

# Decentralization, Blockchains, and the Development of Smart Communities in Economically Challenging Environments: Open Review

Brett Bourbon,\* Renita Murimi†

Reviewers: Reviewer A, Reviewer B, Reviewer C

**Abstract.** The final version of the paper “Decentralization, Blockchain, and the Development of Smart Communities in Economically Challenging Environments” can be found in Ledger Vol. 9 (2024) 30-50, DOI 10.5195/LEDGER.2024.302. There were three reviewers involved in the review process, none of whom have requested to waive their anonymity at present, and are thus listed as Reviewers A, B, and C. After initial review by Reviewers A and B, the submission was returned to the authors with feedback for revision (1A). The authors resubmitted their work and responded to reviewer comments (1B). Reviewer A recommended accepting the paper, but Reviewer B was unavailable for another round of review, at which point Reviewer C was enlisted for a second round of review (2A). The authors revised their submission and responded to Reviewer C’s comments (2B) and the paper was returned to Reviewer C, who then recommended the paper be accepted, thus ending the peer review process. Author responses have been bulleted for reader clarity.

## 1A. Review

### Reviewer A

*Does this paper represent a novel contribution to cryptocurrency or blockchain scholarship?*

Not sure

*Please briefly explain why you think the paper makes or does not make a novel contribution.*

The paper addresses an interesting issue, but it is vague in its core propositions.

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\*B. Bourbon (bourbon@udallas.edu) is Associate Professor of English at University of Dallas, USA.  
†R. Murimi (rmurimi@dallas.edu) is Associate Professor of Cybersecurity at University of Dallas, USA.

*Is the research framed within its scholarly context and does the paper cite appropriate prior works?*

Yes

*Please assess the article's level of academic rigor.*

Unsatisfactory (better than poor but a long way from excellent)

*Please assess the article's quality of presentation.*

Good (not excellent but a long way from poor)

*How does the quality of this paper compare to other papers in this field?*

The paper has some value but it can easily be replaced by better scholarship in the field.

*Please provide your free-form review for the author in this section.*

This paper proposes four illustrations from poor and, in a couple of cases, crisis-ridden contexts where a blockchain has been effectively utilised to alleviate poverty.

This is an inspirational space in which to explore blockchain adoption. But i feel that the argument is way underdeveloped. The paper spends a lot of time establishing the importance of the subject matter, and is followed by four brief illustrations. These illustrations would be really interesting if they explained in more detail how and on what foundations a ‘blockchain’ was effectively used. Im not suggesting that this must identify the ‘technical’ implementation - it is fine that this isn't the focus of the paper. But there are basic questions that are not engaged: how were these blockchains implemented: how did a central authority distribute control, what was the basis of trust, what was the system of governance, how is proof or work/stake implemented/verified.

All these dimensions are largely absent, so that ‘blockchain’ becomes a black box category, while it is the content of this box that needs to be explained. As a result, the claims of the paper appear more like assertions than conclusions.

Having said that, if the paper spent less time justifying why the topic is legitimate, and more giving an insight on how blockchain technology was applied in the nominated contexts, then this paper has the potential to be ampn important, indeed inspirational essay.

**Reviewer B:**

*Does this paper represent a novel contribution to cryptocurrency or blockchain scholarship?*

Not sure

*Please briefly explain why you think the paper makes or does not make a novel contribution.*

This paper does not make a novel contribution because the scope of research is very broad and the methodology is not clearly described.

*Is the research framed within its scholarly context and does the paper cite appropriate prior works?*

Important references are missing

*Please assess the article's level of academic rigor.*

Poor (terms are poorly defined, the use of jargon is widespread, proofs/derivations are flawed or absent [if necessary], arguments contain significant logical holes, etc.)

*Please assess the article's quality of presentation.*

Good (not excellent but a long way from poor)

*How does the quality of this paper compare to other papers in this field?*

The paper has some value but it can easily be replaced by better scholarship in the field.

*Please provide your free-form review for the author in this section.*

In this paper the author(s) need to provide the discussion regarding the research methodology that is 'case-study based approach' in detail. It is very important to mention the mode of administering the case study based approach. Whether the researchers conducted interviews with the participants of four cases or it is based on the secondary data. I fail to see novel contribution in this research if this research has considered secondary data.

What was the basis of selecting these 4 case studies specifically?

It would be good to pose clear Research questions that would seek answers through case study based approach. The research question in its current form is too broad.

All the cases concentrate on a very small application of blockchain as compared to the

claim of uplifting the rural or under privileged communities or making them smart communities. I would advise to set the scope of this research accordingly.

It is advised to the authors to define clearly the decentralization and centralization concepts in the context of social communities.

## **1B. Author Response**

### **Reviewer A**

This paper proposes four illustrations from poor and, in a couple of cases, crisis-ridden contexts where a blockchain has been effectively utilized to alleviate poverty.

This is an inspirational space in which to explore blockchain adoption. But I feel that the argument is way underdeveloped. The paper spends a lot of time establishing the importance of the subject matter, and is followed by four brief illustrations. These illustrations would be really interesting if they explained in more detail how and on what foundations a ‘blockchain’ was effectively used. I’m not suggesting that this must identify the ‘technical’ implementation - it is fine that this isn't the focus of the paper. But there are basic questions that are not engaged: how were these blockchains implemented: how did a central authority distribute control, what was the basis of trust, what was the system of governance, how is proof or work/stake implemented/verified.

All these dimensions are largely absent, so that ‘blockchain’ becomes a black box category, while it is the content of this box that needs to be explained. As a result, the claims of the paper appear more like assertions than conclusions.

Having said that, if the paper spent less time justifying why the topic is legitimate, and more giving an insight on how blockchain technology was applied in the nominated contexts, then this paper has the potential to be important, indeed inspirational essay.

- Thank you for this comment. We have added an entire section (Section 4: Technical Elements of Blockchain-Enabled Smart Communities on pages 6-10) to address the issue of a lack of technical description of the blockchains used for each of the case studies described in this paper. This new section focuses on the mechanism of governance, the basis of trust engendered by blockchain in these communities, the consensus algorithms used, and in general, the sociotechnical context for the implementation of these blockchains. We appreciate this suggestion for making the blockchain description less of a black box, and more aligned with the nominated contexts in which the blockchain adoption was used for creating the smart community.

### **Reviewer B**

This paper does not make a novel contribution because the scope of research is very broad and the methodology is not clearly described.

In this paper the author(s) need to provide the discussion regarding the research methodology that is ‘case-study based approach’ in detail. It is very important to mention the mode of administering the case study-based approach. Whether the researchers conducted interviews with the participants of four cases or it is based on the secondary data. I fail to see novel contribution in this research if this research has considered secondary data.

What was the basis of selecting these 4 case studies specifically? It would be good to pose clear Research questions that would seek answers through case study-based approach. The research question in its current form is too broad.

- Thank you for this comment. While the scope of blockchain research in this paper is broad, the choice of the four case studies chosen fits specific criteria, namely, that the blockchain implementation is not of the kind that is found in smart city implementations in the developed world. Each of our examples highlight a different kind of challenge, which allows us to delineate different ways blockchain can be used in such circumstances. Despite this variety, we found a common requirement in order for the successful implementation of blockchain solutions in these environments. In each case we found that that smart technology builds not a mini-smart city, but rather a smart local community that was self-sufficient in varying degrees while addressing fundamental economic and political difficulties prevalent in economically challenging environments. We have included a description of this methodology in the last paragraph of Section 1. So, although the paper makes use of secondary data for describing the role of blockchain in building smart local communities, it serves a key role in blockchain literature in analyzing the role of blockchain as a significant technological tool in creating smarter living conditions for people in resource-impooverished environments.

Important references are missing.

- Thank you for this comment. We have added an entire section (Section 4: Technical Elements of Blockchain-Enabled Smart Communities on pages 6-10) to make the paper more robust by including technical descriptions and socio-technical contexts for blockchain adoption in each of the case studies described in this paper. This new section focuses on the mechanism of governance, the basis of trust engendered by blockchain in these communities, the consensus algorithms used, and in general, the socio-technical context for the implementation of these blockchains. Consequently, we have added key references corresponding to each of the blockchains.

All the cases concentrate on a very small application of blockchain as compared to the claim of uplifting the rural or under privileged communities or making them smart communities. I would advise to set the scope of this research accordingly.

- Thank you for this comment. Scholarly research into the possible uses of blockchain in under-developed countries is limited. In addition, the number of smart city

initiatives in these countries is not plentiful. Consequently, in this paper we have undertaken a basic examination of particular cases related to financial inclusion and identity management for under-resourced communities. From these use cases, we have inferred a basic set of schematic elements and relationships that we believe facilitates the development of smart city functions through the foundational use of blockchain. Our case-study approach has allowed us to set the scope of this research in terms of identifying the critical role of what we call communities in under-developed socio-economic contexts. It is advised to the authors to define clearly the decentralization and centralization concepts in the context of social communities. Response: Thank you for this comment. We have added a subsection on centralization, decentralization, smart cities, and smart communities in Section 1 (pages 1 – 3) that addresses the interplay of the forces of centralization and decentralization within communities and cities.

## 2A. Second Round of Review

### Reviewer A

*Did you review an earlier version of this submission? (If "no," please contact the editor.)*

Yes

*Has the submission been sufficiently revised to address your previous concerns?*

Yes

*Do you have any new concerns specific to this revision?*

Yes

*If you answered "yes" to the previous question, please provide more detailed feedback here.*

There's never been a paper without ‘concerns’! I think this paper is way more robust than the original and it addresses the reviewer concerns. It is innately general, posing the realm of the possible, and framed as commentary rather than hard, formal analysis. But I think this framing is appropriate to the vision set by the authors.

The only thing i would like to see added is some use of references to parallel illustrations. These do not appear in the ‘academic literature’ (the reference space nominated by the authors) but organizations like EthicHub and OneProject pursue the sorts of projects described in this paper and their websites provides some detail of their discourse and operations. I don’t think these sources need to be all over the paper, but it would be a way of transmitting to the audience the existence projects beyond the four case studies. I appreciate that this list could be very long where the request pursued in detail, but a few non-academic links in the bibliography would be useful. I don’t feel that acceptance is

conditional upon this inclusion.

*Please provide your recommendation to the Editor.*

Accept (this paper should be published subject only to minor corrections [described in my comments] that can be coordinated between the author and editor)

### **Reviewer C**

*Does this paper represent a novel contribution to cryptocurrency or blockchain scholarship?*

No

*Please briefly explain why you think the paper makes or does not make a novel contribution.*

The description of the four case studies is interesting, but the core elements/contribution of blockchain is not worked out such that it can be the foundation for future research. There is no overarching general framework/theory that results from this research. Consequently, the findings in section 5 (e.g., decentralization, trust, identity management) are all well known and do not provide a novel contribution. The main problem is that the method is not adequately described. I suggest that the authors have a look at the paper from Rozas et al. (2021).

*Is the research framed within its scholarly context and does the paper cite appropriate prior works?*

Important references are missing

*Please assess the article's level of academic rigor.*

Poor (terms are poorly defined, the use of jargon is widespread, proofs/derivations are flawed or absent [if necessary], arguments contain significant logical holes, etc.)

*Please assess the article's quality of presentation.*

Good (not excellent but a long way from poor)

*How does the quality of this paper compare to other papers in this field?*

The paper has some value but it can easily be replaced by better scholarship in the field.

*Please provide your free-form review for the author in this section.*

Dear Authors,

I am glad that I had the opportunity to review your paper “Decentralization, Blockchain, and the Development of Smart Communities in Economically Challenging Environments”. I am personally very fond of interesting case studies that pursue a qualitative approach. Correctly done, they can generate a lot of new insights and be the foundation for future studies. You also have a highly interesting subtopic (smart communities) and your choice of case studies (i.e., the diversity of them) is great. Having said this, your paper still suffers from numerous substantial issues, which is surprising, given that you already got feedback in a first review round. I agree with the main issues that the other reviewers raised, all of which are not adequately addressed.

For example, reviewer B was asking for a clear research question and in your answer you basically justify your approach. I believe that it would help a lot if you could formulate your research goal in the form of one or more questions at the end of the introductory section.

The biggest problem is by far the methodology, which you have not addressed in the revision of your paper. Even though it is a very flexible approach, case study research can be done in a rather rigorous manner. Broadly speaking, different types exist, depending on your respective starting point. You can find more information about this in Ridder (2017). In your case, I suggest that you follow a more descriptive approach, as outlined in the seminal work of Yin (2013). Importantly, this means that you need to clearly document your choice of studies, your collection of data and also the way in which you analyze them and how you derive your conclusions. All of this is (still) completely missing in your paper.

You write “We have included a description of this methodology in the last paragraph of Section 1”. In the paper it reads: “In section 2, we will examine four cases in which smart technologies ‘in which smart technologies’ (sic!) were implemented in ways that do not fit the patterns”. Apart from the fact that this gives a sloppy impression, all the basic information that is needed for the methodology is missing. As outlined above, this includes the way in which you gathered and analyzed the data and derived your conclusions. In this regard, it would help if you included a separate methodology section. Additionally, I recommend that you have a look at other published blockchain case studies. Recommendations can also be found on how to write them (e.g., Treiblmaier, 2019).

Additionally, it would help if you could connect your own research to previous work on communities. The most important literature in this area comes from Ostrom (1990). Her concepts have already been applied to blockchain (Rozas et al., 2021). It would highly increase the usefulness of your research if you built on such previous work and then make it clear how you extend it.

I also highly recommend that you include visuals and a specific discussion/conclusion section. If you can put your findings in a nomological network, this would make it clear how exactly you want to generalize your results. As I outlined before, I find your choice



of case studies to be very interesting and I enjoyed reading your paper up to section 2. Section 3 should be incorporated into the literature review. Section 4 mimics the case description of section 2 with a more technical focus and it would help if those two sections would be combined. A table might help in which the core features of the respective case studies are juxtaposed. The biggest problem is Section 5, in which you more or less continue your description. Even a subheading is “copy and paste”: “Formal verifiable identities for financial inclusion: the case of Sierra Leone”. This should be the section in which you distill your results and combine them in a new way (e.g., a novel framework). The topics that you describe here (decentralization, trust, identity management) have long been discussed in blockchain research. It will benefit your paper a lot if you manage to produce real interesting findings of how blockchain can in fact benefit smart communities. Currently, you are running in circles (e.g., “in a situation in which trust is low and in which people cannot rely on preexisting institutions, blockchain’s immutability offers a system in which people can place a high degree of trust”). In other words, this is the place where you can make contribution.

Given that this paper has already been revised, I unfortunately have to recommend “Rejection”. While I understand that this outcome might be disappointing for you, I still see a lot of value and potential in your choice of topic and your case studies. Correctly done, this can be a study that can offer a substantial contribution to the academic community. I wish you all the best for your future work.

## References

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press.

Ridder, H.-G. (2017). The theory contribution of case study research designs. *Business Research*, 10(2), 281–305. <https://doi.org/10.1007/s40685-017-0045-z>

Rozas, D., Tenorio-Fornés, A., Díaz-Molina, S., & Hassan, S. (2021). When Ostrom Meets Blockchain: Exploring the Potentials of Blockchain for Commons Governance. *Sage Open*, 11(1), 1–14. <https://doi.org/10.1177/21582440211002526>

Treiblmaier, H. (2019). Toward More Rigorous Blockchain Research: Recommendations for Writing Blockchain Case Studies. *Frontiers in Blockchain*, 2(3), 1–15. <https://doi.org/10.3389/fbloc.2019.00003>

Yin, R. K. (2013). *Case Study Research (5th ed.)*. Sage Publications.

## 2A. Authors' Response to Second Round of Review

The description of the four case studies is interesting, but the core elements/contribution of blockchain is not worked out such that it can be the foundation for future research. There is no overarching general framework/theory that results from this research. Consequently, the findings in section 5 (e.g., decentralization, trust, identity management) are all well-known and do not provide a novel contribution. The main problem is that the method is not adequately described. I suggest that the authors have a look at the paper from Rozas et al. (2021).

- Thank you for the recommendation to add details of our methodology. We have added the method in Section 1 (lines 154 – 181), as well as Section 2 on pages 5 and 6 (lines 194 – 244), and aligned our methodology to the recommendations for blockchain case study research in the academic literature. The Rozas et al. (2021) paper has been helpful.

Important references are missing.

- We have added the following references related to blockchain in the humanitarian sector, as well as references related to systematic literature review for blockchain case study research (and case study research, in general). See highlighted sections in the References to find the newly added articles. See lines 47-96 for related work in blockchain for social good, and lines 194-244 for the systematic literature review.
- Benkler, Y. (2002). Coase's penguin, or, Linux and "the nature of the firm." *The Yale Law Journal*, 112(3), 369–446.
- Treiblmaier, H. (2019). Toward More Rigorous Blockchain Research: Recommendations for Writing Blockchain Case Studies. *Frontiers in Blockchain*, 2(3), 1–15. <https://doi.org/10.3389/fbloc.2019.00003>
- Lacity, M. C. (2018). *A Manager's guide to blockchains for business: From knowing what to knowing how*. SB Publishing.
- Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press.
- Ngai, E. W., & Gunasekaran, A. (2007). A review for mobile commerce research and applications. *Decision support systems*, 43(1), 3-15.
- Watson, R. T. (2015). Beyond being systematic in literature reviews in IS. *Journal of Information Technology*, 30, 185-187.
- Rozas, D., Tenorio-Fornés, A., Díaz-Molina, S., & Hassan, S. (2021). When Ostrom Meets Blockchain: Exploring the Potentials of Blockchain for Commons Governance. *Sage Open*, 11(1), 1–14. <https://doi.org/10.1177/21582440211002526>

- Coppi, G., & Fast, L. (2019). *Blockchain and distributed ledger technologies in the humanitarian sector*. HPG Commissioned Report.
- Ridder, H. G. (2017). The theory contribution of case study research designs. *Business research, 10*, 281-305.

Reviewer B was asking for a clear research question and in your answer you basically justify your approach. I believe that it would help a lot of you could formulate your research goal in the form of one or more questions at the end of the introductory section. The biggest problem is by far the methodology, which you have not addressed in the revision of your paper. Even though it is a very flexible approach, case study research can be done in a rather rigorous manner. Broadly speaking, different types exist, depending on your respective starting point. You can find more information about this in Ridder (2017). In your case, I suggest that you follow a more descriptive approach, as outlined in the seminal work of Yin (2013). Importantly, this means that you need to clearly document your choice of studies, your collection of data and also the way in which you analyze them and how you derive your conclusions. All of this is (still) completely missing in your paper.

- Our research question concerns the use of blockchain in situations where basic socio-technical infrastructures are lacking. This primarily leads to scenarios of humanitarian work, and the current version of the paper addresses the lack of this information. The research question is mentioned on page 2 of the paper. See lines 47-51.
- Regarding the methodology, thank for suggesting the Ridder (2017) article. We found it very useful, and have rewritten the case study methodology section of our paper. On pages 5 and 6, we have mentioned the *social construction of reality* approach that we used in this paper, while also highlighting how the other categories of case study research proposed by Ridder would not be possible for the context of our research questions. See lines 215-244.

You write “We have included a description of this methodology in the last paragraph of Section 1”. In the paper it reads: “In section 2, we will examine four cases in which smart technologies ‘in which smart technologies’ (sic!) were implemented in ways that do not fit the patterns”. Apart from the fact that this gives a sloppy impression, all the basic information that is needed for the methodology is missing. As outlined above, this includes the way in which you gathered and analyzed the data and derived your conclusions. In this regard, it would help if you included a separate methodology section. Additionally, I recommend that you have a look at other published blockchain case studies. Recommendations can also be found on how to write them (e.g., Treiblmaier, 2019).

- Thank you for suggesting the Treiblmaier (2019) paper. We have included the specific details including keywords, databases, constraining conditions, and the general identification process that we used to select the four case studies mentioned in our article. See lines 194-214.

- At the same time, we are also forthcoming about the general dearth of information available either in industry literature or academic literature about how blockchain implementations in environments lacking technological infrastructure is meager.
- All of this information is in a separate methodology section on pages 5 and 6. See lines 194-244.

Additionally, it would help if you could connect your own research to previous work on communities. The most important literature in this area comes from Ostrom (1990). Her concepts have already been applied to blockchain (Rozas et al., 2021). It would highly increase the usefulness of your research if you built on such previous work and then make it clear how you extend it.

- Thank you for the recommendation to connect our research to broader work in commons governances. References to both Ostrom’s governance rules and Rozas et al’s application of Ostrom’s research to blockchain scenarios have been added to this revised version on pages 1 and 2, while highlighting how we extend their work. See lines 66-96.

I also highly recommend that you include visuals and a specific discussion/conclusion section. If you can put your findings in a nomological network, this would make it clear how exactly you want to generalize your results. As I outlined before, I find your choice of case studies to be very interesting and I enjoyed reading your paper up to section 2. Section 3 should be incorporated into the literature review. Section 4 mimics the case description of section 2 with a more technical focus and it would help if those two sections would be combined. A table might help in which the core features of the respective case studies are juxtaposed. The biggest problem is Section 5, in which you more or less continue your description. Even a subheading is “copy and paste”: “Formal verifiable identities for financial inclusion: the case of Sierra Leone”. This should be the section in which you distill your results and combine them in a new way (e.g., a novel framework). The topics that you describe here (decentralization, trust, identity management) have long been discussed in blockchain research. It will benefit your paper a lot if you manage to produce real interesting findings of how blockchain can in fact benefit smart communities. Currently, you are running in circles (e.g., “in a situation in which trust is low and in which people cannot rely on preexisting institutions, blockchain’s immutability offers a system in which people can place a high degree of trust”). In other words, this is the place where you can make contribution.

- Thank you for the many suggestions to improve the structure of the paper. Below please find a summary of the changes we have made:
  - a. We have added a methodology subsection in Section 2: Four case studies for smart communities (pages 5 and 6). See lines 194-244.
  - b. We have merged Section 4 (technical details of the blockchain implementations in each case study) with Section 2. See the technical details at the end of each case study.

- c. We have merged Section 3: Blockchain for smart communities with Section 4: Conceptual elements of a smart community. See Section 3: Conceptual Elements of a Smart Community that merges the previous content in Sections 3 and 4.
  - d. We have added a visual in Section 3: Fig. 1. Conceptual elements of smart communities facilitated by blockchain technologies in economically challenged environments (page 13). See lines 539-540.
  - e. We have added a table to juxtapose these conceptual elements found in the four case studies in our paper: Table 1. Overview of the conceptual elements of blockchain-assisted smart communities in the case studies examined in this paper (page 14). See lines 566-568.
  - f. The subheading copy was sloppy work. We apologize. The proper subheading (Newer pathways for integration) has been added on page 15, and is also reflected in both Fig. 1 and Table 1. See lines 574-583.
- We have rewritten the conclusion to better reflect how blockchain can create smart communities to satisfy basic needs in the absence of underlying socio-technical infrastructure. See lines 646-658.



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