Software Engineering in Civic Tech: A Case Study about Code for Ireland

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Structure

- Introduction
- What is civic tech
- Research question
- The case
- Research method
- Findings: The software creation process
- Findings: Unique characteristics
- Lessons learned
- Discussion
Civic technology defined as: (means for) *diverse ways people are using technology to influence change in society*

Some aspects are well understood or under research, such as orchestration or engagement

However: Civic tech software engineering processes are not, especially at grassroots level

Our aim: Closer look at grassroots-level civic technology groups and how they create software through a case study
Civic tech versus open source software communities

Issue-centric vs. technology centric
Civic tech

Palette of public participation

- Ideator
- Co-Creator
- Collaborator
- Disruptor
- Data consumer
- Data provider

Map of civic tech by Knight Foundation, CC BY SA
Research question

What software creation processes emerge in grassroots-driven civic technology groups?
Case studies

- Code for Ireland – “organically grown civic tech”
  - Driven by a group of concerned locals in Dublin
- No external support, orchestration, or a large backer
  - Engaged in two projects: Transparent water and finding vacant homes

Ongoing work since 2019: The luftdaten network
## Code for Ireland projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Participants</th>
<th>Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparent Water</td>
<td>4 core team; 1 mentor; 1-2 others</td>
<td>Achieved minimum viable product; preparing for a beta release.</td>
</tr>
<tr>
<td>Identifying Vacant Homes</td>
<td>Fluctuating; 2-3 (core team); 1 mentor</td>
<td>Undergoing a restart after a switch of development team.</td>
</tr>
</tbody>
</table>

### Diagram

- **Group**
  - **Team**
    - Team 1
    - Team 2
  - **Project**
    - Transparent Water
    - Finding Vacant Homes
  - **Deliverable**
    - Software
  - **Outputs**
    - Contributes to
      - Consists of
        - Code for Ireland

- Code for Ireland projects consist of two teams: Team 1 and Team 2. Team 1 focuses on Transparent Water, while Team 2 focuses on Finding Vacant Homes. Both teams contribute to the development of software outputs.
Research approach

- Interpretive case study
- Data analysis with grounded theory research method
  - Used in IS/SE research to create context-based, process-oriented descriptions and explanations of phenomena
- Charmaz’s constructive grounded theory & Runeson et al. guidelines for case studies in software engineering
  - Building knowledge together with the participants towards creating an explanation of the phenomenon at hand
Participants and motivations

- **Mentor:** Change in society and impact
- **Core group:** Investment in the group; otherwise as below
- **Regular contributor:** Solving real problems; improving technology skills
Overall project process

Event: Monthly meetups
- Evaluation and recruitment
- Event: Monthly meetups
- Outcome: 2nd team composition and new consensus
- Outcome: Group vision and 1st team composition
- Event: Weekly standups
- Task followup and assignment
- Event: Weekly standups
- Task assignment
- Solo work
- Event: Weekly standups
- Outcomes: Technical design and software
- Looping back as required
- Group evaluation
- Motivation
- Design and work individually
- Design together
- Evaluate
- Set objectives
  - Build consensus
Iterative weekly process

1. Design together
   - "What works and what doesn't"
2. Peer evaluation
3. Commit to source code repository
   - "When ready"
4. Work alone
   - Software artefacts
   - Consensus
   - Documentation
   - Unit tests
5. Automatic evaluation
6. Commit plans
7. Re-negotiation of goals and actions
The overall software engineering process:

- **Plan:** Goals, requirements, task allocation.
- **Design:** Architecture & Data
- **Prototyping**
- **Development**

Evaluation

Group vision
Unique characteristics

- Internal stakeholders with development goals driven by team member motivations.
- Inflexibility and project inertia.
- Skeptical external stakeholders.
- Meritocratic technical involvement.
- Civic ghosting.
- Opportunistic decision-making and flexibility in evaluation.
- Short-term perception.
Lessons learned and recommendations for practice

- Civic ghosting and the challenge in engaging newcomers.
- Engaging other groups, non-technical contributors, and residents.
- Group cohesion and trust.
- External mentoring and support (especially in community engagement and hand-off).
- Towards a civic tech toolkit?
Discussion

- There exists a software engineering beyond civic hacking. Contains steps for specification, development, validation, and evolution.
- There are challenges in stakeholder engagement and co-creation with non-technical locals.
- Code for Ireland failed to network with other communities and the software artefact had limited impact (however, others have succeeded there, such as Luftdaten).

Future research: Why Luftdaten succeeded and Code for Ireland didn’t?

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