Analysing Civic Tech project to design replicable process models allowing them to scale-up

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Context and challenges of the project

Civic technology refers to the diverse ways people are using - mostly digital - technology (exchange platforms, data aggregation platforms, but also physical sensors) to provide more accurate and complete information about a problem, coordinate to address it, and ultimately improve its democratic governance. Common to all these projects is that they address a societal need identified by the citizens, or together with the citizens. Examples are: identifying air pollution (i.e. sensor.community), transparency (i.e. open water quality data in TrinkWasser), or developing participatory governance (e.g. participatory budgeting using the decidim.org open-source infrastructure, like in Brest).

Civic tech projects are often driven by volunteers, in that they develop the technologies, participate in the data collection, or in the debates on how to solve social issues by designing policy proposals. **For these projects to be truly democratic, they must rely on platforms easy to access for everybody**, regardless of their computer skills, both in terms of their usage and of people's capacity to request design evolutions. Most of the time, the solutions are created together with or bespoke for the community making them specific both technically and in terms of functionalities developed. However, to have a tangible impact, successful approaches at the local level must scale up by sharing the tools (technologies and action plans). Some nonprofits have started such a plan, such as "code for all", but several challenges have to be addressed to do so.

1) The projects have to be able to inboard the different stakeholders, from those who have the technical skills to contribute to the technologies developed to those who need help to use these technologies or to feedback on their needs,
2) The projects have to develop the socio-technical organisation that allows them to govern tens to hundreds of participants, from different local places, having different needs.

This research aims to help projects scale up by developing models of their organisation and processes, informed by the literature in software engineering and digital commons institutional studies.

The research **proposal is linked to IMT Atlantique's strategy** to develop interdisciplinary

research for a more sustainable society and **LUT University's strategy** to support civil society in sustainable transformation. It is also in line with the Brittany region's strategy for research (S3) as a lever for improving cohesion and social inclusion (strengthening the relationship between science and society) and for developing responsible digital technologies (p. 94 et seq.).
Civic tech development is part of the Horizon Europe research agenda in Cluster 2, which aims to "empower all citizens in the green and digital transitions". (p. 7)

Scientific issues addressed

Based on the complementary backgrounds of the two supervisors (digital commons management and software engineering), the PhD work will be able to address the technical and human challenges that face such endeavours.

More precisely, we understand this organisation as a two-layer architecture:

- A global community who collaborates around a shared global issue and develops tools to address it;
- A network of local groups that adopt and adapt the technology to their local challenges.

Together they form a social problem-solving ecosystem supported by commons-based, adaptable open technologies. The capacity of this socio-technical system to specify the local problem in technological requirements for the global community, but also to build a global solution that can adapt to the local context (needs, skills), is key for these projects to scale up. Based on the literature, we hypothesise that the presence of "boundary spanners", who advocate for the local groups in the global community and help to adapt the shared software solutions at the grassroots level, is a key factor for success.

Main stages of the project, methodology

The research project follows the PADRE methodology, a participatory action research design developed by Haj-Bolouri et al. that integrates principles of action research and design science research. Its objective is to advance the descriptive knowledge within the scientific community and generate practical recommendations that cross the academia-industry gap. These suggestions are subsequently put into action through a series of co-designed interventions with the community that further validates the new findings and recommendations. In this way, the project advances a) descriptive, positivist science knowledge and b) prescriptive practical software design or management knowledge for the industry.

The doctoral research project will consist of four stages:
1) Identify and evaluate how technology is adapted for local use in existing civic tech development models and practices, using the lens of activity theory and commons with IAD framework.
2) Supported by scientific literature, systematise this knowledge into software development governance best practices.
3) Create improved process models and validate them in a case study using participatory action design research method as a way to apply the interventions together with the community.

4) Generalise the lessons learnt and publish them as a) scientific knowledge and b) actionable recommendations for stakeholders.

The research project will be supported by the foundational theory of the digital commons developed by Jullien and Roudaut (2020) from the commons, developing scientific body of knowledge on civic tech, and the concept of practice theories for software engineering by Dittricth et al. Consequently, activity theory and the IAD framework will be used for data analysis.