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Strategizing blockchain adoption in public cultural services: a comprehensive scoping review

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Abstract

Purpose – This paper explores the application of blockchain technology in the public cultural sector, where adoption remains limited despite its potential. The study identifies major use case scenarios and empirical examples of blockchain adoption in public sector cultural services through a scoping literature review.

Design/methodology/approach – A scoping literature review was conducted to map research and conceptual approaches to blockchain technology in the public cultural sector, focusing on key use cases emerging and empirical examples.

Findings – The review reveals that while blockchain has the potential to enhance public cultural services, its adoption is still in its early stages. Identified use cases include tokenization of cultural assets, digital rights management and decentralized funding models. Empirical examples in the public cultural sector are sparse, and the impact of the technology remains largely theoretical.

Research limitations/implications – The study is limited by the scarcity of empirical data on blockchain adoption in public cultural services. Future research should focus on in-depth case studies and empirical analyses to understand the practical implications of blockchain in this sector.

Practical implications – Public sector organizations offering cultural services may use these insights to guide blockchain adoption and implementation decisions.

Social implications – Blockchain adoption in public cultural services has the potential to democratize access, enhance transparency and foster community engagement, contributing to a more inclusive and participatory cultural ecosystem.

Originality/value – This paper contributes to the emerging discourse on blockchain in the public sector, focusing on the often-overlooked cultural services. It highlights the benefits and challenges of blockchain adoption in this sector, providing insights for future research and policy decisions.

Keywords Blockchain adoption, Public cultural services, Scoping literature review, Use case scenarios, Blockchain use cases, Cultural sector innovation, Blockchain in public sector, Decentralized technology in culture

Paper type Literature review

Introduction

Scholars are increasingly studying the phenomenon of blockchain and diffusion of distributed ledgers technologies in the public sector (Ølnes *et al.*, 2017; Catalini, 2018; Cagigas *et al.*, 2021, 2023; Tan *et al.*, 2022; Lee *et al.*, 2023). Understanding how this disruptive technology is spreading in the public sector allows scholars to assess its potential impact on

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government services, public administration and overall innovation in the public sphere landscape to bring evidence of its potential positive change (Bosch *et al.*, 2022). A blockchain is a particular implementation of a distributed ledger, which consists of a database shared among different nodes of a network: these share the same copy of the database, and any change made on a single node is replicated to all the other nodes in a short time (Duca *et al.*, 2020). Blockchain technology is defined in Collins dictionary (2024) as "*a system for storing records of transactions using digital currencies, that can be accessed by linked computers*." Emerging blockchain technology thus represents a decentralized system of identical, distributed ledgers stored across multiple nodes (Patrickson, 2021). In the blockchain system, there is not a central ledger but rather numerous linked and identical ledgers that record every transactional detail. Blockchain-based systems have been defined as socio-technological "assemblages" (De Filippi *et al.*, 2020) made up of different actors, from miners, validators, programmers, token holders, to end-users, and, even if still to a lesser extent, regulators. This technology enables the trust of each actor towards the whole aggregation of network actors contributing to operating and maintaining the system.

Currently, a consistent body of scholarship on blockchain in the public sector has emerged, where it is claimed that this technology will profoundly transform public service production and delivery (Ølnes *et al.*, 2017; Cagigas *et al.*, 2021). Scholars are exploring how, in the context of public governance, blockchain has the potential to shape the exchange between public institutions, citizens and social and economic agents (Tan, 2023), as well as enquiring about the costs and risks for governments in this context of public sector innovation (Cagigas *et al.*, 2021). It is thus critical for academics to get a proper analysis and understanding of the process of introduction of this technology in the public sector.

The present study wants to take part in the academic conversation about blockchain adoption in the public sector, with a specific focus on arts and cultural services offered by public sector organizations. The choice of the cultural sector as a representative of the public field is supported by the evidence of the high potentialities of this technology for the cultural realm as it is emerging from policy documents in the field (Grech *et al.*, 2022). Blockchain technology is identified as one of the five emerging trends in its annual forecast and attempted to explore how this new technology might affect cultural institutions' work. This interest was certainly pushed by leading museums, such as the Austrian Museum of Applied Arts (2015), the State Central Museum of Contemporary History of Russia (2017) and the Zentrum für Kunst und Medientechnologie (ZKM Center for Art Media) in Karlsruhe (2018). The International Council of Museums (ICOM) (2022) assessed from the Patron-of-Art.com survey at ICOM Conference in ICOM Prague, 2022) that museum professionals believe that 50% of museums will use non-fungible token (NFT) technology in the future and organized a webinar to address the common questions and misconceptions of museum professionals to show several use cases for museums that demonstrate how NFTs can foster museums' impact towards public education (Mucchi *et al.*, 2022; Hu *et al.*, 2023). Most of the presented examples show the interest of cultural institutions in crypto-art and blockchain as an *art medium*, rather than as a technology that can affect their organization internally in a broader digital transformation strategic effort, underestimating its potential. Cultural institutions rightly recognize blockchain technology to be a precious resource for artists and creators, significantly reducing the barriers to entry to the market and enabling them to monetize their work effectively (De Filippi, 2015; Whitaker and Kräussl, 2020). Nevertheless, to fully grasp the potential of blockchain and distributed ledgers technologies in this sector, through this review, we would like to expand this focus and highlight from recent literature how blockchain technology can enable the innovation of services in the public cultural realm. Indeed, public sector literature already provided evidence for the potential of blockchain technology for its properties to enhance operational efficiency, transparency and security. For example, recent explorations have cultivated the possibility of engaging with

infrastructural experiments through decentralized autonomous organizations for public sector innovation (Tan *et al.*, 2022): within the cultural field, these have started being experimented at the practitioners' level, and Catlow and Rafferty (2023) underlined how these structures can impact the socio-economic dimensions of public cultural institutions, by introducing new models of governance, funding and community engagement. Still, we can assess the understudy of blockchain technology in the field of cultural services offered by public sector institutions. Considering the evidence of blockchain potential in other public sector domains in this respect, public institutions offering cultural services may be hindered from fostering blockchain technology adoption. For instance, the recent dissemination and sale of NFTs stimulated the Italian Ministry of Culture in 2021 to focus attention on these new tools: nevertheless, "*the Directorate General of Museums launched a survey of the agreements, stipulated up to that date, inviting the suspension of ongoing activities to allow for the evaluation of the various contractual situations and to adopt guidelines and coordination, given the adoption of a specific regulation on the subject, uniform throughout the national territory*" (AgenziaCult, 2022). In this specific example, the evaluation of proposals related to the use of blockchain applications, such as NFTs, proved to be particularly complex, due to a regulatory framework that is still in evolution. It is thus crucial to start enquiring about the implications of blockchain adoption for public service delivery in the cultural sector.

The research question leading the scoping review consists of enquiring what is known in the existing literature about the employment of blockchain technology in public cultural services and about the effects of the adoption of this technology on public service delivery and governance. The paper aims to provide a synthesis of previous research on the topic through a scoping literature review, stressing the focus on the public sphere and highlighting the implications for public governance in blockchain-based cultural services. In this respect, in the present review, we take into consideration public services referring to those services that are provided in the public or general interest: UNESCO (UIS, 2009) defines cultural services as "*not representing cultural material goods in themselves but facilitate their production and distribution. For example, cultural services include licensing activities and other copyright-related services, audio-visual distribution activities, promotion of performing arts and cultural events, as well as cultural information services and the preservation of books, recordings, and artefacts in libraries, documentation centres, museums*". As previously mentioned, we focus on "public" cultural services, considering that many public services in the artistic and cultural realm are delivered by non-governmental agents, or through mixed ownership partnerships, such as inter-municipal cooperation, third sector or public–private partnerships. More specifically, within the scope of cultural services, we consider museums, galleries, archives, theatres, libraries and cultural tourism and exclude higher education institutions, social housing, smart cities and non-governmental organizations not involved in providing artistic and cultural services. This choice is justified by the fact that most literature reviews in the public management and governance field, even if discuss public services affected by blockchain, do not refer to cultural services (Ølnes *et al.*, 2017; Novak, 2019; De Filippi *et al.*, 2020; Mohammed *et al.*, 2020; Cagigas *et al.*, 2023; Alshamsi *et al.*, 2022; Tan, 2023): for example, in Cagigas *et al.* (2021), cultural services are assumably falling under other categories, e.g. recreational, community engagement. Moreover, we are assuming public cultural services as an exemplification and further specification of public sector service: problematizing this sub-domain, given its specificities and contextual elements, allows for highlighting the implications of blockchain technology adoption for public service delivery and outlining emerging governance implications (Tan *et al.*, 2022) referring to public cultural domain.

The present study starts by reviewing use cases of blockchain technology treated in the literature, after describing the methodology for data collection as a scoping review and displaying the major bibliometric results. A discussion section follows, trying to highlight

how and to what extent public institutions can benefit from these applications, as well as outline implications for public service delivery.

Methods

The approach for this review is a scoping study: we followed Arksey and O'Malley's (2005) methodological framework as a protocol to examine the extent, range and nature of research activity, to map the fields of study where it is difficult to visualize the range of material that might be available. A scoping study aims to map the key concepts underpinning a research area and the main sources and types of evidence available (Arksey and O'Malley, 2005; George *et al.*, 2023): it can be taken as a standalone project, especially where an area is complex or has not been reviewed comprehensively before. As explained in Arksey and O'Malley (2005), among the objectives of a scoping study, we find the identification of research gaps as an output of the study itself and the evaluation of the potential costs of conducting a literature review.

The scoping review in the context of studying a phenomenon occurring in the public sector (George *et al.*, 2023) has been therefore chosen for understanding the topics and trends in the large body of research on the specific subject; the object of study is still broad (cultural services in public sector, across various domains); moreover, it revealed to be the proper methodological approach, considering the need to jump across different disciplines and literature domains, as well as different types of sources. Previous attempts by the authors to conduct a fully systematic literature review on the topic have been taken into consideration, but the scattered references available, the novelty of the phenomenon in the empirical context under study, and the high variety of typology of sources available, led us to opt for a scoping study, which allows us methodologically-wise to embrace multiple and diversified sources of academic work.

The process of records collection is not linear but iterative, requiring us to engage with each stage reflexively and, where necessary, go through the process again to ensure that the literature is covered comprehensively. Considering the differences from a systematic literature review raised by Arksey and O'Malley (2005), the stages we went through for conducting the scoping study include *Stage 1*, identifying the research question*; Stage 2*, identifying relevant studies; *Stage 3*, study selection; *Stage 4*, charting the data; and *Stage 5*, collating, summarizing and reporting the results (Arksey and O'Malley, 2005).

As a first step, in Arksey and O'Malley (2005), we see that "*The method adopted for identifying literature in a scoping study needs to achieve in-depth and broad results. Rather than being guided by a highly focused research question that lends itself to searching for particular study designs (as might be the case in a systematic review), the scoping study method is guided by a requirement to identify all relevant literature regardless of study design*" (p. 8). We are enquiring about what is known in the existing literature about the employment of blockchain technology in public cultural services. To answer the research question, we acknowledged that different study designs are applicable, given the cross-disciplinarity and novelty of the phenomenon under study. To this extent, we did not adopt strict limitations on search terms, identification of relevant studies or source selection.

The following step thus consisted of identifying the keywords to be used when researching selected databases of academic work. For the keywords, we followed Arksey and O'Malley's (2005) recommendation to maintain a wide approach to generate breadth of coverage. Keywords that cover the three main dimensions of analysis of this review concurrently were identified: blockchain technologies and distributed ledgers; public sector innovation and governance; cultural services and arts and cultural institutions. These keywords were combined to obtain a comprehensive framework for exploring how blockchain technologies and distributed ledgers can foster innovation in public sector

initiatives to enhance governance and improve the delivery and management of cultural services. The intersection of these dimensions – public sector innovation, arts and cultural services and blockchain technology – aimed to collect academic work concerning the potential for blockchain to bring transformative changes to the way public cultural institutions may operate with blockchain adoption. The process of data collection has not been linear, but rather iterative, to ensure that all literature is covered comprehensively across the domains. Therefore, we determined eligibility criteria: we did not take any *ex ante* decision in terms of period, given the newness of the phenomenon under study; on the other hand, we considered only records in English for matters of cost and time involved in translating material.

Given the diversity of conversations in the literature belonging to different literature streams, we adopted a strategy that involved searching for research evidence via different sources: electronic databases, reference lists, hand-searching of key journals existing networks and relevant organizations. To ensure coverage of a broad range of journals, Scopus, JSTOR, Google Scholar and IEEE Xplore were used as electronic databases, and we further integrated records from snowball sampling and reference lists; further data were collected through hand-searching of key journals (*International Journal of Cultural Management*, *European Journal of Cultural Management and Cultural Policy*, *Journal of Cultural Management and Cultural Policy*, *Journal of Cultural Economics*, *International Journal of Cultural Studies* and *Journal of Cultural Heritage Management and Sustainable Development*) and existing networks (mainly, Europeana, Network of National Museums Organizations and International Council of Museums).

In the screening and study selection step, the search strategy allowed the exclusion of many studies that were deemed irrelevant from the public sector perspective. Our scoping study still adopted methods to develop inclusion and exclusion criteria, although these criteria were devised iteratively and post hoc, based on increasing familiarity with the literature, we could then apply to all the citations to determine their relevance. This differs from systematic review methods, which follow a linear protocol to develop inclusion and exclusion criteria based on a specific research question. As our final research parameters, in the title and abstract screening phase, we excluded those records concerning blockchain technology applications restricted in their scope to financial and business environments, which was out of the extent of the research.

In the second stage, other records have been removed as not relating to both cultural services and the public sphere: for example, some records were excluded, even if explicitly related to blockchain adoption in the arts and cultural sector, as merely focusing on the art market, ignoring any relationship with the public sphere; analogously, those works addressing public sector in general, and not relating in any way to the cultural sector, were excluded. At this stage of the process, 54 articles were obtained for full-text analysis (see Tables 1 and 2).

At this level of analysis, we assessed a significant number of conference proceedings belonging to the computer science domain, which provide very technical details into the coding structure of the blockchain while overcoming explicit use cases and implications of

Source	Articles
Conference	16
Journal	38
Total	54

Source(s): Authors' own work

Table 1.
Records found for full-text analysis

Source	Articles
Journal	*70.37%*
Business and Management	1.85%
Computer Science	20.37%
Cultural Economics	1.85%
Cultural Management and administration	20.37%
Digital Humanities	9.26%
Engineering	5.56%
Law and Political Science	1.85%
New Media	1.85%
Tourism and Hospitality	1.85%
Social Sciences	5.56%
Conference	*29.63%*
Computer Science	25.93%
Cultural Management and Administration	1.85%
Digital Humanities	1.85%
Total	*100.00%*

Source(s): Authors' own work

Table 2. Distribution of records found across per source for full-text analysis

the application of blockchain technology in the public cultural sector and the related impacts. Initially, conference proceedings were taken into consideration in the review, given the objective of the present work as a scoping study aimed to present the state-of-the-art academic works on the topic. In the final round of review, as a final quality check, we decided to include in the scoping review only peer-reviewed articles published in journals.

These steps were followed by an in-depth analysis of the content of the final 38 selected articles published in peer-reviewed journals, which were classified by the year of publication, geographic distribution, discipline and journal (see Table 3).

The following stage involved "charting" key items of information obtained from the records being reviewed. The "charting" process (Ritchie and Spencer, 1994) was done for

Phases	Number of records	Notes
Identification		
Records by database search	113	
Records by other sources	60	
Records after duplicates removed	163	Removed 10 articles
Screening		
Records after title and abstract screening	114	Removed records not related to either cultural service or the public domain
Eligibility		
Full-text articles assessed for eligibility	54	Removed records not relating to both cultural services and the public domain
Included		
Final records included in the study	38	Quality check: excluded conference proceedings from qualitative analysis

Source(s): Authors' own work

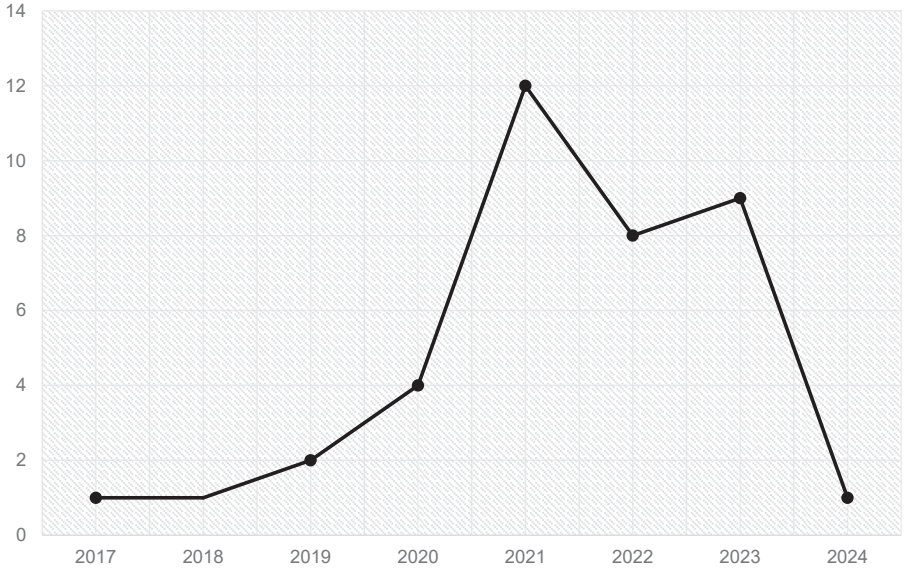
Table 3. Flow chart showing the overall process of selection of final records

synthesizing and interpreting qualitative data according to key themes. In our case, we charted our results based on the main themes emerging from previous literature reviews on the topic (Vacchio and Bifulco, 2022; Stublič *et al.*, 2023), further integrated with other themes and domains of application emerging to the body of literature selected for the present review. Data charting has been done on Excel sheets, recording the following data items: author, year of publication, geographical distribution, journal and disciplines. In terms of critical appraisal of individual sources of evidence, the records were classified for the aim of the study, methodology used, outcomes in terms of blockchain use cases and governance implications, if mentioned; additional data were extrapolated, when present, about factors hindering and facilitating blockchain adoption, as deemed to be relevant during the process of articles' review. As mentioned, the synthesis of the results has been done following Vacchio and Bifulco's (2022) categorization of themes emerging from blockchain technology in cultural heritage literature, to which have been added two additional dimensions based on the literature selected for the review. Therefore, the literature was organized in the results section thematically according to this rationale.

Results

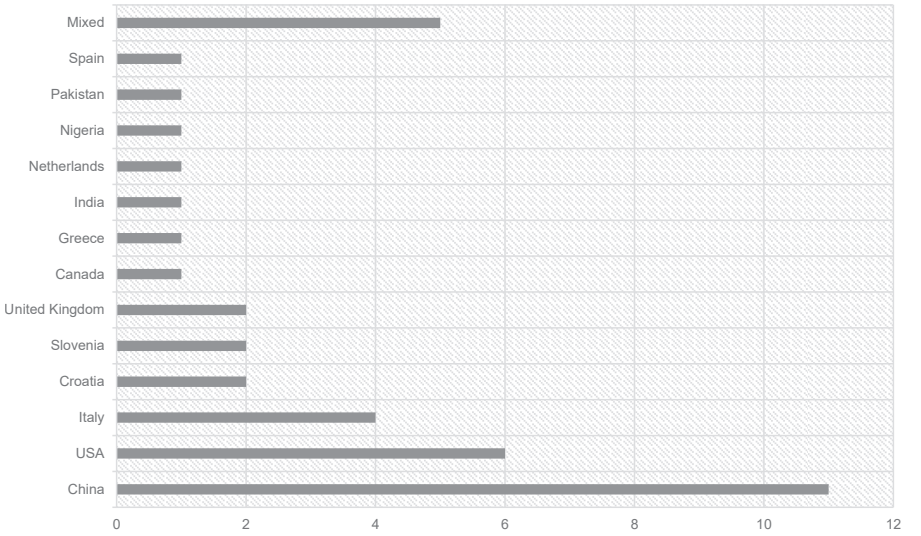
The scoping literature review highlighted that blockchain technologies are increasingly being adopted by different cultural heritage organizations, from theatres to museums, from art galleries to monuments managed by public entities, with the potential of bringing structural changes to such organizations (Whitaker, 2019; Whitaker and Kräussl, 2020; Patrickson, 2021; Prokupek *et al.*, 2022) (see Figures 1–3).

Overall, the fundamental characteristics of blockchain technology enable its implementation in a potentially wide range of processes in the domain of public cultural services. These have been synthesized in the present results section based on the use cases emerging from the review for blockchain-based digital strategies. Building upon Vacchio



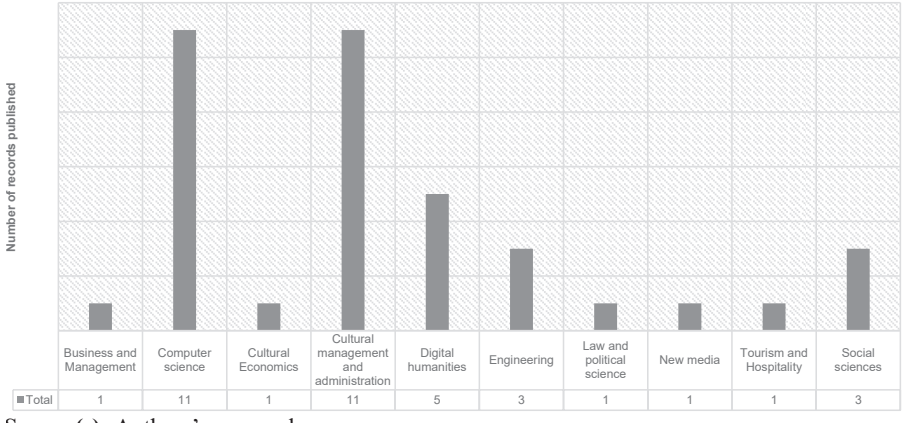
Source(s): Authors' own work

Figure 1.
Time distribution of final records from peer-reviewed journals



Source(s): Authors' own work

Figure 2.
Geographic distribution of final records from peer-reviewed journals



Source(s): Authors' own work

Figure 3.
Disciplinary area distribution of final records from peer-reviewed journals

and Bifulco (2022), the identified core use cases for blockchain-based digital strategies in the context of public cultural services are (1) tokenization of cultural assets and fractional equity, (2) digital rights management, (3) cultural asset management, (4) decentralized funding and (5) decentralized cultural platforms for heritage preservation (see Table 4).

The following paragraphs summarize the charted results as they relate to the review question and objectives.

Tokenization of cultural assets

Fractional equity and tokenization of digital art assets (Whitaker and Kräussl, 2020; Vacchio and Bifulco, 2022) consist of converting a right on an asset owned into a token, which

	Core use cases	Definition	Domains of application (integrated from Stublić *et al.*)	Sources
Key themes in the cultural heritage domain (from Vacchio and Bifulco, 2022)	Tokenization of cultural assets and fractional equity	Representing ownership or value of cultural assets through issued tokens. Assets are divided into tradable units to enable broader participation in ownership: tokens on a blockchain platform can be exchanged between users	Museums	Zhao *et al.* (2023a, b), Damiani (2022), Jung (2023), Valeonti *et al.* (2021), Stublić *et al.* (2023), Ch'ng (2018), Trček (2022a), Woodall and Ringel (2020), Whitaker (2019), Liddell (2021)
	Digital copyright management	Using blockchain technology to prevent the easy reproduction of digital files: managing and enforcing the rights associated with digital content, ensuring that only authorized users can access or distribute the content in predefined ways	Museums	De Filippi (2016), Damiani (2022), Jung (2023), Wang *et al.* (2021a), Wang *et al.* (2021b), Zhao *et al.* (2022), Sater and Wright (2020), Vacchio and Bifulco (2022), Trček (2022b), Mucchi *et al.* (2022), Ch'ng (2018), Whitaker *et al.* (2021)
	Tracking provenance and authenticity, cultural asset management	Managing and preserving cultural assets through blockchain (documentation, conservation, cataloguing, exhibition, facilitating public access)	Museums, Archives, Libraries	Stančić and Bralić (2021), Damiani (2022), Duca *et al.* (2020), Lvping (2021), Woodall and Ringel (2020), Stublič *et al.* (2023), Wang *et al.* (2021a), Zhen (2023), Sater and Wright (2020), Goldenfein and Hunter (2017), Vacchio and Bifulco (2022), Zhang *et al.* (2021), Abid (2021), Frederick (2019), Khelifi *et al.* (2024), Oyelude (2022), Whitaker *et al.* (2021), Yuan and Zhou (2023)

(*continued*)

Table 4. Core use cases emerging from scoping review

	Core use cases	Definition	Domains of application (integrated from Stublić *et al.*)	Sources
Additional themes identified	Decentralized funding	Enabling through blockchain technology a distributed and transparent system for raising, managing and allocating funds for cultural institutions. This practice aims to decentralize traditional funding models	Museums, Cultural heritage organizations	Dolan *et al.* (2019), De Filippi (2016), Prokupek *et al.* (2022), Valeonti *et al.* (2021)
	Decentralized cultural platforms for heritage preservation	Employing digital platforms built on blockchain technology in the preservation of cultural artefacts, historical records and other elements of cultural significance	Libraries, Smart cultural tourism, Cultural heritage organizations	Zoannos *et al.* (2023), Jha (2023), Trček (2022a, b), Jankova *et al.* (2023), Jens *et al.* (2021), Gloerich *et al.* (2020), Miguel-de-Bustos and Izquierdo-Castillo (2021), Wei and Guan (2021)

Table 4.

Source(s): Authors' own work

represents digital information; this is then issued on a blockchain platform for its exchange between users. Tokenizing cultural assets, e.g. rare manuscripts or historical documents (Zhang *et al.*, 2021), represents a possible strategy for public cultural institutions to enable fractional ownership and democratize access to culture (Liddell, 2021). Therefore, among the benefits of tokenizing cultural assets, we find the possibility for a public cultural institution to broaden the access to cultural assets for its users and also to facilitate, through the acquisition of tokens, crowdfunding for preservation efforts – the benefits are, majorly, economic and strategic (Ølnes *et al.*, 2017). This use case is based on a decentralized funding strategy, which will be later discussed. Indeed, the public cultural institution can potentially involve various members of the community, the token-holders, as well as other cultural institutions and partners. After designing token standards, it is then necessary to develop smart contracts to govern the process (Vacchio and Bifulco, 2022) and establish ownership and governance rules.

Tokenization is connected in the literature with the concept of shared ownership enabled by blockchain (Liddell, 2021) and applied to cultural assets. In Liddell (2021), we find an interesting example of how digital museum assets played a role in building relations through "shared guardianship", stressing public engagement. In this audience development strategy, a collaborative approach was adopted to explore the museum collections, which privileged the experience of users by documenting their relationship with an object to a blockchain-enabled version of the object itself. In so doing, the participants claimed ownership over a digital token of the museum's collection by using blockchain technology. Tokenization of cultural assets allows the public institution to leverage the museum's collections by fostering a sense of shared ownership, involving visitors and strengthening the relationship with users, both with the cultural asset and the museum itself.

Digital rights management

This use case includes rights management and digital protection of artistic and cultural products (Zeilinger, 2018; Wang *et al.*, 2021a, b; Bacciu *et al.*, 2022; Zhao *et al.*, 2022). Benefits for public cultural institutions are mainly informational, strategic and economic (Ølnes *et al.*, 2017): they are concerned with providing a secure and transparent platform based on blockchain for tracking intellectual property rights and preventing unauthorized use of cultural assets, through the involvement of potentially different stakeholders, such as researchers, conservationists, artists and the broader public; moreover, digital rights management through blockchain could support public cultural institutions to fight piracy of creative content and manage rights and royalties. The key factor in managing digital copyright is to create platforms to manage licensing and permissions through smart contracts on the blockchain (O'Dwyer, 2020); to be properly used by different stakeholders, it is necessary to develop a user-friendly interface and to foster stakeholders and cultural professionals' education. In Jung (2023), the legal and ethical issues around the use of NFTs in museums are widely discussed: the scholar proposes a new model based on the theory of the commons as a conceptual model to fit the museum sector, for a common pool use of NFT sharing among museums in a consortium. The theoretical model proposed is meant to be regulated under the policies of fair use and open access (Jung, 2023), embracing the concept of a bottom-up governance model.

Tracking provenance and authenticity, digital asset management

This use case is related to tracking the provenance of cultural artefacts and proving authenticity. Blockchain provides a transparent and tamper-resistant record of transactions: this transparency can enhance accountability in the delivery of public cultural services as all relevant stakeholders can have access to a verifiable and unalterable record of activities. For example, in collections management, blockchain technology may be used to create a secure and transparent record of the ownership, authenticity and provenance of the cultural institution's assets (Duca *et al.*, 2020); loan of cultural objects and procurement (Whitaker *et al.*, 2021; Damiani, 2022). Benefits are strategic, economic, informational and technological and concern achieving transparency, accountability and traceability of assets, enhanced security, provenance tracking and easy sharing of digital assets while ensuring copyright and ownership rights. Key factors for cultural institutions are to design provenance tracking smart contracts and the tokenization of cultural assets (*see above*); furthermore, to integrate it with the existing systems, it is crucial to conduct educational programs to inform stakeholders, including curators, art historians and collectors, about the benefits of using blockchain for provenance tracking. One relevant application of this use case is, indeed, provenance tracking for arts and artefacts, which allows for storage of information securely, e.g. recordkeeping, archiving and documentation purposes and artefact storage. This enables the reduction of the risk of art fraud, providing a transparent history of ownership and facilitating the authentication of cultural assets (Vacchio and Bifulco, 2022). In terms of community involvement, artworks can be added and updated only by authorized users to reduce the risk of fraud. Mucchi *et al.* (2022) report the case of collaboration among museums in the city of Florence when blockchain technology was set up by a provider for a certified database aimed at exchanging art pieces among the museums themselves. A certified distributed ledger was built to be able to record and certify the transactions of items between the two museums. Any transaction is approved by the museums and thus immutably stored in the blockchain; all the information about the lending of an art piece, e.g. time, conditions, certificates, etc., was approved and stored in a database accessible by museums. An analogous project was specifically designed for theatres, with relevant applications for other public cultural institutions, where information about the scene objects, as well as conditions

like period, cost per object, the cost for each day of delay, the cost for damaged objects, etc. are written in the smart contract, and a transaction among theatres is enabled once the conditions are met.

Decentralized funding

Blockchain-based decentralized funding opens opportunities for crowdfunding strategies, pay-per-view payment, empowering communities to support cultural endeavours directly, reducing reliance on traditional funding channels and fostering a sense of ownership among supporters (De Filippi, 2016). Fundraising, micro-payments and similar financing strategies can involve users as active stakeholders in the creative work (as well as in cultural operations, for instance in van Haaften-Schick and Whitaker, 2022). Key factors for this use case scenario concern developing smart contracts that govern the fundraising process, tokenizing memberships or rewards associated with donations, implementing a secure digital identity management system to verify the identity of contributors and allowing them to interact directly with the blockchain. It is relevant to track the impact of their contributions so that they may participate in decision-making processes related to funded projects; "donors" may also need to store and manage their tokens in secure wallet solutions. Examples of public cultural services are creating decentralized crowdfunding platforms for cultural projects and initiatives and providing stakeholders with a clear view of how public funds are utilized. Prokupek *et al.* (2022) provide an example of a funding mix by museums, which offer digital content, develop new online practices with which to engage with their major stakeholders and initiate open funding mechanisms and tools reliant on crowdfunding platforms and blockchain technologies. These strategies at the basis of a blockchain-based service address the ambivalence of engaging members of their supportive communities and monetizing their assets, experimenting with novel funding tools for cultural institutions.

Decentralized cultural platforms for heritage preservation

dApps (decentralized applications) are open-source coded digital applications or programs that exist and run on a blockchain or peer-to-peer network of computers. Through dApps, users can access blockchain networks and engage with other users for different purposes (e.g. storage of data space) (Tan *et al.*, 2022). In this regard, dApps can be used for the sake of protecting cultural identity and cultural heritage preservation by public bodies to foster collaborative conservation (Woodall and Ringel, 2020; Lvping, 2021; Trček, 2022a, b) and restoration of cultural heritage, share data and information about cultural heritage sites and artefacts and to facilitate collaboration and coordination among different stakeholders. This use case may involve museums, galleries, archives, theatres and performing arts institutions, heritage sites, public monuments, cultural tourism (Anagnostakis, 2019), libraries (Jha, 2023), outsourcing of the preservation processes to tourists via a mobile application (Trček, 2022a, b); relics protection (Wang *et al.*, 2021a, b; Zhang *et al.*, 2021) and restitution of cultural heritage (Whitaker *et al.*, 2021). Key factors concern collaborating with legal experts to ensure compliance with laws and regulations related to cultural heritage, intellectual property and data protection; creating identity and artefact smart contracts; implementing a secure digital identity management system to uniquely identify cultural artefacts, either tangible or intangible (Zoannos *et al.*, 2023); creating a clear record of ownership history, exhibition history and other relevant information and implementing secure storage solutions for digital records and artefacts. Zoannos *et al.* (2023) recalled how in recent conflicts and natural disasters the need to safeguard intangible cultural heritage bursts. Zoannos *et al.* (2023) specify why blockchain technologies are better, data security-wise, for storing global intangible cultural heritage data and for presenting a dApp which may be used by UNESCO. The authors suggest how blockchain technologies can be effectively used to store the global

Intangible Cultural Heritage (ICH) and ensure its continuity in future generations by creating a decentralized worldwide network between the heritage stakeholders, therefore UNESCO and the local bearers, such as libraries, archives, and museums.

Discussion

The benefits of the diffusion of the adoption of blockchain technology within the public sector have been grouped by Ølnes *et al.* (2017) into five major categories: strategic, organizational, economical, informational and technological. The five core use case scenarios listed in the Results section may have the following implications for public service delivery.

(1) *Tokenization of cultural assets and fractional equity*: Implications for public service delivery could relate to stimulating a governance model of cultural institutions, where users, as token-holders, can be part of the decision-making process about managing (e.g. exhibiting, showcasing, restoration, etc.) a given cultural asset. In this respect, public governance bodies managing digital cultural assets through blockchain may need to establish clear legal frameworks for tokenized cultural assets and address issues such as copyright, ownership and compliance with ethical standards.

(2) *Digital copyright management*: Privacy concerns are of utmost importance, especially in situations where data privacy is a concern, as transparency of blockchain technology may not align with required privacy requirements. Smart contracts, which are integral to blockchain applications, can raise legal challenges within traditional legal systems. Public service delivery implications related to managing copyright through blockchain imply that institutions must establish robust data protection policies that address privacy concerns. This element might have a high variability concerning the geographical dimension; for instance, in the US, most museums are private nonprofits, whereas they are more commonly public institutions in Europe and Asia: the legal structure may come with policy and legal provisions that cultural institutions cannot directly engage in commercial activities (Whitaker, 2019). Therefore, cultural institutions need to make sure their monetizing activities do not violate their public mission and that the income generated goes back to taking care of the acquisition, preservation and valorization of the collection.

Tracking provenance and authenticity, cultural asset management: Public service implications in this regard concern the fact that the involved public institution is likely to benefit from increased trust and confidence among citizens when they can verify and track the allocation and utilization of resources for cultural services (Vacchio and Bifulco, 2022). Public institutions may need to adapt governance structures to leverage blockchain's transparency, ensuring that stakeholders have access to verifiable and unalterable records of cultural service-related activities. Institutions may need to redesign procurement procedures to leverage blockchain for greater transparency and traceability in the acquisition of cultural resources.

(1) *Decentralized funding:* benefits are primarily strategic and economic (Ølnes *et al.*, 2017). Although there are several benefits, there are also several challenges in utilizing blockchain applications, e.g. NFTs, in the museum sector specifically, including the lack of expertise in minting and trading NFTs among museum professionals. Public governance may experience improved resource management and cost-effectiveness, allowing for better utilization of public funds allocated to cultural services (Prokupek *et al.*, 2022). Public institutions may need to improve the

traceability of funds allocated for cultural services; in this view, decentralized funding allows the exploration of the possibility of implementing community governance models where donors have a say in decision-making processes related to funded projects. Smart contracts can facilitate voting mechanisms and transparent governance structures (Tan *et al.*, 2022). We also find evidence in the literature that museums, as public cultural institutions, would be better off using NFTs for fundraising purposes or education. Several nonprofit museum boards are already determining that NFT use for fundraising to raise contributed income may not be appropriate for their organization due to the high risk and uncertainty associated with NFTs. Museum governance needs to address the rewards as well as risks in determining the use of NFTs for their museum and may choose to stay away from the use of NFTs for solely cash-raising purposes (Jung, 2023).

(2) *Decentralized cultural platforms for heritage preservation:* Challenges arise from the substantial costs and resource demands associated with establishing and sustaining blockchain networks, which could potentially hinder their widespread adoption. Additionally, blockchain networks require decentralized governance models, which may not align with the hierarchical structure of many public sector organizations, leading to governance and decision-making challenges. Benefits are mostly organizational, informational and strategic (Ølnes *et al.*, 2017) and concern unrestricted access to cultural content for users, decentralization and citizen empowerment, fostering a more inclusive cultural ecosystem and enabling direct peer-to-peer transactions; public bodies could also consider tokenizing access to cultural content and exhibitions with rewards. From this perspective, blockchain technology can facilitate interoperability and seamless collaboration between different public entities involved in cultural services: smart contracts can automate inter-agency processes, leading to smoother collaboration. Public governance structures may need to adapt to a more inclusive and participatory model, considering the input and feedback from a more empowered citizenry, and to accommodate decentralized decision-making, fostering increased collaboration and participation from stakeholders. Rozas *et al.* (2021) see opportunities to deploy the blockchain in common projects to bring out a shift from "a culture of competition" to "a culture of cooperation". These decentralized technologies, they state, "*could facilitate coordination, help to scale up commons governance or even be useful to share agreements and different forms of value amongst various communities in interoperable ways*" (Rozas *et al.*, 2021). Public governance structures may thus need to evolve to support cross-agency collaboration and ensure interoperability standards are adopted and maintained. To do so, public institutions may need to collaborate on standardization efforts to ensure interoperability, fostering smoother collaboration and data sharing. Among the features of blockchain, decentralization therefore represents an opportunity and also a potential barrier for its adoption in the public sector.

In addition, the intricate nature of blockchain technology can pose challenges to its adoption within the public sector, potentially due to a shortage of necessary skills. The lack of understanding and awareness of blockchain technology within the public sector can indeed also delay its adoption. Public sector managers and policymakers have begun to design user-centred public services: a deeper understanding of design is informing public organizations and governments looking to change the way they operate in their digital transformation paths. A close read reveals a call for more human-centred design approaches in public administrations, in line with the notion that management theories and management practices

are a matter of design (Junginger, 2017). There is now a call for new forms of design leadership and design management in the public sector. This perspective would help us to better evaluate user perception and acceptance and examine studies that focus on the attitudes and perceptions of users (both internal stakeholders and the public) toward the adoption of blockchain in cultural services and on how user acceptance and trust play a crucial role in the diffusion of blockchain technology. A user-centred approach can help us consider examining factors influencing user acceptance and trust in blockchain applications: user experience and usability, perceived benefits and risks, examples of user engagement, cultural institutions staff perspectives, public perceptions and engagement and factors influencing adoption.

Final remarks

The described phenomenon has been so far understudied, as mentioned in the Introduction. According to Whitaker (2019), blockchain blurs the for-profit/non-profit distinction in the cultural realm as its decentralized structure shifts responsibility for infrastructure away from trusted central authorities. Despite the turmoil experienced from a practitioner's standpoint, cultural institutions in the public sector remain largely sceptical about the application of this technology. This could be due to different reasons: first, we acknowledge that public cultural services are still representing a niche area in the broader panorama of public services, where the adoption of blockchain, and in general disruptive technologies, may be slower. Moreover, cultural services, including museums, libraries and public cultural heritage organizations, often have traditional practices and established methods for preserving and managing cultural assets. The adoption of new technologies, such as blockchain, may face resistance or scepticism due to a preference for proven, conventional approaches: public cultural services often experience long adoption cycles, further slowed down by regulatory uncertainty and lack of technical expertise by cultural professionals. Moreover, like other technologies, the narratives, and dominant discourses around blockchain technologies, NFTs and cryptocurrencies and decentralized web frameworks have been shaped either by criticism, partiality or "hyped" by the various actors in the cultural domain (Woodall and Ringel, 2020). So far, there has been relatively little interrogation of the positive perspective that is implied in adopting this technology (De Filippi *et al.*, 2020), especially in the public sector organizations delivering public services.

Concerning the major limitations of the present study, the major limitation of the present methodology primarily concerns a possible lack of in-depth analysis, given the objective of mapping relevant literature on the topic, and not digging into a specific case study. Results would have been more relevant with a further consultation exercise to enhance the results in case practitioners and policymakers would have contributed to the work. These actors could have suggested different implications to be developed and applied. Moreover, this study does not include the role of regulations in shaping the landscape of blockchain adoption in cultural public services. Intended as a scoping study, the work is characterized by a high level of subjectivity in both its sample selection and analysis, even if we transparently reported our results, and the criteria to achieve them. As such, the results cannot be said to be representative or generalizable. Finally, one of the major shortcomings of the literature is a lack of empirical analyses on blockchain in public services; the application of this technology, particularly in public services, is still at a very early stage, and most of the analyses are abstract or theoretical: most of them focus on discussing potential benefits, costs or risks of blockchain in public services without entering into specific cases already implemented or focus in case of studies without including sufficient empirical evidence (Ølnes *et al.*, 2017).

The contribution of the present scoping review is an overview of the emerging use case scenarios of blockchain diffusion and adoption in the public cultural sector in the academic

literature: academically wise, the work wants to stimulate a discussion about the contextual specificities of the cultural sector in the blockchain adoption process, as well as providing evidence from the literature as a basis for further research, for example, in-depth empirical case studies. The results of this review may also be relevant for practitioners and policymakers, to improve the awareness of the spread of blockchain phenomenon in the field, and address the major challenges related to this process.

In studying the diffusion of the blockchain phenomenon, some of the key questions that still need to be adequately researched and addressed by both academics and policymakers concern the consequences of blockchain on job displacement and the new skill sets required to manage the infrastructure, governance and organizational structures of transformed public services. To this end, a wide range of research methods will be useful, including case studies, comparative analysis, structured and semi-structured interviews and survey methods. Further research therefore will entail the following points: first, the review of the applications of blockchain in the public sector for cultural services revealed a consistent gap between the empirical profusion and variety of experimentations on a practitioner's level and the current state of the art of academic research. Moreover, comparative studies analyze the response of users toward blockchain adoption in cultural services compared to other technologies or traditional methods.

References

Abid, H. (2021), "Uses of blockchain technologies in library services", *Library Hi Tech News*, Vol. 38 No. 8, pp. 9-11, doi: 10.1108/LHTN-08-2020-0079.

Agenzia Cult (2022), "NFT, a breve le linee guida del mic per tutelare i beni culturali", *AgenziaCult*, available at: https://www.agenziacult.it/cultura-e-digitale/nft-a-breve-le-linee-guida-del-mic-per-tutelare-i-beni-culturali/

AlShamsi, M., Al-Emran, M. and Shaalan, K. (2022), "A systematic review on blockchain adoption", *Applied Sciences*, Vol. 12 No. 9, p. 4245, doi: 10.3390/app12094245.

Anagnostakis, A. (2019), "Towards a blockchain architecture for cultural heritage tokens", in Moropoulou, A. (Ed.), *Transdisciplinary Multispectral Modeling and Cooperation for the Preservation of Cultural Heritage*, Springer International Publishing (Communications in Computer and Information Science), Cham, pp. 541-551.

Arksey, H. and O'Malley, L. (2005), "Scoping studies: towards a methodological framework", *International Journal of Social Research Methodology*, Vol. 8 No. 1, pp. 19-32, doi: 10.1080/1364557032000119616.

Bacciu, C., Duca, A.L. and Marchetti, A. (2022), "A blockchain-based application to protect minor artworks", *15th International Conference on Web Information Systems and Technologies*, pp. 319-325, doi: 10.5220/0008347900002366, available at: https://www.scitepress.org/Link.aspx?doi=10.5220/0008347903190325 (accessed 9 June 2022).

Blockchain definition and meaning | Collins english dictionary (2024), "Blockchain", available at: https://www.collinsdictionary.com/dictionary/english/blockchain

Bosch, M.J., Tangi, L. and Burian, P. (2022), *European Landscape on the Use of Blockchain Technology by the Public Sector*, Publications Office of the European Union, Luxembourg, p. 2022, doi: 10.2760/18007,JRC131202.

Cagigas, D., Clifton, J., Diaz-Fuentes, D. and Fernandez-Gutierrez, M. (2021), "Blockchain for public services: a systematic literature review", *IEEE Access*, Vol. 9, pp. 13904-13921, doi: 10.1109/ACCESS.2021.3052019.

Cagigas, D., Clifton, J., Diaz-Fuentes, D., Fernández-Gutiérrez, M. and Harpes, C. (2023), "Blockchain in government: toward an evaluation framework", *Policy Design and Practice*, Vol. 6 No. 4, pp. 397-414, doi: 10.1080/25741292.2023.2230702.

Catalini, C. (2018), "Blockchain technology and cryptocurrencies: implications for the digital economy, cybersecurity, and government", *Georgetown Journal of International Affairs*, Vol. 19 No. 1, pp. 36-42, doi: 10.1353/gia.2018.0005.

Catlow, R. and Rafferty, P. (2023), "Radical friends. Decentralized autonomous organisations and the arts", *Torque Editions*, ISBN 978-0993248771.

Ch'ng, E. (2018), "The first original copy and the role of blockchain in the reproduction of cultural heritage", *Presence: Teleoperators and Virtual Environments*, Vol. 27 No. 1, pp. 151-162, doi: 10.1162/pres_a_00313.

Damiani, C. (2022), "Certification and preservation of artworks in digital environments [La certificazione e la conservazione delle opere d'arte in ambiente digitale]", *JLIS.it*, Vol. 13 No. 2, pp. 189-202, [Preprint], doi: 10.36253/jlis.it-467.

De Filippi, P. (2015), "Blockchain-based Crowdfunding: what impact on artistic production and art consumption?", *Observatório Itaú Cultural*, No. 19, p. 2015.

De Filippi, P. (2016), "Blockchain-based Crowdfunding: what impact on artistic production and art consumption?", *Berkman Center for Internet and Society at Harvard Law*.

De Filippi, P., Mannan, M. and Reijers, W. (2020), "Blockchain as a confidence machine: the problem of trust & challenges of governance", *Technology in Society*, Vol. 62, 101284, doi: 10.1016/j.techsoc.2020.101284.

Dolan, L., Kavanaugh, B., Korinek, K. and Sandler, B. (2019), "Off the chain: blockchain technology—an information organization system", *Technical Services Quarterly*, Vol. 36 No. 3, pp. 281-295, doi: 10.1080/07317131.2019.1621571.

Duca, A.L., Bacciu, C. and Marchetti, A. (2020), "The use of blockchain for digital archives: a comparison between ethereum and hyperledger (AIUCD 2019)", *Umanistica Digitale*, [Preprint], No. 8, doi: 10.6092/issn.2532-8816/9959.

Frederick, D.E. (2019), "Blockchain, libraries and the data deluge", *Library Hi Tech News*, Vol. 36 No. 10, pp. 1-7, doi: 10.1108/LHTN-09-2019-0059.

George, B., Andersen, L.B., Hall, J.L. and Pandey, S.K. (2023), "Writing impactful reviews to rejuvenate public administration: a framework and recommendations", *Public Administration Review*, Vol. 83 No. 6, pp. 1517-1527, doi: 10.1111/puar.13756.

Gloerich, I., De Waal, M., Ferri, G., Cila, N. and Karpinski, T. (2020), "The city as a license. Implications of blockchain and distributed ledgers for Urban governance", *Frontiers in Sustainable Cities*, Vol. 2, doi: 10.3389/frsc.2020.534942, available at:

Goldenfein, J. and Hunter, D. (2017), "Blockchains, Orphan works, and the public domain", *Columbia Journal of Law and the Arts*, Vol. 41 No. 1, pp. 1-44.

Grech, A., Balaji, V. and Miao, F. (2022), Education and Blockchain, UNESCO and COL, Published in 2022 by the United Nations Educational, Scientific and Cultural Organization, doi: 10.56059/11599/4131.

Hu, W., Han, H., Wang, G., Peng, T. and Yang, Z. (2023), "Interactive design and implementation of a digital museum under the background of AR and blockchain technology", *Applied Sciences*, Vol. 13 No. 8, p. 4714, doi: 10.3390/app13084714.

ICOM Prague (2022), available at: https://prague2022.icom.museum/

Jankova, L., Auzina, A. and Zvirbule, A. (2023), "Regional smart cultural tourism destinations in a region of Latvia", *Worldwide Hospitality and Tourism Themes*, Vol. 15 No. 5, pp. 507-516, doi: 10.1108/WHATT-06-2023-0082.

Jens, D.E., Etzrodt, M., Bartling, S., Walshe, R., Harrington, T., Wittek, N., Posth, S., Wittek, K., Ionita, A., Prinz, W., Kogias, D., Paixão, T., Peterfi, I. and Lawton, J. (2021), "Unchaining collective intelligence for science, research, and technology development by blockchain-boosted community participation", *Frontiers in Blockchain*, Vol. 4 No. May 7, 2021, 631648, doi: 10.3389/fbloc.2021.631648.

Jha, S.K. (2023), "Application of blockchain technology in libraries and information centers services", *Library Hi Tech News*, 0741-9058, doi: 10.1108/LHTN-02-2023-0020.

Jung, Y. (2023), "Current use cases, benefits and challenges of NFTs in the museum sector: toward common pool model of NFT sharing for educational purposes", *Museum Management and Curatorship*, Vol. 38 No. 4, pp. 451-467, doi: 10.1080/09647775.2022.2132995.

Junginger, S. (2017), "Design research and practice for the public good: a reflection", *She Ji: The Journal of Design, Economics, and Innovation*, Vol. 3 No. 4, pp. 290-302, doi: 10.1016/j.sheji.2018.02.005.

Khelifi, A., Altaweel, M., Hashir, M., Hadjitofi, T. and Ghazal, M. (2024), "Salsal: blockchain for vetting cultural object collections", *Heritage Science*, Vol. 12 No. 1, p. 15, doi: 10.1186/s40494-023-01129-6.

Lee, J., Kim, B. and Lee, A.R. (2023), "Priority evaluation factors for blockchain application services in public sectors", Edited by B. Guidi, *PLoS One*, Vol. 18 No. 3, e0279445, doi: 10.1371/journal.pone.0279445.

Liddell, F. (2021), "Building shared guardianship through blockchain technology and digital museum objects", *Museum and Society*, Vol. 19 No. 2, pp. 220-236, doi: 10.29311/mas.v19i2.3495.

Lvping, S. (2021), "Blockchain technology for management of intangible cultural heritage", Edited by J. Hussain, 2021, *Scientific Programming*, Vol. 2021, pp. 1-7, doi: 10.1155/2021/2613656.

Miguel-de-Bustos, J. and Izquierdo-Castillo, J. (2021), "Public service media and blockchain technology: first thoughts", in Túñez-López, M., Campos-Freire, F. and Rodríguez-Castro, M. (Eds), *The Values of Public Service Media in the Internet Society*, Springer International Publishing.

Mohammed, A., Potdar, V. and Yang, L. (2020), "Key factors affecting blockchain adoption in organizations", in Tian, Y., Ma, T. and Khan, M.K. (Eds), *Big Data and Security*, Springer, Singapore (Communications in Computer and Information Science), pp. 455-467, doi: 10.1007/978-981-15-7530-3_35.

Mucchi, L., Milanesi, M. and Becagli, C. (2022), "Blockchain technologies for museum management. The case of the loan of cultural objects", *Current Issues in Tourism*, Vol. 25 No. 18, pp. 1-15, doi: 10.1080/13683500.2022.2050358.

Novak, M. (2019), "Crypto-friendliness: understanding blockchain public policy", *Journal of Entrepreneurship and Public Policy*, Vol. 9 No. 2, pp. 165-184, doi: 10.1108/JEPP-03-2019-0014.

Ølnes, S., Ubacht, J. and Janssen, M. (2017), "Blockchain in government: benefits and implications of distributed ledger technology for information sharing", *Government Information Quarterly*, Vol. 34 No. 3, pp. 355-364, doi: 10.1016/j.giq.2017.09.007.

Oyelude, A.A. (2022), "Trending issues in advancing blockchain technology in libraries, archives and museums", *Library Hi Tech News*, Vol. 39 No. 6, pp. 6-7, doi: 10.1108/LHTN-06-2021-0040.

O'Dwyer, R. (2020), "Limited edition: producing artificial scarcity for digital art on the blockchain and its implications for the cultural industries", *Convergence: The International Journal of Research Into New Media Technologies*, Vol. 26 No. 4, pp. 874-894, doi: 10.1177/1354856518795097.

Patrickson, B. (2021), "What do blockchain technologies imply for digital creative industries?", *Creativity and Innovation Management*, Vol. 30 No. 3, pp. 585-595, doi: 10.1111/caim.12456.

Prokůpek, M., Loots, E. and Betzler, D. (2022), "Emergency or emerging financing strategies of art museums in the context of a pandemic?", *Museum Management and Curatorship*, Vol. 38 No. 5, pp. 1-18, doi: 10.1080/09647775.2022.2111327.

Ritchie, J. and Spencer, L. (1994), in Bryman, A. and Burgess, R. (Eds), *Qualitative Data Analysis for Applied Policy Research*, Routledge, London, pp. 173-194.

Rozas, D., Tenorio-Fornés, A. and Hassan, S. (2021), "Analysis of the potentials of blockchain for the governance of global digital commons", *Frontiers in Blockchain*, Vol. 4, doi: 10.3389/fbloc.2021.577680.

Sater, S. and Wright, R. (2020), "A conversation on art, museums, and blockchain", *Tulne Journal of Technology and Intellectual Property*, Vol. 21 No. 35, pp. 35-52.

Stančić, H. and Bralić, V. (2021), "Digital archives relying on blockchain: overcoming the limitations of data immutability", *Computers*, Vol. 10 No. 8, p. 91, doi: 10.3390/computers10080091.

Stublić, H., Bilogrivić, M. and Zlodi, G. (2023), "Blockchain and NFTs in the cultural heritage domain: a review of current research topics", *Heritage*, Vol. 6 No. 4, pp. 3801-3819, Article 4, doi: 10.3390/heritage6040202.

Tan, E. (2023), "The missing piece: the link between blockchain and public policy design", *Policy Design and Practice*, Vol. 6 No. 4, pp. 488-504, doi: 10.1080/25741292.2023.2233160.

Tan, E., Mahula, S. and Crompvoets, J. (2022), "Blockchain governance in the public sector: a conceptual framework for public management", *Government Information Quarterly*, Vol. 39 No. 1, 101625, doi: 10.1016/j.giq.2021.101625.

Trček, D. (2022a), "Cultural heritage preservation by using blockchain technologies", *Heritage Science*, Vol. 10 No. 1, p. 6, doi: 10.1186/s40494-021-00643-9.

Trček, D. (2022b), "HeriLedger—a new generation of blockchains for cultural heritage preservation", *Sensors*, Vol. 22 No. 22, p. 8913, doi: 10.3390/s22228913.

UIS (2009), *UNESCO, Cultural Services. Framework for Cultural Statistics*, UNESCO UIS, available at: https://uis.unesco.org/en/glossary-term/cultural-services

Vacchio, E.D. and Bifulco, F. (2022), "Blockchain in cultural heritage: insights from literature review", *Sustainability*, Vol. 14 No. 4, p. 2324, doi: 10.3390/su14042324.

Valeonti, F., Bikakis, A., Terras, M., Speed, C., Hudson-Smith, A. and Chalkias, K. (2021), "Crypto collectibles, museum funding and OpenGLAM: challenges, opportunities and the potential of non-fungible tokens (NFTs)", *Applied Sciences*, Vol. 11 No. 21, p. 9931, doi: 10.3390/app11219931.

van Haaften-Schick, L. and Whitaker, A. (2022), "From the artist's contract to the blockchain ledger: new forms of artists' funding using equity and resale royalties", *Journal of Cultural Economics*, Vol. 46 No. 2, pp. 287-315, doi: 10.1007/s10824-022-09445-8.

Wang, Y.-C., Chen, C.-L. and Deng, Y.-Y. (2021a), "Authorization mechanism based on blockchain technology for protecting museum-digital property rights", *Applied Sciences*, Vol. 11 No. 3, p. 1085, doi: 10.3390/app11031085.

Wang, Y.-C., Chen, C.-L. and Deng, Y.-Y. (2021b), "Museum-authorization of digital rights: a sustainable and traceable cultural relics exhibition mechanism", *Sustainability*, Vol. 13 No. 4, p. 2046, doi: 10.3390/su13042046.

Wei, H. and Guan, S. (2021), "Path and mechanism of blockchain embedded in innovation management of cultural and creative industrial park", *Discrete Dynamics in Nature and Society*. doi: 10.1155/2021/9574223.

Whitaker, A. (2019), "Art and blockchain: a primer, history, and taxonomy of blockchain use cases in the arts", *Artivate: A Journal of Entrepreneurship in the Arts*, Vol. 8 No. 2, doi: 10.34053/artivate.8.2.2.

Whitaker, A. and Kräussl, R. (2020), "Fractional equity, blockchain, and the future of creative work", *Management Science*, Vol. 66 No. 10, pp. 4594-4611, doi: 10.1287/mnsc.2020.3633.

Whitaker, A., Bracegirdle, A., de Menil, S., Gitlitz, M.A. and Saltos, L. (2021), "Art, antiquities, and blockchain: new approaches to the restitution of cultural heritage", *International Journal of Cultural Policy*, Vol. 27 No. 3, pp. 312-329, doi: 10.1080/10286632.2020.1765163.

Woodall, A. and Ringel, S. (2020), "Blockchain archival discourse: trust and the imaginaries of digital preservation", *New Media and Society*, Vol. 22 No. 12, pp. 2200-2217, doi: 10.1177/1461444819888756.

Yuan, X. and Zhou, S. (2023), "Research on library intelligent service based on blockchain technology", in Hong, W. and Weng, Y. (Eds), *Computer Science and Education*, Springer Nature, pp. 267-277, doi: 10.1007/978-981-99-2443-1_24.

Zeilinger, M. (2018), "Digital art as 'monetised graphics': enforcing intellectual property on the blockchain", *Philosophy and Technology*, Vol. 31 No. 1, pp. 15-41, doi: 10.1007/s13347-016-0243-1.

Zhang, J., Guo, M., Li, B. and Lu, R. (2021), "A transport monitoring system for cultural relics protection based on blockchain and internet of things", *Journal of Cultural Heritage*, Vol. 50, pp. 106-114, doi: 10.1016/j.culher.2021.05.007.

Zhao, L., Zhang, J. and Jing, H. (2022), "Blockchain-enabled digital rights management for museum-digital property rights", *Intelligent Automation and Soft Computing*, Vol. 34 No. 3, pp. 1785-1801, doi: 10.32604/iasc.2022.029693.

Zhao, L., Zhang, J., Jing, H., Wu, J. and Huang, Y. (2023a), "A Blockchain-Based cryptographic interaction method of digital museum collections", *Journal of Cultural Heritage*, Vol. 59, pp. 69-82, doi: 10.1016/j.culher.2022.11.001.

Zhao, L., Zhong, L. and Zhang, J. (2023b), "Traceable one-time address solution to the interactive blockchain for digital museum assets", *Information Sciences*, Vol. 625, pp. 157-174, doi: 10.1016/j.ins.2022.12.084.

Zhen, Y. (2023), "Design of library smart cloud service system based on blockchain technology", *Security and Privacy*, Vol. 6 No. 2, p. e213, doi: 10.1002/spy2.213.

Zoannos, N., Chourdaki, P. and Assimakopoulos, N. (2023), "Can UNESCO use blockchain to ensure the intangible cultural heritage of humanity? A systemic approach that explains the why, how, and difficulties of such a venture", *Heritage*, Vol. 6 No. 3, pp. 3232-3255, doi: 10.3390/heritage6030171.

Further reading

Abbate, T., Vecco, M., Vermiglio, C., Zarone, V. and Perano, M. (2022), "Blockchain and art market: resistance or adoption?", *Consumption, Markets and Culture*, Vol. 25 No. 2, pp. 105-123, doi: 10.1080/10253866.2021.2019026.

Adams, R., Kewell, B. and Parry, G. (2018), "Blockchain for good? Digital ledger technology and sustainable development goals", in Leal Filho, W., Marans, R.W. and Callewaert, J. (Eds), *Handbook of Sustainability and Social Science Research*, Springer International Publishing (World Sustainability Series), Cham, pp. 127-140, doi: 10.1007/978-3-319-67122-2_7.

Benchaya Gans, R., Ubacht, J. and Janssen, M. (2022), "Governance and societal impact of blockchain-based self-sovereign identities", *Policy and Society*, Vol. 41 No. 3, pp. 402-413, doi: 10.1093/polsoc/puac018.

Botz-Bornstein, T. (2021), "'Bullshit art' and non-fungible-tokens", *The Polish Journal of Aesthetics*, Vol. 4 No. 63, doi: 10.19205/63.21.4.

Brenton, S. and Bouckaert, G. (2021), "Managing public museums appropriately and consequentially: the distinctiveness and diversity of leading organizations", *Public Administration Review*, Vol. 81 No. 4, pp. 715-727, doi: 10.1111/puar.13323.

Colella, S. (2022), "Disrupting the art market? Blockchain, NFTs and the promise of inclusion", *Il Capitale Culturale*, Vol. 26 No. 2022, doi: 10.13138/2039-2362/2946.

Culture, W.L.-W. (2023), "Who holds the keys? The issues with putting NFTs in the museum collection", *The Medium*, available at: https://medium.com/@wac-lab/who-holds-the-keys-the-issues-with-putting-nfts-in-the-museum-collection-f41ddc5d6150

Debono, S. (2022), "Museums and the NFT hype", *The Humanist Museum*, available at: https://medium.com/the-neo-humanist-museum/museums-and-non-fungible-tokens-e69d1514b78

European Investment Bank (2021), *Artificial Intelligence, Blockchain and the Future of Europe: How Disruptive Technologies Create Opportunities for a Green and Digital Economy: Main Report*, Publications Office, LU, doi: 10.2867/126279

Executive Agency for Small and Medium sized Enterprises (2021), *Advanced Technologies for Industry: Sectoral Watch : Technological Trends in Creative Industries*, LU: Publications Office, doi: 10.2826/444418

Executive Agency for Small and Medium-sized Enterprises (2021), *Transforming the Creative and Cultural Industries with Advanced Technologies: Sectoral Watch: Technological Trends in the Creative Industries. LU*, Publications Office, doi: 10.2826/057937

Franceschet, M., Colavizza, G., Smith, T., Finucane, B., Ostachowski, M.L., Scalet, S., Perkins, J., Morgan, J. and Hernández, S. (2020), "Crypto art: a decentralized view", *Leonardo*, Vol. 54 No. 4, pp. 1-8, doi: 10.1162/leon_a_02003.

Fu, Z., Dong, P., Li, S. and Ju, Y. (2021), "An intelligent cross-border transaction system based on consortium blockchain: a case study in Shenzhen, China", Edited by B. Guidi, *PLoS One*, Vol. 16 No. 6, e0252489, doi: 10.1371/journal.pone.0252489.

Hartelius, E.J. (2023), "'The great chain of being sure about things': blockchain, truth, and a trustless network", *Review of Communication*, Vol. 23 No. 1, pp. 21-37, doi: 10.1080/15358593.2022.2112270.

Huckle, S., Bhattacharya, R., White, M. and Beloff, N. (2016), "Internet of things, blockchain and shared economy applications", *Procedia Computer Science*, Vol. 98, pp. 461-466, doi: 10.1016/j.procs.2016.09.074.

Huilan, W. and Guan, S. (2021), "Path and mechanism of blockchain embedded in innovation management of cultural and creative industrial park", Edited by Guangdong Wu, *Discrete Dynamics in Nature and Society*, Vol. 2021, pp. 1-12, doi: 10.1155/2021/9574223.

Jaiman, V., Pernice, L. and Urovi, V. (2022), "User incentives for blockchain-based data sharing platforms", *PLoS One*, Vol. 17 No. 4, e0266624, doi: 10.1371/journal.pone.0266624.

Jutel, O. (2022), "Blockchain humanitarianism and crypto-colonialism", *Patterns*, Vol. 3 No. 1, 100422, doi: 10.1016/j.patter.2021.100422.

Kawabata, M.K. and Camargo, A.S. (2023), "E-Government innovation initiatives in public administration: a systematic literature review and a research agenda", *Administration and Society*, Vol. 55 No. 9, pp. 1758-1790, doi: 10.1177/00953997231185847.

Khomami, N. (2021), "British Museum enters world of NFTs with digital Hokusai postcards", *The Guardian*, 24 September, available at: https://www.theguardian.com/technology/2021/sep/24/british-museum-nfts-digital-hokusai-postcards-lacollection

Miguel-de-Bustos, J.C. and Izquierdo-Castillo, J. (2021), "Public service Media and blockchain technology: first thoughts", in Túñez-López, M., Campos-Freire, F. and Rodríguez-Castro, M. (Eds), *The Values of Public Service Media in the Internet Society*, Springer International Publishing, pp. 93-110, doi: 10.1007/978-3-030-56466-7_6.

NEMO (2019), "American alliance of museum's 2019 museum trend forecast, NEMO - the network of European museum organisations", available at: https://www.ne-mo.org/news-events/article/american-alliance-of-museum-s-2019-museum-trend-forecast

Tartan, C. (2023), "Blockchain-based welfare distribution model for digital inclusivity", *The Region*, Vol. 10 No. 1, pp. 19-44, available at: doi: 10.18335/region.v10i1.434.

Tricco, A.C., Lillie, E., Zarin, W., O'Brien, K.K., Colquhoun, H., Levac, D., Moher, D., Peters, M.D., Horsley, T., Weeks, L., Hempel, S., Akl, E.A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M.G., Garritty, C., Lewin, S., Godfrey, C.M., Macdonald, M.T., Langlois, E.V., Soares-Weiser, K., Moriarty, J., Clifford, T., Tunçalp, Ö. and Straus, S.E. (2018), "PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation", *Annals of Internal Medicine*, Vol. 169 No. 7, pp. 467-473, doi: 10.7326/M18-0850.

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