

Blockchain Technology for Recordkeeping

Help or Hype?

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Competition on “How can emerging
technologies be leveraged to benefit
Canadians?”

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Table of Contents – Volume 1

Acknowledgements.....	2
Key Messages.....	4
Executive Summary	5
Context.....	6
Implications	8
Approach.....	9
Results	10
Blockchain technology as a recordkeeping technology	10
The Blockchain “technoscape”	10
Registration of title to assets	12
Notarization	12
Digital signature	12
Privacy Protection	13
Provenance tracking	13
Smart contracts.....	14
Blockchain innovators’ awareness of archival science.....	16
Blockchain records as legal evidence	18
Blockchain recordkeeping and financial stability	19
Blockchain Standards	20
State of Knowledge	21
Knowledge Strengths	21
Knowledge Gaps.....	21
Additional resources	22
For Blockchain innovators and decision-makers	22
For records professionals	22
Knowledge Mobilization	22
Conclusion	23
References and Bibliography.....	24
<u>Appendices.....</u>	<u>Volume 2</u>

Key Messages

1. Blockchain technology, often described as providing a distributed and continuously growing immutable ledger of transactions, is a recordkeeping technology, in the archival science sense of the term¹, as much as it is a value transfer technology.
2. Many current and proposed applications of blockchain technology aim to address recordkeeping challenges; they offer a new form of generation use, storage and/or control of records. For example, the blockchain aims to change the way that the authenticity of records is established from reliance on a trusted third party to a system-based mode of establishing authenticity.
3. Claims associated with use of blockchain technology for recordkeeping are, in a number of cases, overhyped. As an example, blockchain solutions that claim to provide “archival” solutions do not actually preserve or provide for long-term accessibility of records.
4. There appears to be little awareness in the blockchain community of archival science (the science of recordkeeping) theory, principles and practice, or of recordkeeping requirements and standards derived from them. More interaction between the archival/records management and the blockchain communities would promote greater awareness.
5. Despite the fact that blockchain technology is fundamentally a recordkeeping technology and there are many new start-ups that focus on using the technology in recordkeeping applications, there is relatively little research focused on the recordkeeping implications of this technology. Academia-industry collaborations in the application of blockchain technology for recordkeeping are mostly absent.
6. As it is a recordkeeping technology, the blockchain's future development will benefit from the theoretical and practical knowledge of archival science.
7. Blockchain technology is giving rise to new forms of records² that must be managed as legal evidence alongside other records in order to meet business and societal purposes. This includes determining how blockchain records will be dealt with under Canada's law of evidence as well as how best to preserve their long-term authenticity and accessibility as evidence.
8. Considerations of the impact of blockchain technology on financial stability should explore whether its widespread use for recordkeeping could be a contagion channel.
9. There is growing support for the introduction of technical standards relating to blockchain technology. Standards focused on use of the blockchain for recordkeeping may help assure that blockchain technologies embed existing recordkeeping solutions and requirements.

Therefore, this report recommends that interdisciplinary research be conducted that integrates the expertise of legal, economics, archival, diplomatic, forensic, and computer and information academic researchers with blockchain start-ups and solution providers. Specifically, such research could begin by using existing archival science theory, principles and practice to identify, and help mitigate, risks to the long-term preservation and accessibility of trusted records generated or stored using blockchain technology.

Executive Summary

Blockchain technology, often understood as a distributed ledger that maintains a continually growing list of publicly accessible records cryptographically secured from tampering and revision³, is perhaps best known as the value transfer technology underlying cryptocurrencies such as Bitcoin and Ether. However, many new blockchain innovations seek to capitalize, not on value transfer, but on the technology's *recordkeeping* capacity; that is, they offer a new form of records storage, use, maintenance or control of records. Socially significant application areas include identity management, to registration of title to property and other assets, certification of educational achievements, and protection of personal privacy. The blockchain, when ideally operating, creates a persistent, immutable, and ever-growing, public ledger that can be updated (i.e., by appending information using cryptographic digital signatures) to represent the latest state of a blockchain.⁴

Blockchain innovators, seeking to leverage the potential for increased transparency, permanence, and efficiency of blockchain records envision, and in some cases, have developed, applications for payments, clearing and settlement, securities trading, supply chain management, identity management, notarial services, Internet of Things, land transfer and registration, health recordkeeping, voting, intellectual property management and more.

At the moment, blockchain recordkeeping is highly hyped.⁵ This technology does have potential, but there are still significant questions surrounding its use for recordkeeping, such as how long-term authenticity and availability of blockchain records will be assured. This is a question that archival science, as the science underpinning recordkeeping, is particularly well-placed to assist in answering. Because most of the work on, and conversation regarding, blockchain applications has been within the community of blockchain innovators and enthusiasts, much of the conversation is focused on the possibilities of blockchain, with little awareness of the risks to the long-term availability of trustworthy digital records. Furthermore, some blockchain enthusiasts oppose a focus upon the risks due to fears of stifling innovation.

For Canadians to truly benefit from blockchain recordkeeping, those risks must be understood and, to the extent possible, mitigated. Some of the most significant risks of blockchain recordkeeping include:

- Consumers of blockchain recordkeeping solutions will not be able to see through the hype and will purchase solutions that disappoint or, worse, unintentionally or maliciously lead to negative consequences such as such as loss of competitive advantage, loss of a customer base, and loss of critical information, title to assets, or claims to certain rights.
- Blockchain innovators focused on using the technology to improve recordkeeping will wastefully “reinvent the wheel” (i.e., develop solutions for establishing authenticity of records already well-developed in archival science), or produce solutions that create, rather than solve, recordkeeping problems.
- Businesses and citizens will not be able to protect their legal rights or defend against legal claims due to unreliable and inaccessible records created on overhyped blockchain solutions.⁶
- Adopters of blockchain technology may introduce unintended sources of financial contagion via the micropayments that are made to secure transactions on the blockchain.

Given both the many possibilities and the potential risks of blockchain recordkeeping, a deeper understanding is necessary.

This knowledge synthesis represents a first step towards understanding blockchain recordkeeping beyond the hype. Because of the breadth of blockchain technology's potential applications, the current state of knowledge on a number of issues was examined, including: a) the design and operation of blockchain technology; b) current developments and applications of the technology in Canada and internationally to uncover the particularities of the Canadian “technoscape”; c) insights of archival science concerning trustworthy recordkeeping relevant to blockchain technology; d) the results of leading edge research on digital records, digital recordkeeping and preservation from research projects in which the principal investigator or her collaborators are involved and the application of these results to blockchain technology; e) the current state of

the law of evidence in Canada in relation to this technology; and f) standards concerning management, security, and preservation of records relevant to the security and preservation of blockchain records.

While blockchain recordkeeping is being developed and pursued globally, our focus on Canada revealed that the underlying conditions in Canada are particularly well-suited to leading blockchain research and implementation. Our investigation further revealed that Canada has a vibrant, highly active blockchain technoscape, with a diversity of start-ups and consultancies doing innovative work. Unfortunately, however, our research also indicates that Canada is not currently capitalizing on this potential; at time of writing, little programmatic research is being done in the area of blockchain recordkeeping, and academia-industry partnerships have not been developed. The state of knowledge with regard to blockchain technology for recordkeeping is largely undeveloped, with many important gaps that must be filled if Canadians are to see the benefits of blockchain technology for recordkeeping. There also appears to be little awareness in the blockchain community of archival science theory, principles and practice, or of recordkeeping requirements and standards derived from them. Blockchain technology is giving rise to new forms of records, such as smart contracts, that must be managed as evidence alongside other traditional records in order to meet business and societal purposes. Gaps in knowledge also exist around how blockchain records should be dealt with under Canada's law of evidence as well as how best to preserve their long-term authenticity and accessibility as evidence. Moreover, the implications for financial stability of 'financializing' (i.e., requiring tiny micro-payments for) our recordkeeping transactions have yet to be investigated.

There is growing support for the introduction of technical standards relating to blockchain technology as a spur to innovation. Standards focused on use of the blockchain for recordkeeping may help assure that blockchain technologies embed existing recordkeeping solutions and requirements in much the same way that earlier standards outlining functional requirements for electronic records management systems (ERMS) ensured that these systems supported effective recordkeeping. Yet, before effective standards can be developed in the area of blockchain recordkeeping, work must be done to close the knowledge gaps relating to, in particular, long-term authenticity and accessibility of blockchain records and recordkeeping systems.

The potential of blockchain technology is great. The blockchain community is developing seemingly endless creative business applications supported by recordkeeping functionality. As ideally imagined, blockchain recordkeeping could increase transparency, protect privacy, improve efficiency, and even help guard against obsolescence. However, there remains much to be learned and understood before such an ideal can be reached. Recordkeeping risks must be investigated and mitigated. The wisdom and knowledge of other disciplines, including archival science, should be brought to bear in the development of blockchain solutions reliant upon and/or supporting recordkeeping. And records professionals must work with the blockchain community to be prepared to adequately care for the new types of records that blockchain technology will bring within their purview and connect legacy systems to blockchain recordkeeping solutions. This report reveals that Canada is uniquely situated to benefit from and capitalize upon blockchain technology for recordkeeping, but only if we look beyond the hype, seize the opportunity and fill the knowledge gaps.