

Blockchain for Academic Research Libraries: Executive Summary, August 2018

Lots has been written about possible applications of blockchain technology in higher education and libraries, and to support research and scholarly communication. This summary focuses on some key and/or novel applications, and potential drawbacks to blockchain adoption by research libraries.

Blockchain works best for simple transactional data and is ideally suited to immutable recordkeeping. It can balance the library community's principles of personal privacy with open access, transparency and accountability. And if nothing else, blockchain is helping libraries rethink their workflows in terms of trusted, immutable transactions and their subjects, even if it isn't ultimately the best solution... it brings supply chain management thinking into all kinds of activities that libraries undertake.

Potential for Traditional Library Operations

The most obvious application of blockchain in research libraries is in archives and special collections, including records management, where provenance and authenticity are essential for authoritative tracking and where providing broader access to that provenance and authenticity is expected. Existing blockchain platforms could support provenance metadata for archival assets and offer a superior solution to the current fragile, labor-intensive record-keeping workflows.

Another application is digital preservation and general data deposit, e.g., climate data where integrity is paramount, regardless of preservation intent. Current systems have non-standard methods of tracking digital asset sources and integrity (e.g., hash values to track unintended changes to the digital object). Blockchain registries might be ideal for tracking distributed digital assets at large scale, as well as locations, owners, stewards, and other metadata that should be reliable and traceable over time.

Research libraries buy lots of things from all over the world in every currency, and currency fluctuations can wreak havoc on library budgets. Blockchain's financial applications offer intriguing possibilities for using blockchain-based currencies (e.g. bitcoin) for financial transactions between libraries and publishers, potentially eliminating exchange rate problems while streamlining acquisition processes (essentially a supply chain). This would require large-scale change by many stakeholders but could be experimented with a smaller scale.

Staying on the subject of library operations and supply chain management, blockchain also has potential to improve ownership and first sale records management for library acquisitions, and of circulation and interlibrary borrowing and e-lending records management. However there are equal risks in this capability, described below.

Blockchain could also support new distributed, large-scale metadata systems, obviating the need for centralized databases like Worldcat, CrossRef, or ORCID. However the need to reform large-scale metadata systems is unclear and other technologies like linked data provide alternative ways to accomplish decentralization.

Finally, research libraries provide training in information literacy and identifying trustworthy information sources. Applying blockchain technology to data about scholarly information, from news items to research results, might improve public trust in that information by providing new ways to evaluate its sources and changes over time. For example, "Climate Feedback," which is now annotation based, could use blockchain to "sign" notations or criticisms by scientists using a ledger based comment system.

Potential for Changing Research Library Functions

Many research libraries have begun offering services to manage research data of all kinds. Research data management involves not only storing and curating the bits, but governing the data and supporting open scientific workflows across the research lifecycle. There are many efforts underway to use blockchain technology in research workflows to improve accountability and reproducibility (e.g. artifacts.ai) and they offer potential for better compliance monitoring, for example by government funding agencies. Libraries will need to participate in those explorations to continue supporting research data management on the blockchain.

In the area of scholarly publishing and communications, there are similar efforts underway to apply blockchain to aspects of it like version tracking, peer review, and content management. Since libraries are often at the receiving end of these processes, taking the results and making them available to their clientele over long timeframes, they need to get involved in defining how blockchain is applied to the scholarly record.

The Downsides of Blockchain for Research Libraries

A particular concern for research libraries is the blockchain's potential to significantly tighten intellectual property control and DRM, e.g., via smart contracts on the Ethereum blockchain, crippling legal concepts like fair use or first sale rights. Ironically, while blockchains are distributed and decentralized, they could lead to even stronger monopolies on critical information resources. Blockchain could eliminate the possibility of a "digital first sale" by creating a verifiable transaction record ensuring that limited rights are passed on with the designated restrictions of the IP owner. It can destroy the possibility of rights exhaustion through use licensing and transfer tracking.

Any research library deals with absent-minded professors and students who lose track of everything. Blockchain's dependence on private keys is worrying given that once a private key is lost, there is no possibility of recovering the data it protected. A lot of information could be permanently lost if private keys are in the hands of casual and unsophisticated users.

Another problem with blockchain for research is its immutable record-keeping. While aspects of research and scholarly communication are transactional, scholarship in general is not. It's an evolutionary discovery process with healthy disagreement and sudden paradigm shifts. Unlike finance, science and research are messy, and blockchain doesn't deal with complex, messy data.

Finally, as this technology evolves, and companies come and go from the landscape, who will preserve the blockchains for the future?