



# REIMAGINING THE PUBLIC RECORDS VALIDATION PROCESS USING BLOCKCHAIN TECHNOLOGY IN RIVERSIDE COUNTY CALIFORNIA

## Abstract

This white paper discusses how blockchain technology can potentially transform the public records management process in Riverside County, California, and how Infosys Public Services, in collaboration with Amazon Web Services, created a platform where various forms of digital records (like land records, births, marriages, deaths) can be seamlessly verified and authenticated. This results in cost savings, faster turnaround time, and enhanced customer service for the department responsible for public records management in the County.



## Executive Summary

Citizens around the world are familiar and comfortable with digital technologies like mobility and social networks. Most commercial sector organizations are transforming digital customer interactions to provide more convenient and personalized experiences. Citizens also expect the same experience when interacting with government departments, so governments around the world are adopting new digital services.

As part of the larger California technology vision, Riverside County, the fourth largest in California and the 10<sup>th</sup> largest in the US, wants to deliver citizen-centric services to its residents through secure, effective, and innovative technology solutions<sup>1,2</sup>.

However, the County faced several challenges including a rapidly-changing digital technology landscape, privacy rules, threats of data theft and misuse, managing resident records and establishing trustworthiness of those records. As with other government agencies trying to reduce the risk of data breaches, the County needed to architect decentralized records management systems, which would be connected via a distributed network. The primary goal of this pilot project is to modernize Riverside County Assessor-County Clerk-Recorder Office's paper-centric operations and reflect the expectation of citizens through a new digital-centric approach. This new platform will improve the security and data privacy for identities, credentials and personally identifiable information (PII), solve the paper records storage issues for government departments, and enable the different departments and agencies in the County to work together in a collaborative manner, minimizing duplication of effort.

This paper discusses the County's pilot solution that uses blockchain technology to enable any individual or organization to remotely validate the authenticity of a digital credential issued by Riverside

County Assessor-County Clerk-Recorder in real time as opposed to the current process of 'in-person' or 'via mail' authentication.

## Present scenario and challenges

"Trust is the cornerstone of every relationship." That is also true for the interactions that take place between citizens and governments. Although paper is still preferred as a medium by some government offices to create, store and prove authenticity or establish the 'trust' element of records, 'paper-centric' processes are manual, time-consuming and expensive. Many state regulations still require outdated and inefficient procedures that rely on manually-generated paper records through the use of 'security paper' to establish the trustworthiness of the record. The common practice is to authenticate a particular document by using security papers, wet signatures or office seals. However, with easy access to specialty papers globally, advanced printers, Photoshop etc., these types of authentication processes often create avenues for fraud and don't guarantee authentic sources of information. There is a need for a common platform where valid credentials can be issued digitally, bypassing paper-centric processes, and where proof-of-record verification can be done by any individual or organization in real-time.

Government departments and agencies are responsible for storing and maintaining an extraordinary amount of data including public records. However, issues of data security and privacy in the paper-centric approach limit the ability of governments to share data across departments/agencies. Since citizens expect greater transparency and faster delivery of their record requests, integration and access become paramount. Interacting with the government is often inconvenient for citizens because of redundant paper-centric operations across multiple agencies/departments. In many cases, citizens and businesses must wait until the physical copy of their proof-of-records/credentials are generated and

authenticated, highlighting inefficiencies in the process and diminishing their experience. Obtaining a physical official record can take up to weeks via the postal service or hours in traveling to government offices and waiting in the lobby for in-person services.

Governments are embarking on digital transformation projects to meet the rising expectations of citizens for digital interactions. As part of the ['digital government' strategy of the US Department of State](#), Federal, State, and Local government agencies are tasked with building a 21<sup>st</sup> century 'digital government' that delivers better digital services to the people. Unfortunately, too often the continued use of legacy tools and paper-centric processes make these user interactions cumbersome and frustrating as well as vulnerable to fraud.

For instance, the current California State Health and Safety Code 103526.5 details the required procedures of managing, storing, processing, and issuing citizen records on specialized "official" paper. Because of the Health and Safety Code, citizens across the US (and around the world) who need to obtain their vital records from Riverside County will either have to go through the postal service process that takes an average of 3 days, or drive to one of 5 office locations in a county that is over 7,300 square miles in size with a population of 2.4 million residents to obtain the paper record in person. This is a direct result of paper-centric regulations that are not in keeping with citizens' expectations and technological advancements.



“As Riverside County’s Assessor-County Clerk-Recorder, we are not just in the business of record keeping, record issuance, and valuing properties. We are in the business of providing the most convenient, timely, secure, and cost-effective services to our customers possible. To achieve this, we need to advance our digital transformation strategy, and partner with industry experts and leaders like AWS and Infosys Public Services.”

~ Peter Aldana, Assessor-County Clerk-Recorder at County of Riverside



## Blockchain – A broad perspective technological solution

We have seen multiple examples of how blockchain technology delivers solutions to government departments as they embark on their digital-transformation. While the list of potential applications for blockchain in the public sector is always increasing, here are some of the main drivers of the adoption of blockchain in the public sector today:

### A. Process Complexity and Information Silos:

Manual processes are error prone and arduous, and most government departments rely on manual record generation and verification systems. This often results in redundancy of processes and data, eventually creating information silos, which increases the processing time for a citizen's request and increases the cost of government operations.

**B. Intermediaries:** As a solution to cumbersome government agency processes, third party intermediaries (brokers/agencies) step in to improve citizen experience. This adds additional cost to the citizen's request and often complicates the process, leading to a further delay in meeting the citizen's request.

**C. Cost-Efficiency:** Governments need to fulfil their departmental objectives while responsibly managing scarce resources. Lack of automation and cumbersome manual paper-centric processes can lead to increased time and cost of compliance while having a negative impact on citizens' experience and satisfaction.

**D. Fraud and Error:** Citizens are on the move, so their day-to-day physical location and even their home/residence can be fluid, requiring creative processes to manage citizen records and data. When citizens move, it becomes more difficult to access records stored in a siloed government ecosystem. The likelihood of errors and fraud also increases because of

non-uniform/inconsistent data across the government ecosystem.

### E. Digital Government:

On July 1<sup>st</sup>, 2020 California's Blockchain Working Group delivered their technology analysis, assessment, and recommendation report in accordance with the State's AB 2658, the workgroup was tasked with taking an in-depth look at blockchain technology as a crucial and needed step to empower agencies to start their digital transformation journey.

Blockchain is a decentralized system of records or 'ledger' that stores every transaction detail that is happening in the network. Transactional data stored in blockchain is cryptographically secured, which means encoding data using a mathematical algorithmic function that creates an alphanumeric code or 'hash'. These transactional data or 'blocks' are bound to each other in an unbreakable bond or 'chain'.

Blockchain technology supports collaborative networks where participants can see and verify data in a trusted and transparent manner. It also reduces reconciliation needs and process and data redundancies, improving efficiency and minimizing cost. Blockchain can deliver accuracy and trust among government departments, commercial sector organizations and public users by facilitating a secure and trusted exchange of records and information. Through its cryptographic techniques, only certain

metadata and the hash of the public records/credentials are stored in the blockchain ledger and can be retrieved from the ledger while verifying the authenticity of the same.

Blockchain technology has the potential to cause a paradigm shift in the way private and public organizations operate today. Using its core strength of trust, unalterable source of truth (immutability), transparency and privacy, blockchain provides the foundation to the digital-centric processes by making transactions fast, accurate and secure.

## The AWS – Infosys Public Services approach for Riverside County

Infosys Public Services (Infosys) collaborated with Amazon Web Services (AWS) to develop the blockchain-based, digital records fulfillment solution for Riverside County's Assessor-County Clerk-Recorder Office. For this pilot solution development, Infosys used Amazon Managed Blockchain, which makes it easy to create and manage scalable blockchain networks using the open source Hyperledger Fabric blockchain framework. Additional AWS managed services are also being used including Amazon Cognito, AWS Lambda computing service, Application Load Balancer, Amazon Simple Storage Service (Amazon S3), Amazon DynamoDB, Amazon Virtual Private Cloud (Amazon VPC) and Amazon API Gateway.



# THE PILOT SOLUTION

The objective of this pilot solution is to demonstrate the ability to bypass the generation of physical paper records and to use technology to facilitate a full digital-record process from a citizen's online request. This includes digital delivery of the requested record, while verifying the record's authenticity and its trusted origin. The ideal customer experience would be similar to purchasing a product online. In this case, the "purchase" is actually a record/document. Mirroring e-commerce, citizens can select needed records, authenticate themselves as the secured customer, make the payment, and receive digital delivery of the requested record in a few minutes through an electronic government portal. Key considerations in the blockchain technology pilot solution are:

## 1. HOW WILL THE CITIZEN KNOW THAT THE DIGITALLY GENERATED RECORD IS OFFICIAL?

The pilot solution using blockchain is a proof-of-concept for how the technology can be integrated with any agency's existing internal or outward-facing electronic commerce system. This is accomplished through Application Programming Interfaces (APIs) where the process from service request to digitally fulfilling the request is seamless for the citizen.

For the proof-of-concept, user interfaces were developed to illustrate how blockchain records authenticated/certified digital records onto its immutable ledger. In the first part of the use case, the admin from the County Recorder's office logs in to the admin portal of the application and completes the request form using the metadata of a particular credential (proof-of-record), which has been issued by the County Recorder's office. On the same page, he/she can drag and drop the PDF copy of the credential to create the hash (encrypted alphanumeric output of a fixed length). Then the admin can automatically store this information including the 'hash' that has been generated into the blockchain and a success message is displayed. As a result, only agencies that are participants of the closed blockchain ecosystem can make entries onto the ledger. Therefore citizens can trust that the digital record obtained is an official record.

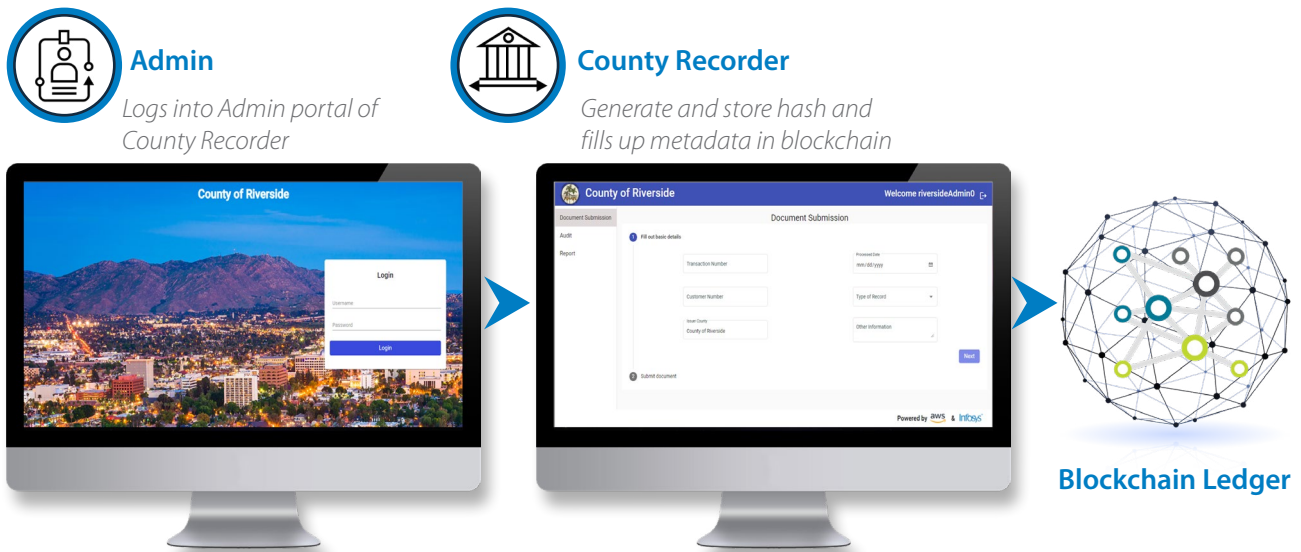


Figure 1: Indicative to-be process flow of storing hash into blockchain

# EXPECTED (TO-BE) PROCESSES IN THE PILOT SOLUTION (continued)

## 2. HOW WILL THE ENTITIES RECEIVING A DIGITAL RECORD CONFIRM IT'S OFFICIAL?

Digitally-issued records can be authenticated by entities/agencies apart from the issuing agency by using an internet-hosted verification portal. Using the closed-blockchain, anyone can visit a public portal hosted by the Riverside County Assessor-County Clerk-Recorder to check the authenticity of the digital copy (PDF) that was issued by the agency. The website allows the user to drag and drop a digital record file to calculate the hash, which the application matches with the stored version in the blockchain ledger.

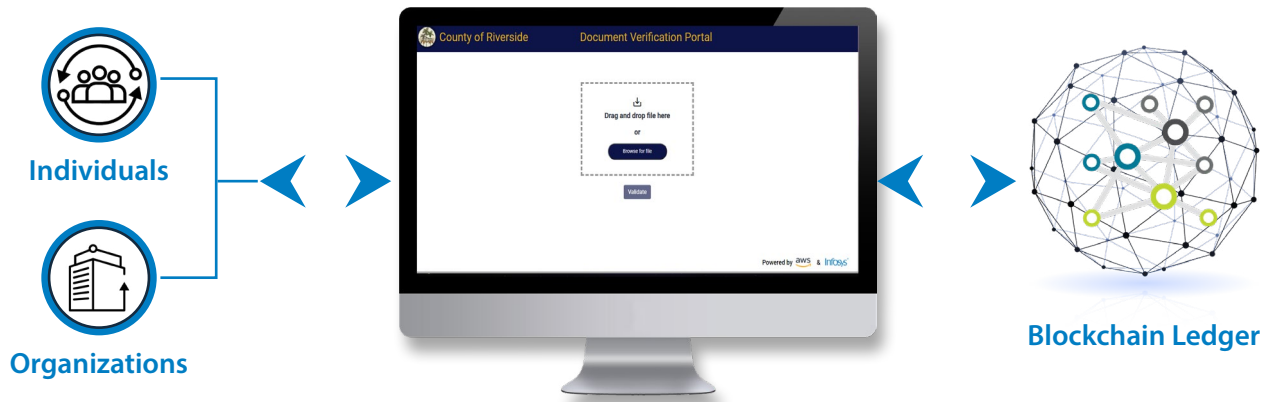
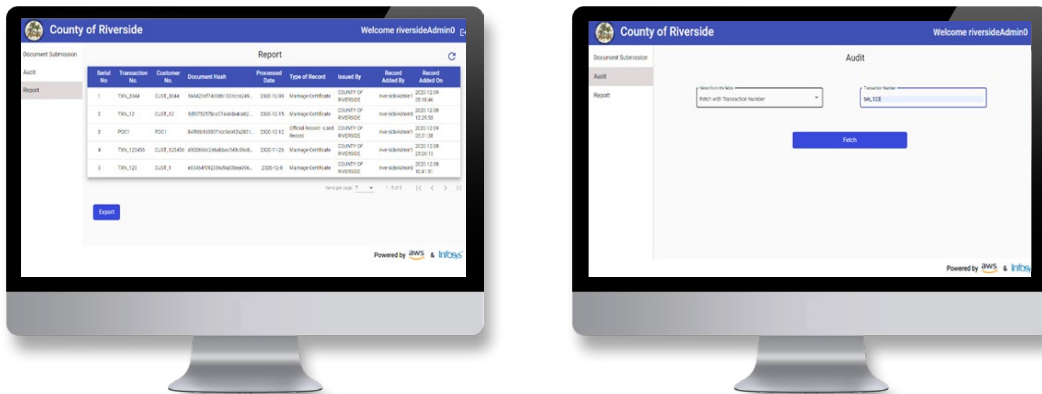


Figure 2: Validation of the credential

## 3. HOW WILL RIVERSIDE COUNTY ENSURE THAT ONLY AUTHORIZED DIGITAL RECORDS ARE DELIVERED?

The pilot solution enables reporting and audit log features in the admin portal. The admin can use the reporting feature to view and export the list of records/credentials that have been processed and the corresponding hashes stored in the blockchain ledger along with the timestamps. The audit feature can also be used by the admin to check the instances a particular credential has been downloaded or processed for verification, as well as any anomalies on the ledger.



# EXPECTED (TO-BE) PROCESSES IN THE PILOT SOLUTION (continued)

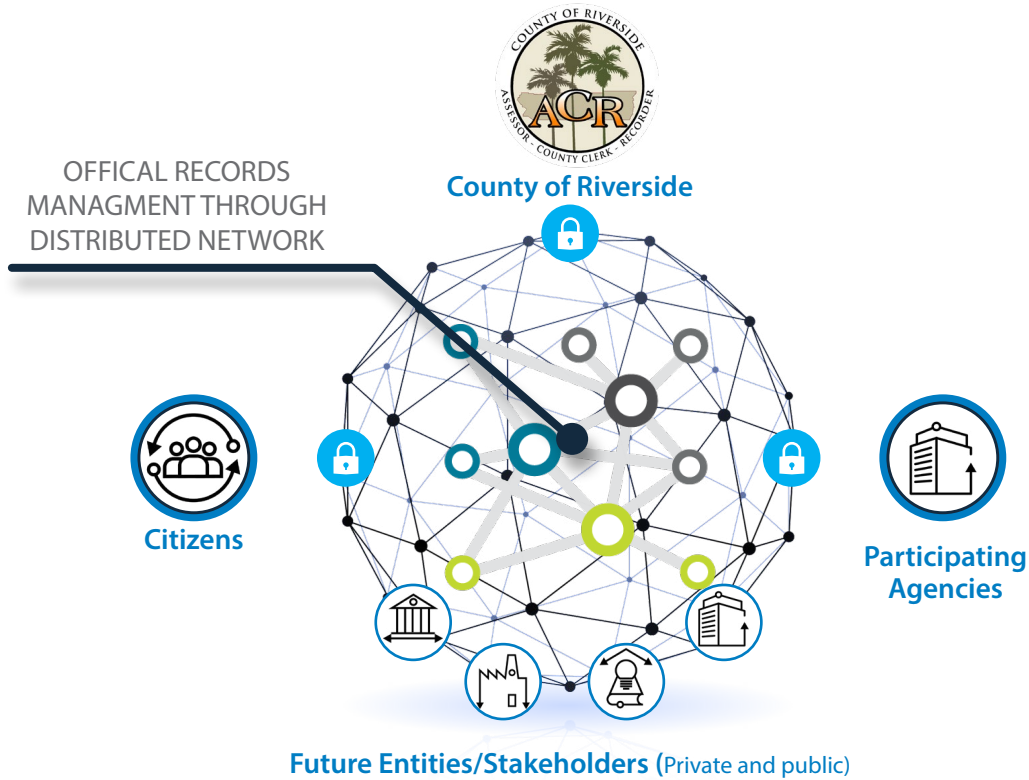





Figure 3: Pilot network with proposed participants

## PARTICIPANTS IN THE PILOT NETWORK

ACTORS	ROLE	ACTIONS / PROPOSED ROLES
 <p><b>County Assessor-County Clerk-Recorder</b></p>	Issuer and verifier	<p>County Recorder can either issue or revoke a credential (proof-of-record)</p> <p>Admin at County Recorder office can store hash and metadata of a credential in the blockchain ledger</p>
 <p><b>Participating Agencies / Departments</b></p>	Verifier	Participating agencies can check the authenticity of a state-issued credential from public portal
 <p><b>Resident of Riverside County / Any Individual User</b></p>	Verifier	Individual user can also check the authenticity/status of a Riverside Assessor-County Clerk-Recorder issued credential from public portal



## POTENTIAL BENEFITS



### Enhanced user and citizen experience

The credential validation process will become more efficient as validation can be done online by anyone. From a user perspective, the credential verification process during any service completion will be mostly contactless and paperless.



### Lower operational cost

The solution will reduce redundancy and streamline the credential verification process. Eventually, this will help reduce the cost of compliance by enabling automated validation and eliminating paperwork.



### Increased process efficiency

The solution will accelerate service completion time by any government department. It will also ensure data integrity by making sure the credentials contain trusted and error-free information.



### Improved transparency

Any individual user or organization can independently verify the digital copy of the credentials from a public website. By being extendable to the departments or agencies of other county governments, the solution can multiply the benefits of transparency across the states.



### Increased data security

A blockchain-based public records management solution removes the need to maintain a large pool of data, which might attract potential hackers. By decentralizing the credential verification system, the risk of data theft or manipulation becomes almost zero.



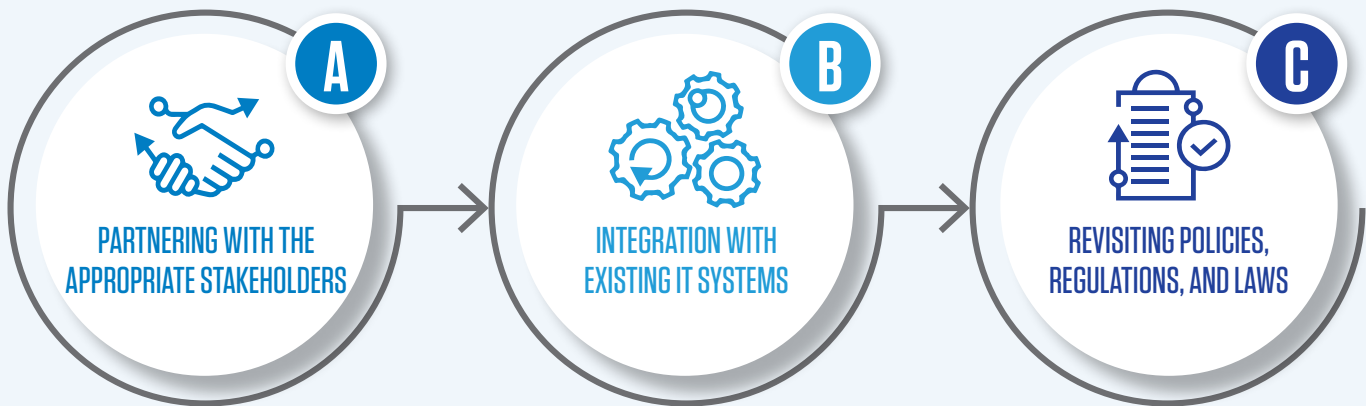
### Greater trust

The solution will offer 'privacy by design' and complete control to the individuals over their credentials. The blockchain ledger doesn't store any personal information from the credential and the issuing authority also doesn't need to store the whole digital credential. Rather, the metadata and the hash of the credential gets stored in blockchain. Users can store credentials in their local devices. If required, the user can share it with a third party, who can check the authenticity of the digital copy of that credential, making the system more trustworthy.



## THE PATH AHEAD: EXPAND THE NETWORK WITH ADDITIONAL GOVERNMENT SERVICES

While the initial pilot solution focuses on the proof-of-records issued by Riverside County (office of County Assessor-County Clerk-Recorder), the blockchain network can integrate additional government departments across the state. However, harnessing the complete value from the proposed blockchain-based records management solution would require additional considerations like expanding the digital community by connecting counties, local agencies, individuals and private institutions to create a common platform for digital record issuance and verification.



There are ongoing discussions to include more departments in Riverside County and other California counties. Through this solution, departments or agencies can remove paper-centric processes and convert to digital-record processes that can be trusted and verified.

Participants of the digital records issuance and verification network will continue to use their existing systems. The existing IT systems will connect with the blockchain network using APIs. There will be no rip-and-replace of the existing core systems where the source of truth resides, and security and privacy will not be compromised.

With the pilot proof of concept for blockchain technology, defining appropriate applications and the scope of adoption is the next logical step. Identifying additional agencies that share the same vision of a digital transformation strategy is a crucial step. Multiple departments and agencies can build a consortium that will strengthen the security of the blockchain ecosystem, establish standards for sharing data, and collectively drive 'change' at the legislative level to modernize laws and regulations for the future.

## ABOUT THE AUTHORS



**Kan Wang** is currently serving as the Assistant Assessor-County Clerk-Recorder in Riverside County, California. Kan is also a Lecturer with the University of California Riverside School of Business and Management teaching management information systems disciplines. Kan holds an MBA, a master's in computer science, and a bachelor's degree in business administration. He has a passion for developing management methodologies to align technology to achieve organizational goals by fostering a culture of entrepreneurship, creative thinking, and execution agility and effectiveness.



**Vikrama Adethyaa** is a Senior Partner Solution Architect at Amazon Web Services. Vikrama acts as a technical trusted advisor to AWS Partners so they can be successful in building and selling their cloud-based solutions to their customers. He provides recommendations on security, cost, performance, reliability and operational efficiency best practices to run mission-critical workloads on AWS. He specializes in containers, blockchain and IoT.



**Abhishek Khare** is currently working as a Principal Consultant at Infosys Limited. Abhishek, a chartered accountant (equivalent to CPA in the US) with close to two decades of industry experience in Treasury and Capital Markets domain including Trading, Risk Management, Operations, and Compliance, has led digital transformations in the Financial Services sector under the Digital Experience practice of Infosys. He advises Infosys government sector clients in India and the US on the value blockchain powered networks bring to government departments and citizens. Taxation and simplification of citizen services are his areas of interest. He has been instrumental in developing Infosys proprietary solutions for e-Governance and Supply Chain Management. Abhishek is also a research scholar pursuing a PhD in the area of blockchain adoption.



**Debopam Majumder** is a Senior Consultant at Infosys Limited, helping public sector clients to define go-to-market strategy for digital transformation programs focusing on blockchain technology. He is responsible for new business development, defining clients' requirements and proposing solutions by closely working with the clients and development teams. Debopam holds an MBA and an engineering degree with a specialization in computer science.

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For more information, contact [askus@infosyspublicservices.com](mailto:askus@infosyspublicservices.com)

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