BLOCKCHAIN FOR THE HUMANITARIAN SECTOR: FUTURE OPPORTUNITIES

DH Network
Digital Humanitarian Network

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KEY MESSAGES

- The blockchain is a type of distributed database hosted across a network of multiple participants. Moreover, the blockchain provides a way to share information and transfer digital assets in a fast, tracked and secure way.
- The blockchain has the potential to transform the humanitarian sector by providing cost savings and traceability of information flows, and by reducing transaction times.
- Originally created to transfer financial value, the blockchain is now viewed as having the potential to be an efficient and secure way to transfer or share any type of information or asset.
- Humanitarian practitioners should understand that blockchain technology can be applied to humanitarian challenges, but it is not a separate humanitarian innovation in itself.
- When layering applications, such as smart contracts, on top of the blockchain, its full potential can be realized.
- In the humanitarian sector, some potential use cases for blockchain technology are in information management, identification, supply chain tracking, cash programming and humanitarian financing.
- Since blockchain technology can offer solutions to existing humanitarian challenges, it may be wise to begin studying its impact and experimenting with future implementation.

INTRODUCTION

The blockchain is a **type of distributed database hosted across a network of multiple participants.** Moreover, the blockchain provides a **way to share information and transfer digital assets in a fast, tracked and secure way.** Originally created to enable the digital currency Bitcoin, blockchain technology has garnered attention by creating new opportunities beyond currency for organizations in all sectors, including the humanitarian sector. The blockchain has the potential to transform the humanitarian sector by providing cost savings and traceability of information flows, and by reducing transaction times.

There has been tremendous interest in blockchain technology around the world and across sectors. DARPA is investigating the blockchain for a messaging service. National and local Governments, such as the United Kingdom, Estonia, Russia and Delaware in the United States, have been researching blockchain applications for public record-keeping, commercial vendors and voting systems. In the financial sector, banks have already formed consortiums and research labs centred on the blockchain and its potential.

This Think Brief explores blockchain technology and its potential application to the humanitarian sector. It provides a primer on blockchain technology, and it highlights applications in the humanitarian sector, potential use cases and recommendations for implementation. This is meant to serve as guidance for potential use within the humanitarian community, and it outlines future areas of research and exploration.

TECHNOLOGY OVERVIEW

What is blockchain technology?

The blockchain **is a type of decentralized database that records transactions shared across a network of multiple participants.** The first and most well-known use of blockchain technology was to exchange the digital currency Bitcoin.[1]

The blockchain maintains a continually growing list of data records, with all participants within a network having their own identical copy of the ledger. Any changes to the ledger are reflected in all copies close to real time.[2] The security and accuracy of the assets stored in the ledger are maintained cryptographically through the use of digital signatures.[3/4]

Information or assets on the blockchain are distributed, accountable and tamper-proof. What is stored on a blockchain can be any token of value or shared data value, and it can mean anything from monetary payments to intellectual property to personal data.

> *"The blockchain ... is the biggest innovation in computer science—the idea of a distributed database where trust is established through mass collaboration and clever code rather than through a powerful institution that does the authentication and the settlement."*
>
> **Don Tapscott for the McKinsey Global Institute[5]**

1 Nakamoto, S. (2009). Bitcoin: A Peer-to-Peer Electronic Cash System. Retrieved from: bitcoin.org/bitcoin.pdf

2 Only in traditional blockchains does every participant have a full copy of the ledger. That doesn't scale, of course. The solution is "sharding", where each participant holds a fraction of the overall data. So that no data is lost, there are at least a few copies of each chunk of data.

3 United Kingdom Government Office for Science (2016). Distributed Ledger Technology: Beyond Blockchain. Retrieved from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf

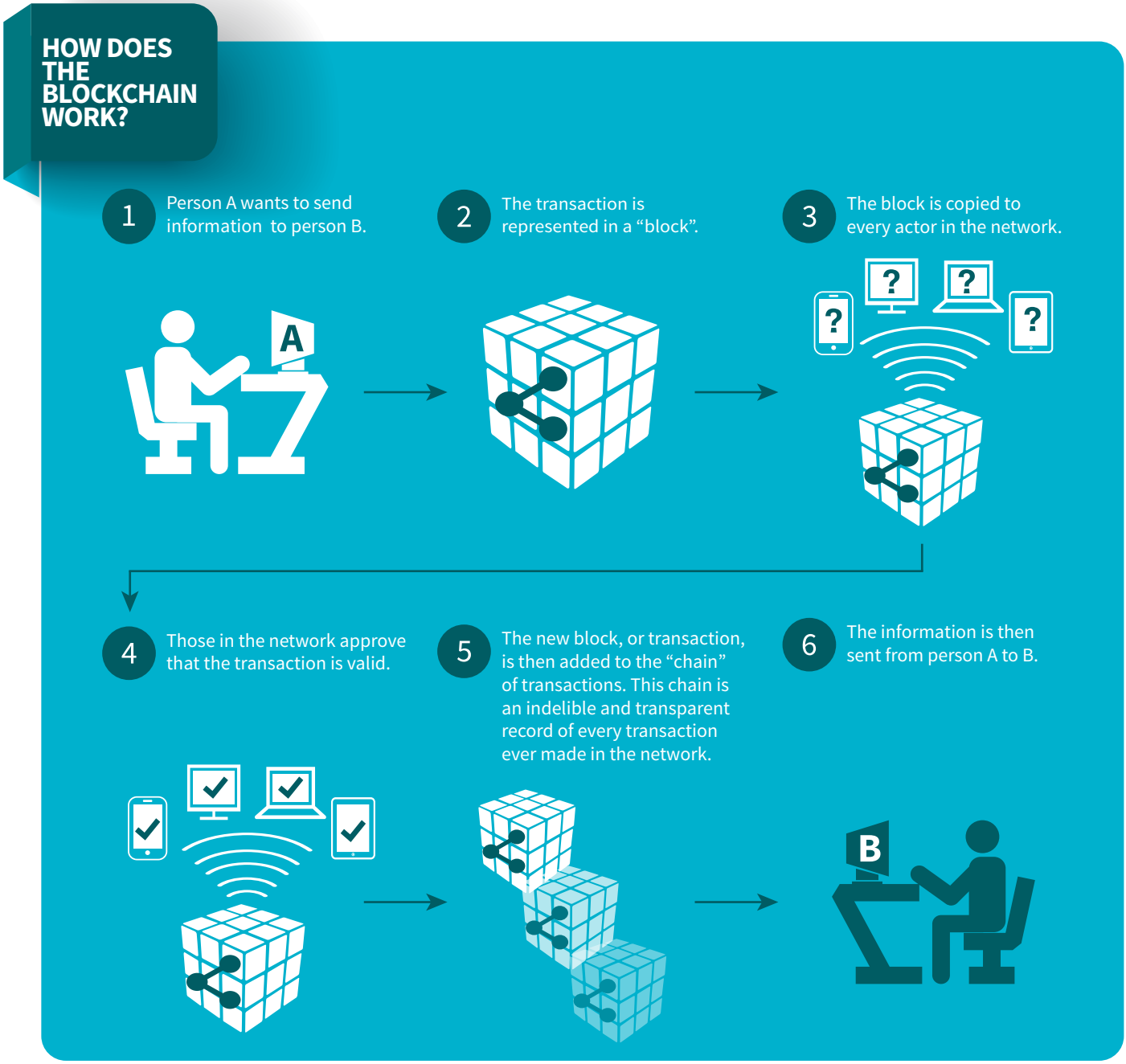
4 The signatures are critical to ensure that only the rightful owners of Bitcoin or any currency/asset can transact them. When discussing the security of the overall network, it is important to mention a concept known as proof of work. For example, in the Bitcoin network, the security of the overall network is achieved through concepts known as proof of work or proof of stake, depending on which blockchain you are referring to.

5 McKinsey & Company (May 2016). How blockchains could change the world. Retrieved 26 May 2016 from: www.mckinsey.com/industries/high-tech/our-insights/how-blockchains-could-change-the-world

How does the blockchain work?

The blockchain groups data into time-stamped "blocks" and stores them in an immutable chain of transactions, linked by "headers". Given the latest block, it is possible to trace all previous blocks linked together. This way, the blockchain contains the entire history of all assets and history from the very first block. This makes the blockchain's data verifiable and auditable.

One of the blockchain's main features is that it eliminates the need for a central intermediary, which enables users to interact with each other directly. The blockchain uses the participants in a network to authenticate and verify each new block, for example, to ensure non-duplicate transactions. Since every change to the blockchain must be replicated and verified by every person in a network, information stored on the blockchain grows increasingly more tamper-proof as more participants are added to the network.



The blockchain stores data in the block and the header, with only the header being public.[6] When storing personal data, for instance, anyone can verify information added to the blockchain due to individual signatures, but only the owner can unlock the underlying information with his or her cryptographic signature. Public visibility; private usage.

To understand how the blockchain works, consider the example of a home address versus its contents: the home address can be listed publicly in a street directory, but only the owner can access the house with his/her private key. In the context of blockchain, the address is public information. However, what is inside the house is private and only those with keys can access the house and its contents. Therefore, despite enabling public accessibility and transparency, the blockchain can also store sensitive or personal data.

> *"We need to fundamentally rethink how the humanitarian system manages information in light of the increasingly complex system of networks and dataflows."*[7]
> **Disaster Relief 2.0**

Smart contracts

A key aspect of the blockchain includes the potential to integrate with programmable smart contracts. Smart contracts are computer protocols that facilitate, verify and enforce the performance or negotiation of a contract. In the context of the blockchain, they are automated and self-executing, meaning that no one controls smart contracts. In the humanitarian sector, smart contracts could be used to tie funding or transactions based on agreed rules to ensure all parties are held accountable.

For example, person A and person B agree that the ownership of some asset is transferred only if a certain amount of money is sent from A to B. If person A pays in time, a smart contract transfers that ownership automatically, otherwise, it will decline the transfer of ownership.[8]

Types of blockchain platforms

The **Bitcoin blockchain** was originally designed for one thing only: moving Bitcoin from one owner to another. Anyone who has access to a computer can join and write to the Bitcoin blockchain, and the system is completely public and fully decentralized.

After the Bitcoin blockchain, the technology was adapted to create many next-generation **public blockchains.** For instance, the Ethereum platform is a public blockchain that supports smart contracts, while other platforms include Nxt, Bitshares and Stellar.

A **private blockchain** is a blockchain system with controlled access. Participants are limited to those who are known and trusted (e.g., people in a particular industry).[9] Various institutions or companies that are part of a blockchain agree on pre-specified rules and use it to exchange assets between each other. Each blockchain has a different set of features, as decided by its actors. In the financial services industry, for instance, private blockchains are used for settlement and clearing of payments.[10] A prominent example of this is R3CEV.[11]

6 This may not be true for all blockchains. For example, on the Bitcoin blockchain, all information is public. However, it is pseudonymized, making it difficult to determine the owner, though it may be possible through things such as graph analysis: blockchain.info/block/0000 000 000000000011eb70a82a16f9e 044eedaee22d34c88ad55412ddc362bb

7 Harvard Humanitarian Initiative (2011). Disaster Relief 2.0: The Future of Information Sharing in Humanitarian Emergencies. Washington, D.C. and Berkshire, UK: UN Foundation & Vodafone Foundation Technology Partnership.

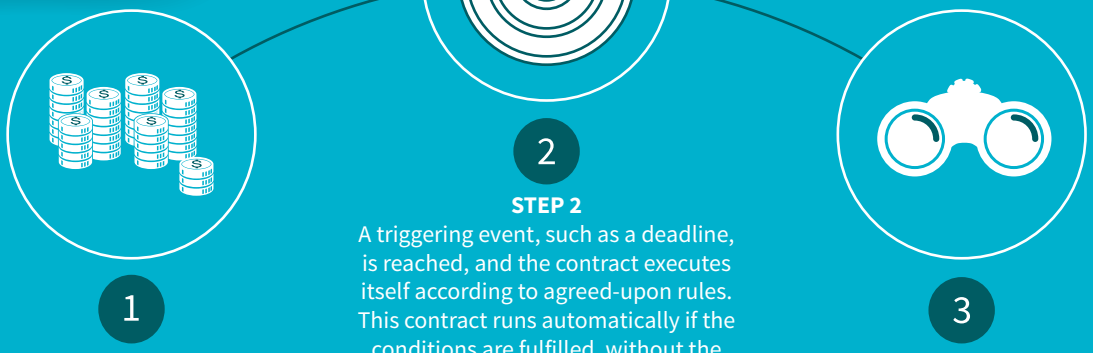
8 Smart Contracts - Everledger.io. Retrieved from: www.everledger.io/smart_contracts

9 Buterin, V. (7 August 2015). On Public and Private Blockchains - Ethereum Blog. Retrieved from: blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/

10 What is Blockstack? Retrieved 4 July 2016 from: blockstack.org/docs/what-is-blockstack

11 Del Castillo, M. (5 April 2016). R3 Announces New Distributed Ledger Technology Corda. Retrieved from: www.coindesk.com/r3cev-blockchain-regulated-businesses/

HOW DO SMART CONTRACS WORK?



1

STEP 1
A contract between parties is written into code in the blockchain. The individuals involved are anonymous, but the public ledger is the contract. For instance, person A and person B agree that ownership of an asset is transferred only if a certain amount of money is sent from person A to person B.

2

STEP 2
A triggering event, such as a deadline, is reached, and the contract executes itself according to agreed-upon rules. This contract runs automatically if the conditions are fulfilled, without the need for a third-party overseeing the transaction.

3

STEP 3
Other parties in the blockchain, such as regulators, can use the blockchain to understand activity while still maintaining the privacy of individual parties.

BENEFITS AND CHALLENGES

Benefits

1. **Distributed:** The blockchain's main innovation enables actors to engage directly with each other on a peer-to-peer basis and eliminates the need for a third-party intermediary to oversee interactions.
2. **Lower transaction costs:** Through the blockchain, actors are able to transmit value without an intermediary by "linking users and organizations directly together through a shared ledger and distributed processing across a network."[12] This removes many of the costs involved in facilitating exchanges through a third party.
3. **Faster transaction times:** Compared to the existing technology of financial transactions in the banking system, the blockchain offers a much faster route. Smart contracts run on a blockchain are nearly instantaneous.
4. **Transparency and accountability:** The blockchain provides an unalterable public ledger. This facilitates the availability of open and transparent data.
5. **Usage information and traceability:** Since the blockchain records, verifies and time stamps every action made on the network, actors can see exactly the source and time of each action. This feature can be used not only to trace usage, but also to enable tracking population movements in aggregate. This helps share and understand patterns and trends found in transaction data, such as equality of usage and access among affected population groups.
6. **Data security through encryption:** "Like the internet, anyone can post anything to the blockchain, but the credibility and veracity of that information can be determined by whomever's digital signature was used."[13]

12 Blockchain POV|Deloitte UK (2015). Retrieved from: www2.deloitte.com/uk/en/pages/innovation/articles/blockchain.html

13 Forde, B., & Carey, M. (January 2016). The blockchain will become our new signature (Wired UK). Retrieved from: www.wired.co.uk/news/archive/2016-01/05/blockchain-is-the-new-signature

Challenges

1. **Internet access and infrastructure:** Using blockchain technology requires access to the Internet; areas with inadequate infrastructure or capacity would not be appropriate use cases for blockchain. This digital divide also extends to technological understanding between those who know how to "operate securely on the Internet, and those who do not."[14]
2. **Relatively new technology:** The technology is still in its infancy. It is hard to recognize its full potential and implications, as existing applications are limited and untested. Moreover, as most uses of the blockchain are currently largely vendor driven, further development is necessary at this formative stage.
3. **Scalability limitations:** Similarly, as the blockchain is still in its infancy, the technology can only be scaled within its current uses, as necessary algorithms and other developments have not yet been created for further applications. However, new developments, such as BigChainDB,[15] have started to solve this problem by developing new algorithms.
4. **Reputational risk of Bitcoin:** There is a misconception that blockchain technology is fundamentally tied to Bitcoin and digital currencies, rather than being seen as two separate innovations. Moreover, Bitcoin's image has become associated with speculators, profit-driven entrepreneurs and libertarians.[16/17]
5. **Technical barriers in understanding blockchain technology:** The technology is new, intricate and difficult to understand. More appropriate and user-friendly applications still need to be developed for blockchain solutions.
6. **Social, legal and regulatory challenges:** The social, legal and regulatory frameworks, including applicable privacy norms, for blockchain are developing at a relatively slower pace than the technology. Practitioners using blockchain should continue to monitor these developments and stay on top of changes.

14 Swan, M. (2015). Blockchain: Blueprint for a New Economy. O'Reilly Media. Retrieved from: https://ahkyee.files.wordpress.com/2015/09/swan-2015-blockchain-blueprint-for-a-new-economy.pdf

15 McConaughey, T. et al (2016). BigChainDB: A Scalable Blockchain Database (Tech.). Berlin: Ascribe GmbH.

16 Wilson, M., & Yelowitz, A. (2015). Characteristics of Bitcoin Users: An Analysis of Google Search Data. SSRN Electronic Journal

17 Blockchain: Understanding the potential (2015). Retrieved from: www.barclayscorporate.com/content/dam/corppublic/corporate/Documents/insight/blockchain_understanding_the_potential.pdf

WHEN IS BLOCKCHAIN THE RIGHT FIT?

As with any new technology, blockchain technology has its own advantages and limitations. Practitioners need to determine whether blockchain technology is the right tool to use for a particular issue or topic area, or whether another tool may be more appropriate.

Blockchains are most valuable when:

- They are used to track ownership of complex things over time.
- There are multiple groups or actors involved.
- There is no well-established or effective central authority in place.
- Groups or actors involved need to work collaboratively.
- A record or proof of transactions is desired.[18]

Crucially, if your particular issue area does not fall within one of these sets of criteria, a centralized database may be a better solution.

APPLYING BLOCKCHAIN TECHNOLOGY TO THE HUMANITARIAN SECTOR

Blockchain technology has the potential to provide substantial benefits in the humanitarian sector, such as protected data sharing, supply chain, donor financing, cash programmes and crowdfunding. By providing a decentralized, verifiable source of data, blockchain technology can enable a more transparent, efficient form of information and data management.

Practitioners should understand that blockchain technology can be applied to humanitarian challenges, but it is not a separate humanitarian innovation in itself. Furthermore, when distributed ledgers have other applications, such as smart contracts, layered on top of them, their full potential can be realized.

The following section looks at potential use cases for blockchain technology in the humanitarian sector. These use cases are not meant to be prescriptive, but rather to prompt exploration into potential applications of blockchain technology.

Protected data sharing

Unreliable information and information silos between different humanitarian actors is often cited as a key barrier in humanitarian information management.[19/20] This will continue growing with the advent of big data in humanitarian response "becoming more prominent and important."[21]

The blockchain can overcome these barriers to data sharing by providing an information marketplace that is publicly accessible to all users while ensuring information security. In particular, the blockchain lends itself well to being "a universal, permanent, searchable, irrevocable public records repository."[23] A combination of time-stamped and digitally verified information hosted on an accessible ledger could play an important role in reducing costs and increasing transparency with humanitarian data. Projects such as Ascribe.io's BigChainDB are making use of this concept to build blockchain-enabled databases.[24]

> *"The reality is that in a disaster cycle, everyone has a piece of information, everyone has a piece of that picture. The more that people are able to share information data across ecosystems, and the more information that people have to utilize, then we'll really see disaster response really be able to be more effective."*
> **Kate Chapman, Humanitarian OpenStreetMap Team[22]**

Due to the blockchain's distributed nature, it is possible to have different humanitarian agencies being able to collect and share data on the same network. By reducing cost for protected data while enabling data sharing between entities, this allows for the creation of information marketplaces in the humanitarian sector. Companies such as Stampery already use the technology to notarize information and ensure proof of ownership by providing time-stamped data in an unalterable state.

Additionally, the use of blockchain will help ensure greater data security while increasing coordination and transparency. The use of digital signatures increases privacy by protecting the person posting the data. Moreover, compartments within the blockchain protect data by only allowing those with the necessary permissions to access it. Then, through the digital signatures, it is possible to trace owners of different data compartments in the blockchain for accountability. A blockchain-based information-sharing platform can potentially be built upon existing database systems in the humanitarian sector, such as OCHA's Humanitarian Data Exchange.

18 Accenture (2016). Blockchain Technology: Preparing for Change. Available at: www.accenture.com/cn-en/~/media/Accenture/next-gen/top-ten-challenges/challenge4/pdfs/Accenture-2016-Top-10-Challenges-04-Blockchain-Technology.pdf

19 Humanitarian Information Management Failures: Survey Report (2016)

20 Altay, N., & Labonte, M. (2014). Challenges in humanitarian information management and exchange: Evidence from Haiti. Disasters, 38(S1). doi:10.1111/disa.12052

21 Whipkey, K., & Verity, A. (2015). Guidance for Incorporating Big Data into Humanitarian Operations(Rep.). DHN. Retrieved from: digitalhumanitarians.com/sites/default/files/resource-field_media/IncorporatingBigDataintoHumanitarianOps-2015.pdf

22 Harvard Humanitarian Initiative. (2011). Disaster Relief 2.0: The Future of Information Sharing in Humanitarian Emergencies. Washington, D.C. and Berkshire, UK: UN Foundation & Vodafone Foundation Technology Partnership.

23 Swan, M. (2015). Blockchain: Blueprint for a New Economy. O'Reilly Media. Retrieved from: https://ahkyee.files.wordpress.com/2015/09/swan-2015-blockchain-blueprint-for-a-new-economy.pdf

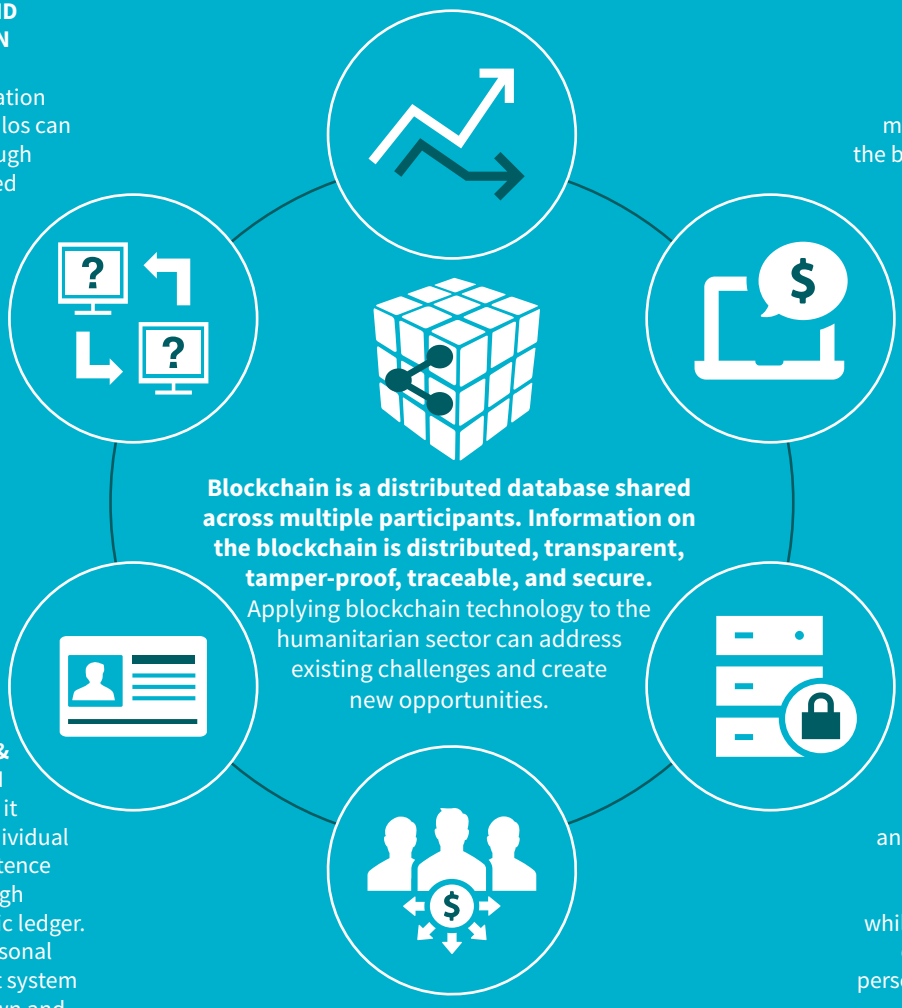
24 McConaughey, T. et al (2016). BigChainDB: A Scalable Blockchain Database (Tech.). Berlin: Ascribe GmbH

BLOCKCHAIN USE IN THE HUMANITARIAN SECTOR

SUPPLY TRAIN TRACKING & TRANSPARENCY
Blockchain can be used as a data platform that traces the origins, use, and destination of humanitarian supplies

INFORMATION AND DATA COLLECTION AND SHARING:
Unreliable information and information silos can be overcome through blockchain-enabled data sharing. Blockchain can provide an information marketplace that is publicly accessible to all users while ensuring information security

HUMANITARIAN FINANCING
Transparency and effective financial management: using the blockchain to trace the distribution of aid and enable better coordination among humanitarian actors



Blockchain is a distributed database shared across multiple participants. Information on the blockchain is distributed, transparent, tamper-proof, traceable, and secure.
Applying blockchain technology to the humanitarian sector can address existing challenges and create new opportunities.

IDENTIFICATION & DOCUMENTATION
Blockchain makes it possible for an individual to prove their existence and identity through a distributed public ledger. This enables a personal data management system that individuals own and control themselves

CASH PROGRAMMING
Beneficiary data and payments made can be stored on the blockchain while ensuring secure data protection of personally identifiable information

CROWDFUNDING
Blockchain can provide a platform that ensures rapid disbursement of funds, transparency and a lower cost of transactions

"Humanitarian organizations are handling increasing volumes of detailed and sensitive information... Due to an increased focus on accountability and transparency to donors, information previously used only for implementation is now stored or reported as evidence. Many of these new technologies raise difficult thical questions about how much information should be collected or retained and who has the right to access it".[25]

OCHA "Humanitarianism in the Age of Cyber-warfare"

Identity

A lack of identity documentation is a key challenge in humanitarian response and early recovery systems.[26] Holding basic documentation to verify one's identity is fundamental to survival and security, as they are essential in order to obtain basic humanitarian assistance and reach areas of safety.[27]

The blockchain can provide accessible and verifiable identification in humanitarian and disaster situations. For instance, a recent project by Microsoft, Blockstack Labs and ConsenSys is working on an "open source, self-sovereign, blockchain-based identity system".[28] With this, it is possible for a person to prove their existence and identity through a distributed public ledger, akin to an international public notary. This enables a decentralized personal data-management system that individuals own and control themselves.[29] Since the blockchain protects information using encryption, the technology can protect the personal data of those who are most vulnerable. BitNation and OneName are also working in this space.

Humanitarian actors could also use the blockchain for their staff to prove affiliation without showing documentation. A UNICEF innovation project prototype that outlines this specific use case is available online.[30] This could remove inefficiencies when working with multiple humanitarian agencies and staff members in conflict zones. Shocard and Blockstack are also working on using blockchain for identification, and The World Citizen Project aims to build a decentralized digital passport.

Supply chain

Logistics efforts account for 80 per cent of disaster relief.[31] Moreover, humanitarian supply chains are extremely dynamic. As a result, supply chain visibility and data tracing can often be poor.[32] Increasing supply chain transparency can "greatly improve humanitarian operations by providing data to inform more effective and accurate decisions, enabling evidence-based interventions and management, exposing issues for effective remedy and increasing accountability."[33]

Blockchain technology offers a way to introduce transparency in humanitarian supply chains. By providing a publicly visible ledger, the blockchain can be used as a data platform that traces the origins, use and destination of humanitarian supplies. As a shared, secure record of exchange, blockchains can "track what went into a product and who handled it along the way, breaking supply chain data out of silos, and revealing the provenance of a product to everyone involved from originator to end user."[34]

Several companies are already using the blockchain for supply chain management, such as Provenance, Wave and Fluent. Other companies focus on specific product tracing, such as Everledger, which uses the blockchain to track diamonds.[35] These companies enable every physical product to "come with a digital 'passport' that proves au-

25 United Nations Office for the Coordination of Humanitarian Affairs (OCHA) (2014). Humanitarianism in the Age of Cyber-warfare (OCHA Policy and Studies Series, Policy Think Brief).

26 ICRC Advisory Service on International Humanitarian Law. Means of Personal Identification. Retrieved from: www.icrc.org/eng/assets/files/other/means_of_personal_id_eng.pdf

27 King, J., & Ardis, D. (2015). Identity crisis? Documentation for the displaced in Iraq – Overseas Development Institute (ODI) Humanitarian Practice Network. Retrieved from: http://odihpn.org/magazine/identity-crisis-documentation-for-the-displaced-in-iraq/

28 Rhodes III, Y. (31 May 2016). What does identity mean in today's physical and digital world? Retrieved from: azure.microsoft.com/en-us/blog/what-does-identity-mean-in-today-s-physical-and-digital-world/

29 Zyskind, G., Nathan, O., & Pentland, A. (2015). Decentralizing Privacy: Using Blockchain to Protect Personal Data. 2015 IEEE Security and Privacy Workshops. doi:10.1109/spw.2015.27

30 vipid.herokuapp.com/

31 Nikbakhsh, E., & Farahani, R. Z. (2011). Humanitarian Logistics Planning in Disaster Relief Operations.Logistics Operations and Management, 291-332. doi:10.1016/b978-0-12-385202-1.00015-3

32 Privett, N. (24 February 2014). Improving visibility in humanitarian supply chains - ODI HPN. Retrieved from: odihpn.org/blog/improving-visibility-in-humanitarian-supply-chains/

33 Ibid

34 Williams, R. (31 May 2015). How Bitcoin Tech Could Make Supply Chains More Transparent. Retrieved from: www.coindesk.com/how-bitcoins-technology-could-make-supply-chains-more-transparent/

35 Everledger.io. www.everledger.io/

thenticity and origin, creating an auditable record of the journey behind all physical products."[36] Therefore, rather than wait for reports to be created after the fact, the blockchain can ensure a real-time record of all activities and products. This ensures stronger collaboration, less duplication of resources, more accountability and more efficient use of time.

Donor financing

The High Level Panel report "Addressing the Gap in Humanitarian Financing" highlighted that "companies need to be encouraged—from insurance and digital cash to logistics and telecommunications—to get involved in providing their relevant skills and capacity for delivering life-saving assistance."[37] Furthermore, more open and transparent data, published on a single global platform, "could help reduce transaction costs and increase effectiveness."[38]

Other reports echo these challenges. There are calls for "more research on **online peer-to-peer financing and the potential for scaling up finance models that cut out the traditional 'middleman',** and instead go directly to communities in need to reduce the usual transaction costs associated with international humanitarian financing."[39]

These recommendations point to the need for more flexible, efficient, transparent and effective donor financing. This is coupled with a call for greater visibility and transparency of financing, not only to address issues of corruption and misuse of funds, but also to enable actors to better identify funding gaps based on impact rather than institutional requirements.

The blockchain could enable humanitarian actors to better control the distribution of aid, and ensure that funds reach the intended recipients by lowering transaction cost (no intermediaries) and publicly tracking commitments made, distribution and use (transparency). The Start Network is already developing a blockchain-based humanitarian financing prototype based on its early research into blockchain applications in the humanitarian sector.[41] Finally, the blockchain enables flexible and responsive financing. Since it works on a peer-to-peer basis, this feature can facilitate localization efforts.

> *"Technological advancements that could help strengthen prevention efforts would be beneficial for the wider aid system. Fraud and corruption reduces opportunities for poverty alleviation, reduces inward investment, and is strongly linked to lower educational achievement. There is, therefore, a great opportunity to apply DLT in international aid in order to provide transparency and traceability of funds. Proving that money is being well spent could encourage nations to give more, and also all funders to target key outcomes more effectively."*
>
> **UK Government on blockchain[40]**

Cash programmes

Cash-based programming is a widely employed technology among humanitarian actors and is expected to rise in the future.[42] Blockchain technology can be leveraged to support and address challenges in using centralized databases, ensuring data security and sharing information across multiple actors.

Digital cash has been highlighted as a key recommendation for cash-programme practitioners.[43/44] The Overseas Development Institute High-Level Panel on Humanitarian Cash Transfers recommends "where possible, deliver cash digitally

36 Provenance|Blockchain: The solution for transparency in product. Retrieved from: www.provenance.org/whitepaper

37 Too important to fail—addressing the humanitarian financing gap (2016). High-Level Panel on Humanitarian Financing Report to the Secretary-General.

38 Ibid

39 IASC Task Team on Humanitarian Financing, Background document for the Future of Humanitarian Financing dialogues, October 2014. interagencystandingcommittee.org/system/files/fhf_looking_beyond_the_crisis_report.pdf

40 United Kingdom, Government Office for Science. (19 January 2016). Distributed Ledger Technology: Beyond Blockchain. Retrieved from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf

41 Currion, P. (2015) AidCoin: a revolution in humanitarian financing. Retrieved from https://medium.com/@paulcurrion/introduction-513f86ed92df#.2dz4l3166 (20 June 2016)

42 ODI (2015). Doing cash differently: How cash transfers can transform humanitarian aid (Rep.). Report of the High-Level Panel on Humanitarian Cash Transfers.

43 Too important to fail—addressing the humanitarian financing gap (2016). High-Level Panel on Humanitarian Financing Report to the Secretary-General.

44 ODI (2015). Doing cash differently: How cash transfers can transform humanitarian aid (Rep.). Report of the High-Level Panel on Humanitarian Cash Transfers.

and in a manner that enhances further financial inclusion."[45] Digital cash and payments are recommended as they ensure greater transparency around how much aid reaches affected populations, make payments cheaper, increase security and accelerate financial inclusion.[46]

> *"The transparency and tracking of digital payments also offers opportunities to address donor government concerns about potential corruption and diversion".*
> ***Too important to fail—addressing the humanitarian financing gap (2016).* High-Level Panel on Humanitarian Financing Report to the Secretary-General.[47]**

As cash transfers often rely on digital technology, considerations on data-exchange standards, data security, privacy and encryption are critical to the process.[48] The use of centralized databases is another challenge, as cash programming allows for more connected programming. The blockchain may address these considerations. A shared platform based on the blockchain can allow humanitarian actors to easily and responsibly share population and usage trends and anonymized transaction data. Digital cash payments can be made traceable, interoperable across multiple actors, more secure and at a lower cost through blockchain technology, with the possibility of tracking funds from original donor to final recipient while still ensuring privacy and security.[49]

Crowdfunding and microfinancing

Blockchain technology can be used for crowdfunding and microfinancing in emergencies in two ways: through using existing digital currencies and by providing a decentralized funding platform.

OCHA's *Crowdfunding for Emergencies Think Brief* reports that "increasing transparency, accountability and reporting among donors, project initiators and funding recipients increases trust in the project and ensures continued donor engagement."[50] Harnessing the blockchain can increase this transparency, accountability and trust by providing a verifiable platform.

Existing crowdfunding programs already use Bitcoin and other cryptocurrencies to fund humanitarian emergencies. Examples include Colu, BTC Funding, CoinFunder and BitPesa. These platforms have lower transaction costs, which ensures transparent and rapid disbursement of funds during crises.

Moreover, these crowdfunding initiatives can go beyond digital currencies, such as Bitcoin. Where previously a centralized service, such as Indiegogo, was needed to enable a crowdfunding campaign, crowdfunding platforms powered by blockchain technology remove the need for an intermediary third party to monitor and disburse funds. These platforms use blockchain technology to reduce transaction costs and enable rapid disbursement of micropayments. As funds are processed on a peer-to-peer basis, funds raised can be approved and transferred directly to the recipients. The humanitarian sector could establish its own dedicated cryptocurrency, such as AidCoin, to reduce transaction times and exchange-rate losses while maintaining transparency and traceability of funds.[51]

45 Ibid.
46 Ibid.
47 Too important to fail—addressing the humanitarian financing gap (2016). High-Level Panel on Humanitarian Financing Report to the Secretary-General.
48 United Nations World Food Programme. Information technology for cash-based transfers. Retrieved from: www.wfp.org/node/649700
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RECOMMENDATIONS FOR THE HUMANITARIAN SECTOR

Capitalize on existing research and development: Blockchain technology is already having a profound impact on how private companies manage data, interact with customers and pursue innovation.[52] The humanitarian sector can leverage this existing knowledge to adapt the technology for humanitarian needs. This also involves creating incentives for the private sector to invest in research and development that benefits the humanitarian space. The humanitarian community can also partner with Governments and companies already working in this area (Estonia, Delaware, UK), as well as with the blockchain open-source community and non-profits in the blockchain space, such as COALA, IPDB and Blockstack.

Build on existing infrastructure: There are several different blockchain platforms that can be adapted to humanitarian use cases. The sector can partner with existing blockchain platforms, such as Ethereum, to build pilot projects for smaller and specific test applications.

Similarly, those interested in implementing blockchain can look to previous instances of new technology being adopted in the humanitarian sector. For instance, humanitarian actors can look to the adoption of mobile banking as an example of how the blockchain and digital currencies can be adapted to humanitarian needs. Actors could also investigate leveraging existing infrastructure, such as mobile banking infrastructure, to enable blockchain applications.

Research the humanitarian applications of blockchain technology: The humanitarian sector needs research and development to further investigate how blockchain technology can be adapted to address humanitarian challenges. The above use cases are just some of the potential applications of blockchain technology in the sector. More careful research into the benefits, challenges and consequences of using the technology should be pursued. Furthermore, additional research and evidence are needed to translate these potential use cases to actual implementation. Once clear use cases are established in other sectors, the humanitarian sector should adapt best practices and lessons learned from other sectors to translate the blockchain to humanitarian purposes. Research organizations, such as the Overseas Development Institute, can build and test prototypes of humanitarian-specific blockchain applications.

Create basic frameworks for understanding and using blockchain technology: If blockchain technology is to be implemented in the humanitarian sector, guidelines for safety, security and data sharing must be established. Best practices and guidance for using data responsibly must be adopted, which can then be used to develop a framework to use the blockchain responsibly. These policies must be developed and agreed on by all actors using the technology. For instance, this may involve creating minimum data-usage standards for blockchain-enabled information sharing. The Humanitarian Data Centre may be one space well suited for further exploration of this.

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CONCLUSION

As blockchain technology continues to gain momentum across sectors, the humanitarian community can look to this new technology to help address ongoing challenges. The technology alone cannot solve fundamental issues within the sector, but it can offer new insights and provide a new tool for solving some of these challenges. Further research and development are necessary into which applications and use cases are most appropriate for the blockchain, and careful consideration of the benefits, impacts, risks and required resources must be taken into account.

Appendix: What is digital currency?

There is a difference between virtual currency, digital currency and cryptocurrency.

Virtual currency: This medium of exchange is issued and controlled by its developers, and used and accepted among the members of a specific online community.[53] In particular, virtual currency does not have legal tender status in any jurisdiction. It either has an equivalent value in real currency or acts as a substitute for real currency.[54]

Digital currency: This form of virtual currency is electronically created and stored. Digital currency operates on a decentralized peer-to-peer network, without a third-party intermediary monitoring transactions.

Cryptocurrency: A type of digital currency that uses cryptography for security, making the currency difficult o counterfeit. Bitcoin is one example.

The characteristics of digital currency that are relevant to this report: ***non-hierarchical, immediate, collaborative, peer-driven, transparent and accountable.***

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