Using Blockchain to Authenticate and Maintain Vital Records

While the secure nature of blockchain can be implemented in a variety of contexts and uses, its application to personal identity has the potential to significantly improve the way governments record and maintain identifying events such as birth, marriage, and death. These milestones create markers of one's identity, and are used to authenticate and provide critical services and benefits to a person.

Most often, vital record tracking systems in the United States are heavily reliant on the exchange of paper, which can be time consuming to replace, and is vulnerable to tampering, theft, and loss. Despite a person's best ability to keep their physical records safe, a natural disaster or accident could damage or destroy their certificates within seconds. Additionally complicating the process are disparate recordkeeping systems and the reliance on physical copies (e.g. submission of birth certificates for drivers' licenses) which result in unnecessary delays and additional opportunities for errors.[1]

Alternatively, if local governments were to shift the management of these records to a digital ecosystem, such as online banking, this highly sensitive information would be vulnerable to theft and data breaches. Blockchain technology has the potential to bridge this gap by providing a secure and immutable platform to simplify the management of trusted information and keep it safe from manipulation.[2] While aspects of blockchain technology could be used as a transformative tool, there are few case studies about blockchain in the context of government use[3].

As the birthplace of modern technological innovation, California is particularly poised to tackle questions surrounding the streamlining of government. In examination of how the technology can be implemented to support the fundamental function of vital recordkeeping, several themes emerged. The technology shows promise in improving access to individuals, bolstering protections and security while improving transparency and efficiency for governments. With these benefits come attendant drawbacks, namely cost, disruption to current systems and privacy concerns. In any event, challenges related to vital recordkeeping will only become more pressing with time, and California policymakers will need to weigh current practice against rapidly evolving technology in order to construct the most effective and efficient system.

Vital Record Keeping

The United States did not begin systematically recording vital records until the early 1900s.[4] Despite their use in federal programs and the like, vital records are created and maintained by local authorities and are not considered Federal records.[5] The process for requesting a vital record varies by state. In California, The California Department of Public Health – Vital Records (CDPH-VR) maintains birth, death, fetal death/stillbirth, marriage, and divorce records once they have been recorded by the County Recorder's Office. Services provided by CDPH-VR include issuing certified copies of California vital records, registering, and amending vital records.[6]

Types of Vital Records

The three most common types of vital records are birth certificates, marriage certificates and death certificates. The vital record most often used to validate identity is one's birth certificate, which verifies age and place of birth. Birth certificates are needed to enroll in school, apply for a passport or government benefits, join the military and claim pension or insurance benefits.[7] Similarly, marriage certificates and death certificates are necessary to providing essential benefits and authentications.

While these three types of certificates are most commonly referred to as vital records, there are questions as to whether, fingerprints, and other genetic data or identifiers could be considered a vital record.

Issues with Current Vital Records System

The World Bank estimates that 1.1 billion people in the world do not have access to proper forms of identification.[8] Without reliable access to vital records, approximately one seventh of the world's population is left unable to conduct basic social activities such as, open a bank account, vote, utilize social programs, or gain employment. Access to identity is an integral part of our social and economic structure, both domestically and globally. Access to proper forms of identification allows individuals to participate in political, economic and social activities, and programs. This identity gap creates barriers for vulnerable populations from gaining much needed benefits and social programs.

Utilizing blockchain technologies for vital records such as birth, marriage and death certificates, has the potential to bridge the "identification gap"[9] by providing individuals with agency and power over their identity, as well as accessible and secure digital identification.

California Context and Considerations

The California Legislature has recognized the potential of blockchain technology by the passage of two bills: SB 838 (Hertzberg, 2018), which provides statutory authority for corporations formed in California to use blockchain to create and maintain corporate records and AB 2658 (Calderon, 2018), which defines blockchain for purposes of law and created the workgroup and framework that has led to this report.[10] The first and only legislation related to the management of vital records is SB 373 (Hertzberg, 2019) which was introduced in 2019 and is still being considered by the Legislature. SB 373 originally authorized the issuance of birth, marriage, and death certificates by means of blockchain, and has since been pared down to only marriage certificates. While local governments such as Berkeley and Sacramento have launched pilot programs that use blockchain technology to improve services, no programs have centered on the use of vital records.[11]

Currently, the California Health and Safety Code chiefly governs California Law surrounding vital records. Sections of this code outline everything from the creation of these records to the distribution of access to them.

- Health and Safety Code section 102400 states, "Each live birth shall be registered with the local registrar of births and deaths for the district in which the birth occurred within 10 days following the date of the event." (Health and Safety Code 102400).

- Health and Safety Code 102430 outlines the access laws for vital records, including who has access, and under what circumstances.

- Health and Safety Code Section 103525 describes the required content for certified copies of a birth, death, or marriage certificates.

    - SB 373 (Hertzberg, 2019) amends this section to allow for the use of blockchain technology to distribute digital vital records.

Any future legislation would need to address these code sections, which currently govern the creation, managing, and distributing of vital records.

How can Blockchain Improve Local Government

Government has an important role to play in the creation, management and protection of the vital records of its people. Identity is not only foundational to nearly every government service, but it is a starting point of confidence in resident's interaction with government and is a critical enabler of service delivery, security, privacy, and public safety activities. How identity attributes are collected, managed, and secured will continue to be of critical interest to leaders in the public sector charged with protecting the rights of residents.[12]

Current vital record management models across the state vary from county to county. In many instances, this information is kept using outdated technology, and some counties rely solely on paper filing systems. Blockchain has the potential to create uniformity across the state, and promote access, protection of records, security, privacy, transparency and overall efficiency in the management of vital records.

Access and Authentication: Blockchain has the power to allow individuals agency over their civic and vital information. By utilizing the distributed ledger function of blockchain, data can be input onto the ledger and accessed from any computer in the world through a TBD secure authentication process. Moreover, the authenticated user can use related technologies, such as zero knowledge proofs, to convince third parties of the authenticity of their record – without revealing the actual content of the record itself (or revealing only selected parts of it).

With the only prerequisite of an internet connection, a blockchain based management model allows for unprecedented access. By ensuring that individuals have immediate access to their information and the ability to convince others of its authenticity, they can quickly be connected to needed services. This level of agency allows for more efficient and secure interactions with public and private actors that require the proper forms of identification for verification.[13]

Protection of Vital Records: With traditional centralized storage, government records have been lost in fires and database failures, and many agencies do not have the time, or resources to keep redundant backups of every file.[14] The decentralized nature of blockchain means that copies of vital information can be distributed across multiple locations. In the event of a natural disaster or destruction of participating computers, vital information will not be lost. This form of resilience and security provides the opportunity to create new identity systems where users own the data, which remains universally consistent and cannot be destroyed, a characteristic that is extremely valuable when managing vital records.[15]

Security and Privacy: The decentralized aspect of blockchain provides an additional layer of security, making hacking very difficult because information cannot be gained or controlled from a single computer server.[16] In addition to security, blockchain provides potential privacy benefits. In contrast to a traditional system in which a central authority verifies transactions, network users validate the transactions in a blockchain, replacing the need for a single third-party institution to provide trust. Since an intermediary is not verifying the transaction, the data from the transaction is not shared with advertising companies, social media networks, or even credit bureaus. Furthermore, the information itself can be stored on the blockchain in ecrypted form. This level of privacy gives individuals autonomy over their data.

Transparency: Records kept on the ledger can be immutable, meaning they are permanent and cannot be altered. This is a powerful tool that allows you to verify the state of a piece of data at a particular time. On blockchain, any transaction, including attempts to view, modify or tamper with data, is marked and stored on the blockchain, and viewable by all individuals on the network. This level of transparency could improve the public's perception of government, and raise trust in government institutions.[17]

Efficiency: Information can be accessed by any entity that has validated permission. This allows for a more efficient process of identification validation, and removes the need for costly procedures when paperwork is lost. In addition, the decentralized nature of the blockchain allows information to be validated from multiple locations and by multiple parties simultaneously. One proposed concept has been to create a blockchain as a kind of living document, containing all vital records for a single individual. Instead of inputting documents into separate databases, it would make more sense for a death certificate for example, to be simply added to the existing blockchain. This allows for quick reference and more efficient management of vital documents.[18]

<u>Potential Risks and Considerations:</u>

Disruption: As with any new technologies, disruption of current norms and procedures is inevitable. Similarly, the new technology will itself be subject to disruption. With vital records, any disruption in the system can put valuable personal information at risk. While the introduction of blockchain will provide numerous advantages over traditional procedures, blockchain technologies should be integrated into existing systems in a way

that complements and upgrades current practices in order to mitigate disruptions. [ed – we will expand on mitigation and transition in a future draft or annex].

Privacy and Governance: Under the U.S. Constitution, every citizen is protected from unlawful search and seizure. Arguably, this means that even if a government entity is an administrator of information held on a blockchain, that government entity cannot have unfettered access to personal information of citizens without reasonable controls.[19] This constitutional concern is at the heart of many of the fears surrounding blockchain. With the use of blockchain on vital records, it is justified that there is a general fear of publishing private information on a distributed ledger. The country of Estonia, which has emerged as a leader on blockchain ledgers, has gotten around these fears by creating an open register showing what types of personal profile information that is held in each governmental system, the reason it is held, and who is authorized to access it. All access to these ledgers is logged, and it is illegal to view someone's information without appropriate justification.[20]

Additionally, if illegal, personal, or otherwise objectionable data is entered onto a public blockchain ledger it cannot be removed. The potential impacts of the permanence and persistence of this information could potentially affect the privacy of individuals. Strong governance models and controls around data security and privacy will have to be examined carefully in order to regulate the information added to the blockchain. [ed- this may argue for the use of a permissioned blockchain or some combination of permissioned and permissionless blockchains][21]

Finally, to the extent the State retains over-arching responsibility for vital records, the State will need to establish some mechanism for the public oversight of the governance of blockchains that are used to store and access them. Note the oversight does not mean that the State needs to be involved in the operation of the blockchain(s) or even directly involved in their governance.

Accessability: While Blockchain removes barriers connected to traditional record management models, it also creates new technological barriers, particularly for low-income or rural communities without computer access. Therefore, when rolling out blockchain programs it is imperative that there be efforts made to provide greater internet access to targeted populations. There are many ways this could happen, but some examples include in the form of public library programs, or social service centers.

Implementation Costs: In order to roll out the technology, there needs to be an existing digitized database to draw from, and a large population willing to participate. Both can be time consuming and costly for the implementing agency. Therefore, it is recommended that any pilot programs be established in areas that meet both of these prerequisites.

<u>Relevant Programs and Case Studies:</u>

Marriage Certificates:

Washoe County: In April of 2018, Washoe County in northern Nevada created a pilot program to use blockchain technologies to allow couples to receive digital marriage certificates directly to their home desktops and smartphones. The program utilizes the Ethereum blockchain to virtually store certificates, allowing for faster delivery times and more secure storage. The program has been a great success, with participating couples receiving their marriage certificates within 24 hours via email, instead of having to wait 7 to 10 business days.[22]

Birth Certificates:

Illinois: The Illinois Blockchain Initiative (IBI) was launched on November 16, 2016 as a collaborative effort by a number of state and county agencies in Illinois to explore and assess the possibilities of applying blockchain technology in governance and public service delivery.[23] One of the pilot projects established by the IBI involved the development of digital birth certificates using blockchain technologies. The IBI partnered with the blockchain technology company Evernym to develop a birth registration process that would allow residents access to digitized birth records without the pains and costs of the traditional heavy record management models, which rely heavily on paperwork filing.

The program was set up to work as such: after a child's birth, government agencies verify birth registration information, using existing standards of live birth certification, and then secure the information via blockchain. After the information has been stored, the parents of the child gain legal authority to manage a digital ID until they are 18 years old. This identity information can be requested by businesses and government institutions via encrypted access for verification and authentication. As added security, access to the information is cryptographically sealed, and requires the identity holder's consent or the consent of their legal guardian to access it.[24] However, after initial concerns were brought to program directors, the project eventually shifted to using existing birth records rather than generating new ones.

General ID Information:

Austin MyPass: In February of 2019, the city of Austin created a pilot project that utilizes blockchain to help their growing unsheltered population. A collection of city agencies and other groups in Austin are testing the service called MyPass, which gives unsheltered individuals who might not have valid identification access to all of their vital records on a digital blockchain that they can access from any device. The goal of the program is to empower the homeless with that information and allow them to have ownership and autonomy of [their data] and use it to garner services. [25]

E-Estonia: In 2007, Estonia launched the e-Estonia initiative to digitize all governmental data concerning individuals using blockchain. Most of Estonia's government services and functions, including taxation, citizen identification, voting, health, and public safety

are fully digitized and many utilize blockchain technology. The initiative utilizes a Keyless Signature Infrastructure (KSI) blockchain technology designed to make sure networks, systems, and data are free from compromise all while retaining data privacy. Estonia claims that digitization ensures its history cannot be rewritten by anybody and the authenticity of the electronic data can be mathematically proven. [26]

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[1] Franks, Pat. "Blockchain for Identity Management: Can a Case be made to Begin at Birth?" *CIRI Blog: Digital Records and Curation*, May 2, 2019. https://ischool.sjsu.edu/ciri-blog/blockchain-identity-management-can-case-be-made-begin-birth

[2] State of Illinois. "Illinois Blockchain and Distributed Ledger Task Force Final Report to the General Assembly" *House Joint Resolution 25.* January 31, 2018. https://www2.illinois.gov/sites/doit/Strategy/Documents/BlockchainTaskForceFinalReport020518.pdf

[3] Julie Hamill, Harris Bricken. "Blockchain Technology: Local Government Applications and Challenges" *International City/County Management Association (ICMA) and Government Finance Officers Association (GFOA).* October 2018. https://icma.org/sites/default/files/2018-Nov%20Blockchain%20White%20Paper.pdf

[4] "Vital Records" *National Archives.* November 15 https://www.archives.gov/research/vital-records

[5] Ibid.

[6] SB 373 (2019-2020). http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200SB373

[7] USA Gov. "Replace Your Vital Records." January 2, 2020. https://www.usa.gov/replace-vital-documents

[8] World Bank Group, and the Center for Global Development. "Principles on Identification for Sustainable Development: Toward the Digital Age." February 2017, 4. http://documents.worldbank.org/curated/en/213581486378184357/pdf/Principles-on-identification-for-sustainable-development-toward-the-digital-age.pdf

[9] Ibid, 3.

[10] Senate Office of Research. "Issue Primer—Blockchain Technology. "*Policy Matters"* June 2019. https://sor.senate.ca.gov/sites/sor.senate.ca.gov/files/Issue%20Primer%20-%20Blockchain.pdf

[11] Ibid, 4.

[12] State of Illinois. "Illinois Blockchain" p.20.

[13] Young, Andrew and Michelle, Winowatan, and Verhulst, Stefaan. "Case Study: Registering Births on the Blockchain in Illinois." GovLab, October 2018. p.4. https://blockchan.ge/blockchange-birth-registration.pdf

[14] Julie Hamill, Harris Bricken. "Blockchain Technology: Local Government" p.7.

[15] State of Illinois. "Illinois Blockchain" p.13.

[16] Senate Office of Research. "Issue Primer," p.3.

[17] Julie Hamill, Harris Bricken. "Blockchain Technology: Local Government," p.6.

[18] Ibid, p.6-7.

[19] Julie Hamill, Harris Bricken. "Blockchain Technology: Local Government" 13.

[20] Ibid, p.13.

[21] State of Illinois. "Illinois Blockchain," p.14.

[22] Washoe County, "Digitally Certified Document Copies" https://www.washoecounty.us/recorder/blockchain.php

[23] Young, Winowatan, and Verhulst. "Case Study: Registering Births" p.3. https://blockchan.ge/blockchange-birth-registration.pdf

[24] Ibid, p,3.

[25] Fisher, Daniel. "Austin Looks to Blockchain-Powered ID Management," Government Technology, September 13, 2018. https://www.govtech.com/products/Austin-Looks-to-Blockchain-Powered-ID-Management.html

[26] Julie Hamill, Harris Bricken. "Blockchain Technology: Local Government," p.7-8.