Decentralizing Democracy with Semantic Information Technology: The D-CENT Retrospective

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Abstract: One of the central questions facing democracy is the lack of engagement from ordinary citizens. D-CENT (Decentralized Citizens ENgagement Technologies) used cross-platform and decentralized technologies, ranging from Semantic Web ontologies to W3C federated social web standards, helps communities to autonomously share data, collaborate and organize their operations as a decentralized network. With the benefit of hindsight, we can analyze why this decentralized and standardized approach, while successful in the short-term, did not succeed in sustaining engagement in the long-term and why blockchain systems may be the next step forward.

1 INTRODUCTION

While Web-based technologies have been remarkable in attracting engagement, even addictive engagement in social media, there has been declining engagement in democratic political processes. The central research question is then: *How can we use Web-technologies to enable increased engagement in democratic processes?* One hypothesis is the Web help rebuild democratic engagement by relying on the same principles that drive engagement on commercial platforms, such as notifications.

Traditional democratic institutions were built in a pre-Web era, and so relied on representatives due to the latency required for face-to-face decision-making and deliberation. A kind of radical democracy, *direct democracy*, differs from traditional representative democracy insofar as the entire community is considered to engage in democratic deliberation and decision-making, rather than a few representatives (Kling et al., 2015). With increasingly ubiquitous connectivity, could the entire paradigm be changed to one of *digital direct democracy* where people deliberate and even make collective decisions over the internet? Across Europe, attempts to engage citizens and social movements in democratic decision-making for the social good using digital platforms have not yet scaled or reached wide usage. Thus, a secondary hypothesis is that Web technologies can enable new forms of wider radical democratic engagement beyond traditional representative politics.

There has been many platforms built for increased democratic engagement, but many of them have not been successful. Most of these platforms lack features and have complex user-interfaces, which might leave many people unable to meaningfully participate in their democratic process via the Internet. A few existing platforms, such as LiquidFeedback used by the Pirate Party, have been specifically designed to engage users into large-scale Internet-based democratic process that goes beyond the limits of traditional social media (Kling et al., 2015). In general, collective deliberation is shown to increase the collective intelligence of groups beyond its individual members (Woolley et al., 2010). There is some evidence that this process can reliably be done via online deliberation (Klein, 2007). Still, most of these initiatives did not succeed in scaling the process of large-scale collective action and participation outside relatively small communities. It is unclear if this is a limit of direct democratic structures or if digital tools could scale social innovation across society with the right set of digital tools (Halpin and Bria, 2015).

One central insight from the Web is that open standards and interoperability led to the initial take-up of the Web, even though currently the Web is becoming a series of closed platforms. On the other hand, most e-government services for democratic engagement are closed platforms. Thus, our final hypothesis is that lack of engagement is due to the inability of these platforms to meaningfully interoperate across

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community boundaries, and Semantic Web ontologies combined with W3C Social Web standards could address these scaling issues across local and national boundaries.

Developing a common formal vocabulary - an 'ontology' - is one solution to the issue of interoperability in e-government (Obrst, 2003), and this study attempts to build software to decentralize e-government using open standards. The software, called *D-CENT* (Decentralized Citizen EmpowermeNT)[1] conducted multi-year pilots across Europe from 2015-2019[2] to accelerate the development of distributed alternatives for online deliberation and data governance. The goal was to develop a framework for the deployment of decentralized networks for community-driven democracy which are both easy to use and properly aligned with fundamental rights. Some of the features were specifically designed to link into existing formal structures of democratic power; others purported to build the capacity for the deployment of new democratic institutions that could harness the network effects of digital tools and real-time collaboration to solve social problems. To our knowledge, our effort was the first time ontologies have been used to strengthen democratic politics in a bottom-up manner while engaging institutions, in contrast to the top-down traditional uses of ontologies in e-Governance (Mampilli and Meenakumari, 2012) and newer efforts in blockchain-based Decentralized Autonomous Organization (DAOs) that seek to replace institutions but lack common standards (Sims, 2019).

This paper provides a retrospective on the ambitions, successes, and ultimate failure of decentralizing democracy using open standards. The D-CENT project ran from 2014-2016, and parts of the system in operation till 2018 across Finland and Iceland in 2019. The primary case-studies are in Spain, Iceland, and Finland, and we used a *lean user experience* methodology to understand the distinct problems each of these communities experienced and how technology could help address these issues as described in Section 2. Although there is not enough space to discuss the fascinating results of these user-interview, the technical architecture is overviewed in Section 3, with a focus on the deliberation platform Objective8 and the notifications tool Mooncake, as well as how we use the federated W3C Social Web stack to communicate between the various tools. Lastly in Section 4, we give reasons for the success and failures of D-CENT itself to scale.

[1]https://dcentproject.eu/

[2]The software was completed at the end of the project in 2016, but the actual attempted usage of the software continued after the project until 2019.

2 LEAN USER EXPERIENCE

These case-studies were done using the qualitative interview-based 'lean user experience' methodology in order to develop usable ontology-based software. The main tenet of the lean user experience methodology is technology should prioritize human needs, and the first step in building technology is to understand the concrete human needs via detailed case studies (Ries, 2011). A series of what are called 'lean inception' events were done in Finland, Iceland and Spain to gather information about their problems, and how currently existing software did or did not address these issues. The goal is to create the minimal, i.e. 'lean,' amount of software to address the problem that people actually have, rather than the problem that the software developers and ontology engineers thought their users have.

The reason why these case-studies were chosen to inform - and later, pilot - the D-CENT design was because they were all organically using technology to build direct democracy, although without interoperable components. Also, each of these case studies is on a different scale: Finland on the scale of an entire nation-state via a 'top down' model based on sharing open data and influencing the Parliament, while in Iceland the focus was on the making city government more democratic. The last case-study, Barcelona, was focused on direct democracy at the neighborhood level.

2.1 Finland

One of the more successful efforts in crowd-sourcing policy proposals on the nation-level is Open Ministry in Finland.[3] Since a constitutional amendment made it possible in 2012, Open Ministry crowd-sources proposals from citizen campaigns and puts them in front of Finnish Parliament. On November 28th 2014 the first initiative launched by the Open Ministry was accepted by the Parliament when the Finnish Parliament voted 105 'in favor' and 92 'against' for the equal marriage law proposal giving gays and lesbians equal marriage rights.

At the same time, Finland has become one of the world-leading nations in terms of the production of open data. Under the leadership of mayor Jussi Pajunen, the City of Helsinki has adopted a more open and citizen-centric approach to data, where it opened its internal document management system, called 'Ahjo,' and released all the agendas and decision items of the city council and the city's subcommittees as Open Data available through a JSON API

[3]https://openministry.info/

called 'OpenAhjo' so that developers could build applications on it.[4] After this, the rest of Finland has been following suit, with in 2020 OpenAhjo still being used as a part of larger open government APIs around Linked Events and Geoserver mapping.

2.2 Iceland

Better Reykjavik[5] was launched in 2010, a week before the municipal elections in Reykjavik using the *Your Priorities* codebase,[6] and became a major success in direct democracy. All parties received the capability to crowd-source ideas for their campaigns like the Pirate Party. The 'Best Party' used the system extensively, and won 6 of the 15 seats of Reykjavik City Council in the 2010 election. Thus, when Jón Gnarr became mayor of the capital of Iceland, he called on Reykjavik citizens to use the Better Reykjavik online platform also during the coalition talks that happened after the election. During the elections, 40% of Reykjavik's voters used the platform and almost 2,000 political policies were crowd-sourced. Since 2010 12,000 registered users have submitted over 5,000 ideas and 8,000 priorities, with 257 priorities have been formally reviewed with 165 accepted since 2010. The 10-15 top priorities are being processed by Reykjavik City Council and voted upon at meetings every month. Therefore, it functions very similarly to Open Ministry but on a city-wide rather than local level. The Icelandic government started in 2018 to use the Your Priorities platform on an Iceland-wide basis as *Better Iceland*.[7] As of 2020, the Your Priorities platform hosts 114 different communities outside Iceland, ranging from NHSCitizen in the UK to Forza Nazzjonali in Malta.

2.3 Spain

In Spain, D-CENT primarily worked with Guanyem in Barcelona, a coalition of neighborhood assemblies demanding a more democratic use of data. The rise of '15M' movement as part of the 'movement of the squares' in 2011, produced an unprecedented politicization of people in Spain, cutting across the whole society, including even the traditionally conservative and apolitical sectors. This new politics are characterized by a prioritization of direct democracy that led to the emergence of new citizens' coalitions such as Guanyem ("Let's Win" in Catalan). Guanyem has also been very interested in technology, with many of its participants wanting some form of 'open source' municipalism to increase participation and transparency of more centralized governmental decision-making. At the time of the experiments, the Guanyem coalition was made up of 13 thematic axes, 6 working committees and around 15-20 neighborhood assemblies, with more than 1000 volunteers that are participating on a daily basis. It began an affiliation with the new Spain-wide Podemos party.

Reddit was the actual core of the participation in Podemos, through the space called 'Plaza Podemos' (Podemos Square).[8] The daily average attendance is 15,000 unique visitors, with more than 270,000 unique visitors and more than 2,625,000 page view during October 2014.[9] This is of interest, as Podemos had at the time 220,000 registered people. However, Reddit did not allow sophisticated polling and voting on actual decisions. This led to a centralization of decision-making by the party hierarchy by Podemos.

In contrast, local groups affiliated (but distinct from) with Podemos such as Guanyem had experimented with software such as Agora Voting,[10] but this software was proprietary and so could not be modified. Furthermore, each of the neighborhood councils would like to have their own polls and votes, but would like to be able to optionally send the results of those polling and voting activities to other political groups: So a single neighborhood like Las Ramblas could have their poll on a policy proposal sent to the Barcelona-wide Guanyem in order to determine if the policy proposal was acceptable. However, what was needed was a new kind of interoperable tool that could interoperate and federate between the various neighborhood assemblies in Barcelona, and eventually across all of Spain and even Europe. Therefore, based on this vision, the D-CENT software was built as a tool for 'dual power' by a federation of democratic assemblies.

3 ARCHITECTURE

The overarching vision of the D-CENT architecture is that each group will maintain its own data, deliberations, and polling using its own autonomous online presence, a *D-CENT node*, but that the different nodes will be able to communicate and take actions in a decentralized manner over a *network* of

[4]https://dev.hel.fi/apis/openahjo/

[5]https://betrireykjavik.is/

[6]https://www.yrpri.org/

[7]https://betraisland.is/

[8]http://plaza.podemos.info

[9]Note usage has been in steady decline since the institutionalization of the party after 2015 and its decline in the polls since 2019.

[10]https://www.agora.vote/

Figure 1: D-CENT case studies and users.

D-CENT nodes. Using D-CENT, assemblies could distribute polls across different jurisdictions and discuss common actions over global issues such as climate change. The nodes should start with the existing D-CENT-affiliated projects in Finland, Iceland, and Spain, but allow extension to new neighborhoods, cities, and even countries. Therefore, this project could be considered similar to architecture to Tim Berners-Lee's Solid project, but based on a collective community data store rather than an individual store of personal data for each person.[11]

The problem was that each of these communities had not only linguistic differences, but vast differences in scale and process in how they went about deliberating on policy proposals, and the D-CENT architecture had to be general purpose enough to handle all of these case-studies. Therefore, a Semantic Web deployment approach was chosen for the architecture. Note blockchain technologies do not have open standards to communicate structured data by default and were very immature when the D-CENT architecture was being created. The approach chosen by D-CENT was to focus on an extensible ontology-based approach to structure the data in the communication between nodes. ActivityStreams 2.0, a W3C Semantic Web standard by the W3C Social Web Working Group,[12] was chosen as the basis of the ontologies to be used by each community. As this standard also allowed serialization into JSON, it could be easily added to existing platforms by virtue of customizing the ActivityStreams ontology without changing the existing platform. The use of ActivityStreams would then let existing directly democratic platforms send out notifications of events to other platforms, i.e. other D-CENT nodes.

A number of other components had to be built for real-world deployment. First, users themselves needed to be able to be identified for purposes of political deliberation, in order to prevent spam and other sybil attacks. Although the exact method for connecting an 'online' identity to physical identity was left to the political community using D-CENT (ranging from checking passports in-person to allowing anonymous usage), an identity system of some type was needed. Also, users would need a way to authenticate securely to the system in order to subscribe to and receive notifications to these feeds. Therefore, cryptography needed to be deployed. Each node should control locally for its users or let their users control their own private key such that the cryptographic key material needed to validate every user would be registered with a node via the user's public key.

Each decentralized component was specified using open standards would allow pre-existing direct democracy tools like OpenAhjo and Better Reykjavik to become compliant with the D-CENT architecture rather than force these pre-existing systems to use new systems using Semantic Web technology. Instead, pre-existing systems would simply need to add support for a finite number of open standards and Semantic Web ontologies (using the D-CENT ontology extensions to ActivityStreams) via open-source libraries. This would allow existing direct democratic software to easily communicate, for new applications to be built on top of open standards that could be used with any D-CENT node, and for data portability for users between D-CENT nodes. So, each D-CENT node should have the following minimal components, with each of the components communicates via ActivityStreams with the D-CENT ontology, as explored in each of the following subsections:

1. **Identity:** The personal data store of each user that is part of a D-CENT node, with a sample application (*Stonecutter*). It is based on the OAuth 2.0 standard and an extensible version on the W3C VCard ontology.
2. **Notifications:** The notification engine that lets D-CENT nodes notify users of new events (discussions, policy proposals, polls, votes, etc.) via the W3C ActivityStreams ontology. The sample application *Mooncake* provides these functions to users who subscribe to ActivityStreams from D-CENT nodes, and developers via the *Coracle* application.
3. **Deliberation:** The deliberation platform that lets users propose new policy proposals and discuss them, using *Objective8*, and so sends out notifications to users.

Existing applications would need to implement these functions via open standards on top of their existing code-base using open standards, and for new D-

[11] https://solidproject.org
[12] http://www.w3.org/TR/activitystreams-core/

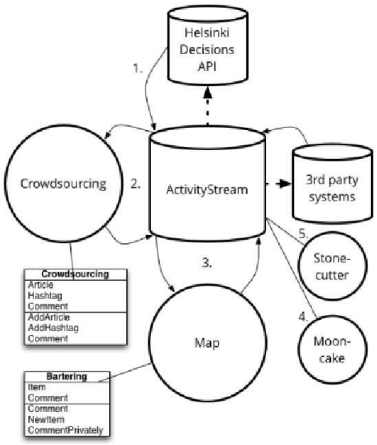

Figure 2: D-CENT architecture.

CENT nodes, example software that has been compliant with the standards has been written. As shown in Figure 2, a particular API (Helsinki Decisions API) is made compatible with the Semantic Web-based ActivityStreams via extending the standard ActivityStreams classes. This use of ActivityStreams allows the Decision API to dynamically display on a map, where a third-party party developer can make their own custom vocabulary. Users can then access and receive notifications via Mooncake after authenticating via Stonecutter - and other third party systems, including other D-CENT nodes, can access the ActivityStreams.

3.1 Identity: Stonecutter

Stonecutter is a privacy-enhanced single sign-on (SSO) tool that also provides identity management for D-CENT nodes, allowing a user to easily authenticate and access their notifications and other applications across D-CENT nodes without having to use centralized third-party platforms like Facebook and Google that may invade their privacy. This SSO service can be easily integrated with other tools hosted by D-CENT nodes via the use of the OpenID Connect, a profile of the IETF standard OAuth 2.0.[13] The use of OAuth 2.0 across D-CENT nodes allows organizations to share their users, with user permission, with other organizations and allows users to have a single consistent identity across multiple D-CENT nodes. This is useful as a user may have a single identity across local (neighborhood), municipal (city), national, and even transnational (European Union) directly democratic applications, and a user may also want to move between locations (such as from Barcelona to Rome) without having to create a new identity. Stonecutter stores user data as VCard,[14] but is extensible in a customizable manner via the usage of the Semantic Web W3C VCard ontology.[15] The exportation of VCards and the self-hosting of data securely allows D-CENT nodes to be compliant with the General Data Protection Directive. Furthermore, Stonecutter uses Docker so it is easy for organizations that wish to host D-CENT nodes can easily install the software on local servers, so that valuable and private user data is not hosted in foreign jurisdiction that may not comply with the General Data Protection Directive.

3.2 Notifications: Mooncake

Notifications are the heart of D-CENT. Mooncake is a notifications tool that securely notifies members of a D-CENT node of activity in the wider D-CENT ecosystem, including on other D-CENT nodes. Mooncake is fundamentally an ActivityStream engine built in Clojure (a functional language compatible with Java and so having access to commonly-needed Java libraries) that supports OAuth 2.0 for sharing data about ActivityStreams.[16] As Mooncake focuses on users, a complementary program called *Coracle* was developed that serves as a notifications server which stores activities in order to the activity stream at an endpoint for third-party applications to access.[17] Mooncake (and other D-CENT enabled applications like Objective8) request these tokens, and use them to permit access to restricted actions within the applications themselves. Through Coracle, applications (like Better Reykjavik, Objective8, DemocracyOS, etc.) can produce ActivityStreams 2.0 JSON documents which can be consumed by any other application that queries the relevant endpoint. Mooncake. Mooncake queries the endpoint of any ActivityStream producer and consumes the result, combining the results into a single feed that can then be displayed to the user as shown in Figure 3. A user can freely use (and a developer can freely implement) another application that consumes ActivityStreams data and use it in conjunction with Mooncake or instead of it. The application simply has to be aware of any extensions to the ActivityStreams vocabulary made by the application, which should be straight-forward as long as the ontology is published and discoverable due to using Linked Data guidelines (Bizer et al., 2011). This fulfills the D-CENT goal of simple de-

[13]https://tools.ietf.org/html/rfc6749

[14]https://tools.ietf.org/html/rfc6350

[15]https://www.w3.org/2006/vcard/ns-2006.html

[16]The open source code is available at https://github.com/d-cent/mooncake

[17]https://github.com/d-cent/coracle

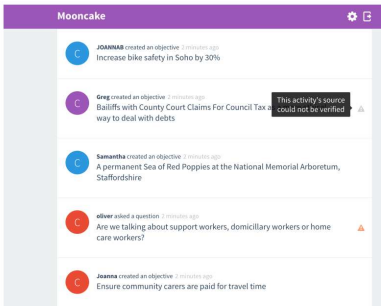

Figure 3: Mooncake Notifications Display.

Decision

```
{
  actor: {
           displayName: <decision-making-group>,
           @type: "Group",
           @id: <group-url>
  },
  object: {
           displayName: <decision-title>,
           content: <decision-content,
           @type: "Content",
           @id: <issue-url>,
           url: <decision-url>
  },
  target: { displayName: <parent-issue-display-name>,
           content: <parent-issue-description>,
           @type: "Content",
           @id: <issue-id>
  },
  published: <published-timestamp>,
  @type: "Add",
  @context: "http://www.w3.org/ns/activitystreams",
}
```

Figure 4: Example usage of D-CENT ontology for deliberation.

centralized integration between both new and old applications within the same ecosystem should be made possible.

Notifications can be added to an existing D-CENT node so that users can stay up to date with multiple other D-CENT node through a single interface. These activities could include actions newly created policy proposals, in the case of Objective8, database activity in open databases, and so on. All notifications use the the open standard Activity Streams 2.0 (AS2) with class extensions to the ActivityStream ontology to support direct democracy via the D-CENT ontology. Currently, Objective8, OpenAhjo (City of Helsinki's Decision API) and Better Reykjavik (Your Priorities), publishes ActivityStreams using the D-CENT ontology that can be consumed by Mooncake. ActivityStreams features a simple ontological model based on a RDF triple (as defined by the W3C Semantic Web standard semantics for RDF[18]), where an ***actor*** that takes an ***action*** on a ***object***. The action may also have a secondary effect on a ***target***. All of these are defined as RDF classes. For example, in the Decision API, the actor is a ***group*** that makes a decision, such as Finnish Parliament. The action could be to ***add*** the decision to those ratified on an issue given by an ***issue-url***. Every notification is given a timestamp via the predicate ***published***. This is illustrated in Figure 4.

[18]https://www.w3.org/TR/rdf11-mt/

3.3 Deliberation: Objective8

Objective8 is a policy drafting tool that allows organizations to work with their members to produce crowdsourced policy proposals. Objective8 was also programmed in Closure with a Docker instance for easy installation.[19] Traditionally policy documents have been written by a single person or small team, and only distributed once complete. Objective8 has been designed to help directly democratic organizations create policy in a more open, transparent and collaborative way. It allows a wider community to shape and inform the policy drafts via proposing and deliberating on policy proposals. The tool allows members of a community to review, comment and annotate drafts of a policy. The feedback provided by the community is then made accessible to the policy writers so that it can be assessed and included in the next version of the draft. Members of the D-CENT node are also able to become policy writers themselves if they choose to. Through the tool, users can gather community opinion, generate ideas, share, discuss, and collaborate with experts to draft the new policy. This could include specific policies, manifesto pages, and so on. The policy writers are able to view an aggregation of their feedback for all their objectives on a dashboard using ActivityStreams 2.0, similar to Mooncake for users.

Objective8 is used to integrate and aggregate data in different contexts to create a multi-channel multi-organization participation experience where parties contribute to the cyclic creation, use, reuse, and enriching of the policy proposal. Objective8 includes a MongoDB datastore in order to store JSON (including RDF data formatted as JSON) as well as links to a native RDF triple-store for integration of RDF data. These databases allow new kinds of open data to be added to policy proposals beyond simple written comments and annotations via crowd-sourcing. For example, the integration of geospatial data allows Objective8 to have map visualization to print items in the ActivityStream on a map to enable local real-life interaction in between users. The extensible RDF D-CENT ontology is the backbone of Objective8.[20] It extends the ActivityStreams 2.0 RDF vocabulary as given below:[21]

[19]The open source code is available at https://github.com/d-cent/objective8

[20]The D-CENT ontology as RDF Schema is available at https://github.com/d-cent/activitystreams-spec

[21]The table uses `as` as the prefix for the ActivityStreams 2.0 and `dcent` for the D-CENT ontology.

Table 1: D-CENT Ontology.

Class name	rdfs:SubclassOf	Description
Group	as:Actor	The group making the decision.
Issue	as: Content	An issue that needs a policy decision.
Proposal	dcent:Issue	A proposal to address an issue.
Decision	dcent:Proposal	A proposal that has been accepted.
create	as:Activity	Creation of a new issue.
add	as:Activity	Addition of a new proposal.
accept	as:Activity	Support for a proposal.
reject	as:Activity	Rejection of a proposal.
abstain	as:Activity	Abstention from a proposal.
Comment	as:Content	Textual comment of comment.
Annotation	dcent:Comment	Annotation of content.
Argument	dcent:Argument	Argumentation point over proposal.
ArgumentAgainst	dcent:Argument	Argument against a proposal.
ArgumentFor	dcent:Argument	Argument for a proposal.

4 CONCLUSIONS

D-CENT was an ambitious attempt to build an decentralized infrastructure for direct democracy that would be interoperable across multiple social movements and scales of democratic governance. In its early stages from 2014 to 2016, D-CENT shows promise as a tool for autonomous and decentralized decision-making and voting in assemblies. The hope was that after testing, multiple assemblies and municipalities each with their own D-CENT nodes, would federate across Europe, leading to large-scale decentralized direct democracy via assemblies. However, ultimately the system launched with much fanfare in from 2014-2016 but by the time of COVID in 2020, D-CENT ultimately did not take root. Although federation remains a powerful potential capacity of still popular platforms like Better Reykjavik via their use of the D-CENT ontology and ActivityStreams, the actual federation capabilities were rarely used in practice.

The reasons for this lack of increased democratic engagement are multiple. First, developers found it difficult to understand and use, much less extend the Semantic Web ontologies used by ActivityStreams, preferring traditional APIs to RDF-based ontologies. Therefore, D-CENT was not widely integrated into existing platforms with real users. Second, although we aimed to allow users to use D-CENT without interacting with traditional tools like Facebook, Google, Twitter, and Reddit, this may have backfired: Users simply did not want to set-up their own account on Stonecutter even if D-CENT allowed customized capabilities for communication within an assembly or other political group, instead preferring to stay with a small number of centralized commercial providers. It was simply too much hassle to use a personal datastore and receive a separate stream of notifications other than those already sent by Instagram.

Lastly, there also may need to be a change of architecture: At the present moment, there is interest in blockchain-based systems that feature more advanced cryptography and a more decentralized peer-to-peer architecture than offered by the D-CENT federated architecture. While there was interest in blockchain technologies inside of D-CENT, in particular community currencies, these were never integrated into the actual software. The same issues of scalability, lack of developer familiarity, and users inability to migrate to new systems also are challenges for blockchain software. These were tackled within the DECODE project,[22] which continued the work of D-CENT using blockchain technology. The advanced cryptography of blockchain technology could offer a number of features that could critically improve over the D-CENT approach. For example, user key-material was unwieldy in Stonecutter, and a blockchain-based wallet approach would have likely been more successful in terms of incentivizing participation than just notifications. From a security and trust perspective, it is also better to have a blockchain that keeps a record of the polls, deliberations, and decisions rather than a set of local if corruptible databases as used in D-CENT. While users were notified of new events for democratic participation, they lacked any incentives to participate, like tokenized reputation points or awards. Lastly, the system is not anonymous, so users are linked to their votes via their public key. For example, mix-networking systems could unlink a vote from a user via mixing, and so let systems like D-CENT eventually engage in private and secure verifiable vot-

[22]https://decodeproject.eu

ing (Jakobsson et al., 2002).

The underlying need for a radically more democratic and cross-border politics are more clear in 2024 than in 2014, and – as it is clear such functionality is not in the business interests of private companies such as Facebook – software should rise to the occasion. However, democratic engagement requires meeting users where they are, which is on a few large platforms, not on the Semantic Web or blockchains. Furthermore, the techno-centric approach put forward by D-CENT did not succeed insofar as despite their shared interest in digital direct democracy, the countries of Iceland, Spain, and Finland had vastly different languages and problems. What is needed more than technology is a common political project and political ideology that works across borders and language barriers. Software for democratic assemblies is only useful if such assemblies already exist and are growing in popularity, and there has not been a resurgence of democratic assemblies in Europe since 2011. Yet as a perennial form of politics in revolutionary moments from the early Soviets in Russia to the cooperatives of the Spanish Civil War to the assemblies in Arab Spring and Occupy, directly democratic assemblies will hopefully return due to the social unrest brought about by climate change.

What D-CENT did was create the interoperable software that prefigured such a movement before it even existed. Thus, it should be surprise the software was not widely used, even if the problems that it tried to solve were real. One should remember one cannot create software 'in media res' of a revolutionary situation. Technology can only come to the aid of radical democracy, but technical notions such as decentralization and interoperability cannot by themselves call democracy into being.

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[23]https://dcentproject.eu/resource_category/publications/

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