Urban Digitization Governance in Birth Registration Field

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Digitization governance is one of the most significant current discussions in the urban governance field. Especially, with the spreading of Blockchain Technology (BCT), researchers have shown an increased interest in the application of the technology in solving birth registration challenges as a digital infrastructure in developing countries.

Keywords: civil registration ; block chain ; digitization governance ; smart contract

1. Introduction

According to [1], Blockchain technology enables the shared registry concept from distributed systems to be implemented in a variety of application domains, ranging from cryptocurrency to potentially any industrial system requiring decentralized, robust, trusted, and automated decision-making in a multi-stakeholder environment. The characteristics of the technology could lead to improvements in efficiency, transparency and therefore trust [2]. However, along with this growth in blockchain technological innovations, there is increasing concern over data security and the effectiveness of social systems like civil registrations. Many countries in low and middle-income countries are struggling to achieve adequate coverage and quality civil registrations [3]. Around one-third of all births are not registered. This disparity is most apparent and is known as the scandal of invisibility. In many nations, computerization of birth registration systems at all levels has substantially improved the management and maintenance of an effective system, which has helped to alleviate many of the urban governance difficulties involved.

However, there is little advice for urban governance at present as to how to manage existing or emerging technology pressures or guidance on cross-system coordination and interoperability for efficient and effective Civil Registration and Vital Statistics (CRVS) [4]. In their studies, [5] demonstrates that in countries with a continuous commitment to digital governance, substantial improvement in CRVS systems can be made very fast, particularly when modern Information and Communication Technologies (ICT) are used. Nations of this caliber have enormous potential for advancement, but lack proper access to modern technology, mostly due to a lack of infrastructure. Fundamentally, these nations want transparency, security, and accountability in their operations, all of which are cornerstones of Blockchain Technology (BCT) [6].

2. Civil Registry in Urban Governance

As a basic infrastructure of Urban Governance, civil registration involves the legal notification and recording of individual vital events, including births and deaths, by the government [7]. The office of the civil registrar maintains the records and registers that contain information about vital events, and issues legal certificates on-demand to entitled claimants. This legal data can be used to support further urban planning and digital governance [8]. Birth certificates establish the identity of a person. They also facilitate access to education, employment, economic resources, social protection systems and services, and legal rights and entitlements [9]. In many countries, computerization at all levels of a registration system has greatly facilitated the managing and maintaining of an effective registration system. This is largely due to the increasing use of relatively inexpensive information and communications technology (ICT) that helps to solve many of the issues involved. The use of ICT can also speed up the compilation and availability of vital statistics [10]. A civil registration system encompasses a range of practices involving many institutions. Activities include notifying and registering events and issuing certificates. The ‘Ten CRVS Milestones’ framework is designed to help CRVS stakeholder’s policymakers, managers and development partners better understand how the systems function as a whole, from end to end, by describing the key processes that must be accomplished in any CRVS system to support better governance [3]. Each milestone represents the output or product of several activities that are logically grouped. It also encapsulates a set of requirements that every CRVS system should fulfil [11]. The systematic application of the CRVS Milestone framework

exposes neglected aspects in many CRVS systems such as the importance of the anti-epidemic of COVID-19, where the health sector could play a crucial role [12].

3. Blockchain Technology

The characteristics of blockchain made it an important technology to solve many urban governance problems. Blockchain is a technology that makes the shared registry concept from distributed systems a reality for several application domains, from the cryptocurrency one to potentially any industrial system requiring decentralized, robust, trusted and automated decision-making in a multi-stakeholder situation [1]. Ensuring the trustworthiness of records is a requirement in a range of different contexts where systems of record provide the critical underlying infrastructure necessary to achieve development objectives. This includes organizations responsible for civil registries of births, deaths and marriages, land registries and repositories of financial transactions. Untrustworthy civil registration entries may mean that citizens are unable to prove their identities as a necessary precondition to accessing social protection benefits, or that opportunities for identity fraud emerge that undermine a country's immigration policies and national security [13]. The characteristics of blockchain technology could lead to improvements in efficiency, transparency and therefore trust [2]. It is characterized by the following features:

- *Peer-to-PeerNetwork infrastructure*—In a P2P network, there is no centralized server, and each user is a node with server functionality. This layer embodies decentralization and network robustness [14]

- *Cryptography*—Blockchain employs cryptography for authentication, permission enforcement, integrity verification, and other areas. It makes use of a variety of cryptographic techniques including cryptographic one-way hash functions, Merkle trees and public key (private-public key pairs) [15].

- *Consensus Mechanism*—In a blockchain network, a consensus is used to prevent dishonest actors from writing potentially invalid information to the database [16].

- *Timestamp*—The process of 'trusted timestamping' is an established approach for claiming that particular digital information existed at a particular 'point in time' in the past. It is assumed that the time-stamped information is not changeable by anyone in the future. The digital information can be time-stamped by using secure cryptographic methods [17].

- *Ledger*—The ledger represents a list of bundled (data) transactions in cryptographically linked 'blocks'. Once the transaction data is verified a 'block' will be created. The 'blocks' in the chain are groups of transactions posted sequentially to the ledger by using a cryptographic signature—that is, added to the 'chain' [2].

- *Validity Rule*—Common set of rules of the network (i.e., what transactions are considered valid, how the ledger gets updated, etc.) [11].

4. Smart Contracts and Time Stamp-Related Research

Zheng et al. classified significant smart contract applications into six groups based on their generalizations [18]. When the transaction request and verification related criteria and conditions are met, smart contracts allow for the transfer of value. Contracts in the actual world are identical to these contracts. The only difference between them is that they are fully digital, which means that they are comprised of a short programming code that is kept inside a distributed ledger system. For example, The use of BCT in trade finance to prove trade-related documents may minimize loan risk, and smart contracts can govern the execution of inter-organizational processes and openly automate delayed or instalment payments, among other things [19]. Smart contracts offer a wide range of potential applications, spanning from the Internet of Things to the sharing economy, among others.

Deth et al., introduced a free-to-use time-stamping service for online news articles. His proposed system uses secure technologies for saving the results of the time-stamped content for example embedding hashes into the Bitcoin blockchain (which is a cryptographically validated blockchain) [17]. Thus, information is present in a distributed blockchain network, making it impossible to get manipulated. Wouda also in his study, proposes an infrastructure for a blockchain-based application to improve the current way real estate is transacted [2]. In the first place, his proposed model could be deployed as a record-keeping tool (blockchain audit trail). Physical and contractual information, related to a property, is recorded and validated by means of blockchain features during the life cycle of a property (operation phase). Validation of related information is summarized in a framework, which is encrypted (hashed) and stored in the blockchain. Again, Lv et al. also designed and developed a catering safety tracing system to solve catering safety traceability problems [20].

Through blockchain technology, the proposed system can ensure the reliability of traceability information. Using a web application and a hybrid APP, users can manage and query trace information. The SSM (Spring + Spring MVC+ Mybatis) framework which was used in web application development simplifies the development and reduces the deployment difficulty. Furthermore, Elisa et al. proposed an e-government framework that can enforce security and privacy in the public sector by employing blockchain technology [21]. The theoretical and qualitative analysis of security and privacy of the framework showed that cryptography, immutability and the decentralized management and control offered by the blockchain technology can provide the required security and privacy in e-government systems. Their proposed system also has the potential of solving the interoperability issues between government departments which is one of the limitations of existing e-government systems. A growing body of literature has elucidated the enormous benefits that distributed ledger technologies like blockchain bring to the table of technological innovations, such as the high transparency on food traceability, high-level autonomy in school credit bank system etc. It is widely an acceptable phenomenon that it solves several verification challenges and thus can be applied to various domains, including CRVS systems [22]. Furthermore, a more appropriate blockchain design is said to be the hybrid architecture in smart contract implementation [23]. However, it is inadequate in terms of implementation and application in a variety of situations, for instance the CRVS system in Africa. Because of this shortcoming, the conclusion's generalizability is limited, necessitating its application over a wide range of fields. Little attention has been given to the application of blockchain technology in tackling issues related to civil registration and vital statistics. Even so, much of the research has been restricted to Europe and Asia without sufficient attention to its application in the context of Sub-Saharan countries like Ghana. This indicates a need to investigate and implement a blockchain-based solution to address the present verification challenges that exist in Ghana.

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