-requisites identified in the Trends Report, the report goes further by evaluating each strength, weakness, opportunity or threat in the context of the specific contextual requirements previously identified for fintech sector development.

The report then identifies, using further analytical frameworks identified in the Trends Report, which aspects of the fintech Sector, including consideration of AI and DLTs, are most aptly suited for Aruba in the immediate future. In this regard, the report identifies key activities that must be undertaken to broaden the market opportunity for fintechs, AI deployment and DLTs – not only as enablers of onshore activity and business, but also as a source of export-oriented activities within the ICT Sector.

In closing, the report seeks to contextualise the options available to the political leadership of Aruba and thus guide its ultimate decision as to whether to pursue a course of action to develop a fintech Sector in Aruba. Should it be decided to pursue this line of sector development, Appendix I provides a summary of the environmental prerequisites for sector development. Appendix II provides a summary of the next steps that can be taken to initiate action to achieve these prerequisites, and establish a platform for fintech Sector development, supported by AI and DLTs.

I. Current position in the regional and global context

A major finding of the international best practice review was the identification of factor-based macro-economic indicators that may guide the determination of a jurisdiction's readiness to support the development of an ICT sector generally, and a fintech Sector specifically. These indicators vary and include those related to:

- ICT readiness, including:
 - Access to the Internet and a breakdown of the types of usage of ICT services; and
 - Regulatory and institutional frameworks.
- Financial sector readiness, including:
 - Financial sector accessibility;
 - Financial sector depth;
 - Financial sector efficiency; and
 - Financial sector stability.

This section reviews these indicators as a means to assess Aruba's readiness. Further, the section seeks to compare these indicators against other regional economies – first where available, for other Caribbean countries in the Dutch Kingdom, and then secondly, to the major Caribbean economies of Trinidad and Tobago and Jamaica. Finally, these indicators are compared to that of the Netherlands, as a benchmark to EU standards.

A. Connectivity to the internet and social media

During the stakeholder engagement, the Department of Telecommunications Regulations (DTZ) acknowledged that it did not track demographic information of Internet Users in Aruba. However, there is non-official data provided by online service providers which can provide an insight into user

demographics of Aruba from the evaluation of online metrics. Such crowd sourced market information is provided through channels like Data Reportal, which aggregates information from firms such as Ookla, GSMA Intelligence, Statista, GWI and others.

An overview of the demographics of users, as compiled by Data Reportal for January 2025, is provided on the overleaf for Aruba, neighbouring Caribbean island states and the Netherlands.

According to the data provided, Aruba boasts a high rate of Internet penetration, comparable to the rates seen in the Netherlands. This is not unique or a particular competitive advantage as most regional counterparts have similarly high penetration rates, with Sint Maarten being the notable exception.

Critically, Aruba boasts high regular use of social media platforms generally. Social media use, particularly when reviewed in the context of the different types of social media channels' core focus, provides a proxy for the type of engagement of Internet users. In this regard, among the comparator countries, Aruba has the highest engagement with media platforms related to social engagements, with the exception of LinkedIn (professional/ career advancement) and Twitter/ X, where penetration rates are only surpassed by the Netherlands. This suggests that Aruba has a higher potential for e-participation than its neighbours in the Caribbean as a whole.

Also notable from this exercise is the paucity of official information available for Aruba with respect to the quality of Internet services received. Whereas for Trinidad and Tobago, Jamaica and the Netherlands, information was readily available of the average (median) fixed (and less so mobile) download speeds, such information was unavailable for Aruba, Curaçao and Sint Maarten. This lack of information may act as a disincentive to investors seeking to appreciate the state of the Aruban market as a target for online services that require effective, and fast networks.

Table 1
Comparative overview of online metrics

Data Reportal (2025)	Aruba	Curaçao	Sint Maarten	Trinidad and Tobago	Jamaica	Netherlands
Population	108 000	186 000	43 600	1 510 000	2 840 000	18 300 000
Male (%)	47.2	47.6	48.6	49.4	49.4	49.7
Female (%)	52.8	52.4	51.4	50.6	50.6	50.3
Internet users	105 000	126 000	29 800	1 280 000	2 370 000	18 100 000
Median mobile download (Mbps)						146.56
Median fixed download (Mbps)				119.01	81.91	197.11
Eligible Social Media users (%)	97.0	70.4	89.4	73.5	70.9	87.7
Male (%)	49.1	48.1	48.1	53.6	54.7	49.9
Female (%)	50.9	51.9	51.9	46.4	45.3	50.1
Facebook Users	83 600	107 000		793 000	923 000	8 050 000
Eligible user (%)	97.0	70.4		66.7	42.1	53.8
Male (%)	47.5	45.0		49.0	46.9	46.5
Female (%)	52.5	55.0		51.0	53.1	53.5
Instagram Users	60 300	64 100		695 000	1 030 000	8 050 000
Eligible user (%)	70.0	41.9		56.4	46.1	53.8
Male (%)	45.6	43.5		45.7	45.8	44.8
Female (%)	54.4	56.5		54.3	54.2	55.2
LinkedIn Users	69 000	88 000		640 000	890 000	13 000 000
Eligible user (%)	80.1	57.8		53.8	40.6	86.9
Male (%)	54.7	51.5		45.3	42.6	55.2
Female (%)	45.3	48.5		54.7	57.4	44.8
Messenger Users	54 900	66 500		449 000	404 000	3 800 000
Eligible user (%)	59	43.7		37.8	18.4	25.4
Male (%)	53.7	43.3		47.6	49.3	43.4
Female (%)	46.3	56.7		52.4	50.7	56.6
Twitter (X) Users	31 700	26 300		165 000	328 000	7 440 000
Eligible user (%)	34.1	17.0		13.5	14.7	43.0
Male (%)	65.7	69.9		62.6	58.9	48.9
Female (%)	34.3	30.1		37.4	41.1	49.5

Source: Data Reportal (2025).

Note: Eligible users refers to users identified as over 18 years of age.

B. Institutional and regulatory readiness

The overview of the legislative environment of Aruba discussed briefly the import of a robust regulatory environment for an ICT Sector as a prerequisite for establishing an attractive environment for investment in fintech specifically.

That discussion underscored that to create the holistic enabling environment that is necessary for all aspects of the digital service value chain to thrive, it is first required that the legislative frameworks associated in key areas be implemented, along with the identification and establishment of the requisite administrative bodies. Further it is imperative that these administrative bodies be provided with the necessary regulatory tools to facilitate enforcement. The key areas identified were:

- Telecommunications.
- Electronic commerce – transactions.
- Electronic signatures.
- Privacy protection.
- Competition management.
- e-Money in the payment system.
- Digital assets recognition and
- Cybersecurity coordination and management.

Tables 2 and 3 below present the comparative status of legislative and institutional frameworks necessary to support an ICT sector generally.

C. Financial sector indices

Assessing and comparing key financial sector indices are of particular concern in determining the readiness of a market to support the emergence of fintech services. Appreciating the differences in regulatory and competitive forces that result in these indicators can also provide a guide to the areas where intervention or adjustment may be pursued. As discussed above, there are four (4) categories of indicators: access, depth, efficiency and stability. For this study, the World Bank's Global Financial Development Database, compiled in August 2022 (GFDD 2022) and the World Development Index 2023 (WDI 2023) were used as common bases for comparative sub-indicators to the four (4) categories.

Notably, Aruba did not report on many of the Financial Sector Efficiency indicators, suggesting that there is little or no reported activity in the areas of "intermediary and investment services".

1. Financial access

Access to financial services means that businesses and households have access to financial services and are able to effectively use services that meet their needs. Financial services must be provided responsibly, economically, and continuously under the conditions of appropriate regulations. Access to financial services includes four areas: savings, loans, banking, and insurance.

As a means to model and compare the state of both insurance and financial services in Aruba, data from the World Development Index 2023 was considered. The findings are presented in figures 1 and 2 below.

Table 2
Overview of implementation of key legislative frameworks to support digital economy

Country	Legislative framework						
	Telecoms - universal service	Electronic transactions	Electronic signatures	Data protection and privacy	Cyber crime	e-Money and e-payments	Competition management
Aruba	N	Y	Y	N	N	N	Y
Barbados	N	Y	Y	Y	N		Y
Jamaica	Y	Y	Y	Y	Y	N	Y
Saint Lucia	Y	Y	Y	Y	N	Y	N
Trinidad and Tobago	Y	Y	Y	Y	Y	Y	Y

Source: Authors' elaboration.

Table 3
Overview of implementation of key institutional frameworks to support digital economy

Country	Institutional framework						
	Telecoms - universal service	Electronic transactions	Electronic signatures	Data protection and privacy	Cybercrime	e-Money and e-payments	Competition management
Aruba ^a	n/a	n/a	n/a	n/a	n/a	CB	AFTA
Barbados ^b	MoDI	n/a	DPC ^f	DPC	n/a	MoISST	n/a
Jamaica ^c	USF	n/a	JTB ^f	OIC	JCF/ JCIRT	BoJ	JFTC
Saint Lucia ^d	NTRC	DPSM	DPSM	DPSM	RSLPF	DPSM	n/a
Trinidad and Tobago ^e	TATT	n/a	n/a	OIC ^f	TTPS/ CSIRT	CBTT	FTC

Source: UN ECLAC (2023).

^aCentral Bank (CB), Aruba Fair Trade Authority (AFTA).

^bMinistry of Digital Infrastructure (MDI), Data Protection Commission (DPC), Ministry of Innovation, Science and Smart Technology (MISST).

^cUniversal Service Fund Limited (USF), Jamaica Trade Board (JTB), Office of the Information Commissioner (OIC), Jamaica Constabulary Force/ Jamaica Cybersecurity Incidence Response Team (JCF/ JCIRT), Bank of Jamaica (BoJ), Jamaica Fair Trade Commission (JFTC), Access to Information Unit (AIU).

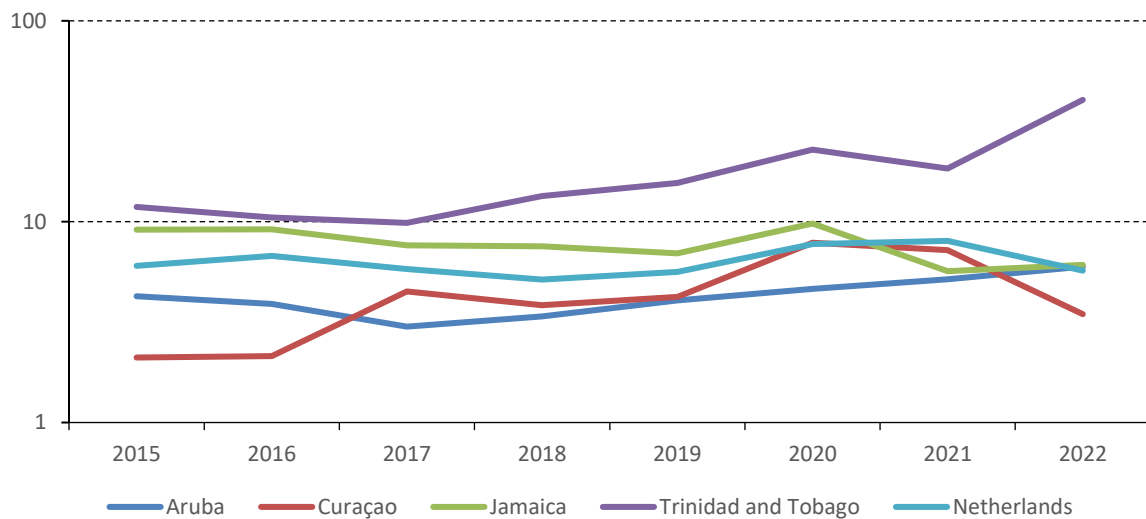
^dNational Telecommunications Regulations Commission (NTRC), Department of Public Sector Modernization (DPSM), Royal Saint Lucia Police Force (RSLPF).

^eTelecommunications Authority of Trinidad and Tobago (TATT), Office of the Information Commissioner (OIC), Trinidad and Tobago Police Force/ Cyber Security Incident Response Team (TTPS/CSIRT), Central Bank of Trinidad and Tobago (CBTT), Fair Trade Commission (FTC), Intellectual Property Office (IPO). Ministry of Digital Transformation (MDT).

^fNot operationalised.

For the period 2015 to 2022, the data suggests that Aruba's financial sector was competitive with that of Curaçao and Jamaica regionally, with respect to the proportion of trade in services, both import and export, related to the insurance and financial services sector. Of particular note, is that in the import of these services, Aruba's performance over the period was not significantly different from that of the Netherlands. This suggests that the services provided in these segments are robust and comparable to not only other Caribbean countries, but also competitive with those services offered from Europe.

Figure 1
Insurance and finance: services as a percentage of service imports
(Percentages)

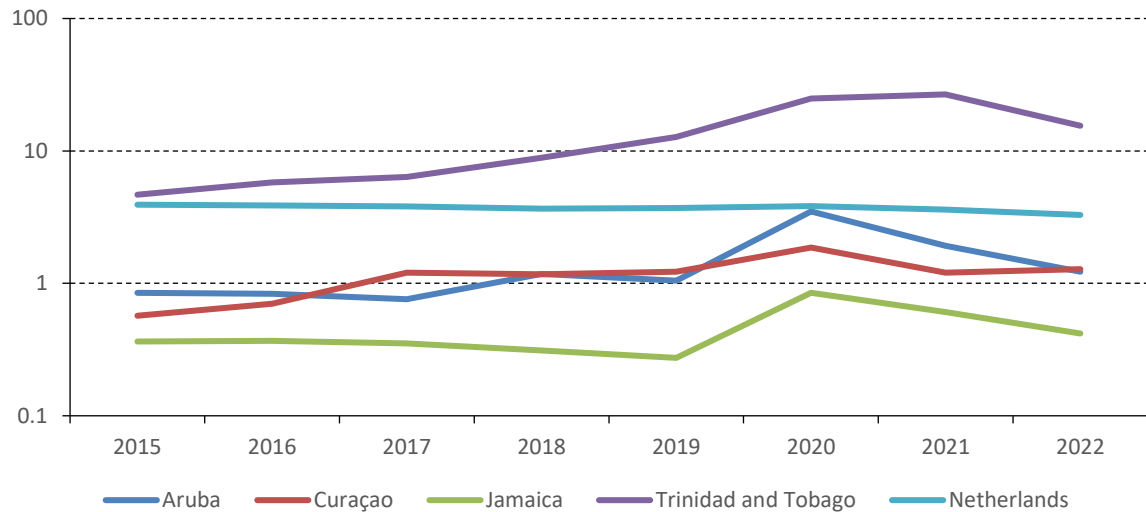


Source: World Development Index 2023.

Regarding the export of these services, Aruba's performance, more closely reflected that of Curaçao and Jamaica. This suggests the competitiveness and availability of these services are in line with those offered in other regional small island developing countries.

Given the sustained accessibility to financial services, the maturity of online service provision as a channel can be evaluated by the concentration of brick and mortar branches in operation: the more mature the online financial services channels, the less the concentration of bank branches that would be seen. This is expected as banks consolidate their operations given the prevalence of the online modality.

Figure 2
Insurance and finance: services as a percentage of service exports
(Percentages)

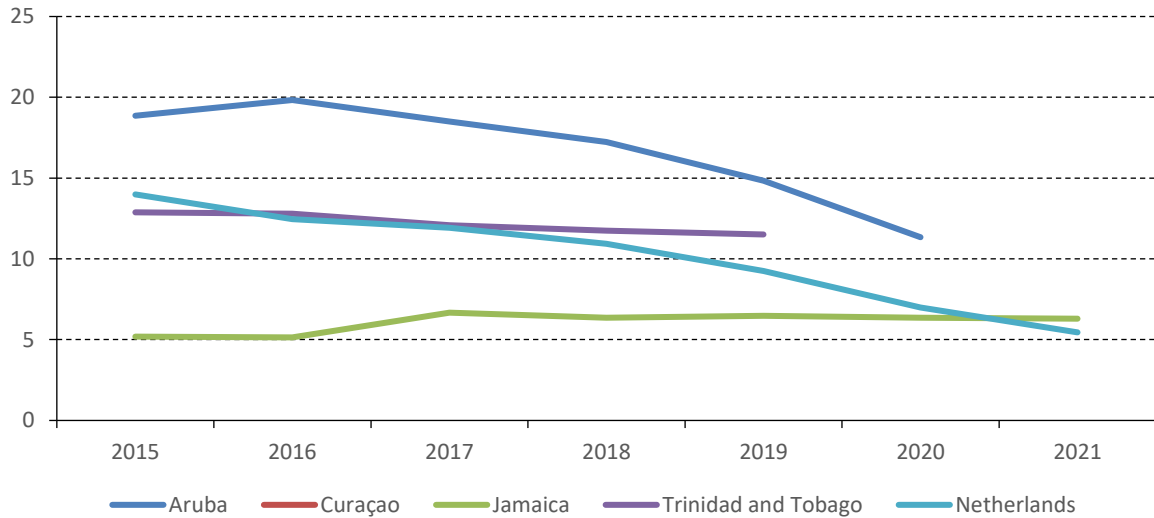


Source: World Development Index 2023.

Figure 3 below demonstrates this trend in Aruba and the comparator countries over the period. Notably, Curaçao did not report on the GFDD indicators. However, it can be clearly seen that up to 2021, the trend in Aruba mirrors the downward trajectory seen in the Netherlands. This affirms the position expressed by the CBA and the ABA of the robust nature of digital banking existing in Aruba. Conversely, figure 4, demonstrates the stable maintenance of ATMs throughout Aruba. Although a notable trend of decline is reflected in the Netherlands, this is not emulated in either Aruba or the other regional comparators. This suggests that despite the use of digital banking, there is still the use of cash, hence the need to withdraw cash by users. It is notable that this analysis did not reflect the impact of the Pay.aw and Sentoo platforms on the Aruban retail and commercial spaces, however it does reflect the market opportunity that existed.

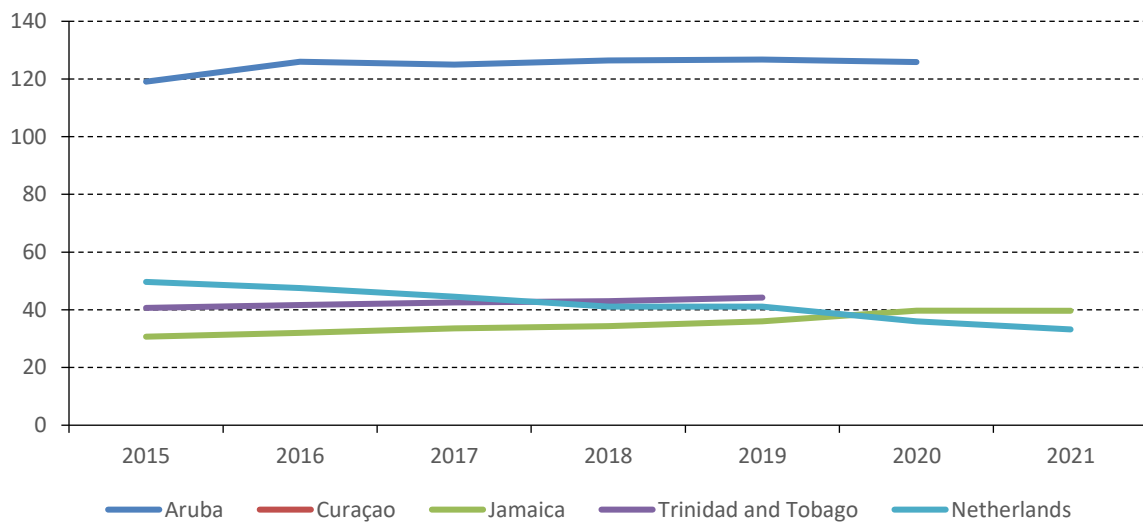
In summary, the analysis of the Financial Sector Access suggests that there is a business opportunity for fintech services in Aruba.

Figure 3
Financial access: bank branches
(Per 100,000 adults)



Source: World Bank's Global Financial Development Database, August 2022.
 Note: Data not available for Curaçao.

Figure 4
Financial access: ATMs
(Per 100,000 adults)



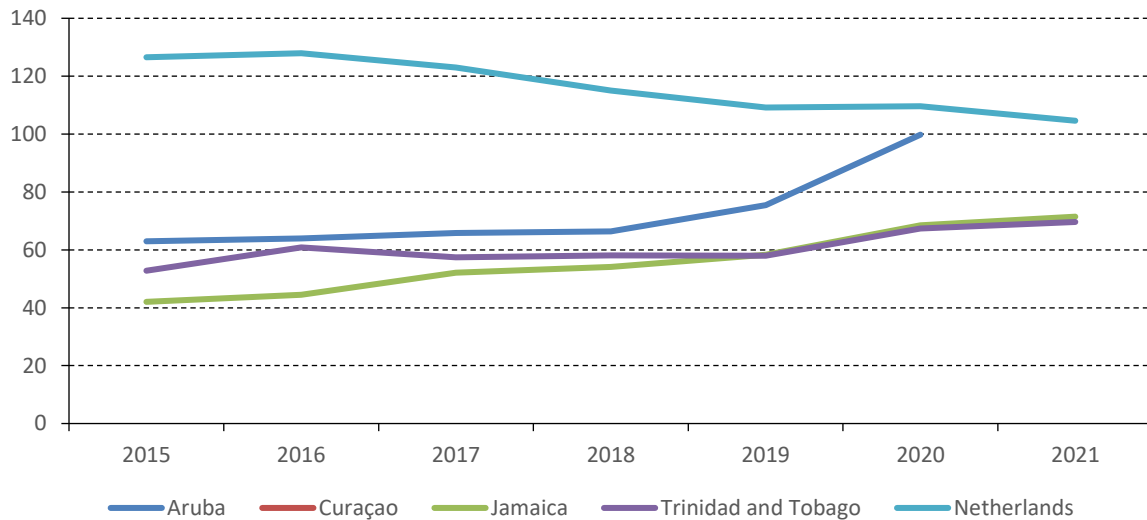
Source: World Bank's Global Financial Development Database, August 2022.
 Note: Data not available for Curaçao.

2. Financial depth

Depth of the financial sector refers to the various indices which reflect the trends of growth and expansion of the financial sector in general. Indeed, research has demonstrated that where financial depth indices improve, there is most likely a positive correlation with fintech sector development.

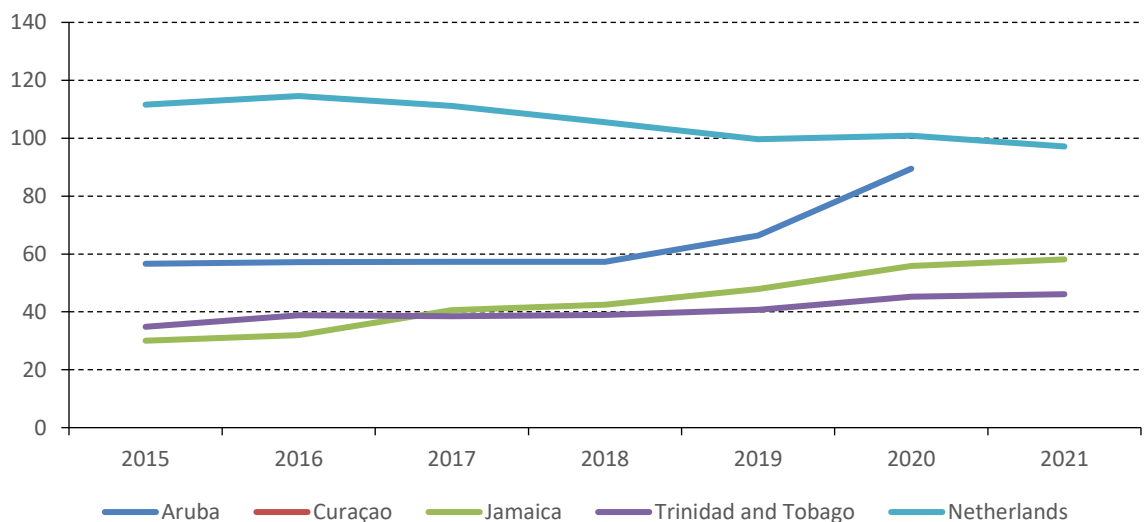
Figures 5, 6 and Figure 7 all provide an overview of Aruba’s performance against metrics of Financial Sector depth, as reported by the World Bank. These metrics all provide an indication of various aspects of the financial sector as a percentage of GDP. Generally, stable and positive trends are preferred.

Figure 5
Financial depth: deposit money banks’ assets to GDP
(Percentages)



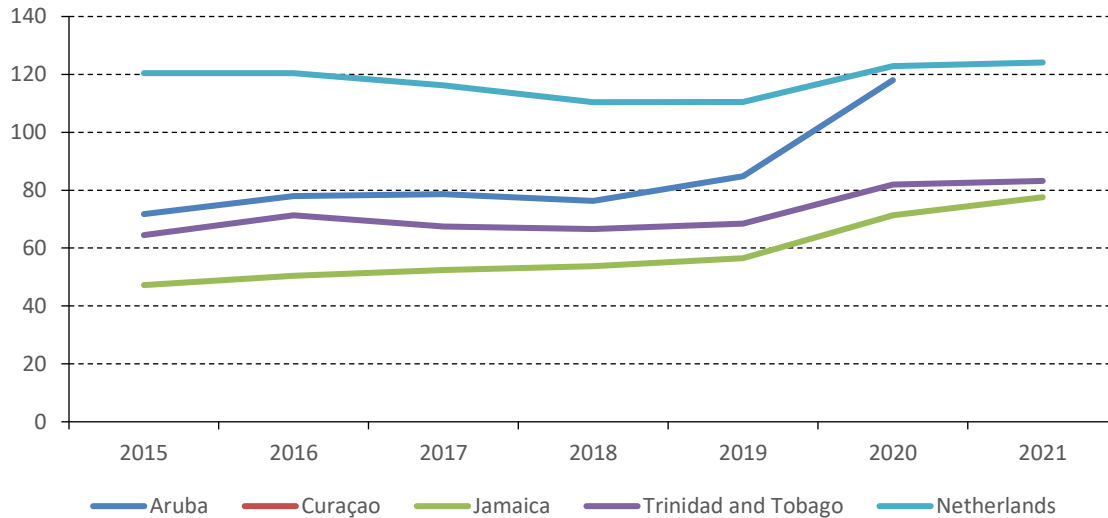
Source: World Bank’s Global Financial Development Database, August 2022.
 Note: Data not available for Curaçao.

Figure 6
Financial depth: private credit by deposit money in banks to GDP
(Percentages)



Source: World Bank’s Global Financial Development Database, August 2022.
 Note: Data not available for Curaçao.

Figure 7
Financial depth: liquid liability to GDP
(Percentages)



Source: World Bank's Global Financial Development Database, August 2022.

Note: Data not available for Curaçao.

In all instances, the trends suggest that Aruba's financial sector demonstrates preferable depth when compared to the regional comparator countries.

- With reference to Private credit to GDP ratios, Aruba outperformed Jamaica and Trinidad and Tobago by at least 15% to 20% from 2015 to 2019.
- With reference to Banks Assets to GDP ratios, the comparison between the three (3) countries were extremely close during the period 2015 to 2019.
- With reference to Liquid Liability to GDP ratios, Aruba again reflected more robust financial depth than the two Caribbean comparator countries during the period 2015 to 2019.

It should be noted that in all instances, these indices reflect a sharp rise in 2020 for Aruba, not as acutely reflected with (in) other comparator countries. This is most likely attributable to the sharp negative impact on Aruba's GDP in that year due to the global COVID-19 pandemic. This thus indirectly reflects the sensitivity to shocks of the Aruban GDP, while also reflecting the Financial Sector's specific capacity to withstand such acute, non-sectoral instances.

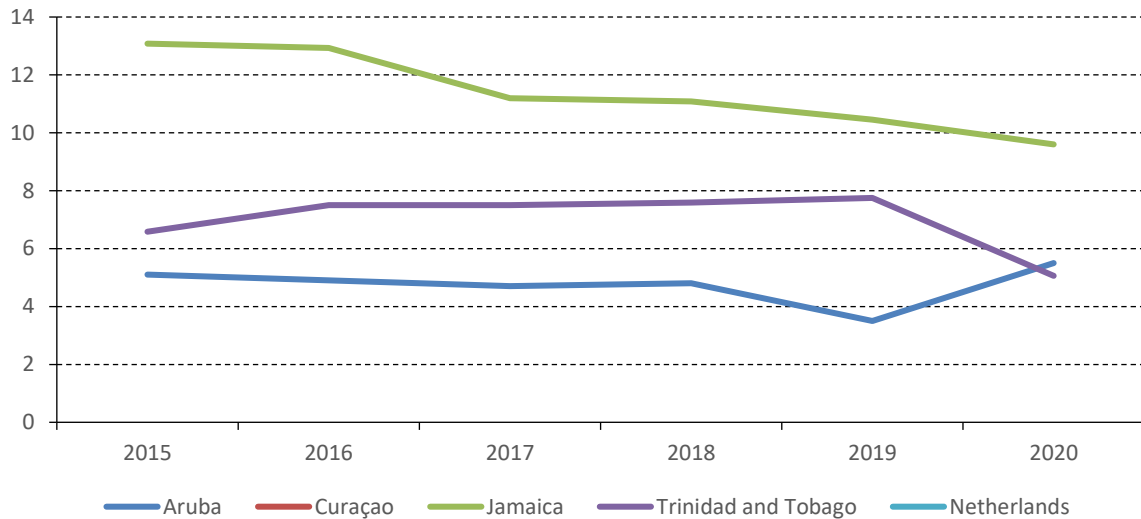
In summary, the analysis of the financial sector depth suggests that there is an appropriate financial market to support the development of fintech services in Aruba.

3. Financial efficiency

Financial sector efficiency demonstrates the ability for institutions to provides services at low cost and with sustainable revenues. Further, the Svirydzienka (2016) posits that financial sector efficiency can be evaluated by the activity of capital markets within the economy.

Feedback from CBA underscored that there is no capital market in Aruba. Accordingly, many of the indicators related to demonstrating Financial Efficiency did not present any reported data for Aruba. Of the GFDD indicators, only that relating to the "Bank Lending to Deposit spread" was reported for Aruba. A comparison of Aruba's trends to those of regional comparators is presented in figure 8.

Figure 8
Financial efficiency: bank lending – deposit spread



Source: World Bank's Global Financial Development Database, August 2022.

Note: Data not available for Curaçao and Netherlands.

Notably, in this aspect of sector efficiency, Aruba generally trended as the most efficient financial sector, with the least spread and thus lowest cost for sustainable revenues, from 2015 to 2019.

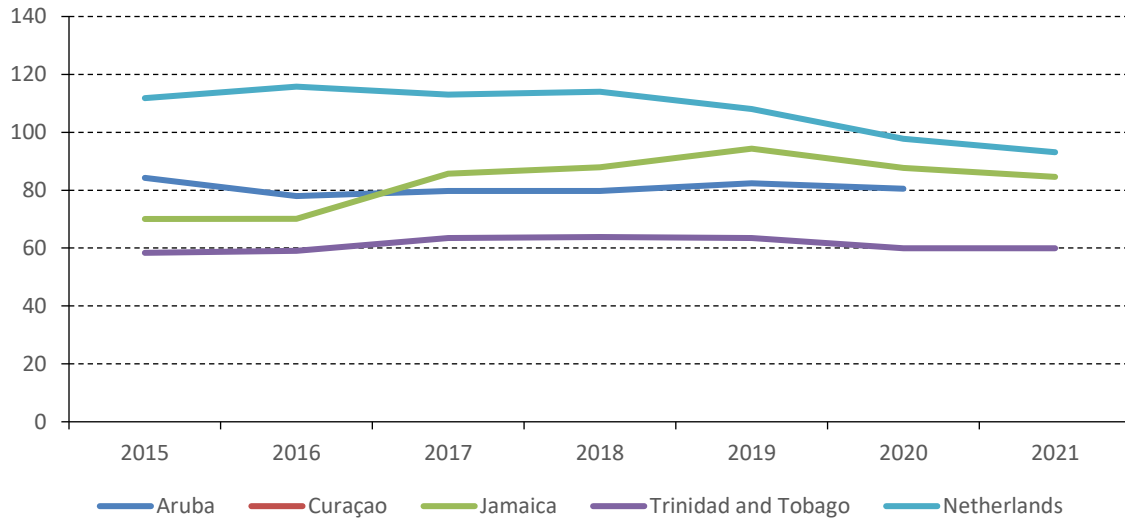
In summary, the analysis of the financial sector efficiency suggests that there is an environment that is conducive to the development of fintech services primarily in the banking services sector.

4. Financial stability

Financial stability is of paramount importance to macroeconomic stability. Financial sector stability refers to the system's resilience to withstand adverse shocks, continuing to support households, communities and businesses during economic stress. In this regard, financial institutions are generally subject to periodic stress tests to confirm systemic stability.

Figure 9 below provides a comparison of a key stability indicator, the ratio of bank credit to deposits. It demonstrates that the banking sector of Aruba reflects the application of moderate regulatory policies which, like the Caribbean peers, appeared not to be unduly impacted by the disruptions of 2020. This is in stark contrast to the trends presented by the Netherlands, where the ratio has a persistent negative trend from 2018 to 2021.

Figure 9
Financial stability: bank credit to bank deposit
(Percentages)



Source: World Bank's Global Financial Development Database, August 2022.

Note: Data not available for Curaçao.

In summary, the analysis of the financial sector stability suggests that there is an environment that is conducive to the development of fintech services in the banking services sector.

II. Evaluation of current state against best practices

The previous interim reports presented, among other things:

- An overview of the current legislative and administrative framework applicable to the ICT and Financial Sectors;
- The perspectives of market participants on the obstacles and opportunities that will impact the development of a fintech Sector in Aruba; and
- Two analytical frameworks through which the extant environment can be evaluated to determine the best way forward with regard to fintech, AI and DLT Sector development.

These findings provide a baseline of the current economic environment of Aruba. This baseline is first analysed through the rubric of a Political, Economic, Social, Technological and Legal (PESTL) framework, to identify and contextualise the internal strengths and weaknesses of the business environment within Aruba. Similarly, external opportunities and threats are also evaluated to identify the viability of options for action that emerge from the internal analysis.

This baseline is also further analysed through the guiding lens of PwC's model of critical elements that are pre-requisites for fintech sector development. These include:

- Business environment/ access to markets: which considers factor inputs associated with the general competitiveness of the business environment of the country.
- Government/ regulatory support: which focuses on the overarching enabling role of Government.
- Access to capital: which analyses funding along the value chain of direct and indirect suppliers of enabling services. These capital sources are typically funded through three main sources (i) Governments, (ii) Venture capital funds, and (iii) Incubators and accelerators.

- **Financial Expertise:** which takes into consideration access to broad financial expertise and know-how, from the early stages of idea generation through commercialization, and lastly provide legal and regulatory counselling.

Each of these elements has been further defined into four sub-elements. Through this analysis, gaps in either administrative systems or policy frameworks which are focused on this sector can be readily identified. Affirmative approaches undertaken to fill these gaps will advance the Aruban business environment's attractiveness for inward investment in the ICT Sector generally, and the fintech subsector specifically. Conversely, if filling these gaps are deemed unappealing to the policymakers, this will guide the general conversation as to whether fintech, AI and DLT are plausible as a platform for economic diversification in Aruba.

Once the approach to filling critical gaps is identified, the interaction of the three dimensions of the fintech Cube proposed by O'Hanlon et al. (2020) (i.e., the financial sector, the business model, and technology) are used to identify which specific aspects of the fintech Sector could be the areas of focus for development. Among those dimensions, the technology dimension includes consideration of the use of AI and DLT domestically as enablers within the fintech sector.

A. Internal context and strategic drivers

As outlined above, this section seeks to distil the strategic characteristics intrinsic in the Aruban business environment. Major findings from the Legislative Overview, Stakeholder perspectives and comparative assessments are considered from the PESTL framework. These are then grouped as either internal strengths (competitive advantages) or weaknesses (competitive disadvantages). Thereafter, these intrinsic characteristics are then further considered in the context of critical elements to establish a fintech Sector.

1. Strengths

Political

- Stable democratic traditions and practices, based on the Dutch governance system.
- Established institutional partnerships with the Dutch governance system.
- Preliminary investigation conducted into the development of Hyperscale Data Centres in Aruba.

Economic

- High level of access within the banking and insurance sectors.
- Digital banking is mainstreamed, as evidenced by the emergent trend in the reduction of branches by banks, and the proposed establishment of a fully online bank.
- Robust banking sector with range of financial products for larger lending.
- Microfinancing options available to SMEs.
- Incubators/ accelerators in the market to support microfinancing.
- Private sector (through various Industry Associations) is leading and encouraging compliance to international standards such as GDPR, and cybersecurity.
- Partnership with emergent firms targeting SME financial education.

Social

- High education and literacy.
- Multi-lingual population (Papiamentu, Dutch, English and Spanish).
- STEM-based programme at local University to develop talent base.
- smaller firms have begun to target and train new hires in ICT related fields.

Technological

- 4G and 5G mobile networks available.
- High speed fixed broadband available.
- CBA administered IPAGO provides for interbank settlement within Aruba.
- Domestically developed digital wallet exists: Pay.aw's use of tokens is a cryptocurrency implementation.

Legal/ regulatory

- Established CBA with broad range of oversight in matters related to Banking and Finance, Foreign Exchange administration.
- Strong AML/ CFT and KYC compliance frameworks established and administered by the CBA.
- There is recognition that adherence to international standards is essential to maintain correspondent banking relationships.
- Strong monetary policy framework established in statute and administered by the CBA.
- CBA has articulated a road map for the implementation of a digital florin CBDC.
- Established statutory framework for competition management, and the associated regulatory body, AFTA.
- Electronic documents and electronic signatures recognised in statute.

This overview establishes that Aruba has strong fundamentals with respect to monetary policy and foreign exchange management. Aruba thus has a strong base in financial sector management, and ensuring the sector is in compliance with international regulatory norms. It does demonstrate that while there have been some forays into the regulatory spheres of ICT and competition management, the platform created is not as robust as that established for the financial sector.

2. Weaknesses

Economic

- Intrinsically small market impacts the feasibility of market entry to service Aruba alone.
- Open economy, which is susceptible to shocks.
- Investment barriers and institutional inertia.
- Economy based primarily on tourism, where traditional business interests do not see ICT-based industry as a priority.
- Limited economic diversification.
- Lack of institutional structure to implement GDPR limits public protection.

Social

- Lack of opportunity leads to the “Brain Drain” challenge.
 - Smaller firms are targeting this directly through the introduction of new jobs, outside of hospitality and banking, within the ICT Sector.
- Given increased room stock planned, there is an anticipated labour demands in tourism/hospitality will compete for available candidates in a new sector.
- STEM-based program is more engineering focused, as opposed to information technology focused – thus not directly aligned to focus on fintech, AI and DLTs.

Technological

- Lack of Government leadership on Cybersecurity regulation, despite significant ransomware attacks in the recent past.
- Key critical ICT infrastructure not yet present, for example, there is no onshore data centre in Aruba.
- Due to limited competition in fixed broadband services, there is increased risk of single point of failure due to monopoly in fixed broadband.

Legal/ regulatory

- Telecommunications regulation incomplete with insufficient coverage on matters such as:
 - Pricing and access to bottleneck infrastructure.
 - Establishment and administration of market-centric universal service/ digital inclusion frameworks.
 - Non-discriminatory access to wholesale services.
 - Efficient and transparent use of resources, such as numbering, including number portability.
 - Procedural requirements associated with the treatment of unlawful content, and legal interception of communications.
- Data Protection framework incomplete, with the additional need to establish an administrative authority.
- Financial regulations with respect to 60% domestic investment is widely seen as a constraint to investment and innovation.
 - Trade in cryptocurrencies would fall under the rubric of general foreign exchange regulations.
- Trade in cryptocurrencies also impacted by application of AML/ CFT and KYC regulations.
- Broad, “one-size-fits-all” application of AML/ CFT oversight is deemed to be constraining:
 - Stock market development.
 - Onshore and offshore investment opportunities.
 - SME investment in e-wallets.
- Tardiness in establishing regulatory institutions discourages investment in innovative new market segments.

- Difficulty in introducing and sustaining imported talent skilled in ICTs and fintech.
- Legal provision to treat with “crypto-assets” are undefined other than the application of AML/ CFT rules as prescribed by the CBA.

This overview establishes that despite the strength of its regulatory framework in the financial sector, there may be a concern of over-regulation which may be negatively impacting innovation in the sector. This seems especially so in emerging market segments traditionally targeted by fintechs. Further, this overview reinforces that there are structural challenges which need to be addressed in the ICT regulatory context, which would need to be addressed to deepen competition, and innovative capacity in this sector. This is critical as best practice suggests that innovation in both the ICT and financial sectors is necessary for fintech sector development.

Table 4 below, further evaluates these strengths and weaknesses in the context of the critical elements for fintech Sector development. In this analysis, the strengths and weaknesses are further mapped to the relevant sector pre-requisites, and subcategories identified by the model proposed by PwC Networking (2020). This additional mapping assists to identify where there are gaps in the environment that need to be specifically targeted going forward.

Table 4
Strengths and weaknesses within critical inputs for the development of a fintech eco system in Aruba

	Strengths	Weaknesses
Business environment/ access to markets		
Cost advantages		Comparative high cost of living compared to Colombia, cited as the tech centre of LAC.
Labour availability and know-how	<p>Highly educated population, however lack of opportunity leads to the “Brain Drain” challenge.</p> <p>STEM based programme at the local university to develop talent base.</p> <p>Tendency for smaller firms to target and train applicants not interested in hospitality or banking</p>	<p>Anticipated labour demands in Tourism/ Hospitality will compete for available candidates.</p> <p>STEM based programme is more Engineering focused, as opposed to Information Technology focused – thus not directly aligned to focus on fintech, AI and DLTs.</p>
Degree of clustering and integration	<p>Small market size means players are generally familiar with each other</p> <p>Widespread recognition of the benefits of CCOE, as a digital economy service provider</p> <p>Chamber of Commerce functions as the business registry</p> <p>Cross membership between ATIA, Chamber of Commerce.</p> <p>Upstream/ downstream interactions/ partnerships between banks and microfinance providers</p>	
Infrastructure quality and access	<p>4G and 5G mobile networks available</p> <p>High speed fixed broadband available.</p> <p>Domestically developed digital wallet exists</p> <p>CBA administered IPAGO provides for interbank settlement within Aruba.</p> <p>Significant investment in new hotel plant, with over 2,000 additional rooms to be added to stock in the near future.</p>	<p>Single fibre-optic landing station</p> <p>Limited rules/ standards established for the protection and sustainability of infrastructure.</p> <p>No onshore Data Centre</p> <p>Housing shortages, as a run on real estate to support stay-over tourism.</p> <p>Strain on public infrastructure to support increased room stock.</p>

	Strengths	Weaknesses
Government/ Regulatory Support		
Policy setting	AFTA established and empowered to managed competition issues across all sectors. AFTA can provide a big impact to the environment, but its capacity to do so will be limited by its size, and the scope of challenges that need to be addressed.	DTZ has limited scope of oversight of telecommunications sector regulation, which has resulted in an environment that is hostile to innovation.
Policy setting (cont'd)	Electronic documents and electronic signatures recognised. CBA is the regulatory authority that looms largest over the sector Strong monetary policy framework Ordinance establishing FATCA compliance affirmed AML/ CFT and KYC compliance which is essential to maintaining correspondent banking. CBA has established rules for digital wallets. CBA has articulated a road map for the implementation of a digital florin CBDC	Key aspects of UNCITRAL and HIPCAR model laws are not included in statute. GDPR framework is incomplete, with a need for Data Protection statute and administrator in Aruba. CBA application of AML/ CFT regulations seems overly onerous for SMEs such as digital wallets for capital market development. CBA implementation of monetary policy Onshore and Offshore Investment opportunities CBA approach to regulation of market is opaque to the practitioner. Lack of Government leadership on Cybersecurity, despite significant Ransomware attacks in the recent past. Use of cryptocurrencies frowned upon due to heightened AML/ CFT risk.
Land ownership and development	Framework for the establishment of Free Trade Zone in Aruba established and previously leveraged. Investment in renewable energy projects under consideration.	
Ease of doing business		Industry laments that lack of information sharing has stymied ease of doing business.
Taxes and work permits		Industry recommends a reform of the frameworks for the licensing and additional taxation of forex transactions.
Access to capital		
Government funding		
Bank funding	High level of access within the banking and insurance sectors High level of stability in the business sector Robust banking sector with range of financial products for larger/ traditional lending. Competitive marketplace targeting traditional borrowers Partnership with emergent firms targeting SME financial education	

	Strengths	Weaknesses
Private equity/ venture capital Incubators/ accelerators	Micro-finance options in the market for SME's. Existence of market-based incubators as part of the micro-finance feeder for Qredits	There is no systemic framework to provide sustainability if Qredits leave the market
Financial Expertise Funding strategies	Existence of market-based incubators as part of the micro-finance feeder for Qredits	There is no systemic framework to provide sustainability if Qredits leave the market
Know your customer and regulatory requirements	Ordinance establishing FATCA compliance affirmed AML/ CFT and KYC implementation.	Trade in cryptocurrencies (as an asset class) fall under the rubric of general foreign exchange and investment regulations of the CBA.
Deals structuring	SMEs in the market that provide deal structuring services. Currently an unregulated market.	There is no systemic framework to provide sustainability if FinanceQuest leaves the market
Due diligence		

Source: Authors' elaboration.

B. External forces and strategic drivers

This section seeks to distil the external forces that impact the Aruban business environment. Major findings from the Legislative Overview, Stakeholder perspectives and comparative assessments are considered from PESTL framework. As before, these are then grouped as either external opportunities or threats. Thereafter, these intrinsic characteristics are further considered within the context of critical elements to establish a fintech Sector. This will aid in identifying trans-national supply or demand opportunities to be leveraged for onshore sector development.

1. Opportunities

Political

- Status of country within the Kingdom of the Netherlands provides political support both regionally and with Europe.

Economic

- International Payment providers, such as PayPal and ApplePay have expressed interest in entering the market, which can generally be facilitated under Electronic Money Institution (EMI) framework.
- Regulatory framework has not yet constrained the entrance of Payment Service Providers such as Sentoo into the domestic space.
- Significant precedence in partnerships between domestic participants in the banking and insurance sectors with international/ metropole firms that provide expertise, policy context and timely implementation.

Social

- Through partnerships with metropole firms there is the opportunity for training in adjunct skills such as project management, to support ICT based skills in the market.

Technological

- CBA investigating the use of "Sup Tech" or Supervisory Technology, a branch of AI to support its administration of more digitally mediated activity.
- Low Earth Orbit (LEO) Satellite service providers can, and do in the case of DirectTV, provide ubiquitous coverage to Aruba.

Legal/ regulatory

- The new Consensus Kingdom Act on Data Protection (CRW) will provide update to statutory framework regarding privacy protection and establish administrator for the Caribbean islands of the Kingdom.
- Implementation of GDPR and AI Act should precede the implementation service sectors in fintech and AI.
- Established technology standards (FCC of the USA or ETSI of EU) available for regulatory adoption, eliminating time needed for country-specific framework definition.
- Precedent experiences in the implementation of CBDCs exist in the Caribbean for both onshore and (limited) cross-border implementations.

- CBA part of network of regulators including:
 - The Dutch Caribbean Central Banks; and
 - The Dutch Central Bank.
- AFTA has established foreign partners to assist it in its functions. These partners include:
 - CARICOM.
 - OECD.
 - ECLAC.
- Model laws (UNCITRAL and HIPCAR) exist to provide for upgrade of current statutes in relation to:
 - Telecommunications liberalization and modernization.
 - Electronic contracts and electronic signatures.

2. Threats

Political

- Shifts in trade and political allegiances which may affect supply chains, treaties as well as enabling frameworks for international trade and financial aid.

Economic

- Competitive ICT service clusters exist in Curaçao, notably with provision of fintech services, some of which are entering the Aruban market, such as Sentoo.
- Globally recognised cryptocurrencies can compete with legal tender as preferred forms of payment, compromising some of central banks' core functions.
- Competitive ICT clusters exist in Curaçao, notably with data Centres and associated facilities.
- Use of cryptocurrencies can result increased potential of Aruba based banks being subject of de-risking by correspondent banking institutions.
- International EMIs seek exemption from AML/ CFT rules. Approach would also increase the prospect of correspondent banks de-risking Aruban financial institutions.
- Domestic entrance of online payment service providers such as Sentoo from Curaçao, demonstrate the competitiveness of the regional space, and Aruba's tardiness in entering the environment.
- Forex and trade system instability.
- Stock and bond market price volatility and commodity price variances.

Social

- Attractive labour market driving brain drain, particularly in ICT and related sectors in:
 - Netherlands.
 - Sint Maarten.
 - Curaçao.

Technological

- Increased incidence of ransomware attacks, evidencing the increased importance of cybersecurity as more services, and databases, are made available online.

Legal/ regulatory

- Changing demands of FATF and FATCA compliance a constant consideration in the definition of AML/ CFT and KYC policy frameworks by the CBA.

Table 5 below evaluates these opportunities and threats within the context of the critical elements for fintech Sector development. In this analysis the external drivers are mapped to the relevant sector pre-requisites to identify which of these may be impacted by broader international developments and thus require targeted consideration in the design of the implementation modalities.

Table 5
Opportunities and threats affecting critical inputs for the development of a fintech eco System in Aruba

	Opportunities	Threats
Business Environment/ access to markets Cost advantages.		
Labour availability and know-how.	<ul style="list-style-type: none"> • Through partnerships with metropole firms there is the opportunity for training in adjunct skills such as project management, to support ICT based skills in the market. 	<ul style="list-style-type: none"> • Attractive labour market driving brain drain, particularly in ICT and related sectors in: <ul style="list-style-type: none"> ○ Netherlands. ○ Sint Maarten. ○ Curaçao.
Degree of clustering and integration.	<ul style="list-style-type: none"> • CBA part of network of regulators including: <ul style="list-style-type: none"> ○ The Dutch Caribbean Central Banks; and ○ The Dutch Central Bank. • AFTA has established foreign partners to assist it in its functions. These partners include: <ul style="list-style-type: none"> ○ CARICOM. ○ OECD. ○ ECLAC. • Significant precedence in partnerships between domestic participants in the banking and insurance sectors with international/ metropole firms that provide expertise, policy context and timely implementation. 	<ul style="list-style-type: none"> • Competitive ICT service clusters exist in Curaçao, notably with provision of fintech services, some of which are entering the Aruban market, such as Sentoo.
Infrastructure quality and access.	<ul style="list-style-type: none"> • Low Earth Orbit (LEO) Satellite service providers can, and do in the case of DirectTV, provide ubiquitous coverage to Aruba. 	<ul style="list-style-type: none"> • Competitive ICT clusters exist in Curaçao, notably with Data Centres and associated facilities.
Government/ regulatory support Policy setting.	<ul style="list-style-type: none"> • The new Consensus Kingdom Act on Data Protection (CRW) will provide update to statutory framework regarding privacy protection, and establish administrator for the Caribbean islands of the Kingdom. • Implementation of GDPR should precede the implementation service sectors in fintech. 	<ul style="list-style-type: none"> • Use of cryptocurrencies can result increased potential of Aruba based banks being subject of de-risking by correspondent banking institutions. • Globally recognised cryptocurrencies can compete with legal tender as preferred forms of payment, compromising some of central banks' core functions.

	Opportunities	Threats
Policy setting(cont'd)	<ul style="list-style-type: none"> • Implementation of frameworks akin to EU's AI Act should precede the implementation service sectors in AI. • Model laws (UNCITRAL and HIPCAR) exist to provide for upgrade of current statutes in relation to: <ul style="list-style-type: none"> ○ Telecommunications liberalization and modernization. ○ Electronic contracts and electronic signatures. • Precedent experiences in the implementation of CBDCs exist in the Caribbean for both onshore and (limited) cross-border implementations. • Established technology standards (FCC of the USA or ETSI of EU) available for regulatory adoption, eliminating time needed for country-specific framework definition. 	<ul style="list-style-type: none"> • Changing demands of FATF and FATCA Compliance a constant consideration in the definition of AML/ CFT and KYC policy frameworks by the CBA.
	<ul style="list-style-type: none"> • International Payment providers, such as PayPal and ApplePay have expressed interest in entering the market, which can be facilitated under Electronic Money Institution (EMI) framework. • Regulatory framework has not yet constrained the entrance of Payment Service Providers such as Sentoo into the domestic space. 	<ul style="list-style-type: none"> • International EMIs seek exemption from AML/ CFT rules. Approach would also increase the prospect of correspondent banks de-risking Aruban financial institutions. • Domestic entrance of online Payment Service Providers such as Sentoo from Curaçao, demonstrate the competitiveness of the regional space, and Aruba's tardiness in entering the environment.
Land ownership and development.		
Ease of doing business.		
Taxes and work permits.	<ul style="list-style-type: none"> • The rise of "Digital Nomad" immigration incentives within the region. 	
Access to capital		
Government funding.		<ul style="list-style-type: none"> • Shifts in trade and political allegiances which may affect supply chains, treaties as well as enabling frameworks for international trade and financial aid.
Bank funding.		<ul style="list-style-type: none"> • Forex and Trade system instability.

Opportunities	Threats
Private equity/ venture capital.	<ul style="list-style-type: none"> • Stock and bond market price volatility and commodity price variances.
Incubators/ accelerators.	
Financial Expertise Funding strategies.	
Know your customer and regulatory requirements.	<ul style="list-style-type: none"> • Changing requirement from FATF, FATCA and other international financial regulatory frameworks which could impact correspondent banking relationships.
Deals structuring.	
Due diligence.	<ul style="list-style-type: none"> • CBA investigating the use of "Sup Tech" or Supervisory Technology, a branch of AI to support its administration of more digitally mediated activity.

Source: Authors' elaboration.

C. Evaluation of internal and external drivers in the context of fintech sector requirements

1. Fintech sector

Generally, the SWOT analysis paints a mixed picture for Aruba.

The business environment's strengths are focused on Aruba's tightly knit community of interests, which allows the ready transmission of priorities among key stakeholders in both the public and private sector. This has in the past allowed for rapid consensus building on a way forward once agreed. Another strength is the retained linkages to the Netherlands. This has facilitated the timely introduction of key principles into the private sector, as a matter of retaining competitiveness in a global market. Conversion of these principles into implementable systems remains a challenge. Along with this, high-speed infrastructure that is comparable with that deployed elsewhere in the Caribbean is deployed. This has facilitated the emergence of a high levels of digital and financial inclusion, evidenced by the elimination of cheques in Aruba and the widespread use of some form of digital banking solution within over-the-counter commerce. This suggests an amiable environment – with a market already acclimatized to service prospects - to attract investment, or encourage entrepreneurship in the ICT space generally, and the fintech space, in particular.

However, the analysis also presents major weaknesses, primarily regulatory in nature, and in particular, weaknesses related to the tardy implementation of the frameworks necessary to support the ICT sectors. Accordingly, while there is a robust regulatory framework for the Financial Sector, this is not the case with ICT-enabling statute. Another major aspect of environmental weakness is intrinsically associated with the size of Aruba, and its limited market size. This is exacerbated by the dominance of tourism as the single major pillar in the economy, creating an environment very susceptible to shocks in that particular sector.

This challenge of market size also presents itself in several ways:

- The emergence of a single dominant entity, Setar N.V., in the wider ICT sector. Setar N.V. boasts operations in telecommunications, broadcasting, ICT and financial services. This dominant position across multiple market segment, entrenched by alleged preferential practices by Ministries and State agencies, can be seen as hostile to new entrants.
- The lack of skilled human capacity in ICTs to pursue the technical aspects of fintech sector. This is exacerbated by the limited opportunities currently available within the economy to grow that capacity, without first losing those resources through the Brain Drain, particularly to the Netherlands.
- The emerging deficiency in homesteads as prime real estate is being absorbed in the online mediated real estate market, for example, through rentals in a model encouraging over-night tourism facilitation, or outright sales. This creates pressure for residents and citizens to access the market with increasing real estate pricing.

Indeed, the last two bullets demonstrate instances where, without strategic guidance, Aruba's strengths are turned against it, causing challenges downstream.

In terms of regulatory institutions, the CBA and DTZ are long established institutions with significantly different positions within their sectors. The CBA is dominant in the financial sector space, with robust regulatory mandates. However, there is the concern by stakeholders other than bankers, that the CBA's application and approach may tend towards opaque over-regulation. Conversely DTZ is not

dominant in the ICT sector and does not have a robust regulatory mandate. Indeed, it has acknowledged that its capacity constraints has led to an approach which may tend towards under-regulation.

Fortuitously, there are significant opportunities that abound that can be leveraged to overcome some of these weaknesses.

With regard to the major regulatory weakness,

- There is significant support available that can be tapped into by policy makers, with a view to rapidly closing the regulatory gap, especially in terms of adequate design of statute with respect to:
 - Interconnection implementation and management.
 - The allocation and assignment practices for effective, efficient and transparent resource administration.
 - The enforcement of technical, operational standards for the deployment of infrastructure, geared to ensuring cybersecurity, as well as network survivability and sustainability.
 - The management of illegal content, and legal interception of communications.
 - The structure of administrative penalties, making available to the regulator a more robust enforcement toolkit.
- There are also established relationships with regulatory partners regionally, that can support shared learnings in operational strategies and approaches. This can expedite operationalization. These partners include:
 - Regional regulators, such as the Eastern Caribbean Telecommunications Authority (ECTEL), Telecommunications Authority of Trinidad and Tobago (TATT), among others.
 - Caribbean Telecommunications Union (CTU).
 - International Telecommunications Union's (ITU) regional office.

Further, the establishment of AFTA, as a competition authority, bodes well for the treatment of issues related to the potential, emerging instances of market failure. However, there is the concern that they may be overburdened by the breadth of issues with which they must treat. In this regard, support from the policy makers and legislature may assist, in establishing ex ante provisions which would shape the market and aid AFTA in its functions.

Based on the SWOT analysis alone, Aruba seems to reflect a moderate opportunity for fintech sector development, if only regulatory issues are treated with, notwithstanding the inescapable challenges associated with its size and lack of economies of scale.

However, despite the general picture established by the SWOT analysis, other key points of necessary consideration or engagement emerge from the application of the PwC analytical framework to identify the critical elements for sector development:

Government/ regulatory support

- There are strengths under "Land ownership and Development" that would have to be brought to fruition, specifically within the context of fintech Sector development. In this regard, the recommendation of leveraging the existing framework for establishing Free Zone Trade Areas emerges as a key point that gained traction from stakeholders. Further, beyond establishing the Free Zone, Government may consider investing in necessary infrastructure and incentives targeting ICT/ fintech service providers.

- Similarly, under “Ease of Doing Business” and “Taxes and Work Permits” there are weaknesses identified, with no associated mitigating strengths, which require targeted consideration of State intervention, possibly in the sphere of e-Government service development.

Access to capital

- There are no clear strengths for initiatives associated with “government funding”. Due to the size of the market and the immaturity of the ecosystem, the readings suggest however, that it would be necessary for the State to play a more direct role in this area, if it sought to establish a fintech sector. In this regard, the government may consider a number of approaches, including:
 - In partnership with banks, provide targeted funding initiatives to specified types of fintech initiatives. As an example, in the partnership Government specifies the types of businesses it seeks to assist, and acts as a guarantor on sums for a stipulated period, while the banks specialise in applying criteria to identify legitimate recipients;
 - In partnership with incubators, establishing subsidized office and co-working spaces. As an example, the Government can provide funding where the costs associated with eligible startups are subsidised for a stipulated period. This will reduce the barriers to entry for startups with severe liquidity constraints; and
 - Provide a framework to structure venture capital investment into the sector, where the Government again, provides some incentive to the private investor/ venture capitalist that is within an acceptable risk profile.

These recommendations are non-exhaustive but reflect some examples identified in the literature and which have had some measure of success. These initiatives once implemented, should be closely monitored to identify any unique pitfalls associated with the capital support programme to ensure that this weakness does not metastasize into a fatal flaw to the initiative.

Financial expertise

- The area of “Financial expertise”, shares the same strength, and weakness, as with “establishing an incubator/ accelerator”. Currently, these are facilitated from market-based initiatives, spearheaded by non-profits such as Qredits. While Qredits is partnering with a widening suite of partners in the State sector, it is notable that there seems to be no clear, systemic platform within the Government that can continue to meet this need should Qredits leave the market. If that were to happen, without a private sector-based replacement, this would have a serious impact to the ecosystem. From a perspective of sustainability this should be a major concern.
- The area of “due diligence”, where entrepreneurs have access to professional support services, particularly through the last phase before launch, is not provided for in any of the existing frameworks. It would be advantageous to the ICT ecosystem if a framework is encouraged and incentivised by the Government as a means to increase the ratio of business startups that transition into material going concerns.
- The above analysis identifies gaps that need to be filled to support fintech emergence and medium-term support, where Government intervention may be required. As the private sector has not yet seen the market opportunity to fill these gaps, it falls upon the Government to be the initial encourager of the activity. When and where the market opportunity is fully defined, and when the private sector enters, the role of the State can then be reduced.

2. Artificial intelligence

Furthering the investigation into the demand for AI services in Aruba, the results of a survey by the Aruba Chamber of Commerce suggested:

- Nearly half of the companies had not implemented AI in their (non-fintech) businesses. Whereas 38% had adopted some form of AI technology;
- The major concerns of respondents associated with the use of AI were its impact on manpower and HR (19%), privacy concerns (14%) and security concerns (14%). Only 7% of respondents cited bias error – a major policy focus in the regulation of AI's use, as reflected in the EU's AI Act;
- Only 25% of respondents leveraged AI for decision-making, whereas 55% used AI in advertising/ content generation; and
- A majority of respondents (62%) believed the legal frameworks in Aruba were sufficient to govern the use of AI.

This cumulatively suggests that while there is a market for the use of AI generally, and there has not been much consideration of the pitfalls associated with its improper use. In this context, it is reiterated that regulatory deficiencies are ameliorated before encouraging widespread adoption of consumer-facing AI tools in the fintech sector, or any other.

3. Distributed ledger technologies/ cryptocurrencies

In 2019, the Central Bank of Aruba (CBA) conducted a feasibility study on a local wholesale CBDC called the digital florin. The main conclusion of the study was that a wholesale CBDC fell outside of the risk appetite of the CBDC based on the contingent characteristics of a retail CBDC with which it would interact.

As a counterpoint, Kock (2024) provided an overview of the benefits and potential pitfalls of retail CBDC implementation and proposed a model for implementation. The study noted that only 8% of Arubans held bitcoins. This is limited by, among other things, the fact that bitcoin is not legal tender in Aruba. However, recognising the benefits associated with the use of cryptocurrencies, the study recommended:

- The implementation of a retail CBDC, in accordance with minimum design criteria, which would include the following features:
 - Permissioned DLT-based platform (to support smart contracts).
 - Some extent of privacy and autonomy.
 - Offline abilities.
 - One-to-one conversion between commercial bank deposits and the digital florin.
- A three-tiered model of transactions to balance KYC monitoring and privacy.
- The decentralization of customer-facing duties to foster competition in the payments system.
- The implementation will include a cap on retail CBDC holdings, and a non-interest bearing CBDC.
- Against cross-border abilities, given stability concerns.
- Undertaking procedures to inhibit cybersecurity and encourage financial stability.

Thereafter, the paper recommends the establishment of a Regulatory Sandbox, where firms can ideate, establish and test innovative services, products and delivery channels and working with the regulator determine the appropriate regulatory oversight needed in the open market. Work needs to be done to determine the terms and conditions for the development of such a Regulatory Sandbox.

4. Emergent opportunities

Given the state of development, as outlined above, there are several proverbial low hanging fruits that can be leveraged to augment particular strengths and mitigate specific weaknesses within the domestic Aruban context. Based on feedback received from stakeholders in Aruba, and in the context of the analyses above, this section identifies some of these opportunities, to crystallise quick wins which can be pursued in readying the environment for ICT Sector investment generally, and fintech, AI and DLT development, specifically.

Political

- Given the enhanced general awareness of the negative impact associated with cybercrime, generally, and Ransomware, specifically, the time is optimal to leverage interest in cybercrime to bolster public support for a strengthened focus. This enhanced profile can support the necessary development in the broader economic and social spheres.
- The implementation of e-government initiatives provides an opportunity for the government to lead by example, and reinforce advocacy in the use of ICT, AI and DLTs.
- Strengthen reporting of ICT Sector and e-government indicators, as a strategy

Economic

- Despite a small domestic market, there is general belief that fintech, AI and DLTs could be targeted as export-oriented activities.
- The Free Trade Zone Model may be suited to providing the platform to support export-oriented ICT-based services.
- Development of new regulatory regime to normalise the entrance of Payment Service Providers such as Sentoo, which do not fall under existing EMI or MTC frameworks. This is necessary to mitigate the challenge of over-regulation of the existing segments, while adequately providing necessary protections targeting this new economic activity.

Social

- The introduction of new jobs, outside of hospitality and banking, within the ICT Sector by private sector is beneficial for sector development.
- There is a need to prepare the public, and thus the marketplace, to the idea that there should be an adoption of a revised approach to privacy. The sensitization of the public is a necessary precursor to robust development in the fintech sector with the widespread use of customer-facing AI and DLTs.
- The establishment of a "Think Tank framework" that will provide entrepreneurs access to capital and business networks. Such a framework will institutionalise and formalise the forum through which entrepreneurs and innovators can access these networks. This will reduce a significant barrier to entry, expediting the iterative process of ideation.
- Vice President of ASIS is a resident of Aruba. This provides access to a network of cybersecurity professionals and knowledge. Through this network, Aruba policymakers will be able to leverage contemporary learnings into its administrative mix.

Technological

- The completion and deployment of the Unique Digital ID project, already underway between two departments, is seen by stakeholders as a key impetus to the widespread adoption of e-government and e-commerce.
- Implementation of certification authorities in Aruba is critical to e-Government implementation.
- Foster public/ private partnerships geared to closing the eco-system technological gap, which includes functionalities such as:
 - Easy online payments.
 - Compliance around fintech standards.
 - Tokenized assets and their legal status.

Legal/ regulatory

- Ordinances already establish “crypto assets” as a concept, which can be leveraged to treat with a wide breadth of matters using DLTs outside of cryptocurrency.
- Opportunity to establish a national CERT and require cybersecurity reporting obligations into statute.
- Pursue the establishment of a regulatory sandboxes to test fintech and DLT in real-world applications.
- Need to normalise in statute liberalization of telecommunications sector, including Internet services and broadband to:
 - Reduce negative externalities of bottleneck facilities and resources.
 - Strengthen the authorities and broaden the jurisdiction of DTZ.

III. Strategic positioning of a fintech sector

The previous sections of this report underscore the readiness of the business environment in Aruba to support the development of a robust, competitive fintech sector. Further analysis is suggested to identify the aspects of the fintech Sector which are most ready for development. In this regard, it is proposed to consider the O’Hanlan fintech Cube’s three dimensions of (1) financial sector, (2) business model, and (3) technology.

The components of the fintech cube can be used to assess the readiness of the enabling environment as it supports the development of each specific component. It is proposed that appropriate regulatory environments for specific components will support the development of fintech actors accordingly. It is thus proposed that there can be some level of determination in the aspects of the fintech sector in which development is encouraged.

Diagrams 1 through 3 below outline the proposed interaction between the individual dimensions of the fintech Model Cube. Table 6 provides a mini-glossary of the terms referenced in the axes of the various faces of the fintech Cube.

Table 6.
Key to Diagrams 1 through 3

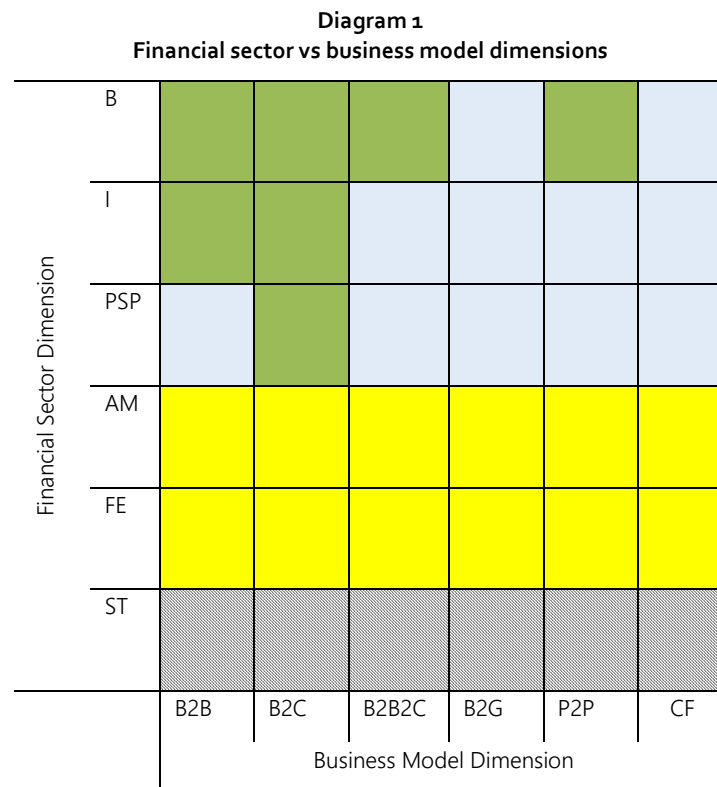
AI	Artificial Intelligence	B2G	Business-to-Government	I	Insurance
AM	Asset Management	B2B2C	Bus –to Bus -to Customer	IOT	Internet of Things
B	Banking	CC	Cloud Computing	P2P	Person-to-Person
BD	Big Data	CF	Crowd Funding	PSP	Payment Service Provider
B2B	Business-to-Business	DLT	Distributed Ledger Tech	QC	Quantum Computing
B2C	Business-to-Customer	FE	Foreign Exchange	ST	Stock Trading

Source: Authors’ compilation.

A. Financial sector versus business model dimensions

The interaction of the Financial Sector and Business Model dimensions provide an insight into the services which will be necessarily impacted by the introduction of the fintech solutions being explored. It also considers the associated target audiences – be they business or individuals. This identifies the possible mix of financial institutions and fintech providers which could partner if appropriately facilitated. This analysis also provides insight into aspects of the market financial development, through indicators such as Depth, Access and Efficiency.

Accordingly, through this analysis there can be a focus on what aspects of the suite of Financial Services regulations warrant amendment to enable fintech development in these spaces. A recommendation of such considerations is provided in diagram 1 below.



Source: Authors' compilation.

The areas identified in green, are those areas where there is already fintech based activity within Aruba:

- There is significant fintech activity occurring within the banking sector. Much of this development is driven by internal initiatives of the banks, with the introduction of Pay.aw as the only third-party operator in the space.
- fintech activity in the insurance sector is currently driven by internal innovations by insurance companies as they compete within the context of the legal framework. There is no emergent third party, as an equivalent to Pay.aw in the insurance space.

- The Sentoo platform, which has entered the market is the sole PSP, participates in the B2B and B2C segment. It is noteworthy that this party is not domiciled in Aruba, but its services are facilitated via the Internet to citizens and merchants.

The areas identified in blue are those areas where there is the opportunity for fintech services to develop in the short-term. Expansion in these areas depends on State actors treating with some of the weaknesses identified in the environment's characteristics. In this regard, the prevailing technological and human capacity environment suggests that these are areas which can be subject to fintech sector development, particularly with the introduction of new business models for banking and insurance services into the market:

- Further development of the PSP market is particularly susceptible to the regulatory policies and tactics proposed to be applied to this segment. The existing developments are largely due to lack of regulatory oversight of the particular niche. Recommendations from the literature suggests that over-regulation of this niche, particularly where regulatory requirements are not proportional to sector and consumer risk, can result in the reversal of existing gains.

The areas identified in yellow are those areas where fintech sector development is largely not feasible in the short term. These areas are broadly stymied by existing regulatory frameworks. In particular, these segments require consideration by the CBA of its regulatory toolkit in the medium-term, with a particular focus on:

- Updating the rules in relation to Foreign Exchange control and management.
- Reviewing the AML/ CFT and KYC requirements which have stymied the development of a vibrant stock exchange.
- Fleshing out regulations in relation to "crypto-assets".
- Reviewing the policy and rules relating to the percentage of a person's or individual's investments that need to be based onshore.

These are areas of a sensitive nature that could impact the overall monetary policy of Aruba. However, without consideration of new modalities of oversight, these aspects of fintech sector development, with or without enabling technologies will be stillborn.

The areas which are grayed out are those where that segment of the financial sector does not exist in Aruba, due to either regulatory or market failure. Accordingly, it is not anticipated that there would be Aruban domiciled fintechs leveraging these technologies in the medium to long term.

B. Financial sector versus technology dimensions

The interaction of the Financial Sector and Technology dimensions provide an insight into the availability of the platforms which can be leveraged by the financial institutions internally or externally; that is, made available as a service by partnering with fintech service providers. The associated target audiences, be they business or individuals, are again considered. The strength of the communities of practice within the various aspects of technology will determine the breadth and depth of these dimensions' interactions. The broader the interaction, the more robust the potential ecosystem to support fintech development in this sphere. This analysis also provides insight into aspects of the market financial development, through indicators such as financial access and financial efficiency as discussed above.

Accordingly, through this analysis there can be a focus on what aspects of the suite of Financial Services regulations warrant amendment to enable fintech development in these spaces. In this regard, the focus on regulatory amendment would be geared to adjusting provisions which were tied to specific technical modalities – releasing the potential to use more advanced technologies to support the implementation of financial functions. A recommendation of such considerations is provided in diagram 2 below.

Diagram 2
Financial sector vs technology dimensions

Financial Sector Dimension	B						
	I						
	PSP						
	AM						
	FE						
	ST						
		AI	DLT	CC	BD	IOT	QC
	Technology dimension						

Source: Authors' compilation.

The areas identified in blue are those areas where there is the opportunity for fintech services to develop in the short-term. The implementation of the technologies identified, DLT and Cloud Computing, are not constrained by any regulations, or ethical considerations which could limit the development of such services. The combination of these technologies does mean that the actual platforms implementing the services need not be domiciled in Aruba, with the benefits and pitfalls that accrue accordingly.

Similarly, the areas identified in yellow are those areas where fintech sector development is largely not feasible in the short term. These areas are broadly stymied by deficiencies in the existing regulatory frameworks:

- With regards to the deployment of customer-facing AI in the Financial Services sector, it is recommended that the ethical use of AI by firms be encoded in statute to mitigate the misuse of AI technologies against the citizenry. A precursor to effective AI administration would be:
 - Privacy and data protection administration, as the former leverages systems, practices and personnel of the latter. Accordingly, timely completion of the CRW project, and implementation of the regional and national administrators, should precede the widespread development of fintechs using AI to deliver services.

- Cybersecurity management and administration. This will involve the establishment of a National CERT, which coordinates public and private sector incident reports, as well as liaising with regional and international partner CERT coordinators.
- With regards to the other Financial Services highlighted, the review of CBA’s regulatory toolkit is required to incentivise activity in this regard, regardless of the availability of technology.

Figure 11 also includes areas which are grayed out. These are technologies which require significant capital investment and infrastructure prior to deployment in Aruba. Accordingly, it is not anticipated that there would be Aruban domiciled fintechs leveraging these technologies in the medium to long term.

C. Business model versus technology dimensions

The interaction of the Business Model and Technology dimensions provide an insight into the availability of platforms which can be leveraged towards specific business ends, such as regulatory compliance, and customer interaction. This analysis provides insight into the way technologies can be used by businesses, other than financial institutions, to improve efficiencies in how customers’ needs are met. Further, it indicates whether a firm may consider deploying these technologies internally or consider making them available as a service by partnering with fintech service providers.

Accordingly, through this analysis there can be a focus on what laws may warrant amendment to enable fintech development in these spaces. In this regard, the focus on regulatory amendment would be geared to adjusting provisions which are tied to enabling the recognition of digital business modalities. A recommendation of such considerations is provided in figure 12 below.

Diagram 3
Business model vs technology dimensions

Technology Dimension	AI						
	DLT						
	CC						
	BD						
	IOT						
	QC						
		B2B	B2C	B2B2C	B2G	P2P	CF
	Business model dimension						

Source: Authors’ compilation.

The areas identified in blue are those areas where there is the opportunity for fintech services to develop in the short-term. The implementation of DLT and Cloud Computing for the business models

identified are not constrained by any regulations, or ethical considerations which could limit the development of such services. The combination of these technologies does mean that the actual platforms implementing the services need not be domiciled in Aruba, with the benefits and pitfalls that accrue accordingly.

Similarly, the areas identified in yellow are those areas where fintech sector development is largely not feasible in the short term. The areas identified are broadly with respect to the deployment of customer-facing AI services, given the regulatory deficiencies discussed above. As noted above, AI is already used by the private sector. However, that use has not yet been deemed to encroach on the ethical use of AI, especially in terms of the potential to negatively impact personal liberties and freedoms. Unmanaged AI in the use of fintech services may more readily have this negative impact. Accordingly, it is not recommended that AI be integrated into customer-facing services until an appropriate regulatory framework is established.

Areas which are grayed out are technologies which require significant capital investment and infrastructure prior to deployment in Aruba. Accordingly, it is not anticipated that there would be Aruban domiciled fintechs leveraging these technologies in the medium to long term.

IV. Discussions and recommendations

A. The precursor of fintech: an enabling, competitive ICT Sector

1. Comprehensive telecommunications sector liberalization

The telecommunications sector is the foundation upon which ICT Sector activity rides, including fintech, AI and DLT. Without a competitive telecommunication sector, providing innovative access and communication solutions to customers, there will always be the threat of a bottleneck outage, or slowed project implementation. Despite the activities of Setar N.V., and the associated commercial benefits from its success, a decision must be made as to whether the Government of Aruba will continue to provide preferential treatment to the firm. In summary, there needs to be an assessment of whether the inflated dividends from this policy of protection exceeds the potential revenue (in taxes and other fees) and other benefits (in terms of direct and indirect job creation, and investment attraction, for example) from a more robust and competitive downstream ICT sector. The areas for regulatory development to support the telecommunication sector are:

(a) Competition management, access to bottleneck facilities

The body of work required to address this issue should include the development of frameworks to determine dominance in the various submarkets in the telecommunications and ICT sector, and provide rules to regulate and ensure:

- Non-discriminatory pricing for accessing bottleneck infrastructure such as:
 - Landing stations.
 - Towers and ducts.

- The accessibility of services by competitors at non-discriminatory quality and wholesale or cost-based rates, including:
 - Interconnection rates between operators.
 - Wholesale bandwidth prices, for domestic or international backhaul.

In the implementation of these frameworks, AFTA would be the key player. To expedite these frameworks, the Government of Aruba may consider defining the expected framework in statute. where AFTA would be the prime administrator of these concerns. This would allow for timelier implementation and assured coherence across frameworks than having the framework emerge from iterations rulings and determinations in the Courts.

(b) Streamlined but robust authorization regimes, recognition of convergence

This body of work should include the development of frameworks to facilitate seamless, predictable entry into the various submarkets in the telecommunications sector. A major outcome will be rules to regulate and guide:

- The technical requirements/ specifications associated with the deployment of telecommunications infrastructure to ensure cybersecurity, survivability and sustainability.
- The administration framework for market-centric Universal Service/ Digital Inclusion frameworks.
- Procedural requirements related to the management of illegal content, legal interception of communications, and other matters related to the responsibilities of operators to ensure the legal use of telecommunications systems, etc.
- Requirements for timely reporting of data sets to the regulator, on indicators as may be defined from time-to-time.
- The definition of administrative penalties for the breach of rules. These penalties could include fiscal penalties based on a defined percentage of gross revenues, as a more realistic and implementable penalty for minor breaches of the licence.

(c) Transparent resource (Spectrum and number) administration

This body of work should include the development of frameworks to facilitate predictable access, in terms of quantum of resources and cost for those resources, by service providers of telecommunications resources. The frameworks should drive efficiency in assignment and seek to minimise the hoarding of the resources. The major outcome would be rules to regulate:

- The efficient use of the spectrum resource mindful of differing requirements for different uses in the spheres of telecommunications, broadcasting, commercial and national security. This would include requirements regarding:
 - Both terrestrial and non-terrestrial applications.
 - Broadcast, point-to-point or point-to-multipoint applications.
 - Maximum power transmission thresholds and spectral envelope criteria; and
 - Onshore and offshore/ inter-island interference mitigation.
- The efficient use of the numbering resource, including:
 - Numbering reuse/ recycling to prevent hoarding.

- The universal use of short-codes by different operators for key emergency and government services (e.g. 911 for police).
- Number portability between operators.

In the implementation of the frameworks in B. and C. above, DTZ would be the key player. To expedite the frameworks, the Government of Aruba must consider defining the expected frameworks in statute expanding the jurisdiction and powers of DTZ, as the prime administrator of these concerns.

2. Broader adoption of model laws relating to electronic contracts and signatures

(a) Provisions regarding recognition and mail law equivalence

The current Ordinance treating with the recognition of electronic contracts and signatures does not adopt many common principles included in Model Laws in this regard. There is an opportunity to revisit the Ordinances with a view to ensuring robust treatment of the rules relating to:

- The determination of time and location of the sending and receipt of documents.
- The legal recognition of the documents.
- Requirements related to consumer protection, particularly with respect to ensuring the user has an opportunity to review conditions of an electronically mediated contract before finalization.

These are common provisions in the Model Laws that are not given effect in current ordinances.

(b) From electronic signatures to electronic authentication

Similarly, while the ordinance provides for the recognition of electronic signatures, as a specific type of electronic authorization, there is no similar framework to treat with the broader scope of electronic authentication services. These other forms of electronic authentication may include (i) third-party electronic identification, (ii) digital certification, or (iii) electronic time stamp services. As these services are not explicitly recognised, there is also no recognition of the persons who provide such services. These services are seen as necessary precursors and enablers of fintech services. As such, it would be prudent to establish a framework for the recognition and oversight of all forms of electronic authentication and their service providers. This framework should ideally have tiered applicability in relation to whether:

- (i) These service providers are domiciled in Aruba or not; and
- (ii) The services are import-oriented or export-oriented.

Within that framework, the identification of a definitive administrator is essential.

Further, the requirements and obligations proposed for these service providers should be developed with a view to ensuring a balance between protection of the consumer and the attractiveness of Aruba as a destination for investment, and a place where these services can be offered without undue risk. These are considerations not evident in the framing of the current ordinance.

Considerations as outlined above, shall encourage appropriate review of the following weaknesses in the current electronic document and signature ordinance:

- A lack of clear articulation of market entry and other operational requirements to guide these service providers, and
- A disproportionate presumption of liability of the electronic signature service providers,

(c) Data Protection and Privacy

The Consensus Kingdom Act project (CRW) targets the enhancement of the regulatory frameworks of the Dutch Caribbean islands to be consistent and compliant with the law in Netherlands. This project's success will ensure appropriate regulatory authorities and obligations are established for compliance with GDPR, but also provide the definition of a regional, and national administrators.

3. Cybercrime and cyber security

With the current experience of disruptive cybersecurity breaches and cybercrime events, it is essential for any digital ecosystem to demonstrate a commitment to the managing safety of the online presence of industry participants and users. Accordingly, this is the opportunity to establish a robust legal and operational framework to treat with, among other things:

- The establishment of a National CERT, with which public and private sector enterprises will liaise.
- Establishing and codifying cybercrime incident reporting requirements and standards, particularly for firms that store customer information.
- Defining effective modalities of CERT coordination domestically, and cooperation internationally.

4. Establishing a hyperscale data centre

Despite the demand for data processing facilities remains high, DEACI identified several supply chain challenges associated with the establishment and maintenance of a hyperscale data centre in Aruba. Key among those were the availability of:

- (i) Silicon and semiconductor-based products;
- (ii) Specialised building materials and necessary components;
- (iii) Specialised human resources with the skill to customise facilities to the needs of intended customers; and,
- (iv) Large quantum of cheap power/ cooling support to facilitate temperature control.

These suggest that Aruba may not be a competitive option in this space in the near to medium term. However, with regard, to points (ii) and (iii), if Aruba still seeks to pursue this path, it may consider downgrading its ambitions from pursuing the development of Hyperscale Data Centres – presumably to be managed by, and targeted to, enterprises with huge data volumes such as Amazon, Google, Oracle, IBM or Microsoft - to establishing commercial Tier 2 to Tier 3 Data Centres, with possibly domestic management. This approach instead targets the “long tail” of enterprise and SME users seeking an outsourced, simplified access to data management services. These users, smaller in scale and data processing demands, are far greater in number, which could reduce the competition in attracting a segment of that market, while driving up gross revenues.

B. Fintech sector

In deliberating on the sector that the Government seeks to design, it is recommended that the work of Bateman and Teixeira (2022) is considered. In particular, they exhort being mindful of the two-edged sword of investor-driven Fintech lending models, ostensibly undertaken to support microfinance initiatives (with the view of poverty-eradication). They note that unless the investor is domestic, the investor-driven model tends to also mean the repatriation of profits outside of the serving country. Further noting the emerging appreciation that not all innovations produce good results, and that some produce bad outcomes, Bateman and Teixeira suggest that unless managed carefully, innovations and their enabling institutions may be exploited by narrow interests to the detriment of the local

community. They argue that the approach of minimised state intervention is not essential for an effective model, highlighting the track record of this model to entrench destructive competition in informal entrepreneurship markets, redistributing and intensifying poverty among the most vulnerable.

Instead, Bateman and Teixeira highlight that, alternatively, cash transfers directly to the poorest had the inverse effect, supporting entrenched SMEs and providing more positive economic activity. In a broad review of international experiences in the particular segment of fintech-based micro lending, they highlighted similarities in successful development-driven lending models:

- (i) Physical proximity to clients, supporting the development of trust, reciprocity and cooperation, as well as a deeper understanding of local markets.
- (ii) Politically mandated commitment to securing long-term community development, over short-term profit extraction.
- (iii) A preference and willingness to support growth-oriented enterprises over no-growth, informal microenterprises or self-employment ventures.
- (iv) A preference to funding community-owned enterprises, particularly those building into formal clusters, networks or chains with joint innovation and technology transfer.

While the Bateman and Teixeira discussion focuses on fintech-based microcredit and lending services, consideration should be given to their critiques in the design of the administrative and regulatory framework of the fintech sector as a whole. Key among their recommendations are:

- Introducing measures to mitigate capital extraction by foreign-based owners, through dividends or extraction of profits by other means, and encourage long-term investment in the service in Aruba. This may include the legal requirement of fintech service providers, that service Arubans, have an ownership component that is Aruban; and,
- Introducing measures for appropriate regulation of the fintech market to ensure that negative competition does not have the effect of destroying economic value of necessary adjunct sectors, such as the labour market, or upstream services.

In light of the above, the direct and indirect impact of fintech services must be closely monitored. This reinforces the need for the establishment of Regulatory Sandboxes, with broader oversight contexts.

1. Legislation upgrade: the regulatory sandbox

Regulatory Sandboxes have rapidly become the international best practice to facilitate the managed introduction of new services or products to market. CBA has recognised in Kock (2024) that the establishment of a regulatory sandbox is necessary. Consequently, it encouraged that the policy approach be expanded to treat with other forms of private sector led fintech solutions.

As discussed in Section III above, there are segments of the fintech Sector which are already seeing the development of services targeting payment and value transfer between users. While many of these developments may be internal to financial institutions such as banks and insurance firms, there are others which provide service to the market. Building on these innovations, there are areas which may be best suited for short-term encouragement within the Sandbox. These include:

- Iterations on token-based payment (C2B) and user-to-user (P2P) transfers products, in the content of AML/ CFT regulations.
- Insurance-Tech services, particularly where these services may prejudice access to services.
- Online merchant payment gateway solutions (B2B2C and B2G), as competition to existing direct bank transfers, e-wallets and money transfer companies.

The inclusion of the existing token-based fintech, Pay.aw, into the Sandbox could allow for the structured tailoring of obligations, such as AML/CFT or KYC requirements whenever funds are onboarded onto the platform, with a view to determining that “sweet spot” of oversight where alleged over-regulation subsides, and there is an appropriate balance and proportionality between risk and regulatory cost.

Similarly, the Sandbox will assist the CBA in determining the appropriate financial and other obligations it may seek to impose on PSPs to maintain sector stability. For example, where the PSP is not within the chain of control where money is transferred between merchant and payer banking institutions, the question arises as to the appropriate financial resources the PSP should be required to have as a statutory reserve. As an example, some could argue that as the PSP does not ever have control of the money, a statutory reserve requirement is moot.

These policy positions should be undertaken with the overarching goal of ensuring that firms’ regulated operations do not negatively impact Aruba’s metrics for Financial Sector stability. The Sandbox facilitates an environment where the policy mix can be iteratively tested and determined.

2. Other areas of fintech sector development

The Sandbox will address the optimization of rules and frameworks within the general framework established by National Ordinances surrounding the Financial Sector. If there is the intent to encouraged development, in other segments of fintech services, such as:

- Asset management facilitation.
- Remittances facilitation outside of the use of Money Transfer Companies (MTCs); or
- Stock Trade facilitation.

This would require more robust deliberation with respect to the respective markets. In some instances, the markets would have to first be defined, with clear policy definition of the scope of expected activities, and the emergence of market structures not extant in Aruba currently, either mediated through fintech solutions or otherwise. For example, the clear policy direction will consider whether activity in these spheres would either target:

- The onshore Aruban market (import-oriented) or
- Offshore market (export-oriented), where the operator is domiciled in Aruba, but services persons located in other countries.

In either instance, determining the appropriate policy mix that would make Aruba an attractive destination for inward investment must be carefully considered. Further, in the context of Stock Trading facilitation specifically, for such to be maximised as an onshore activity, it would first require the development of a domestic stock exchange. This despite the assertions of the CBA that such is challenging in the context of AML/ CFT obligations. Further, should that exchange materialise, that stock exchange would then be mature enough to facilitate of retail trading services. All this would be necessary before there would be the operational context within which fintech services may emerge. This example represents is a complex undertaking, with subordinate policy determinations, that are not expected to be resolved in the near term.

3. Other critical inputs to fintech sector development

Among the critical areas identified for fintech sector development, areas were identified in section II (C) where Government intervention may be necessary to fill key gaps in the ecosystem, at least until the private sector, enters the space.

(a) Provision of land/tenancy arrangements

Further to the recommendations outlined in section II (C), the fundamental question is to address the policy regarding the level of investment the State is willing to engage in to support this fintech, or ICT service sector, becoming a major aspect of the economy. The level of investment increases from:

- Establishing co-working/ incubator spaces and SME accelerator programmes.
- Revisiting the implementation of a Data Centre for onshoring of data for small to media firms.
- The establishment and attracting of a hyperscale data centre facility, with associated anchor operator in Aruba.
- Establishing a free trade zone as a mechanism to provide lands/ space for investment. The Data Centre facility would necessarily be collocated in the Free Zone area.

With each of these options, the implementation risk for the approach increases, and with it the complexity of the model to ensure return on investment and sustainability. Further, it can be expected that with higher risk endeavours, the impetus for greater incentives to new entrants would increase. The Government of Aruba must be mindful that such incentives do not outweigh the anticipated benefits of the approach. In the first instance, it is recommended that lower risk options be considered:

- (i) The establishing of co-working spaces, associated with incubator and SME accelerator programmes.
- (ii) Reiterating the recommendation on establishing a hyperscale data centre (see section IV.A.4 above), the establishment of a data centre facility targeting the onshoring of data for medium sized firms.

(b) Provision of capital injection/ financing

The need to access capital and financing cannot be underestimated for any SME sector. However, this need is exacerbated by the inputs into the ICT Sector, where there are higher risks, concomitant with the higher rewards once successful. This should be structured ideally, with partnering agencies to facilitate ongoing monitoring of participants. In section II (C), recommendations were made in terms of potential partnership modalities, such as:

- Partnership with banks, provide targeted funding initiatives to specified types of fintech initiatives.
- Partnership with incubators, establishing subsidized office and co-working spaces.

To enable these frameworks, it is imperative that while Government should define the targeted segments of the market, the more ethereal evaluations to pick the risk/ reward profiles of applicants should be delegated to the implementation partner. This means the tricky question of “picking the winners” would still be the responsibility of those to which this is their core business. Furthermore, this means that the policy will support, where applicable, long-term financial support required for developmental initiatives through financial institutions.

Otherwise, key areas of policy that the Government of Aruba may want to consider in designing this funding frameworks could include:

- The high-level criteria, other than the risk analysis, which is the speciality of the partner, by which SMEs through means-testing are assessed for eligibility.
- Whether there will be tiered support for targeted subsectors of fintech, for example, a subset of service products which will reflect greater government support/ guarantee.
- The incentives that will be offered to financial institutions to provide support in this initiative.

(c) Advisory support services

As discussed in section II (C) above, PwC (2020) identified the need for affordable, professional advisory services to support entrepreneurs throughout the lifecycle of platform development and service offerings. Currently there seems to be limited availability of such services in the marketplace, and where there is, the focus is limited in the early stages of business case and financial proposal development. These services do not monitor the conversion rate of persons who traverse their programmes to successful going concerns. This gap in data, if not filled, will be a significant weakness in the ecosystem. It is recommended that there are two means through which this can be facilitated through either:

- (i) The establishment of a distinct programme for due diligence support/ legal advisory services.
- (ii) The provision of this support within the framework of the Sandbox. Therefore, the primary beneficiary of this support would be those parties who have successfully accessed the Sandbox and its services and thus are seeking to leave its oversight.

In light of the other recommendations, option (ii) provides the most synergies of effort and investment.

C. Artificial intelligence

With between a quarter and a third of respondents to the Aruba Chamber of Commerce's survey on the use of AI indicating that AI is used in decision-making, it can be inferred that aspects of the platform will continue to be used in Aruba. However, that over 60% were of the opinion that current legal frameworks in Aruba are sufficient to manage the use of AI, suggests that there is a disconnect with respect to the ethical challenges being faced with the use of AI, especially as it relates to impacting the civil rights of minority groups and persons.

In this regard, it is imperative that the Government of Aruba undertake a broad-based education campaign geared to sensitise the general public, and private sector administrators specifically about issues relating to appropriate use of AI.

Further, it is recognised that the regulatory framework that, in the first instance, would seek to limit the negative externalities of the use of AI, is the Data Protection and Privacy framework that complies with GDPR. By limiting the use of personal information generally, and sensitive personal information specifically, the primary major pitfalls may be avoided. However, as discussed above, Aruba awaits the completion of the CRW project and the subsequent administrative implementation to be fully compliance with GDPR.

In the interim, and mindful of the nature of fintech to collect, aggregate and process information about users, it is necessary for the Government and its partners in the ATIA and the Chamber to continue to sensitize the public and businesses of key considerations in the ethical use of AI technologies. If necessary, the Government should include in obligations and administrative controls within licences associated with the implementation of fintech solutions. In this regard, key principles that should be emphasized include:

- Compliance with GDPR principles, particular relating to processing only information that is necessary.
- Compliance with Intellectual Property and Copyright laws.
- Algorithm transparency, particularly with being able to explain how algorithms generally function.
- Requiring human intervention before any decision is made on the eligibility of a candidate, minimising the reliance on the profiling of person or social scoring in the determination of eligibility.

In the medium term, the use of Regulatory Sandboxes can also be used to assess the compliance of AI driven fintech solutions to the above principles. Given the prior recommendation for the

implementation of such Sandboxes, it is recommended that, in the absence of specific ordinances, consideration of such ethical AI principles be built into the Sandbox framework.

D. Distributed ledger technologies

Distributed Ledger Technologies have a myriad applications outside of the development and use of cryptocurrencies. These business use-cases vary from smart contract management, monitoring and confirming the trail of tokens among users, or even identity administration in multi-user systems. However, there is not much commercial appetite for investment in DLTs for these use-cases in Aruba currently. In any case, the effective implementation of these use-cases with DLTs would depend on the strengthening of the generally enabling ICT regulatory framework as outlined in section IV (A) above.

Instead, this section will focus on the cryptography use case for DLTs and the way forward based on proposals of stakeholders.

1. Cryptocurrency as a payment mechanism

The CBA and Bankers Association cite challenges with maintaining correspondent banking relationships as a major rationale for the regulatory and commercial reticence to facilitate general cryptocurrency use in Aruba. These concerns should not be ignored or minimised.

Further, the CBA has identified that widespread use of cryptocurrencies in Aruba would undermine some of its functions in managing monetary policy and foreign exchange control. This would then have a negative effect on its ability to manage the stability and resilience of the sector, key determinants in the attractiveness of Aruba as a destination for fintech Sector development. In this regard, it is recommended to defer to the reticence of the CBA with respect to facilitating the broad entrance of cryptocurrencies in Aruba.

This does not however suggest that there is no room for DLTs such as blockchain to the development of digital currency solutions. Kock (2024) outlined a roadmap for the CBA deploying a Central Bank Digital Currency (CBDC). The roadmap includes five (5) stages from the period 2023 to 2029. Within these stages, key milestones proposed include:

- Definition of minimum design criteria.
- Design and pilot a Regulatory Sandbox.
- Public awareness and marketing.
- Definition of a regulatory framework for Aruba digital citizenship and e-Government.
- Define regulatory frameworks which would include:
 - Aruban Payments System Directive.
 - Consumer Financial protection.
 - e-Commerce laws.

Notably, major aspects of this roadmap converge with the recommendations required to treat with fintech sector development outlined in section IV (B) above, such as the development of a Sandbox and explicit e-Commerce laws. Indeed, citing Latin American experiences where bitcoin was made legal tender, it was noted that this innovation was still facilitated through a Government-managed e-wallet. This then suggest that the Bitcoin wallet merely emulates the deployment of a CBDC, with the advantage of not having to establish technical know-how, but with the disadvantage associated with the volatility of the value of the cryptocurrency.

Critical to the implementation of the CBDC will be the contents of the proposed Payments System Directive, as this will guide how the CBDC will interact with other market players within the fintech Payment Facilitation space. It is imperative that the Directive establishes a niche where existing operators can continue to innovate and develop service products, ultimately geared towards creating service export-potential.

The Payments System Directive should thus be designed to work hand-in-hand with the Regulatory Sandbox. In this regard, guidance from Clarke, Vakataki 'Ofa, Nguyen and Min Kwok (2023) is instructive in determining appropriate, fit-for-Aruba evaluation and eligibility criteria for firms and services to be included in the Sandbox, as well as defining material outcomes of each phase of iterative evaluation.

2. Cryptocurrency as an investment instrument

Outside its use as an alternative to cash payments, and thus a competitor to CBDCs, cryptocurrencies such as Bitcoin have become an investment instrument for some. In that regard, access to cryptocurrency supply is limited by the existing regulations in relation to:

- Foreign exchange transactions offshore, and the licensing and taxing of such transactions; and
- The percentage of a person's investment that must be associated with onshore instruments.

These regulations are longstanding pillars of CBA's monetary policy implementation, geared to stabilise the Aruban florin. Review of these regulations must thus be undertaken cautiously to ensure that enabling cryptocurrency investment by a relatively small percentage of Arubans (CBA estimates 8%) does not cause systemic risk challenges across the financial sector.

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Annexes

Annex 1

Overview of the necessary public preconditions

In summary, the following provides an overview of the necessary public preconditions that are essential to enable and support the development of the fintech sector in Aruba.

1. Legislative preconditions:

- Establishment of administrative frameworks for ICT Sector development, to facilitate:
 - Regulation of a robust, competitive telecommunication sector.
 - Recognition of electronic documents and signatures in accordance with the UNCITRAL and HIPCAR Model laws.
 - Protection of personal data and privacy, in accordance with the EU's General Data Protection Rules.
 - Oversight of Cybersecurity and cybercrime.
 - Oversight of intellectual property rights administration in the digital context.
 - Oversight of ethical use of AI systems through, inter alia, appropriate algorithm transparency and human oversight in decision-making.
 - Recognition and management of digital assets.
- Targeted administrative frameworks for competition management and consumer protection.
- Review of existing Ordinances and rules in relation to Financial Sector administration, including:
 - AML/ CFT compliance in accordance with FATF standards in relation to MTCs, PSPs etc., and
 - Registration and taxation of foreign exchange transactions.
- Development of Policy and Regulatory Sandboxes through which relevant regulators and support institutions can guide new service offerings to market.

2. Institutional preconditions:

- Establishment of new regulatory/ oversight bodies to treat with:
 - Cybersecurity and cybercrime administration (CERT).
 - Data protection administration.
 - Electronic authentication services administration.
- Strengthening of existing regulatory bodies including:
 - Telecommunications department (DTZ).
- Resourcing and support of existing regulatory bodies, including necessary restructuring:
 - Fair Trade Authority (AFTA).
 - Central Bank of Aruba (CBA).

- Establishment of an inter-agency taskforce to facilitate the oversight of ethical AI use in Aruba, including, inter alia:
 - Data protection administrator.
 - Office of Intellectual Property.
- Review of the administration surrounding the establishment of Economic Freezones, tailoring such facilities to export-oriented ICT services with appropriate tenancy arrangements for sector participants.
- Establishment of an appropriate forum for the structured meeting of stakeholders through which partnerships can be facilitated for:
 - Business development and seed financing/ venture capital support.
 - Operational development and secondary financing support.
 - Legal and regulatory support.

3. Technical preconditions:

- Implementation of an electronic ID solution to support e-Government implementation.
- Implementation of more transactional e-Government services to both internal and external stakeholders, including:
 - Information sharing frameworks between government offices.
 - Information sharing frameworks between government offices and specified third party users, in the financial services sector.
- Consider the establishment of a CBDC for Aruba.

Annex 2

Summary of recommended actions to accelerate progress

In summary, the following provides an overview of the recommended actions that are required to address existing gaps and accelerate progress.

1. Implement a regulatory reform programme, in conjunction with regional development partners, such as CTU and ECLAC, focused on:

a. Telecommunications and ICT Sector development, with a priority on:

- (i) Strengthening the DTZ's jurisdiction.
- (ii) Establishing EGDPR (underway with the CRW initiative).
- (iii) Establishing a CERT to support domestic and international collaboration on cybersecurity mitigation.
- (iv) Establishing administrative oversight for electronic authentication providers.

b. Financial sector regulations review, with a priority on:

- (i) Reviewing AML/ CFT rules to mitigate over-regulation.
- (ii) Establishing Regulatory Sandboxes to support, inter alia, the development in Aruba of:
 - CBDC, along with a revised Aruba Payments Directive.
 - fintech Service providers, including e-wallets, PSPs, etc.

c. Digital impact on intellectual property and human rights review, with a priority to establish:

- (i) General rules for ethical AI use in Aruba.
- (ii) Rules for AI as it relates to existing Intellectual Property protections.
- (iii) Categories of services with associated appropriate tiers of algorithm transparency.
- (iv) Categories of services for which human intervention would be required to validate recommendations proposed by AI algorithms.

2. Establish modalities for encouraging the financing of ICT sector and fintech services by the investment class in Aruba, through:

a. Government-led programmes to support financing.

b. Targeted incentives to the investment class to support financing.

3. Review the Economic Freezone Ordinances, with a focus on establishing incentives geared towards business development in the ICT sector, including:

- (i) Revised tenancy arrangements.
- (ii) Introduction of models of co-working spaces and "hot sites".

4. Expedite the completion of model G2G and G2C e-Government transactional services, through public private partnerships, particularly where there is heavy investment in complex IT systems, and/ or prior experience of EGDPR compliance can be leveraged.

This report presents strategic recommendations for the development of Aruba's fintech sector with a focus on leveraging artificial intelligence and distributed ledger technologies. It evaluates Aruba's readiness in the information and communications technology (ICT) sector and the financial sector, comparing key indicators against counterparts in the region, including Curaçao, Jamaica, Trinidad and Tobago and the Kingdom of the Netherlands. The report highlights strengths, such as stable democratic traditions, high education levels and a robust banking sector, and weaknesses, such as small market size and regulatory gaps in ICT.

The report advocates regulatory modernization, including comprehensive telecommunications sector liberalization, the establishment of regulatory sandboxes and targeted government interventions to support fintech development and encourage innovation. The report also emphasizes the importance of ethical artificial intelligence use and proposes a roadmap for implementing a central bank digital currency. Appendices provide a summary of necessary preconditions and recommended actions to accelerate fintech sector development in Aruba. Ultimately, the report underscores Aruba's potential to become a digital financial hub through collaboration between policymakers, industry stakeholders and international partners.

