Data4Good: An Established Framework for supporting Civil Society Organizations

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***Abstract*—Civil society organisations (CSOs) are critical to the advancement of human well-being, particularly in the Global South and in Small Island Developing States (SIDS). In these developing spaces, civil society's impact often faces barriers due to resource constraints ranging from human capacity to finance. It is well established that data science and Information and Communications Technology (ICT) play a key role in the digital age in improving the efficiency and productivity of for-profit companies. However, such benefits have yet to be accrued in the work of civil society in small developing states as they often lack the resources to use tools like Artificial Intelligence (AI) to improve their operations. Simply providing funding or ICT resources may not solve the problem. We propose a framework in which Data Science resources can be provided to CSOs in such a way that all parties benefit, through an adaptation of the technology stewardship model. The proposed model describes a distributed framework for technology stewardship that comprises a coordinating agency, client and beneficiary civil society organisations, students and expert mentors, that all work together to deliver value to the beneficiary organisations, as well as to each other. This Framework has been trialled with 10 beneficiary civil society organisations in Trinidad and Tobago with exceptional results. We provide details of this framework as well as the outcomes of its first deployment.**

***Index Terms*—AI for Good, Data Science, Civil Society Organizations, Impactful Research**

I. Introduction

Broadly defined, Civil Society is the space within which organisations and movements develop outside the private and individual family unit, the private sector and the state [1]. The World Bank defines civil society further as "the wide array of non-governmental and not-for-profit organisations that have a presence in public life, and express the interests and values of their members and others, based on ethical, cultural, political, scientific, religious or philanthropic considerations" [2].

Civil Society Organisations (CSOs) are also as diverse as their definitions and run the gamut from Non-governmental Organisations, Non-Profit Organisations, Community Organisations, Faith-Based Organisations, Educational Institutions and many more, depending on the country or region in which they are located. Regardless of definition, civil society organisations are a fundamental element of the global governance and development framework, and they provide critical contributions towards human well-being through humanitarian aid, human rights advocacy, service delivery to marginalised groups and organisational watchdogs for good governance, to name just a few of the areas in these organisations work [3].

The delivery of these services, globally, has been influenced by organisational, financial and human resources, as well as the governance and legislative contexts within which these organisations operate [4]. These contexts are even more existential for civil society organisations that operate within Small Island Developing States (SIDS) which, as the United Nations describes, "are a distinct group of 38 UN Member States and 20 Non-UN Members/Associate Members of United Nations regional commissions that face unique social, economic and environmental vulnerabilities" [5].

SIDS, and the organisations within them, are faced with several challenges that constrain their development process, or their ability to contribute effectively to development that include: narrow human and natural resource bases; vulnerable economies due to small domestic markets; a low ability to compete in international markets; and high population densities [6], [7]. Civil society organisations that operate in SIDS share many of these constraining characteristics in the implementation of their work, which now includes a lower ability to bridge the digital and technology divide, a fact that has been highlighted in the Latin America and Caribbean Region (LAC), with Digital Adoption Indices (DAIs) that place LAC countries, including many SIDS, substantially behind similar countries outside of the region in relation to the adoption of digital technologies [8].

Facilitating the wider adoption of digital technologies by civil society organisations in SIDS is needed to ensure that they are able to continue engaging in their critical work, as digital technologies can provide the means to overcome constraints such as limited human and financial resources and the lower ability to participate in public policy and developmental processes [9]. This paper begins with a discussion of the theoretical frameworks that support the enhancing of civil society organisations' ability to adopt and use digital technologies in their work. We then describe the proposed distributed technology stewardship framework and preliminary results of an ongoing action research project in Trinidad and Tobago, leading to conception of the first pilot "CSO Data Science and Technology Accelerator Programme" (CSO DTA) that ran for 6 months. The paper concludes with a brief discussion of impact and outcome assessment for the

technology stewardship model and the CSO-DTA.

II. Related Work and Contributions

Building the capabilities of civil society organisations in their use of digital technology as a development aim implies that individuals not only have access to affordable and accessible data science and technology services, but that they can effectively adopt and use the technology in ways that are responsive to their needs and ambitions. The concept of technology stewardship has been developed from the concept of communities of practice and speaks to the stepping up of a person or individuals who take responsibility for the adoption and use of technology by communities. As eloquently defined in [10], "Technology stewards are people with enough experience of the working of a community to understand its technology needs, and enough experience with or interest in technology to take leadership in addressing those needs. Stewarding typically includes selecting and configuring technology, as well as supporting its use in the practice of the community".

Technology stewardship can occur in the form of an individual, a group or organisation or spread across multiple actors within a community [10]. Occupying the role of a technology steward assumes three main characteristics: understanding the community in which you operate and building the trust therein; having the capacity and capability to understand the technology to be shepherded; and the ability to implement the chosen technologies into the operations of the community. However, as described previously, in SIDS, human and financial constraints present barriers to organisations who may wish to act in the role of a technology steward. Developing trust and community awareness, capacity for teaching and implementation capability would be a challenge for any single organisation. The concept of dispersed or distributed technology stewardship therefore appears best suited to these spaces.

Both Kleine and Gigler [11], [12], [13], [14] have introduced theoretical frameworks to address these issues. Gigler, drawing on Sustained Livelihoods Framework, emphasizes the role of intermediaries in contributing to informational capabilities as a step toward enhanced human and social capabilities [14]. Kleine, on the other hand, adopts an empowerment perspective to introduce a Choice Framework that directs efforts toward "achieved functioning" as a proxy for capabilities [13]. These degrees of empowerment express an increasing ability to act on choice in a way that supports a variety of self-determined outcomes. The use of that choice requires an individual or organisation with skills and training to configure and operate the system in the intended manner. Achievement of that choice, however, will require the participation of others beyond the individual, including other users in the community as well as institutions. Technology can establish a centralised and dynamic communication system and analytical tool for communities to align efforts to achieve common goals through transparent and accountable means. "Collective Impact is the commitment of a group of important actors from various fields to share a common agenda for solving a specific social problem, using a structured form of collaboration" [15].

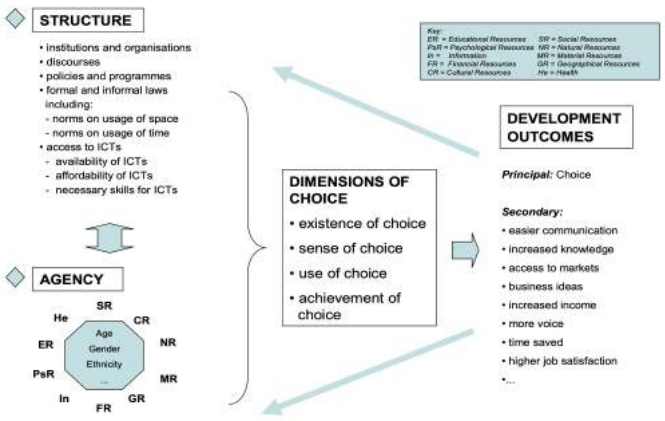

Fig. 1. Kleine's Choice Framework [11]

Kania and Kramer[15] presented five conditions for collective impact: a backbone organisation, a common agenda, shared measurement, continuous communication and mutually reinforcing activities. According to Kania and Kramer [15], efforts to collaborate amongst organisations have not produced the desired outcomes because they do not result in a sustained alignment of goals across the organisations. Further, Kania and Kramer [15] explain that the success of collective impact is rooted in the aforementioned five characteristics.

The Kleine's Choice Framework (Figure 1) looks at the agents (community) element of the capabilities approach and stresses on the importance of individual and collective choices of local people and how those agents interact to influence the degrees of employment and ultimately the development outcomes. In the systemic analysis of the Choice Framework, individuals use their agency to navigate social structures which they have co-created and are constantly co-creating [16]. This social structure encompasses personal characteristics such as age, gender, ethnicity etc. Alsop and Heinshn [17] extended this, re-categorizing the resource portfolio including material, financial, natural, geographical, psychological, cultural, social, and educational resources; health; time, and information in an attempt to capture the agency element of the systemic framework in a holistic way.

Therefore, through the lens of Kleine's Choice Framework, the technology steward serves four primary responsibilities (as outlined by Gow [18]) with regard to their involvement in the innovation process, namely (a) make the community aware of the existence of choice, (b) help the community to develop a clear sense of choice, (c) facilitate and support the effective use of choice, and (d) recognize and sustain the achievement of choice.

Our contribution is as follows. We propose a distributed framework for technology stewardship in civil society organisations that disperses the necessary responsibilities and capabilities among a network of like-minded and interested organisations. This proposed framework has been successfully implemented in an ongoing action research project.

III. The Proposed Framework

Globally, CSOs do impactful work in developing communities, regions and countries. These are non-profit organisations usually staffed by volunteers or with limited resources [19]. Consequently, a CSO's ability to build intelligent solutions depends on the availability of either technical staff within the CSO or funding to hire technical talent. However these initiatives draw only on the skill of professionals with the time and motivation to contribute to social causes. Here we provide a framework to include professionals and students who traditionally would not support CSOs directly, but who can contribute to the technology stewardship.

The proposed framework exploits the interests of four roles: clients, students, mentors and coordinators. Clients are the CSOs who need an intelligent solution built but lack the technical staff or funding. Students are individuals who are motivated and have the time to provide solutions but lack experience and exposure. Mentors are professionals with experience and exposure and are interested in helping their communities but have limited time. Coordinators are individuals (typically an organisation) committed to effecting change. They are at the centre of the proposed framework. Their role is to carefully align the interests of each group to build solutions and increase the technical capacity of client-CSOs, while raising awareness among students and mentors.

The first interaction is between the client-CSO and the coordinator. The coordinator seeks a client-CSOs and asks them to identify problems based on their needs. Here the focus of the coordinator is to get an initial understanding of the client-CSO's needs so they select an appropriate group of mentors. A suitable mentor is any individual or group of professionals who are not motivated by profit. Instead, they seek opportunities to add value outside the workplace and possess a desire to transfer their knowledge.

The first responsibility of these mentors is to provide high-level training to the clients. The goal of this interaction is to improve the CSOs' technical understanding of the problem space which empowers them to better understand and make more informed technology decisions. Next, the mentors collaborate with the coordinator and clients to refine the initial problems into a technical problem statement. Guided by this statement, mentors design high-quality solutions and communicates them to the coordinator.

After the client-CSO approves of the designs, the next step is implementation. Here the coordinator glues the groups together via an internship programme. Through the internship the coordinator provides, CSOs with access to students to implement solutions, students with real-world experience from CSOs and exposure to mentors (who are professionals in their field), and mentors with an opportunity to gain management experience and transfer knowledge. University students are ideal for this task because their need for experience and exposure aligns with the goodwill of CSOs and mentors. Another benefit of using university students for implementation is continuity. Typically, these students are required to complete several course projects in addition to a final year project. The coordinator can leverage this deliverable where students earns credits while continuing to add value to client-CSOs. This approach also increases the visibility of the client CSOs and their causes to University faculty and students.

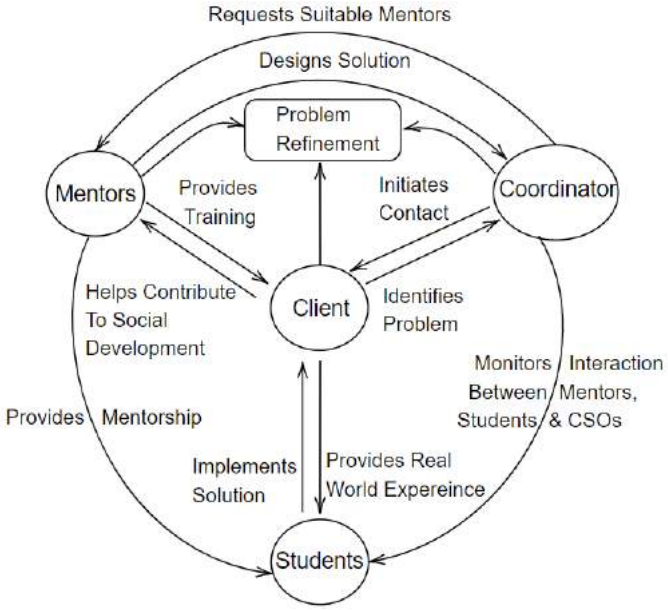

Fig. 2. The Proposed Framework for Distributed Technology Stewardship

TABLE I
Incentives and Motivations

Coordinator	Students	Mentor
Provide access to students	Exposure to professional	Design solutions for societal impact
Provide access to professionals	Project work for degree	Transfer knowledge
Increase awareness of CSOs	Implementation will be in use	Gain management experience

The proposed framework challenges the coordinator to align each group's responsibilities with their interests. Mentors are willing to guide, educate and solve problems voluntarily, not implement, decompose and communicate technical designs to CSOs. Similarly, client-CSOs are motivated to make a social impact, not manage technology projects. Hence, throughout the internship the coordinator must serve as a man-in-the-middle. Specifically they must monitor mentors supervision of students and students implementation for the client-CSO. This aspect is critical because it prevents the framework from over-taxing the goodwill of all groups. Figure 2 contains the interactions between the various participants of the framework. Table I provides the incentives and benefits provided to the parties.

The following case study provides a description of a real world pilot of the proposed framework, and provides the results of participants' perceptions of value achieved, solutions designed and lessons learnt within the implementation of the

framework.

IV. Description of Deployment – Case Study

Through a partnership between The Cropper Foundation (TCF) (a long-standing civil society organisation based in Trinidad and Tobago), TTLAB (a think-tank that is funded by the Trinidad and Tobago Network Information Centre (TTNIC)) and the University of the West Indies, the CSO Data Science and Technology Accelerator program was formed. The accelerator program had the following primary objectives:

- To educate civil society organisations on several topics in Data Science and Computer Science,
- To encourage the adoption of such technologies within civil society organisations, thereby facilitating improved business operations,
- To stimulate data driven ideas and solutions which will allow civil society organisations to further streamline their business operations.

TCF served as the coordinator of the CSO DTA, with students being sourced through an agreement with the the Department of Computing and Information Technology at the University of The West Indies, along with Microsoft Caribbean and Intelligent Applications Company. The program was funded by the TTNIC. A summary of the entities involved and interactions between them are summarised in Figure 3.

TCF and TTLAB co-hosted an information session to interested civil society organisations in Trinidad and Tobago in which they described the field of data science and technology and the expectations and benefits of the pilot CSO DTA. Subsequent to this, TCF and TTLAB developed an application process that was open to registered national civil society organisations who were evaluated using a pre-determined evaluation form that considered their mission and vision, their experience with data science and technology and their interest and ability in incorporating it into their work. Ten civil society organisations were selected whose missions included sea turtle conservation, combating gender based violence, children's rights and youth entrepreneurship.

The coordinator then curated a series of seven knowledge sessions between March to May 2022 in which key resource persons (mentors) sourced from TTLAB, Microsoft, and Intelligent Applications Company delivered 90-120 minutes of content and discussion per session on the following topics: Computer vision and natural language processing, machine learning and artificial intelligence, blockchain, the internet of things, cybersecurity, big data, and data management/visualisation.

A reflective session was held after every two knowledge sessions which allowed participants to speak about what they liked, lacked, learned and longed for in the knowledge sessions. The reflective sessions also allowed participants to speak about how the various technologies covered in the knowledge sessions could be utilised in their daily operations and the potential issues associated with the use of these technologies. Figure 4 below shows an extract of the collaborative visualisation used in the reflective sessions.

Following the knowledge and reflective sessions, a brainstorming session was held in which the client participants, knowledge session presenters and external resource experts (mentors) and interns came together to develop an idea that the CSO participants would like the interns to work on during the internship period. At the brainstorming session, clients, students and mentors were disaggregated into breakout sessions within which they discussed the client's key problem/issue and a possible data science or technology solution that might address it. Secondly, they discussed the feasibility of completing the solution within the six-week internship period for which the students were available. The feasibility discussion also focused on the ability of the solution to be developed using free or low-cost technology and the ability of the client to continue being able to use the solution after the completion of the project. The students were officially paired with mentors and clients at the conclusion of this session.

The internship period ran for a period of six weeks within which both students and clients were required to report to the coordinator on a weekly basis on the progress of their solution. In addition, they reported on any challenges and successes that were encountered in the course of the week. During the course of the internship period, each participating student and client presented the completion of their solutions to the coordinators with a focus on the client's problem, the proposed solution, diagram of the proposed solution, the student's work plan, and any issues in the development of the solution. Figure 5 shows an example of a use case diagram developed by a participating student for use by a participating client engaged in sea turtle conservation.

Finally, one week before the end of the internship period, each student and client presented again to the coordinators focusing on lessons learnt, next steps for the utilisation of the technology and the engagement between the client and the student. The final solutions developed included an AI chatbot, an intranet system that utilised Microsoft Sharepoint as a front-end and Microsoft OneDrive as a back-end, a web scraper and text classification model and a Microsoft Power BI application and Database. In August 2022, the coordinator hosted a final session to bring the CSO DTA to a close and two clients and the respective students presented their reflections on the entire CSO DTA and shared final messages to any other civil society organisations planning to use Data Science and Information Technology in their work.

At the mid-point of the CSO DTA, participants were asked to complete a mid-session survey that sought to inform the ongoing development of the programme as well as gauge the effectiveness of the programme. 46% of respondents indicated that on a scale of 1 to 5, where 5 is excellent, they rated their experience as a 4, while 54% indicated their their experience could be categorised as a 5. In their assessments of the programme, clients' feedback included:

"I think this is an excellent programme that every NGO should be able to get an opportunity to be a part of. There is so much in this programme that is helpful and allows the NGO to really examine the systems that are in place".

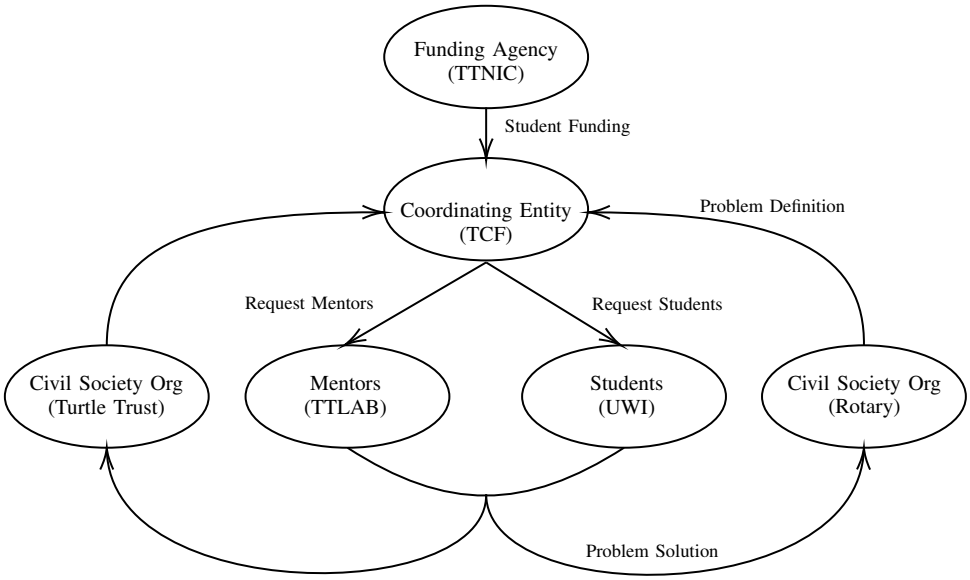

Fig. 3. The Entities and Flows involved in the Proposed Framework

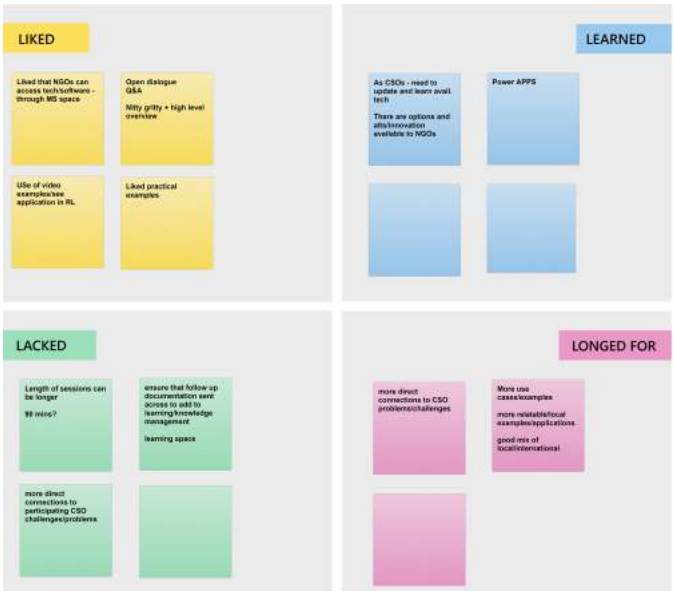

Fig. 4. Whiteboard from the reflective session

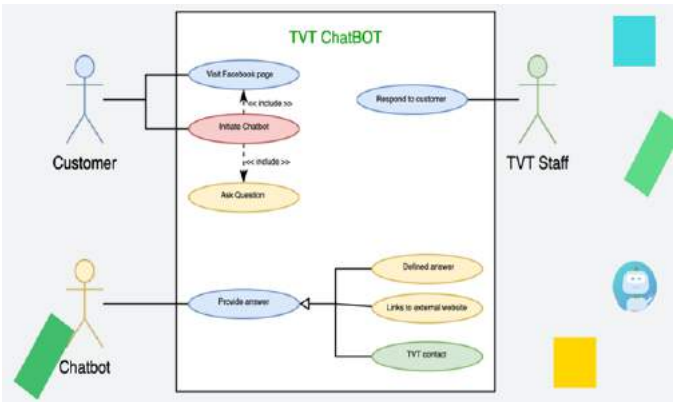

Fig. 5. Use Case Diagram of the Turtle Village Trust's Chatbot

"The willingness to acknowledge feedback and make changes also makes this program really special, directly helping our organisations access the technology we want".

"It has been really good, the knowledge sharing has been a bit overwhelming at times and I don't think we have a full grasp of the capability of the technologies. I'm sure that the interns can support this gap. We may need some time to sit as a team, review all the recordings and create new innovative ideas".

Value was also provided to the other key members of the distributed framework, including the participating students:

"During my internship, I had a lot of fun. I was able to enhance and use my requirements engineering skills. I was able to build my project management skills and time management skills".

"The biggest learning lesson was about communicating properly, not just waiting to hear from someone but also taking the lead in being proactive. I learnt patience as well".

The mentors also shared the value provided to them:

"It was satisfying to be able to show the student how to manage their time and the expectations of the client...also how not to over-think...sometimes we overthink what the client needs. It also made me aware of the good work being done by NGOs and how ICT can impact the work".

Finally, the coordinator also noted:

"We would like to continue this collaboration because we really want to have an impact on these societal problems that we face, not only solve problems for big business. We really want to continue doing work for society as well".

V. Discussion

The implementation of the pilot application of the proposed framework elicited four key lessons learnt for future implementation of the programme:

1) A more rigorous assessment of ICT knowledge, attitudes and practices should be undertaken with shortlisted, presumptive beneficiary civil society organisations before final selection. While the participating organisations engaged well with the content provided in the knowledge sessions, the types of solutions developed highlighted the gap between real-world needs of the organisations and the higher-order ICT and data science topics taught during the programme. It may be possible that they were not ready to implement such novel approaches.
2) Prospective students (interns) with the primary responsibility for developing ICT solutions in collaboration with the client, ought to be brought into the process at an earlier stage. This will help both the client to better understand the feasibility of a proposed action, while also providing the student with the necessary time to build their capacity in the proposed solution, if they do not already possess the necessary skills and competencies.
3) Most participating civil society organisations undertake their work through voluntary or part-time means, which therefore results in limited time for ongoing engagement or feedback through online surveys and other more traditional data collection exercises. This resulted in longer than expected times for feedback undertaken using online forms. Ongoing, in-person feedback practices, either virtually or physically, ought to be designed into the programme to ensure timely feedback mechanisms.
4) The need for a coordinating organisation that is credible and trusted is critical. The role of the coordinating organisation in this programme served as a key relationship builder and mediator for any issues that arose during programme implementation and served as an interlocutor to bring other partners around the table, either as mentors or other stakeholders interested in scaling up the programme. The identification of a funding agency is also vital and so further work is required in this part of the framework.

The distributed framework also opened avenues of information and awareness between and among members of the framework. Members who were not previously aware of one another, such as client civil society organisations and Microsoft Caribbean, now have a better understanding of each others' work and the partnerships that might be developed towards great societal impact.

VI. Conclusions and Future Work

The thoughtful integration of ICTs into the work of civil society organisations in the global south and in small, developing spaces is vital to the continued impact of these organisation. The contextual and effective use of technologies such as Artificial Intelligence, Blockchain and the Internet of Things has already shown to be critical for advances in climate change adaptation, human rights advocacy and combating social ills. The implementation of the proposed framework for distributed technology stewardship provides a workable model for cross-sectoral, sustainable and cost-effective stewardship of ICTs for the benefit of civil society and the people and planet whom they serve.

The authors intend to further test and refine the proposed model through a subsequent implementation of the civil society data science and technology accelerator programme within the Caribbean in 2023, taking into account lessons learnt in the pilot programme. We welcome the application of the proposed model in other similar developing country contexts for social good.

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