7-12-2021

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Research-in-Progress

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Abstract

While there is a rise in the applications of Blockchain technology in humanitarian and development aid programs, our understanding of Blockchain implementation and the resulting implications remains scant in this context. This research-in-progress report on the research currently underway in the United Nations World Food Program – Building Blocks. Adopting a case study approach, this study explores how the Building Block project revolutionizes the aid programs with the application of Ethereum, a blockchain-based distributed computing platform, and what new risk and social problems perpetuate with it. The study contributes to the growing stream of Information Systems research that focuses on the virtues and vices of using Blockchain technology and enhancing the effectiveness of humanitarian aid programs. As a relatively new technology, this study assesses the appropriateness of its usage and intends to provide insights to humanitarian and development organizations to consider when employing this novel technology.

Keywords: Blockchain, humanitarian aid, building blocks, World Food Programme, Ethereum.

Introduction

Humanitarian aid defined as "the impartial, independent and neutral provision of aid to those in immediate danger" (Rysaback-Smith 2015, p. 5) remains fast growing over the past years with approximate 125 million people in need of humanitarian assistance, 60 million people forced to flee their homes, 37 countries affected, and over $20 billion needed (United Nations 2018). Thus, humanitarian aid programs undergo constant pressure to act more effectively and be more strategic in their aid efforts. It is without a doubt that technology is instrumental in humanitarian aid efforts (Kovács and Spens 2007). Prior studies argue that information systems (IS) are the absolute most crucial determinant to predict the success of a disaster relief operation (Long 1997; Sandvik et al. 2014). In line with this, the strategic management of humanitarian aid efforts has recognized applications of Blockchain technology – decentralized and trustless ledgers recording transactions across a peer-to-peer network – to revolutionize aid funding transferability, accountability, and transparency (Aranda et al. 2019; Zwitter and Boisse-Despiaux 2018).

The blockchain that operates as a distributed database hosted across a network of multiple participants can provide a way to share information and transfer digital assets in a fast, tracked, and secure way. This shows the potential to transform the humanitarian sector by providing cost savings and traceability of information flows, and by reducing transaction times (Zwitter and Boisse-Despiaux 2018). Although Blockchain was initially been created to transfer financial value, it is now viewed as having the potential to be an efficient and secure way to transfer or share any information or asset. This is being leveraged in some humanitarian aid programs, i.e., Building Blocks, to provide and manage IDs in refugee camps, distribute and trace aid funding, or create trustworthy land registries, etc. (World Food Program 2018; Zambrano et al. 2018). However, Blockchain is viewed with some doubt given its complex nature and the fact that it requires electricity and internet access, features that many humanitarian crisis areas do not readily and reliably provide (Riani 2018). Thereby, arising uncertainties and concerns about the implementation of Blockchain. At the same time, there is a debate about potential cyber risks – mostly theoretical, since the Blockchain technology is considered extremely secure (Kewell et al. 2017), but may create doubt and social insecurity among the aid beneficiaries. For instance, the implementation of EyePay – where a refugee pays by scanning their iris – at Building Blocks project by the United Nations World Food Program (UNWFP) may provide convenience, transparency, and security in transactions (World Food Program 2018; Zambrano et al. 2018). However, according to civil rights activists, it tends to violate a person's right to freedom as it can track individuals (Zwitter and Boisse-Despiaux 2018).

The research adopts a case study approach of a UNWFP pilot – Building Blocks project – that is based on the Ethereum protocol, a Blockchain-based distributed computing platform, to explore the implementation of Blockchain, ethical constraints, and the new risk or social problems that perpetuated with it. The findings are intended to enrich the understanding of the benefits and pitfalls of Blockchain, particularly to humanitarian aid programs. These findings will contribute to the debate on how to make humanitarian aid more effective. Considering Blockchain a relatively new technology, this study assesses the appropriateness of its usage and intends to provide insights to humanitarian and development organizations to consider when employing this novel technology.

The structure of this research-in-progress paper is as follows. The next section informs on the theoretical background of the key elements of our research topic. It is followed by a contextual background of the research setting, the research design, and the adopted methodology. The next section informs on our preliminary findings. The final section discusses the expected contributions that address the identified gaps in knowledge. In doing so, we also discuss how we intend to take this research in progress forward.

Theoretical background

Blockchain as a disruptive technology

Blockchain has emerged as a disruptive technology to reshape the digital tools we use to conduct day-to-day transactions. Blockchain was first introduced to lay the foundations for cryptocurrencies, i.e., Bitcoin, it was soon recognized as the “incorruptible digital ledger” (Tapscott and Tapscott 2016) that is programmable to record not just financial transactions but virtually everything of value. It is defined as the distributed ledger technology, which combines BitTorrent peer-to-peer sharing with public-key cryptography (McPhee and Ljutic 2017; Swan 2015). Its algorithm runs over a file to compress it, creating a unique 64-character code (the hash), which is then included in the Blockchain with a timestamp to prove existing digital assets at that particular moment. Besides traditional ledger books, the Blockchain database is shared across a network of computers (Purvis 2017). All transactions through blockchain are transparent, but the identities of the parties are shielded (Boucher 2017; Lee and Pilkington 2017). Whenever an individual makes a transaction on the Blockchain, this is broadcasted to the network. It functions without any central control system and stores the transaction history in blocks of data that are cryptographically locked together. As it is replicated on every computer that belongs to the network, it is an immutable, secure, and transparent record of all transactions that have ever taken place (Drescher 2017; Kewell et al. 2017; McPhee and Ljutic 2017).

Organizations may also choose to work through a private Blockchain, whereby people need permission from the organization to work with that Blockchain. This offers closed, transparent, and protected transactions for individuals, businesses, and governments, which explains the rapid rise of investments

in this technology (Kshetri 2017). For instance, Walmart uses blockchain to track the movement of Chines pork and to ensure safe trade (Nash 2016). IBM starts to monitor the movement of diamonds, and Toyota Motor Corp. is developing solutions to track auto parts (ibid.). Recently, Blockchain technology has been getting increased attention in the humanitarian aid program. Development organizations such as the United Nations have been gradually embracing Blockchain, with as many as seven UN entities trying Blockchain initiatives as alternative ways to support aid efforts (Riani 2018).

Blockchain and humanitarian aid programs

As Blockchain technology continues to gain momentum across sectors, the development and humanitarian sectors look to adopt this new technology to help address ongoing challenges. For instance, Bartoletti et al. (2018) examined 120 Blockchain-enabled social good projects (defined as those that have pre-eminent goals coherent with those of the United Nations Sustainable Development Goals) and found that most of them were primarily focused on philanthropy (30.8%), the environment (20%), and financial inclusion (18.3%). The applications of Blockchain technology in the development and humanitarian sectors seem less likely to confine to its original idea of cryptocurrency (Blockchain 1.0) but show the most promise in wider aspects, i.e., automatizing logistical processes (Aranda et al. 2019; Lee and Pilkington 2017; Tapscott and Tapscott 2016), and informational infrastructures, such as the management of digital identity – smart contracts (Blockchain 2.0) (Zambrano et al. 2018; Zwitter and Boisse-Despiaux 2018).

The existing research in IS provides valuable information on the challenges in gaining the outcomes of IT initiatives, i.e., (Syed et al. 2020). Many studies provide either very brief examples of originations, projects, or initiatives that use Blockchain (e.g., Kewell et al. 2017; Kshetri 2017; Zwitter and Boisse-Despiaux 2018), or very short case studies of such firms as an example to support theoretical developments (Galen et al. 2018). The former provides a good source to signpost researchers to look into such organizations individually. These studies serve more like a primer to understanding the spectrum of possible applications of Blockchain in the field of humanitarian aid programs as opposed to gaining an in-depth understanding of the implementation or its implications. The latter is beneficial for brief overviews of projects, initiatives, or organizations using Blockchain for social good but lacks depth in its explanations.

However, humanitarian aid programs need research and development to investigate further how Blockchain technology can be adapted to address humanitarian challenges (Ko and Verity 2016). 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. The research to carefully consider and weigh the pros and cons of the use of Blockchain in the humanitarian aid industry can provide a clear view on how to adapt Blockchain. Therefore, further research to investigate implementation, benefits, impacts, risks, and required resources is necessary to understand what applications and use cases are most appropriate for Blockchain technology in the humanitarian sector.

Methodology

Given the exploratory nature of our research, we adopted a grounded theory building approach that follows the principles of emergence, where relevant concepts develop through the systematic generation and conceptualization of data (Glaser et al. 1968). This research project was initiated by focusing on a research problem that was currently experienced by practitioners and showed limited information in IS literature, i.e., implementation and consequences of Blockchain in humanitarian aid programs. Therefore, the initial informal discussion with our key respondents was based very broadly to shed light on why Blockchain is necessary for humanitarian aid, how it is implemented, and what are social, legal, and economic consequences of implementing this novel technology. We take an approach where specific research objectives and research questions will materialize from the collected data through conceptualization based on theoretical sensitivity (Turner 1981). Therefore, we accepted the initial confusion and data complexity to allow relevant findings to emerge, giving utmost care to avoid forcing existing theory onto our interviewees and data (Urquhart 2012). This conceptualist grounded theory methodology provides a better fit with our theory-building research objective answers the call for more

grounded theories in unique IS contexts (Birks et al. 2013). We used a case study approach for data collection that allows a thorough examination of this complex, real-life issue on which little prior empirical evidence is available, leading to new, in-depth insights (Edmondson and McManus 2007; Eisenhardt 1989; Yin 2009). Further, the case study approach supports our extraction of rich data through a range of techniques (e.g., interviews, observations, and document analysis) and facilitates cross-validation (Siggelkow 2007), thereby aiding external validity, guarding against observer bias, and creating more testable and robust theory (Eisenhardt 1989; Yin 2009).

Research context and case selection

Since the use of Blockchain technology is still very new, many projects undertaken by international humanitarian organizations are pilots. This research investigates the case that implemented a pilot project to use Blockchain technology in a refugee camp in Jordan, called Building Blocks, by the United Nations World Food Programme. WFP pilot project implemented the applications of Blockchain, mainly in the authentication and registration of transaction processes. The first pilot executed this experiment in Pakistan in 2017 and, building on lessons learned, the WFP built and implemented a Blockchain system in a refugee camp in Jordan as a second scaled-up pilot. The Jordanian camp accommodates more than 100,000 refugees where WFP track, record, and verify all transactions and entitlements using Blockchain (Juskalian 2018). The transaction is recorded by creating virtual wallets for every beneficiary – an estimate as of October 2018 records 100,500 beneficiaries served US$1,000,000 undergoing 100,000 transactions (World Food Program 2018).

The innovative implementation in this pilot project is that the refugees were identified by recording the scans of their eyes (iris), which registers on the Blockchain. This biometric authentication technology allowed refugees to shop in a camp-based supermarket and pay by scanning their iris, instead of using a credit card or cash. Iris scan confirmed refugee's identity in the WFP database (Juskalian 2018), which allowed identification and registration of the refugee need to track buying behavior. Although the eye scans were implemented before the introduction of Blockchain at the camp, the registration, identification, and tracking data were stored using Blockchain technology. Building Blocks is based on the Ethereum protocol, which is a Blockchain-based distributed computing platform. It runs on a custom-built Blockchain, with no possibility of fraud, censorship, or third-party interference (Juskalian 2018; Zambrano et al. 2018). Building Blocks run on a private permission Blockchain allowing WFP control over who joins the network. WFP claims the pilot was successful and that they plan to expand this project to over 500,000 Syrian refugees in Jordan (World Food Program 2018).

The choice of Building Blocks case was made because this pilot project was based on the lessons learned from the previous experiments that the WFP has conducted in 2017 with the applications of Blockchain. Moreover, the UN and the WFP are highly respected and legitimate agencies in the international aid architecture. The use of Blockchain by these agencies adds credibility and raises the level of trust in the technology. The Building Blocks project provides a suitable contemporary and appealing setting that is aligned with the objectives of this research, i.e., to understand the implementation and implications of Blockchain in humanitarian aid programs,

Data collection

The case will be examined mainly through semi-structured interviews as the primary data source. Due to the exploratory nature of your research objectives, it is beneficial to allow participants to describe their perceptions freely (King 2004). These interviews will be supplemented by other methods including written documentation (internal project reports, official announcements, newspaper clippings, archival records, organizational charts, and meeting minutes). The use of such several methods is an effective strategy to ensure the triangulation of data, which qualitative researchers especially need to test the validity of data (Carter et al. 2013; Eisenhardt 1989; Yin 2009). Using multiple methods also provides a more holistic perspective, validates the data, and enables each method to compensate for the shortcomings of the others (Yin 2009). The interviews will be mainly with interviews with the respondents directly or indirectly involved in the WFP Building Blocks project. Table 1 highlights our approach to data collection.

Table 1: Sources of evidence for a case study approach (adapted from Yin 2018)

Source of Evidence	Examples	Approaches being used in this study	Strengths	Weaknesses
Documentation	E-mails, letters, agendas, administrative documents, formal studies, news clippings	News articles, formal studies, reports of conferences	Stable, specific, unobtrusive	Retrievability, biased selectivity, reporting bias
Archival Records	Public use files, service records, organizational records, maps, survey data	Case records (e.g. annual WFP report), maps, and charts of the camps	Precise, stable, specific, unobtrusive	Retrievability, accessibility, reporting bias
Interviews	Prolonged interviews, short interviews, survey interview	Interviews (direct/indirect involved individuals)	Targeted, insightful	Response bias, human error, reflexivity
Direct Observations	Field observations	Field observations to be conducted	Real-time data, contextual	Time-consuming, reflexivity
Participant Observation	Participant observations	Field observations to be conducted	Insightful	Time-consuming
Physical Artefact	Tools, instruments, works of art	N/A	Insightful	Selectivity, availability

The interviews are one of the most important and most common data collection resources in case study approaches. However, careful considerations should be used to evade the common pitfalls, i.e., artificiality, level of entry, elite bias (Myers and Newman 2007). Our data collection to date has paid close attention to evade these issues. For example, WFP staff that were contacted and/or interviewed for the case study were made sure to be involved in the Building Blocks project and represented various levels of seniority. Some of the respondents contacted were based in the field, while others worked on the project long-distance with frequent visits to the project site. Respondents were made sure to be experienced and knowledgeable about the project. Table 2 presents an overview of the details of the interviewees and the conducted interviews thus far.

Table 2: Details of interviews and respondents

Respondent	Gender	Title	Interview Structure	Information capture	Interview Length
A	Male	WFP Executive	Semi-structured interview, video call	Recorded, note-taking	1 hour
B	Male	WFP Project Officer	Structured, written question & answer via e-mail	N/A	N/A
C	Female	WFP Project Officer	Structured, written question & answer via e-mail	N/A	N/A
D	Male	External expert commentator	Unstructured interview, video call	Extensive Note-taking	30 minutes

The analysis of the data will follow the comprehensive approach Corbin and Strauss (2014 that include three coding procedures: open coding, axial coding, and selective coding. This approach is specifically suitable for such research that intends to explore and build theory from data because it allows flexibility and adds rigor (Urquhart 2012). The only limitation to this approach is that its phrase-based.

Our preliminary findings, based on four in-depth interviews (Table 2) and reading through secondary data sources (e.g., WFP annual reports, news clippings, public use files on Building Blocks, etc.)

illustrate how political, economic, social, and technological factors affect the humanitarian aid program when implementing Blockchain, i.e., *"the political and financial sphere in Jordan reflects skepticism around technology in general, let alone nascent technologies like Blockchain"* (Respondent A). WFP Respondents also discussed a significant shift in workload with Blockchain implementation, i.e., *"Previously, banks needed a letter of authorization with a physical copy signed by two people that had to then be sent back to them and evaluated which was time-consuming and not always done right or on time. Every transaction is now authorized by WFP so there doesn't need to be a reconciliation of [reports]."* (Respondent C). Energy consumption. Speed in validating transactions, and privacy were the three major concerns highlighted, i.e., *Blockchain is a high energy-consuming technology …. at the minimum, it does require servers and computers to process transactions. The locations where the limited access to the Internet or poor energy infrastructure with frequent brownouts limits the scalability of Blockchain.* For the full study, the researchers plan to interview at least 15 respondents before performing an initial thematic analysis to check for data saturation. In case data saturation is not achieved 5 more interviews will be conducted.

Intended Contributions and Conclusion

This research, although at an early stage, is expected to make significant theoretical contributions to IS; particularly related to the implementation and consequences of Blockchain in Humanitarian aid programs. Although we adopt the approach in which specific research objectives and research questions will materialize from the collected data through conceptualization based on theoretical sensitivity, the intended objectives are to understand how Blockchain technology has been implemented in the context of humanitarian efforts and reflects on potentials and pitfalls that come with the implementation of this technology. The findings will contribute to responding to the call for further research on Blockchain technology in a humanitarian context (Ko and Verity 2016). Furthermore, by theorizing Blockchain technology in the context of social, political, economic, and technological factors, this research will contribute to reducing speculations around the use of Blockchain technology. With the fast growth in humanitarian aid services, there is an ongoing debate on how to reshape the aid program to enhance its effectiveness to implement aid services in the best possible way (Scott 2014). The findings of this research will contribute to this debate by reflecting on the benefits and implementation strategies that may reduce the pitfalls of Blockchain technology.

In sum, we argue here that our research provides a great opportunity to address the above gaps. Additionally, the proposed research is expected to contribute to practice by providing insights for humanitarian and development organizations to consider when employing this novel technology.

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