



Report

Assessing the Potential to Improve Grants Management Using Blockchain Technology

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MITRE

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INTRODUCTION

In October 2018, MITRE, which operates the U.S. Treasury Department's Federally Funded Research and Development Center (FFRDC), began working with a number of government agencies, including the Departments of Education, Health and Human Services, and Housing and Urban Development; the National Science Foundation; Office of Management and Budget; and Treasury Bureau of Fiscal Service, to assess the potential to improve grants management by using blockchain technology.

In addition to working with leaders from these agencies who were advisors to the study, MITRE interviewed agency personnel who work in grants management, financial management, and Inspector General offices and a number of grant recipients in the public and private sectors, including state government agencies, public and private universities, community-based service organizations, and a tribal nation.

MITRE's role was that of an independent third party with knowledge of government grants management and financial management, and blockchain technologies. We designed, conducted, and funded this study ourselves, without financial support from the Federal government or any other entity involved in the grants or financial management processes or vendors of blockchain technologies. MITRE is a not-for-profit organization chartered in the public interest to address issues of national importance. Through public-private partnerships and the federally funded R&D centers we operate, we work across government to tackle challenges to the safety, stability, and well-being of our nation.

Our expertise is in "systems of systems" thinking and the interrelationship between technology and people. The MITRE team for this effort brought expertise in grants and financial management, and blockchain technologies, and human and organizational systems, with experience researching and designing actionable strategies that consider the human aspects of any system or transformational initiative.

This report is intended to provide our perspective on the key takeaways from the study we conducted in conjunction with these Federal agencies and grant recipients, identify the challenges and opportunities that emerged from this study, and provide a set of recommended actions for the government to consider, aligned with the intent and vision of improving grants management for both the Federal agencies and grant recipients.

STUDY SUMMARY

In brief, our study results support the hypothesis that improvements in grant management for both Federal agencies and grant recipients can be enabled through the use of blockchain technology. The primary benefit to Federal agencies was improved decision making through improved transparency, quality, and timeliness of grant financial and performance information. The primary benefit to grant recipients was reducing redundant reporting to multiple grantmaking entities and auditors. Payment efficiency was a secondary benefit.

Achieving the identified benefits will require addressing the Actions Needed items identified by those we interviewed, as well as other actions to mitigate the challenges and barriers identified by the interviewees. Those most often cited were:

- Control of access to and protection of personally identifiable information (PII) and sensitive/proprietary information
- Need for artificial intelligence and analytics to make effective use of all the information
- Changes to regulations, policies, and procedures to clearly define responsibilities and accountabilities in a new business operating model where Federal and non-Federal grants management processes are more integrated

Five potential barriers were identified related to the impact on states based on the few states interviewed; the magnitude and extent of the impact across all states is not yet known.

Findings in three key communities are as follows:

Grants Management Community

- Reduces grant recipients' redundant reporting to multiple grantmaking entities and auditors

- Improves payment efficiency for second- and third-tier grant recipients
- Supports more informed decision making by Federal grantmaking entities
- Must be integrated with grantmaking and grant recipient entities' systems used to manage day-to-day grants management operations

Financial Management Community

- Improves transparency, quality, and timeliness of financial information
- Must be integrated with payment request and processing systems

Inspector General Community

- Improves ability to detect fraud, waste, and abuse
- Improves ability to efficiently conduct audits

Based on our study results, we developed recommendations should the Federal government seek to pursue implementation of the proposed grants management business operating model and a Distributed Grants Ledger solution based on blockchain technology.

We recommend the Federal government set up a grants management blockchain demonstration project, or proof of concept. A demonstration project would test a subset of Benefits and further explore a subset of Actions Needed, Challenges, and mitigation actions and engage a consortium of Federal, public, and private sector grantmaking and grant recipient entities to evaluate the results.

We recommend that in parallel with a demonstration project, the Federal government initiate further analysis of complex challenges and barriers and determine the magnitude and the extent of the state-related Barriers. In addition, the Federal government should, also in parallel, prioritize, sequence, and further analyze Actions Needed and mitigation actions identified by the study to ensure successful adoption of the proposed business operating model and blockchain technology.

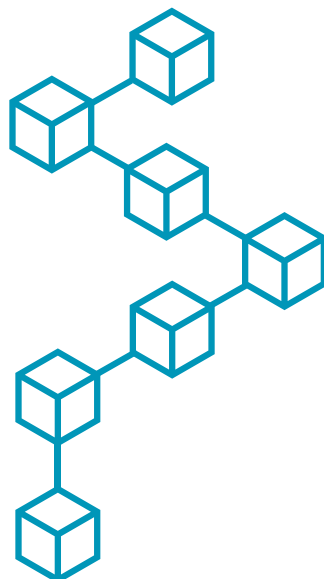
STUDY PURPOSE

The purpose of the MITRE study was to explore the hypothesis that improvements in grants management for both Federal agencies and grant recipients could be enabled by implementing a blockchain-based solution: a Distributed Grants Ledger. The MITRE study identified:

- Impacts to grants management functions/activities related to grant payment processing, spending information sharing, and performance information sharing
- Impacts to financial management functions/activities performing grant payment processes and reporting payment disbursement information
- Business, organizational, programmatic, economic, technical, and operational impacts on Federal agency and grant recipient entities overseeing, managing, or using the Distributed Grants Ledger

OUR APPROACH

To get a full picture of the grants management and whether utilizing a blockchain-based solution would improve grants management, we engaged and interviewed experts from all sectors and aspects of the grants and financial management processes. We interviewed and consulted with Federal agencies, the Inspector General community, and first-, second-, and third-tier grant recipients which included state government agencies, public and private universities, community-based service organizations, and a tribal nation. Interviewees ranged from subject matter experts in grants management and payment processing, to those with expertise in blockchain solution design and implementation.



What Is Blockchain?

Blockchain is a way of recording transactions – typically financial transactions – into an electronic ledger that is decentralized and replicated. That means the information is not controlled at a single central point. This decentralized ledger is open and distributed, which allows anyone with proper access permissions to the ledger to view it.

Each transaction has one or more addresses (“to” and “from” endpoints for the transaction) and a recording of what happened. Each transaction is digitally signed.

Transactions are grouped together into a block, along with a cryptographic hash (unique key) of the previous block. A new hash is created for each new block and recorded within the block’s header data as well as within the next block.

Why is this distributed, decentralized ledger called a blockchain? Because each block is chained to the previous block in the chain by adding the hash of the previous block to the header of the new block.

Who gets to read or write to these blocks? Some blockchain systems are permissionless, meaning anyone can read and write to them. Other implementations limit participation to specific people or organizations, and provide finer-grained controls. But in all cases, transactions are recorded so that the participants in the network can see and independently verify the validity of the transactions.

Who manages a blockchain? A blockchain’s information is accessed and/or updated using one or more “nodes.” These nodes may be managed by a central entity or separately by multiple entities that have a documented agreement of how they will jointly manage the blockchain and its nodes.

Launching

MITRE followed a disciplined analytical process to formulate study conclusions and recommendations.

We launched the study in October of 2018 by:

- Establishing an Executive Advisory Group and Working Group with participants from the Departments of Education, Health and Human Services, and Housing and Urban Development; the National Science Foundation; Office of Management and Budget; and Treasury Bureau of Fiscal Service
- Documenting study **Objectives, Assumptions, and Constraints** (OACs) and validating them with the Executive Advisory Group and the Working Group
- Documenting a hypothetical new business operating model using business use cases (user stories) that were based on the Federal grants management and financial management function/activity lists and blockchain capabilities

Interviewing and Documenting

From November 2018 through January 2019, MITRE conducted interviews and documented findings. This included:

- Developing interview pre-read materials and interview guide using the OACs, business use cases, impact categories and questions, and grant recipient award/funding profile information.
- Interviewing more than 25 Federal agency grants and financial management subject matter experts, numerous members of the Inspector General community, and three Federal agencies implementing blockchain solutions.
- Interviewing more than 30 grants and financial management professionals from 10 first-, second-, and third-tier grant recipient entities including four universities, three community-based service organizations, agencies in two states, and a tribal nation. Documenting findings based on interviewee impact inputs.

Objectives, Assumptions, and Constraints of the Study

Objectives

Implementing a Distributed Grants Ledger among the grantmaking and grant execution entities may have the potential to:

Objective 1 – Improve timeliness of grant payments to the final grant recipient when the grantmaking process involves multiple tiers of granting.

Objective 2 – Improve transparency into and quality and timeliness of grant payment information for Federal agencies, other grantmaking entities, and the public.

Objective 3 – Improve transparency into and quality and timeliness of grant recipient spending information (i.e., what the payment was used to acquire).

Objective 4 – Improve transparency into and quality and timeliness of grant recipient performance information (i.e., what was accomplished with the funds spent).

Objective 5 – Improve internal controls over grant payments, thereby reducing improper payments (fraud, waste, and abuse) and improving grant closeouts.

Assumptions

Assumption 1 – Ability to write to the Distributed Grants Ledger will be limited to grantmaking and grant recipient entities.

Assumption 2 – The grant award documentation will not be stored in the Distributed Grants Ledger, but may be accessible from linked Grants Documentation Repositories.

Assumption 3 – If required, intermediate grantmaking entities will have successfully posted their grant recipient award and payment approval information to the Distributed Grants Ledger before the Federal government disburses grant payments to the final grant recipient.

Assumption 4 – Intermediate grant recipients who select and award grants to sub-award recipients could also be considered final grant recipients when a portion of the funds disbursed to the intermediate grant recipient are used to execute a portion of the grant's overall purpose (e.g., a Federal agency disburses \$100,000 to a state that uses \$10,000 to partially cover the salary of a state program administrator overseeing multiple local nonprofit organizations that receive the remaining \$90,000 to execute their programs).

Analyzing and Developing Conclusions

In January and February 2019, MITRE analyzed the findings and developed conclusions. This included:

- Analyzing the business, organizational, programmatic, economic, technical, and operational impacts of the hypothetical new business operating model that uses a blockchain-based Distributed Grants Ledger and supporting Grants Documentation Repositories
- Identifying potential mitigation actions to address impact challenges and barriers
- Developing evidence-based conclusions and recommendations derived from the analysis of the findings

Completing the Study

MITRE completed the study in March of 2019. This involved:

- Reviewing study findings, analysis, conclusions, and recommendations with Executive Advisory and Working Group members and incorporating feedback
- Issuing a final report with recommendations on next steps

Assumption 5 – Reporting of grant recipient performance information will focus on reporting performance outputs (e.g., number of school children fed a healthy breakfast) not outcomes (e.g., improvement in academic performance).

[NOTE: During the course of the study, we found that both could be captured using the Grants Documentation Repositories in conjunction with the Distributed Grants Ledger.]

Assumption 6 – The grantmaking and grant recipient entities and the public will be able to read the Distributed Grants Ledger and Grants Documentation Repositories; grantmaking and grant recipient entities have no objection to public visibility into grant recipient award, payment, performance, and financial reports, and grant closeout information.

[NOTE: During the course of the study, we found that both grantmaking and grant recipient entities would require some limitations on the access of information in the Grants Documentation Repositories and the Distributed Grants Ledger by the public and other grant recipients not party to the grant award.]

Assumption 7 – The Distributed Grants Ledger nodes may be managed by multiple Federal and non-Federal entities.

Assumption 8 – If necessary, grants management and financial management regulations, policies, and/or guidance may be changed to enable successful adoption and effective management of the Distributed Grants Ledger.

Assumption 9 – Resolving design, development, deployment, and solution operations issues will be addressed in the next phase should the Federal government seek to pursue a Distributed Grants Ledger.

Assumption 10 – The Distributed Grants Ledger will not replace grantmaking or grant recipients' operational grants management and financial management systems.

Assumption 11 – The Distributed Grants Ledger will not replace Federal government financial processes and supporting systems that perform funds disbursement.

Assumption 12 – Information posted to the Distributed Grants Ledger will be consistent with the Federal Integrated Business Framework standard data elements defined for Grants Management and Federal Financial Management.

Constraints

Constraint 1 – The Distributed Grants Ledger cannot create technology barriers for grant recipients seeking to participate in Federally funded grant programs.

Constraint 2 – The Distributed Grants Ledger cannot include the use of cryptocurrency to disburse funds.

HOW GRANTS MANAGEMENT COULD UTILIZE BLOCKCHAIN TECHNOLOGY

Using blockchain technology to implement a Distributed Grants Ledger for grants management and payment processing could enable changes in several key processes of the typical grants management business operating model.

To understand the difference, let's use the scenario of multi-tier block grants management and compare how it works today with how it could work using a Distributed Grants Ledger based on blockchain technology.

Current State

In its simplest form, today, a Federal agency will award a grant and disburse funds to an administering agency, perhaps a state agency, whose job is to award grants to

community-based service organizations. The Federal government disburses the funds to the state agency for the entire amount of the grant award, including administrative monies so the state agency can do its work. The state agency, in turn, is expected to sub-award and disburse funds from the sub-award (not including the state agency's administrative costs) to the community-based service organization.

In a multi-tier granting process such as this, the Federal agency cannot typically see when, to whom, and for what purpose the grant was awarded and funds were disbursed by the state agency. It also cannot see when and how the community-based service organization that received the grant funds is using the funds, and it cannot see what was accomplished using the funds.

From the grant recipient perspective, the current state is burdensome and overly complex. Many grant recipients execute their programs and services using funding from multiple grantmaking entities. In return, they must report their financial and performance information back to each entity that funded them as well as their auditor, often in different formats and using different methods/systems specified by each grantmaking entity. Similarly, auditors

Figure 1. Current State

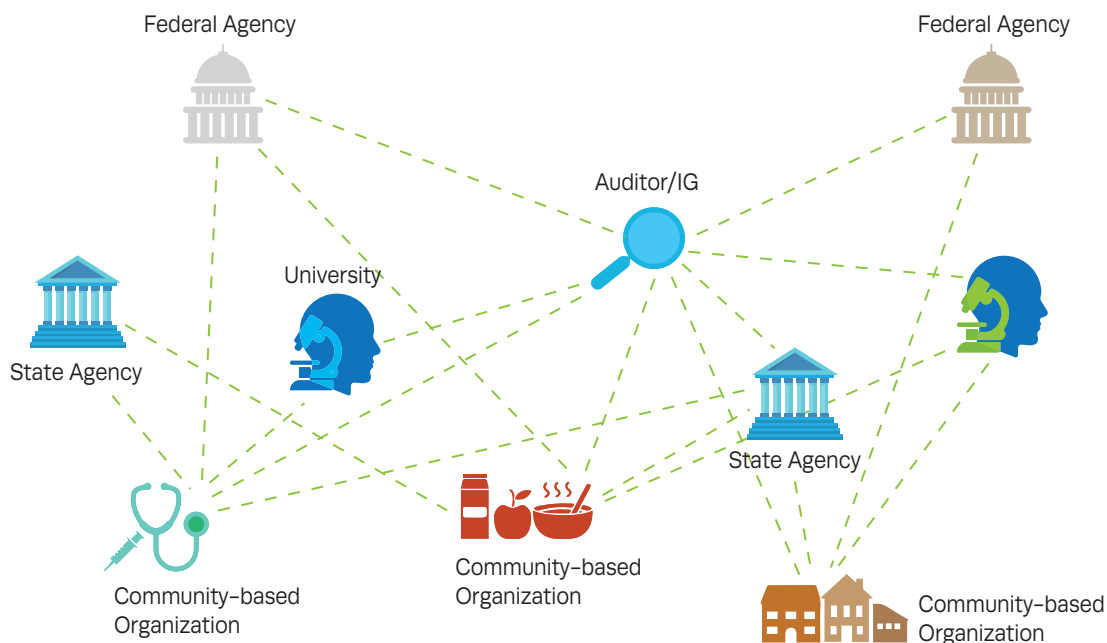
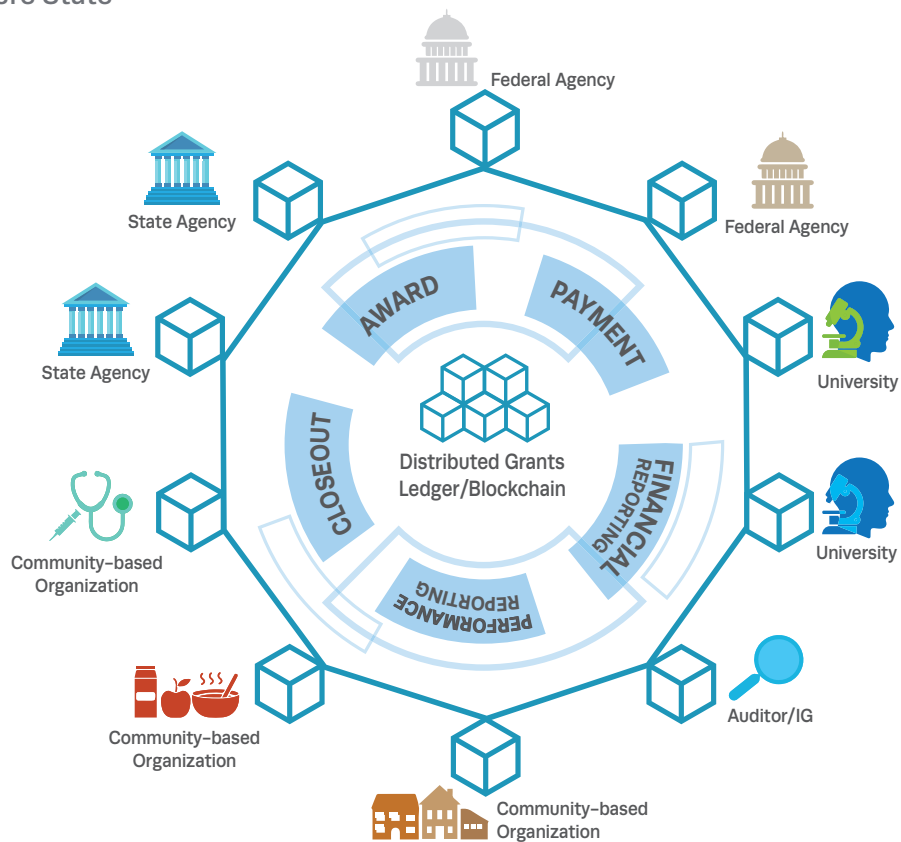


Figure 2. Future State



and agency Inspector Generals (IGs) have a myriad of information formats and methods/systems to learn and use to conduct audits or inspections.

Future State

In a future state grants management business operating model that makes use of a blockchain-based Distributed Grants Ledger, the Federal agency, the state agency, and the community-based service organization would all have access to, and be expected to record details of their key actions during the grant process into, the blockchain-based Distributed Grants Ledger. Because they all have access to that centralized ledger, each organization could see information posted by the other organization. Each organization in the grants process could see when, to whom, and for what purpose grant awards are issued and funding is disbursed; and when and how the funding is being used; and what was accomplished with the funding through the posting of financial and performance information to the Distributed Grants Ledger.

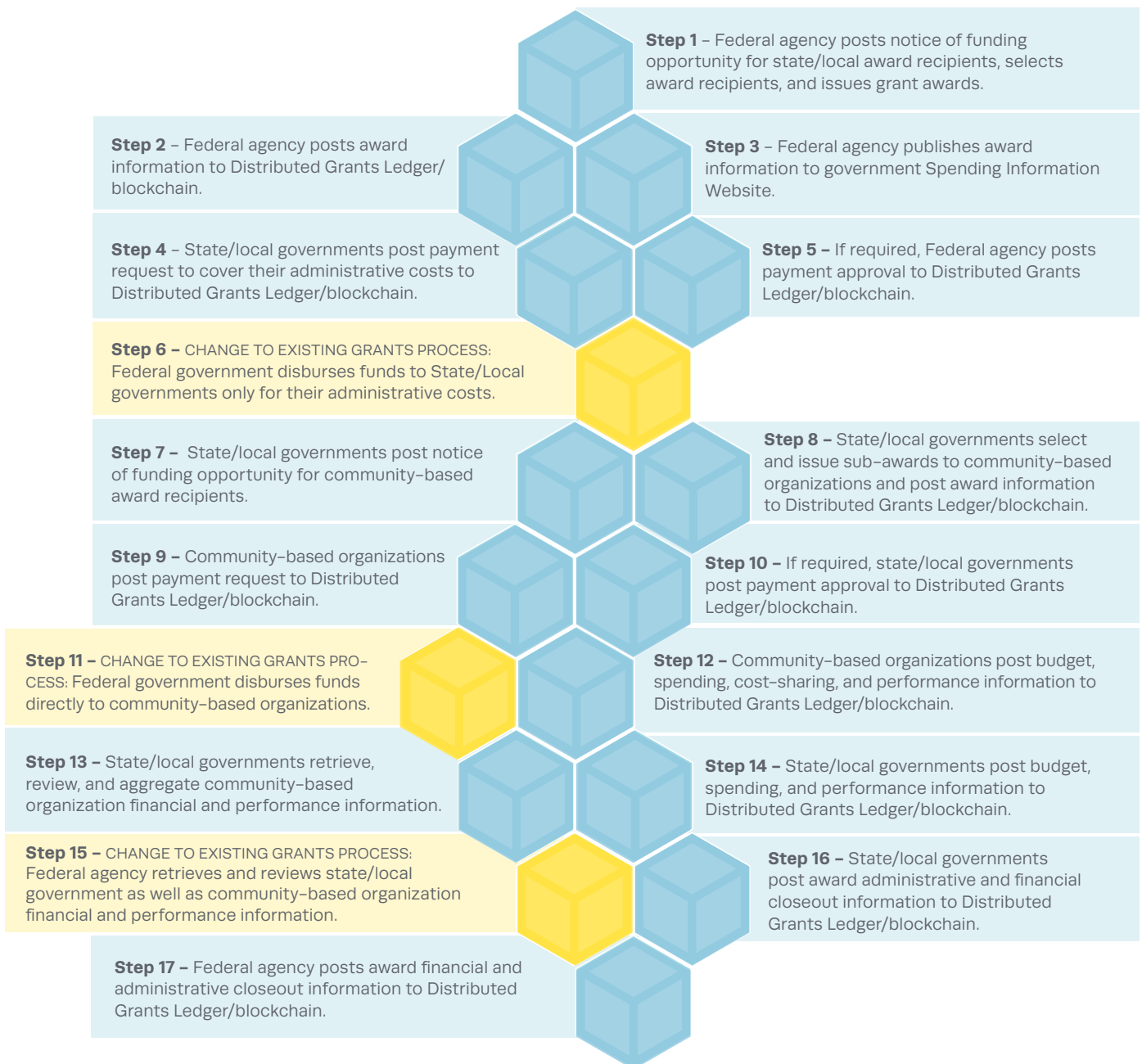
In addition, in the future state business operating model

the Federal agency would disburse to the state agency only the portion of the Federal grant award funds that the state agency needs to cover its administrative costs. Once the state agency issues the grant sub-award to the community-based organization and the community-based organization requests funds disbursement, the Federal agency will disburse directly to the community-based organization the portion of the sub-award funds it needs to carry out its services.

It is important to also note what would not change in the future state business operating model. The Federal agency would still issue an award for the full amount of the grant to the state agency and maintain its contractual relationship with the state agency. The state agency would still select the community-based service organization(s) to receive the grant sub-award; determine the sub-award terms, conditions, and amount; and maintain its contractual relationship with the community-based service organization. Existing policies on review and/or approval of payment (funds disbursement) requests, providing financial and performance reporting information, and closing out awards could still be followed.

PROPOSED BUSINESS OPERATING MODEL USING DISTRIBUTED GRANTS LEDGER/ BLOCKCHAIN TECHNOLOGY

Multi-Tier Block Grant Example



STUDY FINDINGS

Grantmaking Entity and Grant Recipient Input

The study documented the Benefits, Challenges, Barriers, and Actions Needed, based on input from those interviewed from Federal agencies, the Inspector General community, and first-, second-, and third-tier grant recipients.

The definition of **benefits, challenges, barriers, and actions needed** are as follows:



BENEFITS are positive impacts on business processes, organization, governance, economics, systems, and/or operations



CHALLENGES are negative impacts that would require considerable effort to overcome to achieve benefits



BARRIERS are impacts for which a mitigation action has not yet been identified or only partially addresses the identified issue

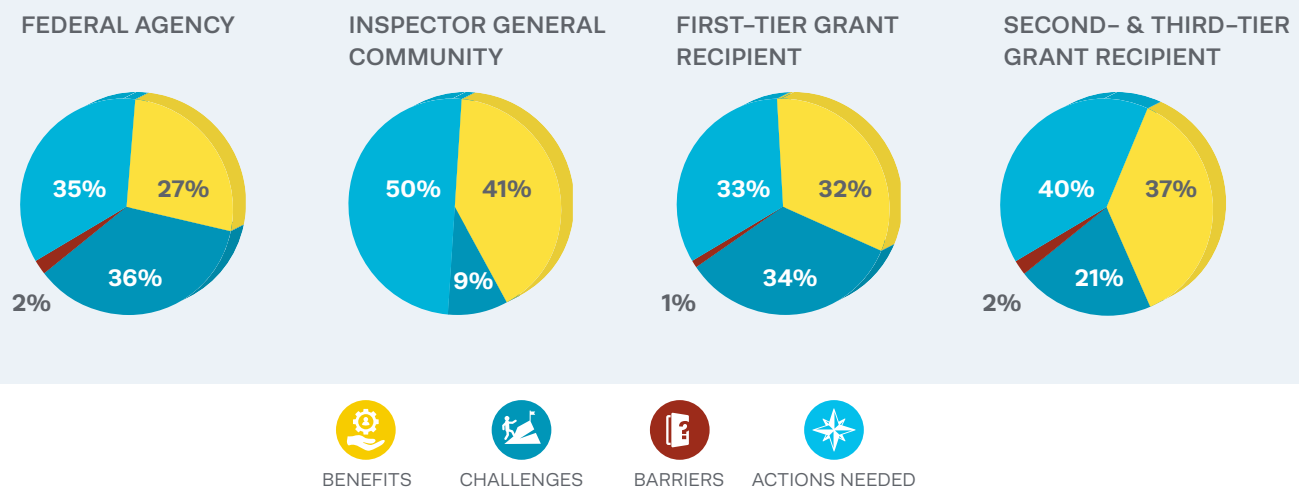


ACTIONS NEEDED are activities that would need to be undertaken to achieve benefits

Overall interviewee impact inputs were fairly evenly divided between Benefits and Challenges while Actions Needed were somewhat higher. Five potential Barriers were identified.

Figure 3 below presents a summary of impact input by entity type. The second- and third-tier grant recipient entities and Inspector General community identified more Benefit than Challenge impacts. In comparison, the first-tier grant recipient entities identified approximately equal Benefit and Challenge impacts, and Federal agencies identified fewer Benefit than Challenge impacts. All interviewee categories provided Actions Needed inputs nearly equal to their Benefit impact inputs. Potential Barriers were identified by both Federal agencies and grant recipient entities.

Figure 3. Overall Impact Input by Entity Type



Lessons Learned from Other Federal Agencies

Several Federal agencies have implemented or prototyped solutions based on blockchain technology. Three of the Federal agency blockchain initiatives are described below:

One Federal agency that received an Authority to Operate for an acquisition management solution in December 2018 is using distributed ledger technology, machine learning, and artificial intelligence to deliver real-time information on Federal acquisition pricing and terms and conditions from across its agency to procurement officers.

One government agency developed a prototype of a permissioned blockchain to aid with timely situational awareness of space debris.

One government agency has tested use of a permissioned blockchain to provide real-time awareness of shipping container positions and status to enable more effective coordination between multiple shipping providers.

Some lessons learned from the experience of these three Federal agencies and others we gathered in-formation from that are using blockchain technology include:

BENEFITS

- Provides enhanced data transparency and visibility to all participants with ability to mediate (limit) access to both the blockchain and associated document repositories. Overall value increases with full participation (e.g., completeness of data).
- Provides protection from node failure and malicious actors and the ability to function despite challenges (e.g., failure of a node due to maintenance issues or attack) if implemented using decentralization and consensus mechanisms.
- Provides highly tamper resistant record that is validated and unchangeable/unalterable except under rare circumstances.
- Uses open source software that enables rapid iteration and evolution of the blockchain nodes and continuous innovation when coupled with simple blockchain integration.

ACTIONS NEEDED

- Requires full commitment of participating organizations' leadership and functional areas.

- Requires developing new skills/competencies and methods for requirements definition, acquisition, development, and testing (i.e., a new type of systems development life cycle).
- Requires a configuration management approach that is integrated into the development testing, rollout, forking, testing, and governance to maintain consistency and ability to operate.
- Investigate options, identify constraints/requirements (e.g., service performance levels), and determine decentralization versus centralization approach for the solution architecture and management of the solution.
- Determine the type of permissioned blockchain (e.g., Tendermint, HyperLedger) to use, and evaluate options for use of smart contracts.
- Investigate integration with other technologies needed to manage blockchain information (e.g., databases, content management, identity and access control management).
- Develop a template and structure with clear definitions of stakeholder member roles and responsibilities, how to fund and where to run the blockchain nodes, and other matters concerning the blockchain (e.g., how to process transactions on the blockchain, roll out updates of blockchain software).
- Investigate means of integration with applicable agency systems. Develop means of integration for participants that lack the technical maturity and/or systems needed to participate in the solution.
- Investigate performance requirements for business processes that use the blockchain, and for associated user-driven activities.
- Investigate the data and computing impact to stakeholders' back-office systems (e.g., elimination of redundancy, automatic triggers, new processes).

CHALLENGES

- Establishing a repeatable, institutionalized accreditation method to avoid repeated use of ad hoc and potentially lengthy accreditation methods for initial deployment, and each update of blockchain nodes. Mitigate this challenge by starting on day one to work with the Office of the Chief Information Officer and other relevant stakeholders.
- Establishing a funding approach that works across stakeholders to support evolution of the blockchain

solution. Mitigate this challenge by exploring the use of Federal agency Working Capital Funds and/or stakeholder contributions to the organizations that take the lead on development and sustainment of the blockchain solution.

- May be subject to International Traffic in Arms Regulations and export licenses if reading and writing transactions to the blockchain is extended to international organizations. Mitigate this challenge by working with relevant stakeholders to analyze the impact of the addition of government-specific software to the base open source permissioned blockchain software.
- With enough strength, quantum computers have the ability to compromise the cryptography of a blockchain (i.e., the protocols, algorithms, and codes that keep information confidential and make changes to data evident as well as to authenticate users). Mitigate this challenge by assigning an organization the responsibility for monitoring and periodically auditing the blockchain operations.

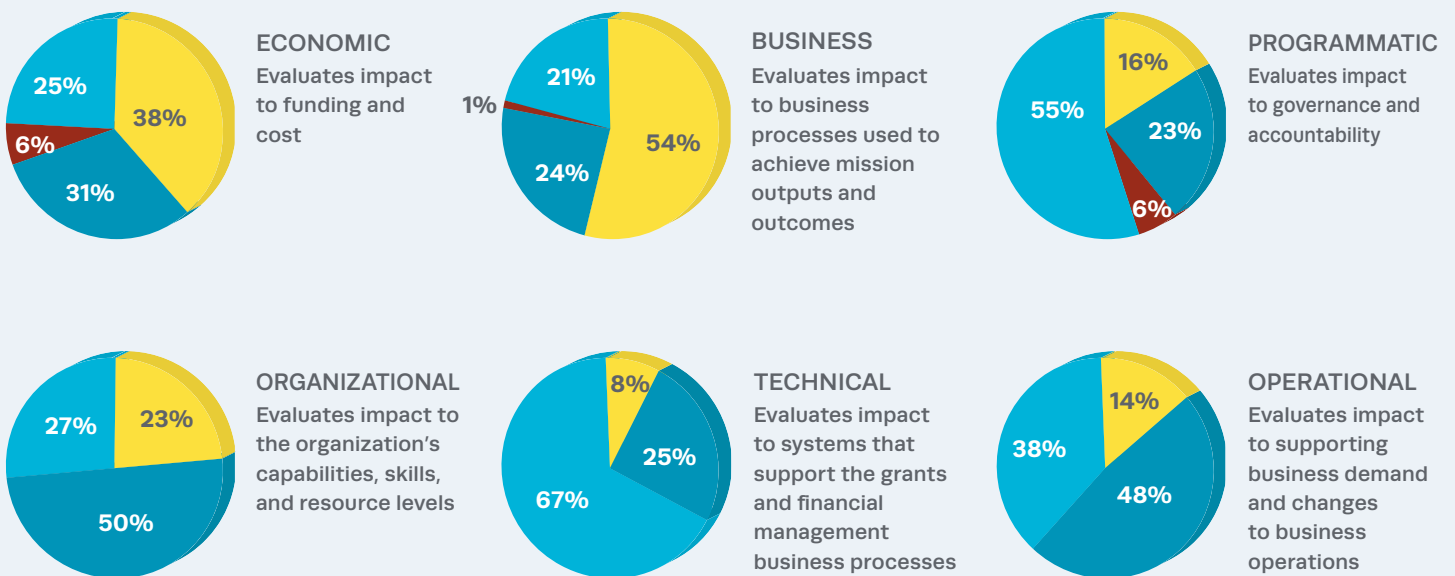
OUR ANALYSIS

We analyzed interviewee inputs in six Impact Categories – Business, Organizational, Programmatic, Economic, Technical, and Operational. Figure 4 below presents the definitions and overall impact input by category. Inputs in each category were then evaluated by impact type (Benefit, Challenge, Barrier, or Action Needed). Challenges and Barriers were further analyzed to identify potential mitigation actions to overcome or lessen their impacts.

Impacts to business processes dominated interviewee inputs and largely reflected positive benefits from the new business operating model enabled by blockchain technology. However, to achieve the benefits, interviewees identified numerous organizational and operational challenges and many programmatic and technical actions needed.

Potential barriers were identified by interviewees in the business, programmatic, and economic Impact Categories. Potential mitigation actions were able to be identified for each Barrier, however, some may only partially mitigate the Barrier.

Figure 4. Overall Impact Input by Category



BENEFITS



CHALLENGES





BARRIERS



ACTIONS NEEDED

Table 1. Benefits, Challenges, Barriers, and Actions Needed involved in implementing the proposed business operating model enabled through use of blockchain technology

	 BENEFITS	 CHALLENGES
Business	<ul style="list-style-type: none"> ▪ Expedites receipt of payments to grant recipients by standardizing and streamlining processes for grant recipients across grantmaking entities (e.g., Federal agencies and states). ▪ Provides access to information that would enable more effective grants management and auditing, grants program oversight, and informed decision making by grantmaking entities. 	<ul style="list-style-type: none"> ▪ Inadvertent disclosure of PII or proprietary or sensitive information may negatively impact grant recipients if access to the information in the Distributed Grants Ledger and Grants Documentation Repositories is not restricted to grantmaking and grant recipient entities.
Organizational	<ul style="list-style-type: none"> ▪ Eliminates the need for grant recipients to learn and access multiple systems to submit grant information to each grantmaking entity. ▪ Reduces resources needed to post information in multiple grantmaking entity systems. 	<ul style="list-style-type: none"> ▪ Increased workload will occur from duplication of work between grants and financial management systems and the Distributed Grants Ledger and Grants Documentation Repositories unless there is the ability to implement automated interfaces. ▪ The public's access to and lack of understanding of more detailed grants information would increase grantmaking agencies' workload unless the information is organized and presented in a useful and meaningful way.
Programmatic	<ul style="list-style-type: none"> ▪ Forces better tracking of expenditures against grant awards and reduces risk by decreasing the number of times funds are transferred among grantmaking entities and accounts. 	<ul style="list-style-type: none"> ▪ Changes to the payment processes and availability of significantly more information could impact accountability unless regulatory and policy changes are implemented to ensure accountability for grant recipient management, oversight, and reporting are clearly defined.
Economic	<ul style="list-style-type: none"> ▪ Generates potentially significant savings for grant recipients if all Federal agencies were required to use the Distributed Grants Ledger and Grants Documentation Repositories. ▪ With data analytics and automation, would allow grantmaking entities to efficiently identify payment and spending anomalies (e.g., double billing, questionable expenses). 	<ul style="list-style-type: none"> ▪ Integrating grants management and financial management systems with the Distributed Grants Ledger and Grants Documentation Repositories would require a significant amount of effort and expense and could be cost prohibitive for some grant recipient entities unless they receive assistance/services from the Federal government.
Technical	<ul style="list-style-type: none"> ▪ Simplifies grant recipient processes for payment and documentation submission by creating a single system interface. 	<ul style="list-style-type: none"> ▪ Linking grant recipient systems to the blockchain may be difficult in instances where existing systems support other non-grant business and operational processes (e.g., in universities) and/or because of security policies (e.g., sovereign nations).
Operational	<ul style="list-style-type: none"> ▪ Provides near real-time access to grant information, including transactions and activities performed by prime and sub-award recipients. 	<ul style="list-style-type: none"> ▪ Ensuring grants management, financial management, Distributed Grants Ledger, and Grants Documentation Repositories remain in sync among partners when updates are needed will be difficult unless well organized and coordinated.



BARRIERS



ACTIONS NEEDED

- Those states that have already implemented centralized grants management solutions across all their state agencies may not participate because of their perception of little or no direct benefit to the State.

- Include an alternative payment approval process in the hypothetical new business operating model that eliminates pre-approval prior to advance payment “at will” drawdowns if the grant recipient has been designated as low risk.
- Include certification/attestation and posting confirmation processes in the hypothetical new business operating model to ensure validity and reliability of information posted to the Distributed Grants Ledger and Grants Documentation Repositories.

- Clearly define roles, responsibilities, and authorizations required for all participants posting and using information in the Distributed Grants Ledger and Grants Documentation Repositories.

- Strong political views that the Federal government should not interfere in state activities may not be able to be overcome by promoting benefits to the broader grants management community to key state and congressional committees.
- Some states have existing laws requiring that Federal funds be deposited in the state treasury and be appropriated by the state legislatures before awarding to grant recipients, and these laws may not be able to be amended.
- Under current Federal regulations, the Federal government may offer to provide services to states, such as a grant payment service; however states have no obligation to accept such an offer of service if they do not perceive any benefits to the state.

- Establish Federal grantmaking and payment service agencies’ and auditors’ commitment to use the Distributed Grants Ledger and Grants Documentation Repositories and not encumber grant recipients with separate duplicative requirements for submitting information.

- Some states cannot manage grant program budgets for funds they do not receive and would have to amend their budget preparation and execution policies and procedures.

- Determine how the blockchain will be paid for and how ongoing enhancements and operations and maintenance will be funded.

NOTE: These barriers were identified by the representative set of entities selected for the study interviews. The magnitude and extent of these specific barriers across all the states is not yet known.

- Establish automated connection points between the Distributed Grants Ledger, Grants Documentation Repositories, and existing grants management, financial management, and government-wide reporting systems (e.g., USASpending.gov) to facilitate synchronization of information.

- Define criteria and alternatives for small Federal grant recipient and sub-award recipient entities that lack the infrastructure and operational scale to fully participate in the blockchain solution.

CONCLUSIONS

The study findings support the hypothesis that improvements in grants management for both Federal agencies and grant recipients can be enabled through the use of blockchain technology. It could eliminate redundant reporting, increase payment efficiency, and result in improved transparency, quality, and timeliness of payment, financial, and performance information. Here's a breakdown of how it would affect different stakeholders in the grants management process:

Grants Management Community

- Reduces grant recipients' redundant reporting to multiple grantmaking entities and auditors
- Improves payment efficiency for second- and third-tier grant recipients
- Supports more informed decision making by Federal grantmaking entities
- Must be integrated with grantmaking and grant recipient entities' systems used to manage day-to-day grants management operations

Financial Management Community

- Improves transparency, quality, and timeliness of financial information
- Must be integrated with payment request and processing systems

Inspector General Community

- Improves ability to detect fraud, waste, and abuse
- Improves ability to efficiently conduct audits

Actions Needed to Reap Benefits

Achieving the identified Benefits will require addressing Actions Needed identified by the interviewees, as well as other actions to mitigate the Challenges and Barriers identified by the interviewees. Those most often cited were:

- Control of access to and protection of PII and sensitive/proprietary information
- Need for artificial intelligence and analytics to make effective use of all the information
- Changes to regulations, policies, and procedures to clearly define responsibilities and accountabilities

Five potential Barriers were identified related to the impact on states; the magnitude and extent of the impact across all states is not yet known.

“Improvements in grants management can be enabled through blockchain technology. It could eliminate redundant reporting, increase payment efficiency, and result in improved transparency, quality, and timeliness of payment, financial, and performance information.”

RECOMMENDATIONS

MITRE recommends the execution of a grants management blockchain demonstration project (proof of concept). This recommendation is based on:

- Study interviewees identified sufficient potential benefits to grantmaking entities as well as grant recipients to warrant further exploration.
- There was a strong interest expressed by several interviewees to participate in such an effort, including a Federal agency, a state, two universities, and one second- and one third-tier grant recipient.
- A demonstration project would provide the ability to validate a subset of Benefits and further explore a subset of Actions Needed, Challenges, and mitigation actions.

In parallel with a demonstration project, we recommend the initiation of further analysis of complex Challenges and Barriers.

- Determine the magnitude and extent of the identified Barriers to state participation and identify any additional potential mitigation actions.
- Prioritize, sequence, and initiate work on high-priority Actions Needed and potential mitigation actions for Challenges and Barriers.

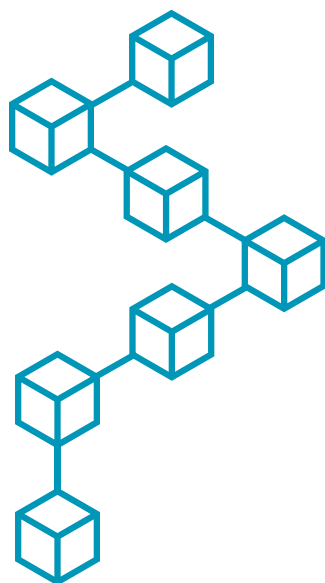
How to Design the Grants Management Blockchain Demonstration Project

We recommend the establishment of a consortium to govern, plan, fund, and assess the results of the Grants Management Blockchain Demonstration Project.

Ideally the consortium grantmaking and grant recipient members would include, at a minimum, two Federal grantmaking agencies; two states who receive grants from both participating Federal agencies; two universities, one private and one public, who receive grants from both participating Federal agencies, two–three second- or third-tier grant recipients that receive grants from the participating states or universities. The consortium members should also include, at a minimum, the Treasury Bureau of Fiscal Service (payment processing expertise) and Treasury FFRDC (engineering expertise, independent assessment).

The design and execution of the demonstration project should focus on:

- Validating key Benefits and identifying any additional capabilities needed to achieve additional Benefits (even if all capabilities are not developed as part of the demonstration project)
- Exploring high-priority Actions Needed and mitigation actions for Challenges, such as:
 - Integration of certifications/attestations and security/privacy controls into the Distributed Grants Ledger and Grants Documentation Repositories
 - Technologies to automatically detect anomalies in Distributed Grants Ledger and Grants Documentation Repositories information (e.g., duplicate payment requests, questionable expenses per award terms and conditions, presence of personally identifiable information)



“Study interviewees identified sufficient potential benefits to grantmaking entities as well as grant recipients to warrant further exploration. There was a strong interest expressed by several interviewees to participate in a demonstration project, including a Federal agency, a state, two universities, and one second-tier and one third-tier grant recipient.”

Further Analyses Needed

To determine the magnitude (percentage of Federal grant funding) and the extent (number of States impacted) for the state-related Barriers, we recommend the following:

- Identify and document extent to which states have implemented centralized grants management solutions for the grants management activities relevant to the new business operating model.
- Identify and analyze state laws that require Federal award funds to flow through the state treasury and be appropriated by state legislatures before they are awarded.
 - Identify amendments to existing laws that would be needed.
 - Identify changes to budget preparation and execution policies and procedures.

We also recommend further exploring the reluctance to sharing of Federal–state grants management information and use of Federal services.

- Identify and characterize Federal congressional oversight committee and state government resistance.
- Explore further state interest in a grants payment service offered by the Federal government.

Finally, we recommend prioritizing, sequencing, and initiating work on high-priority actions that are needed and potential mitigation actions for the challenges and barriers identified in this report. Here’s how we recommend this be achieved:

- Identify and document needed changes to Federal regulations and policy (e.g., Uniform Guidance, Treasury–state Agreements, Federal Funding Accountability Act, Schedule of Expenditures of Federal Awards, Federal Financial Report [SF–425]), including clarifications to roles/responsibilities and accountabilities for grants management activities.
- Determine appropriate business information content and level of detail to be posted to the Distributed Grants Ledger and Grants Documentation Repositories and provided to the public.
- Determine architectural and security design for Distributed Grants Ledger and Grants Documentation Repositories, including:
 - Degree of centralization/decentralization of Distributed Grants Ledger (e.g., number and type of nodes)
 - Other enabling technologies to be integrated with Distributed Grants Ledger and Grants Documentation Repositories (e.g., database/document storage, Login.gov, microservices)
 - Integration approaches with grants management, financial management, and government–wide reporting systems
 - Security considerations to achieve Authorization to Operate.
- Explore alternatives for governance and funding of Distributed Grants Ledger and Grants Documentation Repositories.
- Explore alternatives for providing access to grant recipients unable to implement automated connections to Distributed Grants Ledger and Grants Documentation Repositories.

LOOKING AHEAD

The President's Management Agenda (PMA) published in March 2018 established Cross Agency Priority (CAP) Goal #8, Results Oriented Accountability for Grants, which, if achieved, will "improve data collection in ways that will increase efficiency, promote evaluation, reduce reporting burden, and benefit the American taxpayer." Achieving this goal will require changes to the current grants management business operating model and new technologies that enable the changes. Decentralized grant processing and information creation is inherent in the grants management ecosystem of Federal agencies, state and local governments, tribal nations, universities, and community-based service organizations. Blockchain technology's characteristics are well suited to this decentralized ecosystem. When combined with other technologies that address information security, privacy, analytics, and document management, and the programmatic, organizational, and economic activities that enable successful adoption, blockchain technology has the potential to be an effective enabler of the changes needed in the grants management business operating model to achieve the PMA CAP Goal for grants.

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