Local Solutions with Global Reach — Can Civic Tech Benefit from Open Source Software Ecosystem Practises?

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Abstract
This position paper identifies benefits of using open source ecosystem practices within civic tech projects, the barriers against it, and offers some technical solutions that could address some of these barriers. We also lay the foundation for looking into less tangible aspects such as mutual benefits between the communities and cross community learning.

Author Keywords
civic tech, open source software, software ecosystems

CCS Concepts
•**Software and its engineering** → **Open source model;**

Introduction
Civic technology refers to the diverse ways in which people are using technology to influence change in society [1, 5, 10]. There are a variety of creators of civic tech, ranging from commercial actors, governments, non-profits, volunteer organizations, and loosely organized communities [8]. These creators vary in purpose [7] and in how they identify themselves as practitioners [2] [1]. What is common in all of these projects, is that they address a societal need identified by the public, or together with the public. For example,

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[1]Terms that the groups identify as include free software, digital literacy, community technology, and inclusive design.

the need to identify air pollution, increased transparency, or participatory governance.

Civic tech projects are often partly or fully driven by volunteers, they might lack involved technologists, and the people invested in solving social issues are not always well resourced. Due to this, it is important that software supporting civic technology would be easily available and shared by successful civic tech projects. This can be a challenge due to the fact that civic tech solutions are created together with or bespoke for the community, on the other hand empowering that specific community, but at the same time making them more difficult to share and customize. Furthermore, making software more adaptable requires more effort and resources, and that is rarely the main goal.

Several civic tech groups already consider Free/Libre and open source software important, seeing its values to be consistent with the goals of equity, justice, transparency, and sharing instead of competition [2, 9]. Despite this, poorly resourced projects might turn to commercial or closed software, which is easy to take into use, but at the same time lacks community accountability and transparency, and might ultimately work at cross-purposes with the positive social change the community seeks.

Currently civic tech groups share certain types of resources and knowledge, such as best practises and processes for better co-design or equability. We propose that examining civic technology projects through the lens of open source software ecosystems, could bring additional value in the form of thinking of new ways and processes to efficiently share software solutions, without losing the values that are central to civic tech.

In this position paper, we first briefly review the concept of open source software ecosystems, present different arte-

facts and methods that those ecosystems share, and then discuss how those methods could be harnessed by civic tech projects in future research.

Open Source Software Ecosystems

Open source software emerges from a loosely coordinated, unsupervised community of volunteering developers and other contributors to address a specific need [3]. If an open source software community grows, an ecosystem may grow around it.

Open source software ecosystems (OSSECO) have two fundamental factors: network of organizations or actors and a common interest in a central software technology [6] or a shared market for software and services [4]. OSSECO in turn can be defined as a *"a software ecosystem placed in a heterogenous environment, whose boundary is a set of niche players and whose keystone player is an open source software community around a set of projects in an open-common platform"* [3, p.24]. A review by Franco et al. [3] lists several characteristics unique to OSSECO, which include software distribution paradigms including source code and repositories, license schema facilitating the relationship of keystone players (OSS community) and niche players (partners, providers, adopters), and the OSS community dominating the development rather than an individual organization. Example OSSECOs include for instance the Debian Linux operating system[2], or the Jitsi Meet call platform[3].

What is similar in OSSECOs and civic tech groups is that both have a community as the key player. What is dissimilar is that OSSECOs centre the software and are formed of a decentralised network that form an online community,

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[2]https://www.debian.org
[3]https://jitsi.org/jitsi-meet

whereas civic tech centres the problem (rather than the solution mechanism, which may or may not entirely be tech related) and the community is at least more likely to be primarily physical.

Some examples already exist at the intersection of OESSECO and civic tech. For example, it could be argued that for example Luftdaten[4] is both civic tech movement for cleaner air and an open source software ecosystem around a citizen sensing platform developing open source software for both the platform and diverse measurement devices. Luftdaten also provides other open resources, such as an open data platform.

Discussing Opportunities at the Intersection of Civic Tech and Open Source Software Ecosystems

In this section, we present four discussion points on OSSECO practises and relate them to civic tech.

- **Generalizing and sharing common components or services.** Current software engineering practises allow modular architecture and sharing software components through technologies such as micro-architecture design and containerization. This would allow sharing underlying software components without compromising co-designed functionality.
- **Providing community-controlled deployment options through niche players.** In OSSECOs, niche players can enhance resources by providing a better user experience. For example, various Linux distributions provide a graphical way to install open source software from repositories. The Alphabet company provides an automated way to install open and secure networking software to a server of user's choosing. Better deployment and configuration features

would reduce the need for technical expertise, while allowing the community to retain control.
- **Supporting capacity building and resilient solutions.** Currently most resources and attention to go new tools, despite there being a need for resilient solutions [2]. If communities centering on maintenance, upgrades and support were supported better, it would help making more sustainable solutions.
- **Managing and cultivating the ecosystem.** Many successful civic tech projects acknowledge the community as a central actor and center its needs. Similarly, volunteers and community actors in software development require support. In software ecosystems, OSSECOs try to monitor the ecosystem health and support the ecosystems through diverse methods.

Lastly, we differentiate between the technical aspects that facilitate sharing, such as the use of open source practises within civic tech communities, and other less tangible methods of sharing. These other aspects, such as how open source projects could learn from civic tech's equitable design practises or addressing technology biases, are important but out of scope in this particular paper. We propose that these topics should be addressed in future research.

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