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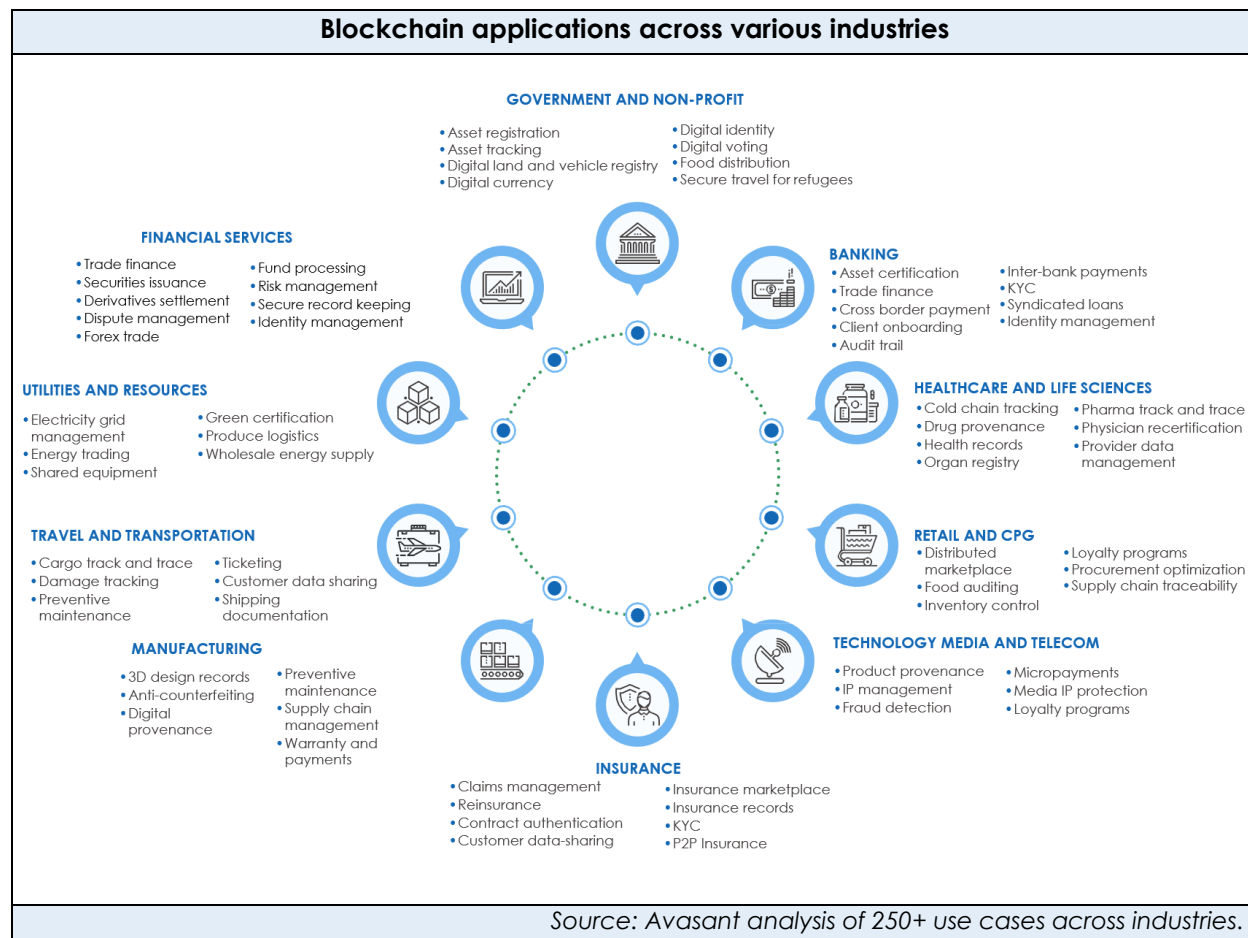# Revolutionizing Governments in the Digital Age

How can Blockchain Transform the Delivery of Public Services?

An Avasant Perspective by:
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Revolutionizing Governments in the Digital Age
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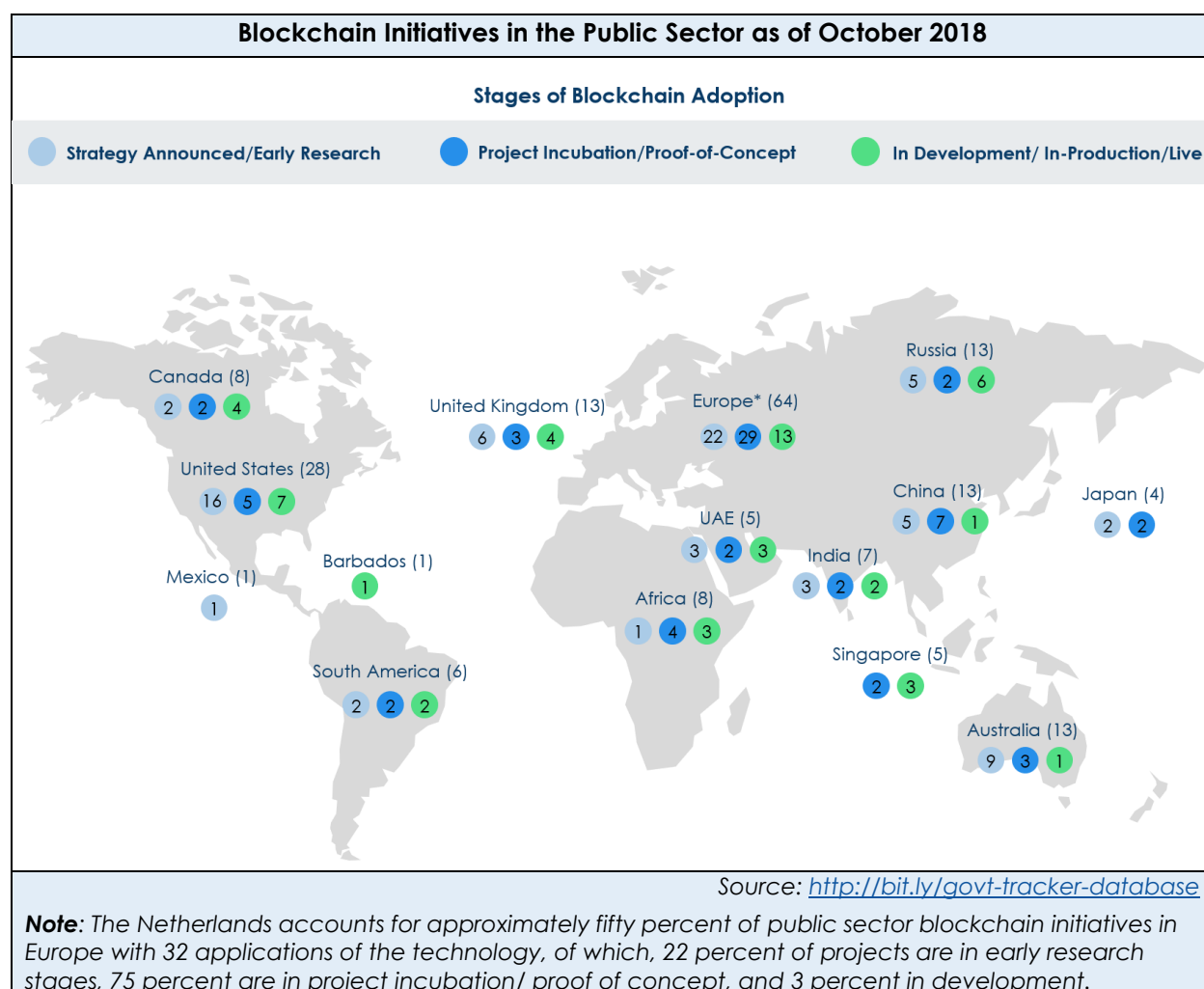# Blockchain is rapidly evolving and disrupting industries' value chain

Blockchain technology is rapidly evolving, and increasingly presenting new opportunities for organizations in this digital age. This transformative and innovative technology has seized the attention of both corporate and public decision makers as well as digital leaders across the world. Blockchain offers the potential to positively disrupt the value chains of several industries, providing solutions which involve trust, immutability and decentralization of information.

Blockchain applications across various industries

GOVERNMENT AND NON-PROFIT
- Asset registration
- Asset tracking
- Digital land and vehicle registry
- Digital currency
- Digital identity
- Digital voting
- Food distribution
- Secure travel for refugees

FINANCIAL SERVICES
- Trade finance
- Securities issuance
- Derivatives settlement
- Dispute management
- Forex trade
- Fund processing
- Risk management
- Secure record keeping
- Identity management

BANKING
- Asset certification
- Trade finance
- Cross border payment
- Client onboarding
- Audit trail
- Inter-bank payments
- KYC
- Syndicated loans
- Identity management

UTILITIES AND RESOURCES
- Electricity grid management
- Energy trading
- Shared equipment
- Green certification
- Produce logistics
- Wholesale energy supply

HEALTHCARE AND LIFE SCIENCES
- Cold chain tracking
- Drug provenance
- Health records
- Organ registry
- Pharma track and trace
- Physician recertification
- Provider data management

TRAVEL AND TRANSPORTATION
- Cargo track and trace
- Damage tracking
- Preventive maintenance
- Ticketing
- Customer data sharing
- Shipping documentation

RETAIL AND CPG
- Distributed marketplace
- Food auditing
- Inventory control
- Loyalty programs
- Procurement optimization
- Supply chain traceability

MANUFACTURING
- 3D design records
- Anti-counterfeiting
- Digital provenance
- Preventive maintenance
- Supply chain management
- Warranty and payments

TECHNOLOGY MEDIA AND TELECOM
- Product provenance
- IP management
- Fraud detection
- Micropayments
- Media IP protection
- Loyalty programs

INSURANCE
- Claims management
- Reinsurance
- Contract authentication
- Customer data-sharing
- Insurance marketplace
- Insurance records
- KYC
- P2P Insurance

Source: Avasant analysis of 250+ use cases across industries.

While initial developments on blockchain use cases were concentrated on the financial services industry, Blockchain discussion and experiments in the public sector are rapidly emerging globally. Governments are proactively learning about Blockchain technology and running pilots, tests and trials to effectively examine its potential as a basis for government service provision and procurement as well as its application for internal use.

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Blockchain can Transform Public Service Delivery

The decentralized, immutable, secure and transparent nature of Blockchain has piqued interest of Governments globally, realizing its transformative potential to improve public sector services and adopt e-Governance to advance in the digital economy. Over forty countries of varying levels of economic development have launched or are in the process of launching over two-hundred Blockchain-related initiatives to improve public service delivery across industries including healthcare, financial services, education, real estate, etc. The United States of America, Netherlands, United Kingdom, Singapore, Australia, Russia, UAE and Canada are among some of the major players implementing blockchain technologies with currently over eighty cumulative applications of blockchain use in the public sector of these countries as per OECD's 2018 working paper "*Blockchain Technology and its use in the Public Sector*".

Blockchain Initiatives in the Public Sector as of October 2018

Stages of Blockchain Adoption

Strategy Announced/Early Research | Project Incubation/Proof-of-Concept | In Development/ In-Production/Live

Source: http://bit.ly/govt-tracker-database

Note: *The Netherlands accounts for approximately fifty percent of public sector blockchain initiatives in Europe with 32 applications of the technology, of which, 22 percent of projects are in early research stages, 75 percent are in project incubation/ proof of concept, and 3 percent in development.*

As the potential of blockchain to transform public services is realized - instilling trust and confidence in citizens and enhancing productivity, security and integrity for governments - widespread application/ implementation becomes inevitable.

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A V A S A N T

Imperatives of Blockchain for Governments

Blockchain, with its highly disruptive capabilities presents significant opportunities for governments to reshape their internal operations, improve procurement processes, enhance relationship with citizens and deliver public services. The technology has become essential for remedying fundamental challenges faced by governments, bringing in new levels of efficiency, security, transparency and accountability.

Challenges faced by Governments vis-à-vis Citizen Services Delivery

Data Security and Protection	• Increasing trends in security and data breaches and cyber-espionage in government agencies • In the US, 70% of federal agencies have been breached (Thales Data Threat Report) • The 2015 US Office of Personnel Management breach exposed data on *"every single active non-military federal employee, former employee and every retiree who worked for a federal agency"* including social security number, military records, address, birth date, job and pay history, health and life insurance and pension information
Perceived Corruption	• Corruption in the public sector remains a major issue globally • Transparency International's Corruption Perceptions Index 2017 ranks 180 countries by perceived levels of public sector corruption, using a scale of 0 (highly corrupt) to 100 (very clean). The index found that more than two-thirds of countries score below 50, with an average score of 43 • The index highlights that the majority of countries are making little or no progress in ending corruption, thereby increasing citizens' distrust in the public sector
Citizens' Distrust	• Public faith in governments worldwide has eroded. Many claim that citizens now trust governments and public services much less, identifying a powerful erosion of confidence and credibility (Trust and Confidence in Government and Public Services) • In the U.S., only 18% of Americans say they can trust the government to do what is right "just about always" (3%) or "most of the time" (15%) (Pew Research Center) • Pollsters in the UK reported that 77% of the population do not trust politicians to tell the truth (ComRes, 2012a); 68% of the public think that most Members of Parliament make a lot of money using public office improperly (Ipsos MORI, 2009)
Records/ Data Management	• Government data needs to be accurate, accessible and secure to support citizen service and informed decision making • Unless this data is efficiently managed, the associated cost, complexity and risk will increase, making it difficult to derive valuable analysis or manage it in a compliant way • With the vast quantities of data that government bodies hold, agencies need clear data governance strategies, and robust data management solutions that facilitate compliance and security

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Inefficiency in Public Service Delivery	• **Land registry processes** and licenses are paper-based, which makes transactions largely inefficient, costly and vulnerable to unauthorized changes. In the U.S. landowners paid $800 million to cover real estate title risks during 2014 and 2015 (ALTA)
	• Widespread **tax evasion** due to inefficient tax collection systems.
	• High costs associated with **electronic voting** machines, ballot printing, maintenance, etc. and no transparency regarding audits of election results

Source: Avasant Research

Applications of Blockchain to overcome Governments' challenges

Governments are increasingly leveraging blockchain technology to ensure that fundamental challenges are remedied, thereby improving public service delivery, and empowering citizens. Blockchain technology can be applied to all areas of government engagements across various industries and citizen participation in the public sphere. This includes establishing digital identities, managing personal records (financial, health, etc.), ensuring transparent delivery in the provision of social benefits to beneficiaries, registering land records, guaranteeing the integrity of public data and services, etc.

Sample Blockchain Applications implemented by Public Sector Agencies globally

Digital Currency	Cross border & Interbank Payments	Trade Finance	Digital Identity	Land Management	Records Management	Supply Chain Management
Estonia	United Kingdom	France	Estonia	Ukraine	Estonia	Denmark
Ukraine	India	United States	United States	Sweden	Russia	Belgium
Russia	China	Australia	Australia	United States	Norway	China
England	United Arab Emirates	China	Dubai	India	United States	United Arab Emirates
France	Kazakhstan		United Arab Emirates	Japan	Dubai	
India				Georgia		
China						
Malaysia						
Singapore	Taiwan	Gibraltar	Switzerland	Bermuda	Cyprus	Netherlands
Barbados	Singapore		Luxembourg		Bahamas	
Netherland					Netherlands	
Switzerland						
Kenya	Argentina	Argentina	Argentina	Brazil	Uganda	Colombia
Uruguay	Malaysia	Kenya	Brazil	Kenya	Thailand	Chile
Ghana	Chile	Nigeria	Bangladesh	Ghana	Vietnam	Ethiopia
Israel	Brazil	Uruguay	Thailand	Vietnam	Argentina	Congo
Senegal	Thailand	Brazil	Taiwan			
South Africa		Thailand	Indonesia			

■ **Leading Blockchain Geographies**   ■ **Offshore Financial Centers**   □ **Emerging Blockchain Geographies**

Source: Avasant Research

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The principal way blockchain can orchestrate these use cases or applications is by enabling increased security, indisputable record keeping and simplifying processes while effective controls are placed on the management of confidential data. It is easy to envision a scenario where Blockchain technology could help reimagine many segments of the public-sector value chain – supply chain management, identity management and data validation, records administration, licensing, financial and contract management.

Blockchain technology can be instrumental in building and enhancing the trust and relationship between Governments and citizens. Referred to as a 'trust machine' (Economist, 2015), blockchain has become especially important for restoring public faith in governments as transactions are visible and immutable, and data is secure, ensuring accountability and transparency. According to the Pew Research Center, only 18% of US citizens trust the public sector. Blockchain could restore trust by removing opacity in the value chain via decentralization, enabling stakeholders to verify relevant data.

Blockchain enables governments to work efficiently and effectively, at reduced transaction and operating costs, enhance data security and integrity, mitigate risks and streamline processes. Government to Consumers (G2C) and Government to Businesses (G2B) services can be improved by blockchain technology through its application across different services such as identity management, taxation and payments. For example, to avoid fraud issues, identity management often requires in-person verification, which can lead to long waiting times at government offices, polling stations etc. Blockchain can help create an improved identity management system. Estonia, for example, has rolled out ID-Kaarts, a blockchain-driven national identity management system, that has eliminated needless bureaucratic procedures to deliver swift and quality government services.

Additionally, being the de-facto record keeper of a country, governments are vulnerable targets for hackers. As breaches of personal information of citizens increase in the digital era, citizens expect the state to ensure the sanctity and confidentiality of their personal records (including names, addresses, social security numbers, driver's license numbers, etc.) Blockchain-driven record keeping solutions could help mitigate or avert cyber-attacks by strengthening network security through reduction of single-point-of-failure risks. For example, The United States Pentagon and Defense Advanced Research Projects Agency (DARPA) are working together on a project that uses blockchain-based protocols to design robust security protocols for Government systems. Through this initiative, the U.S. federal government intends to send and receive encrypted information without worrying about being hacked.

The voting process, a crucial public function is also a key area in which the use of blockchain is being explored to improve inefficiencies, transparency and costs associated with election processes. Blockchain technology can prevent tampering of votes and has the potential to bring greater transparency into the voting process in elections. However, given the high public importance and impact of the election process for countries, it would require widespread public

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consensus before Blockchain as a technology is used to replace existing voting systems and procedures.

Blockchain for Governments – Indicative Applications

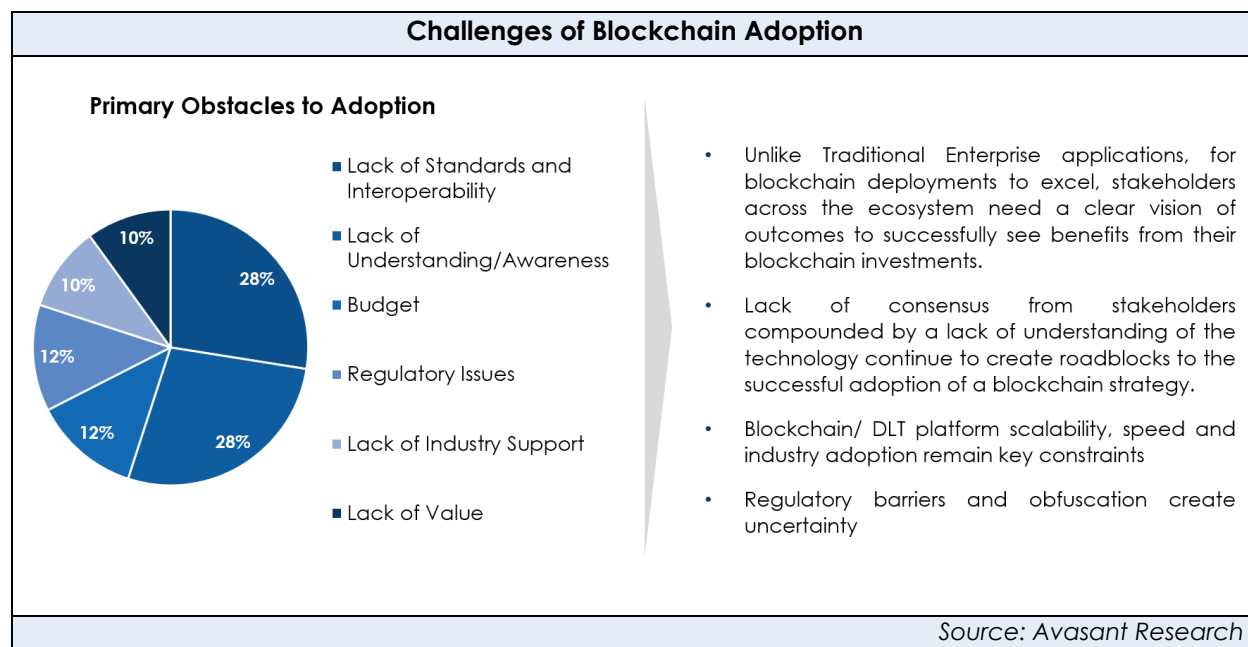| Application Area	Government Entity	Problem/ Objective	Implementation Partner(s)	Project Details
Identity	Ministry of Planning, Budget and Management, Brazil	To establish a new trust model between government and society	ConsenSys, uPort, Microsoft	Protocols for a blockchain-based governance of identification and signature verification has been developed for the Brazilian Ministry. Using uPort, the application allows people to own their identity and control their personal information, and provides public agencies with access to a streamlined system for approvals and signature.
Land Title Registry	Republic of Georgia	Reduce registration transaction costs between buyer and seller from USD 50 – 200, to USD 0.05 – 0.1; and place real estate extracts in a secure and innovative system	Bitfury	Blockchain land titling project manages and registers land title and validate property-related government transactions. Services have expanded to purchases and sales of land titles, registration of new land titles, demolition of property, mortgages and rentals, as well as notary services.
Personal Records	Ministry of Information Communication, Kenya	The Kenyan Ministry argues that the introduction of blockchain in education and real estate will make it harder for Kenyans to print fake academic certificates or to fraudulently sell land.	IBM	IBM is working with the Kenyan government to introduce blockchain technology in management of records in the health, education and real estate sectors to boost transparency in public information. Locally, the government says it is running pilots to keep track of the educational records and to trace land transactions.

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Application Area	Government Entity	Problem/ Objective	Implementation Partner(s)	Project Details
Tax Collection/ Credits	Miaocai Network, China	While reports indicate that China's existing tax system brings in nearly 2.5 trillion dollars in revenue, officials believe there is widespread tax evasion. There are also sectors of the economy that have not yet been brought into that tax system.	GACHAIN	The Miaocai Network, a state-sanctioned electronic taxation and invoicing enterprise, revealed that it will be collaborating with the "government affairs chain GACHAIN" to create a blockchain-based system for "social taxation" and electronic invoicing. The Chinese government will utilize blockchain technology for social taxation and electronic invoice issuance matters.
Supply Chain Management/ Trade, Public Transportation	Antwerp Port Authority, Belgium	Moving a container between 2 places involves over 30 different parties, with an average of 200 interactions. As these interactions are carried out by e-mail, phone and fax, paperwork accounts for up to half of the cost of container transport.	T-Mining	T-Mining is currently working on a pilot project that will make container handling in the port of Antwerp more efficient and secure. Using blockchain technology, processes that involve several parties – carriers, terminals, forwarders, haulers, drivers, shippers etc. – are securely digitized without the involvement of any central middleman.
Voting/ Elections	E-Estonia, E-Governance	To re-imagine electronic voting systems used elsewhere, which involve costly and problematic machinery	Smartmatic, Cybernetica	In 2005, Estonia became the first country in the world to hold nation-wide elections using internet voting, and in 2007, made headlines as the first country to use i-Voting in parliamentary elections. i-Voting allows voters to cast their ballots from any internet-connected computer anywhere in the world. i-Voting saves over11,000 working days per election

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Application Area	Government Entity	Problem/ Objective	Implementation Partner(s)	Project Details
Digital Currency	**Barbados Central Bank (CBB)**	High import bills and the small size of Caribbean states have resulted in international banks leaving the region, limiting access to foreign currencies	Bitt	The CBB studied the effect of adding cryptocurrency to its portfolio of reserve currencies. Reserve banks keep significant amounts of other countries' currencies on hand in order to help manage the exchange rate of their own. The central bank assessed whether bitcoin might be significant enough to give the bank a new means of maintaining its dollar's peg to the U.S. dollar.

Source: Avasant Research

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Government Challenges in Blockchain Adoption

Despite the increasing applications of blockchain to generate greater efficiency in public services, challenges exist for public sector agencies in successful adoption of the technology. Like any new transformation initiative, there are both technical and operational challenges in supporting the successful adoption of a blockchain strategy. In addition, there is the added complexity of building a partner ecosystem that can support the network and allow for the successful implementation of key blockchain applications.

Challenges of Blockchain Adoption

Primary Obstacles to Adoption

- Lack of Standards and Interoperability
- Lack of Understanding/Awareness
- Budget
- Regulatory Issues
- Lack of Industry Support
- Lack of Value

- Unlike Traditional Enterprise applications, for blockchain deployments to excel, stakeholders across the ecosystem need a clear vision of outcomes to successfully see benefits from their blockchain investments.

- Lack of consensus from stakeholders compounded by a lack of understanding of the technology continue to create roadblocks to the successful adoption of a blockchain strategy.

- Blockchain/ DLT platform scalability, speed and industry adoption remain key constraints

- Regulatory barriers and obfuscation create uncertainty
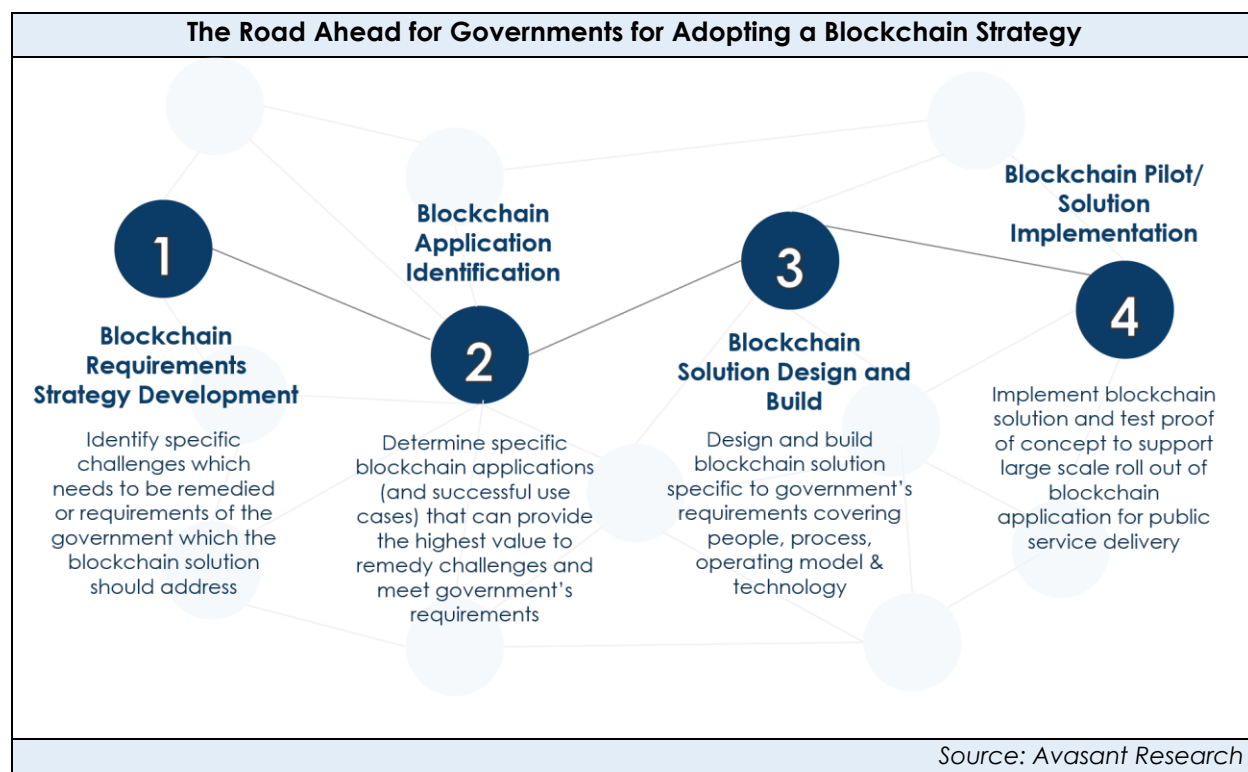
Source: Avasant Research

Blockchain represents a new paradigm for interaction, transferring trust and authority to a decentralized network from central institution. Similarly, regulations have always struggled to keep up with advances in technology. Regulatory uncertainty creates potential barriers to adoption for organizations which struggle to map technology implementation to regulatory impacts. For Blockchain implementations to be effective they must be supported and adopted by a wide spectrum of stakeholders. Lack of consensus from stakeholders compounded by a lack of understanding of the technology continue to create roadblocks for the successful adoption of the technology. As such, working to secure partnerships with key target stakeholders is an integral part of a successful blockchain strategy.

While the technology is increasingly being explored to be used by public and private sector institutions across a variety of sectors, there is a fear that it could be exploited by terrorist or criminal organizations. As blockchain gains traction, new national security issues have arisen, especially in the use of autonomous digital currencies by terrorists or criminal syndicates for activities such as money laundering. Further challenges in blockchain adoption, including high short-term costs,

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and citizens' concerns to interact and trust the technology can also act as a deterrent in Governments' decision to implement them for delivery of public services.

The Road Ahead

The use of Blockchain technology can yield significant dividends for the public sector, including higher transparency, greater operational efficiency and reduced costs. Despite the challenges that exist in adopting the technology in its current form, there are different measures which governments can adopt to strengthen their blockchain capabilities. A well-defined approach or strategy towards adoption of the technology can increase the rate of the adoption and produce the desired outcomes.

The Road Ahead for Governments for Adopting a Blockchain Strategy

1
Blockchain Requirements Strategy Development
Identify specific challenges which needs to be remedied or requirements of the government which the blockchain solution should address

Blockchain Application Identification
2
Determine specific blockchain applications (and successful use cases) that can provide the highest value to remedy challenges and meet government's requirements

3
Blockchain Solution Design and Build
Design and build blockchain solution specific to government's requirements covering people, process, operating model & technology

Blockchain Pilot/ Solution Implementation
4
Implement blockchain solution and test proof of concept to support large scale roll out of blockchain application for public service delivery

Source: Avasant Research

As a first step towards developing a blockchain strategy, governments should clearly identify the problems they are facing and the requirements to be met to improve government operations and enhance public service delivery. Based on the problems that are identified, a list of potential applications or use cases can be identified to address those problems. An initial, short term measure for determining which applications can provide the highest value is to evaluate the blockchain use cases or applications implemented by other government agencies across the world to understand the successes they have had. Stories of successful adoption of the

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technology in other countries can be used to guide decision makers to adopt similar blockchain strategies for their jurisdictions.

Once the blockchain application has been decided on, the blockchain solution, tailored to the specific government's requirements can be designed and built through partnership with a blockchain technology service provider. A blockchain implementation partner can design and build the blockchain solution and ensure that the it meets the goals and objectives of the government entity. As a best practice, pilot programs should be run initially to ensure that the blockchain application envisaged is the most feasible, and the best solution for the government entity.

Blockchain Pilot Programs can alleviate Governments' doubts

Emphasis on running pilot programs before embarking on any large-scale rollout of the technology can negate doubts and concerns around the use and benefits of the technology and help revise the implementation approach. Governments can also capitalize on the benefits of Blockchain technology by adopting an incubator approach that eliminates any upfront risk. This involves setting up of a small team that curates and prioritizes opportunities for blockchain pilots by collaborating with suitable technology partners.

Once pilot initiatives have demonstrated proof of value, governments can then consider charting a national roadmap to offer clear guidelines to public agencies and blockchain technology partners, including technical standards and interoperability norms.

Conclusion

To improve public service delivery, governments will have to fundamentally rethink the way they operate and engage with citizens. While the application of blockchain technology for the public sector is still in nascent stages, there is much more to explore and greater benefits to be derived. It is imperative for governments to experiment with blockchain aggressively if they are to realize their goal of managing and securing trusted data and instilling faith in citizens. The future is all about delivering data-driven services, and it is only by iterating, learning and unlearning that governments can figure out optimal ways of using blockchain for better operations, service responsiveness, faster innovation, and effectively competing in the digital economy.

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