Highlights of GAO-22-104625, a report to congressional requesters

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TECHNOLOGY ASSESSMENT

Blockchain

Emerging Technology Offers Benefits for Some Applications but Faces Challenges

Why GAO did this study

Economies rely on central authorities and trusted intermediaries to facilitate business transactions. Blockchain is a technology that could reduce the need for such entities while establishing a system of verification. It might therefore improve a variety of financial and non-financial applications. However, the use of blockchain technologies raises a variety of ethical, legal, economic, and social concerns.

GAO was asked to conduct a technology assessment on the use of blockchain, with an emphasis on foresight and policy implications. This report discusses (1) non-financial applications of blockchain, including potential benefits and challenges, (2) financial applications of blockchain, including potential benefits and challenges, and (3) policy options that could help enhance benefits or mitigate challenges of blockchain technologies.

GAO assessed blockchain applications developed for or used in finance, government, supply chain management, and organization management; interviewed a range of stakeholder groups including government, industry, academia, and a venture capital firm; convened a meeting of experts in collaboration with the National Academies of Sciences, Engineering, and Medicine; and reviewed key reports and scientific literature. GAO is identifying policy options in this report.

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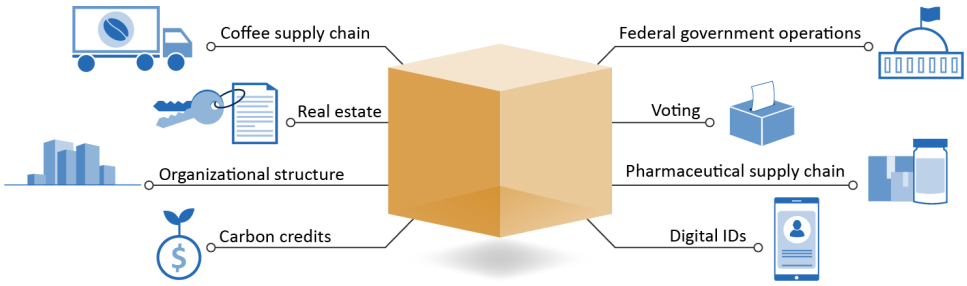
What GAO found

Blockchain combines several technologies to provide a trusted, tamper-resistant record of transactions by multiple parties without a central authority such as a bank. Blockchain can be used for a variety of financial and non-financial applications, including cryptocurrency, supply chain management, and legal records. GAO found that blockchain is useful for some applications but limited or even problematic for others. For example, because of its tamper resistance, it may be useful for applications involving many participants who do not necessarily trust each other. But it may be overly complex for a few trusted users, where traditional spreadsheets and databases may be more helpful. Blockchain may also present security and privacy challenges and can be energy-intensive.

Blockchain has a wide range of potential non-financial uses (see figure).

Blockchain has many potential non-financial applications



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For example, it could be used to organize supply chains, create less hierarchical organizations, and document title registries for real estate. However, most such efforts are not yet beyond the pilot stage and face challenges. For example, most blockchain networks are not designed to be interoperable and cannot communicate with other blockchains. Organizations that want to use blockchain also face legal and regulatory uncertainties, and have found it difficult to find skilled workers to implement blockchain.

Financial applications of blockchain have the potential to reduce costs and improve access to the financial system, but they also face multiple challenges. Cryptocurrencies, likely the most widely known application, are a digital representation of value protected through cryptographic mechanisms, which facilitates payments. Some are known for volatility (i.e., frequent or rapid changes in value), but a type known as stablecoins may help reduce this risk. Similarly, an emerging area known as decentralized finance offers services such as blockchain-based lending and borrowing, which also face several challenges. For example, blockchain-based financial applications can facilitate illicit activity, may reduce consumer and investor protections compared to traditional finance, and, in some cases, are subject to unclear and complex rules.

GAO developed four policy options that could help enhance benefits or mitigate challenges of blockchain technologies. The policy options identify possible actions by policymakers, which may include Congress, federal agencies, state and local governments, academic and research institutions, and industry. In addition, policymakers could choose to maintain the status quo, whereby they would not take additional action beyond any current efforts. See below for details of the policy options and relevant opportunities and considerations.

Policy Options That Could Help Enhance Benefits or Mitigate Challenges of Blockchain Technologies

	Opportunities	Considerations
Standards (report p. 38) Policymakers could collaborate to unify standards that focus on the development, implementation, and use of blockchain technologies.	• Could simplify fragmented standards and help identify gaps and reduce overlap in standard-setting efforts. • Could identify the areas in which standards would be most beneficial across different sectors of the economy or applications of blockchain. • Could help address challenges around interoperability and data security.	• Could require consensus from many public- and private-sector stakeholders, which can be time- and resource-intensive. • May not be clear which entities should take the lead in establishing internationally recognized standards for different technologies and application areas. • May require new funding or reallocation of existing resources to support new efforts.
Oversight (report p. 39) Policymakers could clarify existing oversight mechanisms, including regulations, or create new mechanisms to ensure appropriate oversight of blockchain applications.	• Clear, industry-specific U.S. oversight frameworks could offer the clarity needed for individuals and firms to more successfully engage in blockchain-related commerce in the U.S. • Policymakers, including regulatory entities and developers, could use tools to create oversight mechanisms in addition to testing innovative products and services. • Could provide coordinated and timely clarity to promote safety and soundness, consumer protection, and compliance with applicable laws and regulations to combat illicit activity in blockchain-related commerce.	• Policymakers will need to determine the appropriate level of oversight. Aggressive oversight could hamper innovation and competition as the technology matures, whereas too little oversight could leave consumers and businesses unprotected. • Soliciting input across a range of stakeholders in various sectors may be time consuming and challenging. • May require new funding or reallocation of existing resources.
Educational materials (report p. 40) Policymakers could support the development of educational materials to help users and regulators better understand blockchain technologies beyond existing financial applications.	• Could enable instructors to train a workforce skilled in developing, implementing, and using blockchain-based products. • Could increase consumer literacy and help reduce negative public perceptions of blockchain. • Could stimulate critical thinking and innovation, as well as prompt innovative research and development. • Could help prepare policymakers to better use and regulate the latest technologies.	• Educational materials will likely need to be tailored to meet a wide variety of learning needs across multiple target audiences. • May be difficult to identify who could most effectively create educational materials for any particular target audience. • May require new funding or reallocation of existing resources, especially to address the need for education regarding innovative uses of blockchain beyond existing financial applications.
Appropriate uses (report p. 41) Policymakers could support activities designed to determine whether blockchain is appropriate for achieving specific missions and goals or to mitigate specific challenges.	• Actively investigating where and when blockchain would be the most useful could allow entities to capture the full benefits the technology might offer. • Supporting blockchain use, where appropriate, could enhance transparency and accountability of existing systems and services.	• Legal or regulatory uncertainty may hinder some potential users from benefitting from blockchain. • Could be difficult to revert to a non-blockchain technology once an entity has invested a significant amount of time and resources. • May require new funding or reallocation of existing resources.

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