Summary - "Blockchain Technology and Recordkeeping"

By Danielle Batista, BARM, MIS; Darra Hofman, JD, MSLS; Alysha Joo, MAS, MLIS; and Victoria Lemieux, Ph.D.

This article summarizes a report published by AIEF on May 30, 2019. Additionally, the article is included in *Information Management Magazine, ARMA-AIEF Special Edition*, which will be available for download in mid-November. A printed version of the special issue will be available as well, for a nominal fee.

Blockchain is often defined as ledgers with entries organized in an append-only, sequential chain using cryptographic links and distributed out and stored on a peer-to-peer computer network. It's an emerging recordkeeping technology producing new forms of records, and new modalities of recordkeeping, with which records and information professionals will need to engage. This new technology has been considered or implemented in practically every country in the world; blockchain's ubiquity requires that records and information managers should be able to understand, operate, and support the design of such systems.

In a new AIEF report, *Blockchain Technology and Recordkeeping*, the authors aim to provide an overview of blockchain technology that helps information professionals know how to address the challenge of effectively managing records in these emerging recordkeeping environments. The chapters respond to, and are structured according to, an initial set of questions from the AIEF's call for proposals for a study on blockchain, records, and information management. The authors shared their current state of understanding with a view to help prepare records and information professionals for the future of recordkeeping in a blockchain world.

The first chapter provides an overview of blockchain technology, explains how blockchain operates as a "technology of trust," and introduces technical aspects in greater detail. The chapter presents the three interacting "trust layers" on which blockchain systems are designed: a social layer, a records layer, and a technical layer. The primary focus of the overview is on the records layer, but there is also an explanation of how records professionals can understand the other two layers and, to some extent, how the layers interact in the design and operation of blockchain systems. The technical sections cover aspects of how blockchain transactions are executed, present the blockchain technical features, provide an overview of the types of blockchains, and explain the blockchain technology stack.

Chapter 2, "The Creation and Storage of Blockchain Records," is about what records are generated by and stored in blockchain systems. The chapter highlights that records and their location in blockchain systems are complicated by four factors: 1) differences among various blockchain systems in terms of how they generate and store records, 2) the distributed and decentralized architecture of blockchain systems, 3) the design choices of blockchain solution developers about what to record and how to store records in blockchain systems, and 4) the way in which the nature of records and recordkeeping is being transformed by blockchain technology. The authors propose a typology of records produced and/or recorded on blockchain systems with examples, locations, and a rich diplomatic analysis showing how the elements of the intellectual form may be identified in blockchain records. The discussion shows that this new recordkeeping system imposes challenges for records professionals and records creators that require new strategies and techniques to address the changes imposed by this new technology.

Chapter 3, "Blockchain Technology and the Life Cycle of the Record," presents an analysis of the applicability of the two main models of the management of records – the life cycle and the continuum – to blockchain-based records and blockchain systems. The chapter presents an overview of the two models and analyzes their relevance to blockchain systems, primarily in the context of the Bitcoin and Ethereum public blockchains. The analysis reveals that neither of the models is completely applicable to the management of records in blockchain systems, and this new technology might impose reframing of recordkeeping practices into a new paradigm.

Chapter 4, "Retention & Disposition of Blockchain Records," discusses three main questions: Can blockchain reduce any of the investment required for records retention? Does it impose new challenges or risks for the execution of those archival functions? What could blockchain records retention look like? These questions stimulate a discussion about blockchain and records retention and the difficulty of destruction in blockchain systems. The conclusions determine that retention and disposition depend on decisions made about the design of blockchain systems, and how these decisions can serve as a complement or hindrance to an organization's RIM program.

The issues related to "Blockchain and Defensible Disposition" are discussed in **Chapter 5.** The report highlights the problems of retaining records after the immediate business need for them has passed, and the difficulties in implementing defensible disposition when records are stored on an immutable blockchain. This chapter emphasizes legal elements and technical aspects of defensible disposition on blockchain systems. This chapter concludes that a successful defensible disposition plan depends on the consideration of legal obligations, business goals and needs, technological capabilities, and risk assessment. All these elements must be considered when implementing blockchain systems.

Chapter 6, "Preservation of Blockchain Records and Systems," explores how blockchain technology can be used to support long-term preservation of archival documents, as well as some of the issues around the long-term preservation of blockchain records and systems themselves. The chapter presents two interesting projects that make it easier to understand how blockchain technology could support this archival function. The first one is Project ARCHANGEL, which combines computer vision and artificial intelligence techniques to fingerprint visual records using blockchain technology as a curation tool and as a means of securing content against tampering during the custody of the record. The other is the InterPARES Trust

TRUSTER project, which proposed TrustChain, a model for long-term preservation of digitally signed documents using blockchain technology. There are also relevant considerations about the issues relating to the long-term preservation of blockchain records – a difficult task given that the challenges of envisioning what long-term digital preservation requirements might arise in a blockchain environment. The chapter calls for records and archival professionals to expand their research efforts on these challenges.

The evidentiary character of records in blockchain systems is analyzed in **Chapter 7**, "Blockchain Records as Evidence." The chapter argues that blockchain systems should be designed to provide final, definitive, and immutable records of transactions. The analysis of blockchain-based records' trustworthiness is based on archival and diplomatic theory. Both sciences together form complementary perspectives that enable understanding of the nature and basis of trust in records as sources of evidence of the facts and acts to which they refer. The perspective is characterized by the requirement that records must possess three fundamental qualities to be considered trustworthy: accuracy, reliability, and authenticity. The conclusions are that trusted records creation and recordkeeping are central to the operation of blockchain technologies as a technology of trust, but that additional thought needs to be put into designing blockchain systems for the keeping of trustworthy records since many aspects of records' trustworthiness are still not addressed in these systems.

The ownership of the record is another intriguing aspect of blockchain systems. **Chapter 8**, "Who Owns the Record? Ownership and Custody of Blockchain Records," indicates that the issue of ownership is dependent on how a blockchain is being used in managing information and records, what type of blockchain system is implemented (e.g., public, private, permissioned, etc.), how it is designed, and where the records are stored. This chapter explores at a high level the issues surrounding blockchain records and ownership. The discussion draws upon research into the issues of record ownership in the cloud, discusses various definitions of "ownership" in terms of custody and control, and examines several theoretical blockchain recordkeeping systems scenarios and how ownership would theoretically apply to each one of those scenarios. There are some expectations about ownership being commuted to data subjects, with blockchain recordkeeping systems resulting in a redefinition of ownership and information governance into "self-sovereign" ownership. The results

of the analysis show that there are still many questions of ownership and custody in the blockchain environment.

Chapter 9, "Blockchain Technology and Privacy," discusses how society's notions of records privacy arose when records were in paper form. but the proliferation of digital records has necessitated new tools for managing privacy. This chapter explores different conceptions of privacy and analyzes the use of blockchain to solve some privacy dilemmas. It also highlights challenges in the design of blockchain systems when considering privacy requirements and the immaturity of blockchain systems as records management tools. The chapter concludes that blockchains can be a dream when designed to enhance records' privacy, security, and accessibility, or can become a nightmare when thought and effort are not put into designing in privacy up front.

The final chapter is called "Blockchain Standards and Best Practices." The process of standardizing blockchain technology is only just beginning, and this chapter outlines some of the major standard-making initiatives likely to have an impact. The current initiatives are as follows: 11 standards under development by International Standards Organization; a CEN-CENELAC Focus Group on Blockchains and Distributed Ledger Technologies; a focus group established by International Telecommunications Union (ITU); the World Wide Web Consortium (W3C) and the Decentralized Identity Foundation working group; National Standards from China and United States; standards from different blockchain communities like consortiums, foundations, and societies such as IEEE; and sector-specific best practice standards such as the HIMMS Blockchain Workgroup. It is a fact that many standards initiatives are still in the early stages, and new initiatives are emerging, meaning that the blockchain world has come to recognize the value of standards to promote interoperability and growth of the technology and its application.

The report also presents valuable appendices for a practical view of blockchain use cases, a high-level comparison of some of the features of popular blockchains, an overview of "Records in the Chain Project" case studies, and examples of blockchain risks.

The full report is available at
http://armaedfoundation.org/researchprogram_menu/research-reports/