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‘Envisioning Decentralised Volunteering with Distributed Ledger Technologies’

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Abstract

In this paper, we consider the potential opportunities and implications of emerging distributed ledger technologies (DLTs) in the voluntary sector. By focusing on the potential for new forms of decentralised identity management, we highlight opportunities for volunteers to generate, share and prove certain attributes of their identity as a volunteer without relying upon either any single volunteering organisation. From a volunteer’s perspective, this replication of administration procedures, checks and validations is a friction within the onboarding process. We hence provide an initial conceptualisation of DLTs for the sector, and describe innovative workshop methods we have developed to explore these technologies with volunteers and organisations. Reporting on our initial findings from these engagements, we finally identify several avenues for future research to inform the design and development of DLT systems in voluntary contexts.

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1. Introduction

New technologies in various guises have been designed, and appropriated, to support non-profits and volunteer organisations in managing and co-ordinating volunteering. In this paper, we consider the potential role of distributed ledger technologies (DLTs) within the voluntary sector, and civil society more broadly. DLT’s, including blockchain technologies, are a rapidly emerging class of technologies and infrastructure that promise to support a range of decentralised applications including new cryptocurrencies, provenance and attestation services, digital rights management and identity management (Casino, Dasaklis, & Patsakis, 2019; Elsden et al., 2018; Rauchs et al., 2018). As the technology matures beyond the hype, applications such as these are envisioned to play a role in radical new forms of governance and exchange across society (e.g. (Coppi & Fast, 2019; Elsden, Gloerich, Spaa, Vines, & de Waal, 2019; Kewell, Adams, & Parry, 2017; Nissen et al., 2017; Pazaitis, De Filippi, & Kostakis, 2017).

However, to our knowledge – *there is no prior research on DLT applications in the voluntary sector.* Therefore, in this paper, we set out to explore:

- a. what are the potential opportunities and implications of these technologies for volunteer-involving organisations (VIOs)? Can they (i) lower administrative barriers to entry for prospective volunteers?; and/or (ii) influence the evolution of the sector by enabling additional forms of volunteering – where VIOs perform a new role of more dynamically ‘matching’ collections of relevant volunteer skills, attributes and experience with the needs of beneficiaries?; and
- b. how these technologies might enable volunteers to confidently engage more flexibly, securely and efficiently with both VIO intermediaries as well as in potentially new forms e.g. directly and collectively with particular causes and projects locally, nationally and globally.

As a starting point, our research has drawn on emerging blockchain applications for identity management (Dunphy & Petitcolas, 2018). In particular, we consider the potential for more decentralised and so-called ‘self-sovereign’ approaches to the management of volunteers’ identities and records, and identify opportunities for volunteers to collaborate and manage volunteering activities beyond and in-between formal organisations. Specifically, we explore the prospects of:

Decentralised Volunteer Identities - the ability for volunteers to generate, share and prove attributes of their identity as a volunteer without relying upon any single volunteering organisation.

Tamper-proof Attestation of Volunteer Records - the ability for trusted organisations to ‘attest’ to aspects of a volunteer’s identity that can then be widely shared and trusted.

Control and Portability of Volunteer Records - the ability to selectively share and port aspects of their volunteer identity between a range of organisations and networks.

The paper now proceeds as follows. We first offer a brief introduction to DLTs, and sketch out how identity management applications in particular may have resonance for the voluntary sector. Next, we outline our methodological approach, before providing an overview of the PizzaBlock workshop. We then offer a number of thematic reflections garnered from workshops, interviews and meetings with volunteer co-ordinators. Finally, we offer several points of discussion and future work.

2. Distributed Ledger Technologies, Identity Management and ‘Volunteering on the Ledger’

2.1. Distributed Ledger Technologies

DLTs are an emerging class of infrastructural and database technologies that are proposed to fundamentally transform the ways in which people transact, organise, trust, collaborate, and identify themselves (Elsden et al., 2018). Commonly referred to as ‘blockchain technologies’, there are a vast range of potential application domains, extending well beyond financial applications and cryptocurrencies such as Bitcoin.

A detailed overview of how DLTs work and all of their potential applications is beyond the scope of this paper – there are a number of nuanced review papers (e.g. (Casino et al., 2019; Elsden et al., 2018; Rauchs et al., 2018) which offer considerably more detail in this regard. However, there are a few distinctions which have particular resonance for civil society.

Firstly, DLTs tend to be less reliant on centralised or third-party infrastructure; rather the software protocols are typically distributed and governed across a network without a single point of failure or control.

Secondly, DLTs allow the creation of highly tamper-resistant digital assets (such as tokens or currencies), which can be exchanged based on carefully pre-defined rules or contracts. In other words, very particular kinds of transactions and economy can be agreed and enforced across a network of actors.

Finally, their distributed nature - the inherent security of the cryptography, which ensures that each new transaction is dependent on an always-visible and complete history of previous transactions, ensures a very secure and definitive form of shared record keeping.

Considerable prior work has sought to identify ‘Blockchain for Good’ – especially in the context of international development, charitable giving, sustainability or financial inclusion (Coppi & Fast, 2019; Kewell et al., 2017). Supporters highlight in particular the potential to technologically disrupt current hierarchies and intermediaries, as well as greater transparency and provenance of business transactions. However, there has been very limited attention to blockchain technology in the context of civil society specifically or as Elsdon et al. describe ‘*Making the Blockchain Civic*’ (2019). Indeed, many blockchain startups are envisaged at a grand global scale, connecting online communities across international borders, and hence are far removed from society on a more bounded and local scale. As a notable exception, ‘Colu’¹ and ‘HullCoin’², provide local digital currencies which can be earned through various kinds of community contributions or services, and then redeemed with local merchants. Such initiatives bear similarity to time-banking or other local currencies such as the Bristol Pound, though they have the potential for more decentralised governance, transparency and automation.

2.2. DLT and Identity Management

In this research, we have focused especially on DLT applications related to identity management. Dunphy et al. (2018) provide a comprehensive ‘first-look’ at different approaches in commercial applications. Broadly, the promise of these services is for individuals to be able to maintain, control and selectively share reliable records of identity and certification, without relying on any single centralised organisation – such as a government, or technology company.

2.2.1. Self-Sovereign Identity

Currently, in most cases, when we make claims about our identity, we rely upon records generated and maintained by a third party, for example a government, bank, or social media company (e.g. Google, Facebook). This requires trust in those third-parties and also relies upon their security and long-term sustainability.

As a form of distributed ledger, which is maintained by a network according to a specific protocol, rather than any single third party, blockchains are proposed to support *self-sovereign identity* - in other words, an identity issued, and managed by oneself. Present commercial applications tend to rely upon biometric data to create an initial identity that is correlated with a real individual. The blockchain ensures that once created, this identity data cannot be tampered with, and can be checked by others in the network when an individual makes a claim about their identity.

Self-sovereign identity is perceived as being especially useful in contexts where typically trusted institutions have broken down, or for those who have lost access to, or are somehow excluded from traditional means of identifying themselves. For example, the UN’s World Food Programme is piloting blockchains as a means to issue identities to Syrian refugees³.

2.2.2. Tamper-Proof Attestations

Finally, blockchains may be used to support the creation of tamper-proof records, through maintaining a chain of transactions with the database, which can be used to calculate or detect if changes have been made. In the context of identity management, this allows for the creation of tamper-proof certification and the secure storage of attestations - or witnessed claims - made by trusted third parties.

¹ <https://www.colu.com/>

² <https://www.hull-coin.org/>

³ <https://www.wired.com/story/refugees-but-on-the-blockchain/>

For example, *Appii*⁴ propose to use blockchain technology to record claims about a candidate's CV. A candidate may claim they have a first-class degree from the University of Edinburgh, they ask the university to digitally 'sign' this claim, and then store an encrypted record of this claim and signature in a distributed ledger. From then on, they can prove their qualifications to any number of other parties by sharing the signatures in this 'block'.

2.2.3. Control and Portability

Self-sovereign identity also aims to provide individuals with a far greater degree of control and portability of their identity data. In principle, a primary identity record is held with the individual, and then selectively shared with others in the network only as required. For example, were a hotel to ask an individual to prove they were over 18, and an EU citizen, they only need to share these particular aspects of their identity, rather than handing over their whole passport to be copied, or relying on a third-party to keep and maintain a copy of this information. By using a distributed ledger, the fidelity of this individual record can be verified by others in the network. Furthermore, through the use of 'smart contracts', computer code that is embedded in the network protocol, specific rules and conditions can be made about exactly how identity data is checked and shared. Further, since their identity record is not stored with a single provider, they are able to move and share claims about their identity more easily, even if original providers of identity information are no longer accessible.

2.3. 'Volunteering on the Ledger'

Given these underlying features, we set out to explore some specific applications for the voluntary sector.

Decentralised Volunteer Identities - the ability for volunteers to generate, share and prove attributes of their identity as a volunteer without relying upon any single volunteering organisation.

In the context of volunteering, it may be that organisations struggle to maintain accurate identity data about their volunteers, or over time, as old groups fade and new groups emerge, previous volunteer 'identities' are lost. We wanted to explore the value of these new kinds of self-managed and independent volunteer identities, such that a volunteer could gain and share trust across multiple organisations, without relying on a single, centralised system.

As well as potentially reducing manual administration for VIOs, a DLT could dilute otherwise increasingly complex (and potentially expensive) organisational liabilities associated with holding (unnecessarily) comprehensive user data. Further, while there are GDPR challenges to be resolved regarding DLTs, these principles are consistent with moves for individuals to own, take control of and manage their own personal data.

Tamper-proof Attestation of Volunteer Records - the ability for trusted organisations to 'attest' to aspects of a volunteer's identity that can then be widely shared and trusted.

We wanted to explore what kinds of claims and 'attestations' about identity would be valuable to volunteers and VIOs. Perhaps there are legal checks that could be carried out once by one organisation, but trusted by another? Or it may be necessary to ensure that volunteers for an activity have sufficient prior credentials or experience to volunteer without supervision?

Control and Portability of Volunteer Records - the ability to selectively share and port aspects of their volunteer identity between a range of organisations and networks.

⁴ <https://appii.io/>

We wanted to explore what it means for individual volunteers to be able to control and carry around aspects of their own identity between organisations. Would volunteers value such a record and how would they manage it? What should it record? And could it allow them to volunteer more flexibly across a range of organisations?

While the promises of the technology are aspirational, we are equally aware of the challenges faced by social computing technologies in voluntary sector (Volda, Harmon, & Al-Ani, 2012). Nonetheless, in a largely critical reflection of the status quo, Volda et al. call for technologies that “*might better align with the philosophies and priorities of volunteer coordinators if they were to foster or incentivize longer-term engagement, perhaps by increasing the visibility of the depth or duration of these relationships.*” As a potentially immutable and public ledger, DLTs are certainly well placed to visualise and deepen relationships in a technical sense – in our research we have sought to understand how they might also align or disrupt existing philosophies in the sector.

3. Methodological Approach

This paper reports on the development of a year-long, and ongoing project of scoping work to identify the opportunities and challenges of DLTs for the voluntary sector. First and foremost, this work has been rooted in a collaboration with Volunteer Scotland – Scotland’s national centre for volunteering. In partnership with Volunteer Scotland, we have held multiple conversations with medium to large volunteering organisations, in particular in the environment and heritage sectors, about blockchain technologies and identity management. Throughout, we have also worked closely with colleagues with considerable technical expertise in distributed ledger technologies.

However, in addition to this scoping work, we have developed a bespoke design workshop to be run with non-profit organisations and the general public to introduce and elicit reflection on distributed ledger technologies. Specifically, the workshop demonstrates how identity data that is conventionally managed by either a centralised network, or a series of stand-alone databased can be collaboratively maintained, reliably and independently, by a range of actors, from individual volunteers, to large organisations. We have so far run this workshop on five occasions with a range of novice and expert audiences, including one workshop specifically targeted at volunteer coordinators, where subsequent discussion was audio-recorded and transcribed for further reflections and analysis.

3.1. Introducing PizzaBlock

PizzaBlock is a collaborative game in which participants take on various roles to engage in, record and verify transactions with each other through a distributed ledger. *Social Enterprises* have a mission to improve Edinburgh’s lack of good pizza, but they must find *Volunteers*, who have the right skills for each task. *Volunteers* earn these skills from *Training Centres*. By playing PizzaBlock we introduce between 10-20 participants to decentralised identity management systems and produce a number of physical artefacts which relate back to the core features of distributed ledgers. An entirely comprehensive overview of the PizzaBlock workshop is beyond the scope of this paper, however, examples of key features and physical artefacts include:

1. Whenever a transaction takes place between a volunteer and any organisation in the game, a record of that transaction is recorded on a tamper-proof public ledger, represented by a washing line (Fig. 1). Anyone in the game can use this ledger to verify claims or transactions that have taken place.
2. When *Volunteers* learn a skill, or complete a task, they are awarded a set of uniquely numbered stickers (Fig. 2). One of these stickers is published to the public ledger, and can be used to reference subsequent claims they make about their identity. Volunteers are sharing

de minimus personal information only – sufficient to prove they are eligible to volunteer for a certain task, but no more. This ability to share relevant and narrow information as opposed to broad and unnecessarily comprehensive personal information offers volunteers the prospect of exercising greater control over their data.

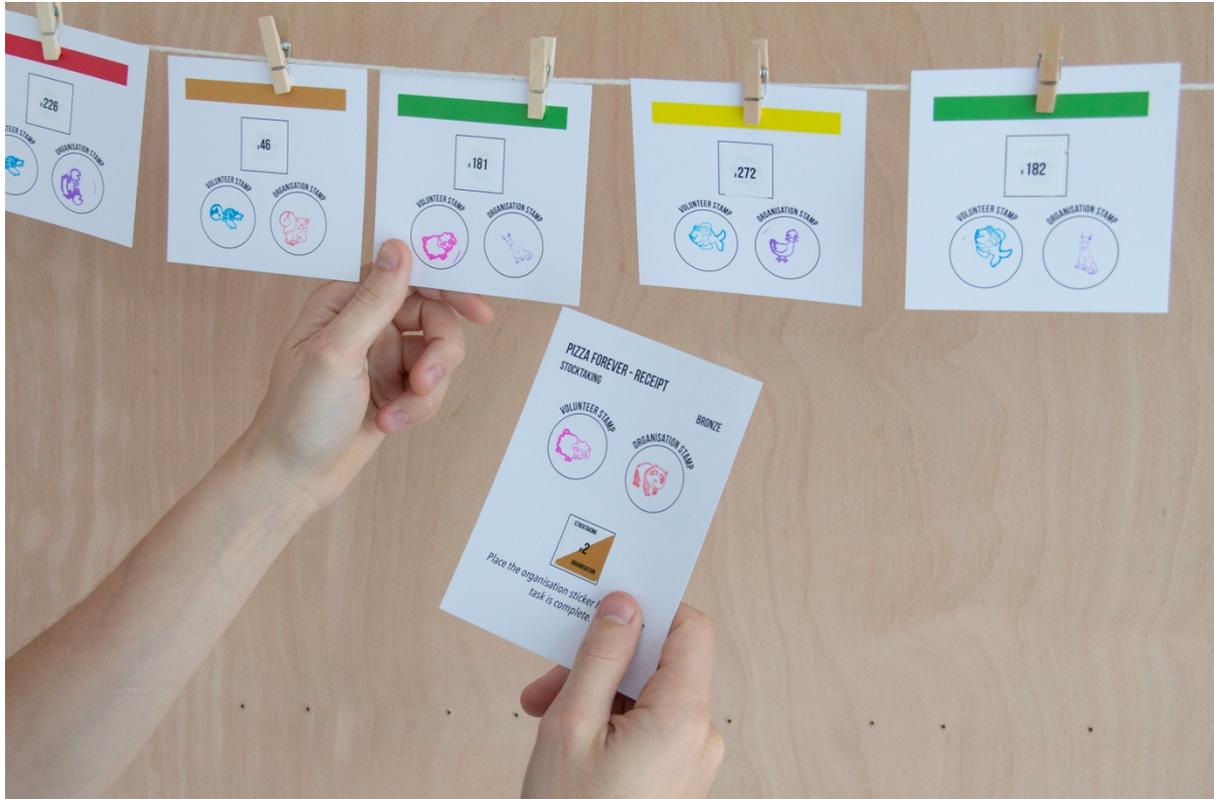


Figure 1: Example of the public ledger washing line. Numbered stickers reference unique transactions, and can be used to validate claims made by players of the game.



Figure 2: Unique set of stickers given to a volunteer for each skill or task they complete. Organisation stickers are kept by Training Centres or Social Enterprises; the white sticker is placed on the public ledger; private stickers are for a volunteer's own wallet; and proof stickers can be used to prove skills to other players in the game.



Figure 3: A volunteer's private ledger, with a chronological record of each transaction resulting in a skill or task sticker. Proof stickers are held in the wallet and can be selectively shared with a stamp, in order to prove their skills.

- Volunteers also maintain personal and private ledger or 'wallet', which shows the order in which they learnt skills and completed tasks for social enterprises (Fig 3). This could be seen as a trusted volunteer CV, which is independent of any other organisation, and can be selectively shared with the volunteer's permission.

4. *Training Centres* are trusted providers of identity, and maintain a centralised record of each volunteer's activities with them. This represents the status quo of much current identity management. They can award volunteers stickers in exchange for payment with tokens, and

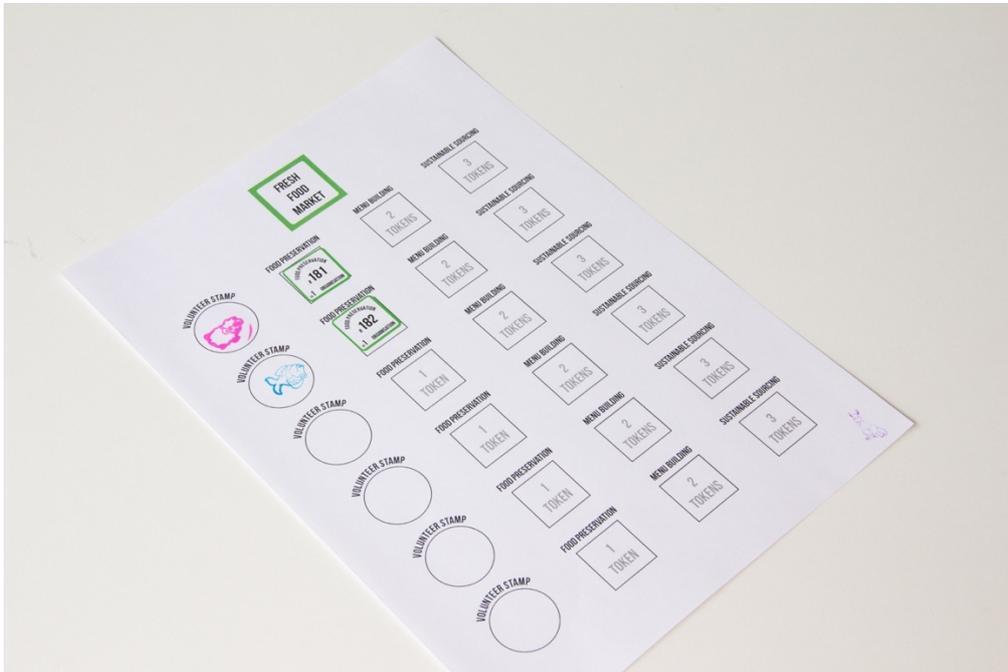


Figure 4: A training centre record sheet of each volunteer, their unique animal stamps, and the skills they have learned. This is the status quo of centralised record keeping.



Figure 5: The Social Enterprise record. On one side, the task description, and required skills. On the other, a receipt stamped by both volunteer and organisation, and the task sticker awarded to the volunteer for their experience.

5. Rather than maintaining a record or database of volunteers directly, *Social Enterprises* simply have a record of completed jobs, and only a snapshot of the skills each volunteer required for a specific task. In this way, the data retained about volunteers and their identity can be minimised and hence more securely shared.

4. Reflections on DLT for the Voluntary Sector

Reflecting on the ongoing design and development of this game, and a series of conversations and workshops with volunteers and VIOs, we outline the opportunities and challenges that are envisioned for these new technologies in the voluntary sector.

4.1. What kind of identity data would benefit from this kind of record?

The primary question is what kinds of data about a volunteers' identity would benefit from being shared in a distributed ledger. In general terms, DLT applications tend to be envisaged where data can be objectively and reliably recorded, and where there is value in sharing this data beyond a single organisation. DLTs need not necessarily replace or compete with existing identity management schemes, but could underpin or anchor some of the data within them. In our discussions, several different kinds of data have been considered:

Certification: Many volunteer organisations share similar regulatory burdens in terms of ensuring the appropriateness of volunteers for the tasks at hand. In particular many organisations require a volunteer to complete a basic disclosure and background check of any past criminal offences, especially when working with children or vulnerable adults. These checks are mostly provided by specific government agencies, according to well-defined, objective criteria and consistent procedures. If an individual volunteers with more than one organisation, they may have to complete the same checks, multiple times. In theory then, both volunteers and organisations could benefit from a means to share the positive results of these check.

Training: Volunteers are often required to undertake basic forms of health and safety training, as well as other specialisms such as First Aid, or operating specialist machinery. While these training courses may be provided by an external agency, each organisation may also conduct much of its own internal training, leading to considerable repetition, especially if a volunteer cannot easily demonstrate their prior training record. A more definitive and shared record of certain kinds of common training, could clearly alleviate these challenges. Further work to explore the need for, or alternatives to, some form of such a training 'register' may be required.

Permissions and Restrictions: Non-profits may also need to maintain (edit and update) a list of permissions that each volunteer has allowed (for example to be photographed and used in publicity material, or to receive phone calls); or permission that each volunteer is granted, for example, access to databases or collections; or any specific restrictions. Once again, these may be consistent across multiple organisations, but maintained entirely separately and in duplicate. It may be considerably more efficient were both volunteers and organisations able to maintain a shared consensus about the state of these permissions and restrictions – potentially via permissioned access to health records, distributed HR systems, etc.

Recording Service: Finally, many organisations record in some way a record of the service of volunteers. This may be a number of hours, participation in specific events and specific achievements. However, while a volunteer may serve a number of organisations, it is currently challenging for this service to be considered in aggregate. This holistic view may be useful where a number of smaller organisations seek to jointly co-ordinate sector wide events, share an awards program or simply better contextualise the service of a particular volunteer.

Each of these use cases warrants further exploration. However, it is clear that in each case, significant collaboration is required beforehand to ensure their effectiveness. One participant hence imagined a blockchain as a way to enforce and mobilise a "*shared charter of principles*" about the procedures of recruitment, training, recording etc.

4.2. Volunteer-Led vs Organisation-Led Ledgers

The above examples hint at two potentially diverging approaches to designing DLT systems for the sector: organisation-led or volunteer-led. DLT applications may provide means for *organisations* to tighten and formalise their bonds and convergence between related stakeholders in the voluntary sector. Operationally, these DLT applications could bring ease-of-use benefits to volunteers, and administration-cost-reduction benefits to VIOs. In this case, a blockchain is valued as a means to enforce, maintain and simplify agreed principles of co-operation. In some respects, this is an evolution of current practices.

A more revolutionary potential can be envisaged where communities of *volunteers* develop their own ledgers, and have the ability to define themselves and their activity beyond any single organisation. While certification of different kinds may still derive from formal and trusted organisations, how might this be used to share their experience with other communities? In some respects, volunteers more resemble free agents, who may serve across a range of related organisations with greater flexibility than they currently can – perhaps with parallels to trends in the ‘gig economy’. In turn this could fundamentally challenge the existing roles of VIOs in how they recruit and co-ordinate volunteers. It may even be that automated systems are able to commission and corral cohorts of volunteers for one off jobs or challenges outside of any single organisations’ remit. Most radically, some organisations could be disintermediated to the extent they are responsible only for delivering opportunities for voluntary work, and validating that this work has taken place. In so doing, they may become more divorced from many of the administrative processes of recruiting, training and managing *their* own volunteers. Clearly, such disintermediation would require great care, and could be quite inappropriate for some contexts and some volunteers. But it may open up volunteering to a wider range of actors, and greater self-determination of how and what volunteering takes place.

4.3. Challenges Defining What Counts for Volunteers and their Identities

As a shared accounting system, creating ledgers of volunteers and their activities can demand highly specific definitions of what ‘volunteering’ is or what counts. This would be true of most technical systems, however is particularly important for a DLTs, which are based on accurately recording pre-defined types of transactions between parties, for an immutable shared record. Clearly creating and agreeing such definitions can be challenging; the ‘hard’ transactional efficiency expected by DLTs can be in sharp tension with the ‘soft’ need for collaboration, improvisation and relationship building in the voluntary sector. For at least some aspects of skills and experience recording, a clear binary distinction (‘have/have not’) can be (initially) confirmed by a third-party awarding body, be that a University, Government agency such as DVLC or other qualification/licensing body. These ‘hard’ objectively determined attributes can work well in a DLT environment. However, softer and fuzzier subjective perceptions about attributes such as the value of individuals contributions, qualities such as empathy and team-participation lack any pre-determined ‘pass’ standards that are widely understood and recognised. More broadly, where eligibility transforms into ‘performance management’, risks undermining some of the core inclusivity of volunteering.

As such, the PizzaBlock workshop itself promoted some immediately interesting and strong reactions from volunteer co-ordinators – in particular to note how the potential ‘value’ of a volunteer often cannot be holistically captured in a series of specific, validated skills. Indeed, any volunteer who comes to an organisation could be seen as a raw resource, which good volunteer organisations should be able to flexibly accommodate. Some participants feared that the formality of a DLT could hinder this. Though the pizza-making narrative of the game focused on skills, it served as a catalyst for participants to identify clearly what aspects of volunteering cannot be so easily accounted for, and to question how new technologies can leave room for this kind of flexibility.

4.4. Designing Inclusive and Collaborative Systems?

Hence, like many other formalised data-driven systems, there are risks that DLT systems may be exclusive to some volunteers and some kinds of voluntary activity. They could for example create tiers of volunteering, and overlook those who give their time generously, albeit less effectively. As such considerable care must be taken in the design and implementation of such tools.

In subsequent discussions, this concern about inclusivity was developed further. As one group summarised:

“One thing we came to quite early on, what we don't want to do in this space, is just create repositories of what people's skills are, but more importantly what people can't do, and in a way making sure that we don't end up looking like we're just another [...] department of work and pensions, which exists to cut people off, and cut back certain services.”

Clearly there's a need for identity records to be designed and used constructively, rather than to be focused solely on compliance, risk or narrowly defining opportunities. While DLTs appear well suited for shared certification schemes, there is a risk that these reinforce barriers to volunteering. As such, several discussions we have had with practitioners have grappled with exactly which aspects of volunteer identity would benefit from more formal recording. Some participants reflected that more formal and distributed reporting of volunteer activities and skills may in fact be most valuable to those beyond the volunteer sector, such as future employers or external organisations. In other words: *“what would it mean to support someone beyond volunteering?”*

However, despite recognising this external value, workshop participants were concerned that such an *'accountant culture'* would favour certain kinds of volunteers, typically the most able and proactive, over others. To provide an alternative perspective, another participant suggested that rather than accountancy, these records should instead ideally function as *“different access points”* for volunteering, and the provision of volunteer-run services. Certification of some basic requirements should ideally enable more people to volunteer and to trust volunteers of all kinds, rather than set another series of barriers which can only be overcome by large organisations and motivated volunteers.

5. Discussion and Future Work

In this short paper reporting on our scoping work, we raise more questions than we can answer. While this project has explicitly sought to understand the disruptive potential of blockchain technologies in the voluntary sector, we have endeavoured to be wary, and reflective, of being solutionist or techno-centric. In principle, our paper illustrates several different avenues for distributed ledger technologies to be considered in voluntary contexts: from certification of skills, training and permissions, to recognising diverse voluntary service. However, it's clear that in practice, any kind of new accounting technology will be more complicated.

In the first instance, while distributed ledger technologies are often presented as a *'trustless'* system, where no single actor is relied upon for the system to work, many applications will rely upon very close-knit collaboration and agreement of the parameters for any system, before it can be implemented and shared across a network. More broadly, there are concerns about the ability of formal, technical systems to accurately reflect and support the complexities of everyday volunteer co-ordination. This echoes Lowe's critique of new public management philosophies which focus solely on simplified outcomes (Lowe, 2017). Relatedly, were volunteering service to become so formally recorded (and rewarded), does this tread on the toes of a voluntary ethics where time is

often given without expectation of explicit rewards? How could DLTs be used to promote recognition and achievement, without producing a transactional experience familiar to paid labour.

Hence, while we optimistically envisage the potential of these technologies to underpin a far greater degree of collaboration between voluntary organisations, and hence the flexibility of volunteers to serve a number of organisations and develop a coherent service record, considerable further work is required. Firstly, recognising a limitation of our own work, we have tended to focus on volunteer coordinators and their organisations, rather than volunteers themselves. Workshops such as PizzaBlock ought to be organised with grassroots volunteers in order to understand their individual perspectives to a more decentralised sector where they might play a greater role in managing their identity data. Similarly, envisioning of these technologies should go hand-in-hand with speculation about the future requirements about how volunteer contributions are identified, commissioned and centrally serviced. DLTs may deliver some efficiencies in how organisations can work together, but a more revolutionary potential requires rethinking entirely the different intermediary roles non-profits play in civil society, and what it would mean for these to become more decentralised. Finally, future work should relish technical partnerships, and the hands-on development of real-world prototypes in order to understand in depth the implications and limitations of their application.

6. References

- Casino, F., Dasaklis, T. K., & Patsakis, C. (2019). A systematic literature review of blockchain-based applications: Current status, classification and open issues. *Telematics and Informatics*, 36, 55–81. <https://doi.org/10.1016/j.tele.2018.11.006>
- Coppi, G., & Fast, L. (2019). *Blockchain and distributed ledger technologies in the humanitarian sector* [Research Report]. Retrieved from HPG Commissioned Report website: <https://www.econstor.eu/handle/10419/193658>
- Dunphy, P., & Petitcolas, F. A. P. (2018). A first look at identity management schemes on the blockchain. *IEEE Security & Privacy*.
- Elsden, C., Gloerich, I., Spaa, A., Vines, J., & de Waal, M. (2019). Making the Blockchain Civic. *Interactions*, 26(2), 60–65. <https://doi.org/10.1145/3305364>
- Elsden, C., Manohar, A., Briggs, J., Harding, M., Speed, C., & Vines, J. (2018). Making Sense of Blockchain Applications: A Typology for HCI. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, 458:1–458:14. <https://doi.org/10.1145/3173574.3174032>
- Kewell, B., Adams, R., & Parry, G. (2017). Blockchain for good? *Strategic Change*, 26(5), 429–437. <https://doi.org/10.1002/jsc.2143>
- Lowe, T. (2017). Performance management in the voluntary sector – responding to complexity. *Voluntary Sector Review*, 8(3). <https://doi.org/info:doi/10.1332/204080517X15006273841592>
- Nissen, B., Symons, K., Tallyn, E., Speed, C., Maxwell, D., & Vines, J. (2017). New Value Transactions: Understanding and Designing for Distributed Autonomous Organisations. *Proceedings of the 2017 ACM Conference Companion Publication on Designing Interactive Systems*, 352–355. <https://doi.org/10.1145/3064857.3064862>
- Pazaitis, A., De Filippi, P., & Kostakis, V. (2017). Blockchain and value systems in the sharing economy: The illustrative case of Backfeed. *Technological Forecasting and Social Change*, 125, 105–115. <https://doi.org/10.1016/j.techfore.2017.05.025>

Rauchs, M., Gliddens, A., Gordon, B., Pieters, G., Recanatini, M., Rostand, F., ... Zhang, B. (2018). *Cambridge Judge Business School: Distributed Ledger Technology Systems*. Retrieved from University of Cambridge website: <https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/distributed-ledger-technology-systems/#.XGxoeZP7Qch>

Voida, A., Harmon, E., & Al-Ani, B. (2012). Bridging Between Organizations and the Public: Volunteer Coordinators' Uneasy Relationship with Social Computing. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 1967–1976*. <https://doi.org/10.1145/2207676.2208341>