



	Project funded by the Horizon 2020 Framework Programme of the European Union, Grant agreement N°: 825268
Start date: 01/11/2018 Duration: 39 months	
DLT-Framework for Grant Distribution Toolkit	

WP	WP5
WP Leader	FBA
Responsible Author	FBA
Contributors	DYNE
Dissemination Level	PU
Nature	RE
Dissemination Level:	
PU	Public
PP	Restricted to other programme participants (Including the Commission Services)
RE	Restricted to a group specified by the consortium (Including the Commission Services)
CO	Confidential, only for members of the consortium (Including the Commission Services)
Nature	
P	Prototype
R	
RE	Report
SP	Specification
TO	Tool
OT	Other

Synopsis:	This is a technical report for awarding bodies that will describe how to use DLT technologies for public funding distribution on the basis of the lessons learnt during the implementation of the Ledger project
List of keywords:	Technical report, MVP, FOSS, DLT, Mentorship, Lessons learned, Business Benchmark

DOCUMENT HISTORY

Version	Status ¹	Date	Comments	Author
1	Draft	15/12/2021	Version for internal review	FBA, DYNE
2	Draft	17/01/2021	Version for partners' review	FBA

LIST OF ABBREVIATIONS AND DEFINITIONS

DoA	Description of Action
EC	European Commission
H2020	Horizon 2020
GA	Grant Agreement
CA	Consortium Agreement
KPI	Key Performance Indicator
FSTP	Financial Support to Third Parties

¹ Status (a status is associated to each step of the document life cycle):

Draft: This version is under development by one or several partner(s)

Under review: This version has been sent for review

Issued: This version of the document has been submitted to EC

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1 Introduction

Project Summary

LEDGER (**DecentraLizEd Data Governance for nExt geneRation internet**) is a mission-oriented project that supports researchers, developers, entrepreneurs, start-ups, SMEs, and other legal entities ("Human-centric Innovators") to develop Minimum Viable Products and services, which achieve new models that preserve citizens' control over the management of their data, where data is a common good owned by citizens and wealth created by data-driven platforms is equally distributed.

The project aims at shifting data management, leveraging on decentralised technologies and algorithms (such as blockchains, distributed ledger technology (DLT), peer-to-peer technologies, artificial intelligence, internet of things, immersive media and new connective infrastructure as 5G) in 5 pre-selected verticals and one generic strand: #HEALTH #ECONOMY #MOBILITY #PUBLIC SERVICES #ENERGY & SUSTAINABILITY #DISRUPTIVE INNOVATION

LEDGER's goal is to ensure data sovereignty and eliminate concentration of data in a few proprietary platforms by supporting Research and Innovation projects linked to relevant Vertical Use Cases addressing: Privacy-by-design Decentralized Data Governance, reliability, trustworthiness and openness as core values.

For this purpose, LEDGER launched three open calls, implementing a competitive and transparent procedure, and offering €5.6 million in funding, business and technology mentoring, access to platforms/tools and further services to 34 European bottom-up experiments.

As a result of 3 open calls LEDGER Consortium partners, represented by FundingBox Accelerator, signed 34 Sub-grant agreements with the teams and entities selected for participation in 3 LEDGER's MVP Venture Builder programmes.

Objective in terms of Sustainability

Additionally LEDGER aimed to provide a sustainable path for the best-in-class projects of these 3 programmes, including access to additional funding where possible and definition of self-sustainable business models in order to precisely ensure their sustainability after the 39 months of co-financing by the European Commission.

The continuity of the MVP Builder programme model beyond LEDGER will mostly rely upon its replication and the consolidation of the 'Public Funding Digital Thread' based on DLT technologies and a toolkit for Public organisations to give more transparency and accuracy in the context of the management of Public Funding for innovation.

Objective of this deliverable

With that in mind, one of the main exploitable results of the LEDGER project will be the **DLT framework for grant distribution toolkit**, consisting of this technical report for awarding bodies that will describe how to use DLT technologies for public funding distribution on the basis of the lessons learned during

the implementation of the LEDGER project providing the corresponding open-source software components based on DECODE technologies linked to the FundingBox platform for Open Call Management and a corresponding benchmarking analysis including the description of specific implementation cases that might illustrate the added value of such a toolkit.

This DLT framework, with the LEDGER MVP Builder Program as a use-case to replicate it in other pilot actions, will allow the easiest adoption by granting bodies, namely the EC and Regional bodies. It is estimated that 34 potential bottom-up projects from the DLT framework can be generated beyond LEDGER.

With regards to the LEDGER use-case, its overall ambition was to stimulate and develop the conditions for the birth of economic, regulatory, and technical alternative models that preserve citizens digital sovereignty, where data is a common good owned by citizens and wealth created by data-driven platforms is equally distributed by adopting a **human centric approach**.

The simplest and concise definition we like to use for expressing the **human centric approach** concept is:

Made by humans: with dignity, passion and ethics.

With humans: with the constant involvement of all the stakeholders in the different development stages.

For humans: aiming for social good and digital sovereignty.



Fig. 1 - Human Centered Design Visualization²

To avoid repetition across deliverables, various references are made to the previous deliverables for more information on the context explained.

² Wikipedia img

https://en.wikipedia.org/wiki/Human-centered_design#/media/File:Wikimania_Human_Centered_Design_Visualization.jpg

2 Implemented Methodologies

This section will describe the methodologies used in the LEDGER Venture Builder Programme for Human Centric Solutions to achieve its main goals with regards to the DLT framework for grant distribution toolkit.

Applying the following interconnected strategies, proved to be fundamental for accomplishing the goals of the project:

- **Ecosystem and Community Building (Decode continuity and collaboration among teams)**
- **Adopting Open source and Open standards methodology and models**
- **Lean development and programme flexibility**
- **Mentorship and ongoing support for the sub-grantees**

Following, we provide the definition and the importance of each strategy and our experience during the LEDGER programme.

Ecosystem and Community Building

One of LEDGER's pillars was the H2020 project DECODE (grant nr: 732546) and using its results in order to create a continuity.

DECODE was an EU-flagship project on blockchain technologies and data sovereignty that produced a wide ecosystem of cryptography and blockchain components (including [Zenroom](#)), many of which are still maintained today and used in public sector and industrial solutions, entirely free and open source.

One of LEDGER's goals was to disseminate DECODE's software output and accelerate its adoption.

Another goal of the LEDGER was to create a thriving community around the project for stakeholders with an interest in decentralised technologies such as researchers, entrepreneurs, start-ups, SMEs and public and private entities including investors, in order to:

- foster interaction, cross- pollination and ideally collaboration during and beyond the project (e.g. Digital Thread for Public Funding replication)
- attract and mobilise a critical mass of potential applicants for our Open Calls
- promote open source technologies generated by the bottom-up projects that were accelerated during the program
- share important knowledge achieved during LEDGER and with regards to the Next Generation Internet initiative's Pan-European ecosystem of decentralized Data Governance.

For this purpose, at the very beginning of the LEDGER project an [online community](#) was created on the FundingBox Spaces platform, which hosts a wide array of Deep Tech Communities ([FundingBox.com](#)) including the [NGI Community](#) and also counts with the Open Call application tool where applicants filled in the Open Call application forms.

At the moment of writing this report, LEDGER's online community has +900 members and the project's Twitter account +1000 followers.

An important part of the general LEDGER community building activities were the Open Call dissemination campaigns geared towards community member recruitment and awareness creation around the LEDGER project and its position within the wider NGI initiative, as well as the attraction of applicants, bottom-up projects consisting of teams of developers, researcher and entrepreneurs, who, when selected, would become pioneering members of the LEDGER Venture Builder programme beneficiary community around open-source stacks created during the programme oftentimes building on DECODE technologies and intrinsically implementing LEDGER values such as human-centricity, privacy-by-design and digital sovereignty. For more information on the 34 beneficiaries please consult the Innovators Portfolio on the [LEDGER website here](#).

In order to attract this specific talent and to create the framework, a Scientific and Research Work programme was created, defining the scope and reach of the Venture Builder and the verticals the project was targeting. In parallel the LEDGER community building strategy and marketing activities supported these objectives, with top performances during the Open Calls including national and international events participation, webinars, online marketing and press.

For more detailed information please see Scientific and Research Work Programmes, Marcom Strategy and Growth Hacking Plan, Open Call Packages and Open call Evaluation reports [here](#).

The above mentioned specific LEDGER Venture Builder programme beneficiary community was built during the tech mentorship of the 3 cohorts by:

- Creating different virtual spaces dedicated to open collaboration, shared experience and peer review. The main 'tools' were: the **All-hands stand-up meetings**: lasting typically one hour, organized around with a fixed template where each team would give a focused 5-minutes update on their project, along with a description of their progress as well as areas where they needed support and the **Virtual Bootcamp events**, called 'Demo Days': after each prototype release all the teams were invited and encouraged to ask questions and provide feedback during the showcase of each MVP;
- Providing effective tools supporting coordination of efforts, like:
 - Shared Calendar use: all the events and meetings were published on a common calendar. Recurring events (such as all-hands stand-up and one-to-one meetings) had fixed time slots, in order to help teams with planning.
 - Mattermost and Cryptpad: ongoing communication with the teams occurred mostly on a Mattermost instance (<https://ledger-chat.dyne.org/>) while documents co-written with the teams are produced using Cryptpad (<https://pad.dyne.org/>)
- Providing topic specific webinars with experts and in depth analysis with mentors, whenever issues and challenges were identified among teams;
- Offering support, expertise, knowledge transfer and tutorials for the DECODE tech stack;

Sharing the experience and the tech stack developed during the DECODE project, enabled teams to clarify challenges and opportunities about DLT tech uses and privacy by design implementation. Teams and mentors worked together trying to solve new challenges and for example as an outcome of the second round of LEDGER, stand-alone components were developed and released in separate repositories, making the code easy to be used and adopted by other OSS communities.

The strategy proved to be successful when in the 3rd Round of LEDGER, some of these components were adopted and implemented (by 2 of the teams), contributing to the continuity and further development of these tools.



Fig.2 - Legacy and evolution cycle of the Decode tech stack

DECODE technologies linked to FundingBox platform for Open Call Management:

Part of the strategy of building an ecosystem and further supporting the DECODE technology, which includes European Commission efforts and initiatives such as NGI whilst addressing and respecting the above mentioned criteria, was for LEDGER and more precisely FundingBox to be one of the first early adopters of the DECODE tech stack, implementing it on its FundingBox platform for Open Call Management and with it meeting KPI 5.1 – New methods of managing public funding by improving transparency and privacy beyond the SoA.

Unfortunately, during the first phase of the LEDGER project, the corresponding tools were still undergoing tests and stability checks, with further delays caused by 2 of the core developers leaving the DECODE project at a critical moment.

In order to experiment with the DLT implementation, FundingBox's developers wrote an alternative module for the FundingBox Open Call Management platform using Hyperledger Fabric, which provided an immutable registry on the blockchain of the time and day (timestamp) every second and third open call application was submitted and reviewed by external evaluators in the corresponding selection phase.

This Ledger TTS (Time Stamping Service) module, building and deploying a 2-tier application that uses the Fabric network to provide a Time Stamping Service was published on the LEDGER project Github here <https://github.com/LedgerProject/ledger.tts>.

Towards the end of the project, with the DECODE technology ready to be implemented, another module was released as a POC for the integration of DECODE based technology Zenroom within the FundingBox platform for Open Call Management and is now publicly available under the project's GitHub workspace here <https://github.com/LedgerProject/restroom-mw-ledger.tts>. It consists of a middleware to make operations on the Ledger TTS, based on Zenroom. This library extends RESTroom and Zencode to allow

them to use the Ledger TTS as a data persistence layer. Its goal is to allow developers rapid prototyping of web services using cryptography, smart contracts, blockchain and DLT technologies and with it complementing LEDGER's 'DLT framework for grant distribution toolkit' and consolidating its 'Public Funding Digital Thread' based on DLT technologies, one of the project's objectives towards providing public organisations with a toolkit for more transparency and accuracy in the context of the management of Public Funding for innovation.

Through this activity the DECODE technology was also taken up by another pioneering European H2020 project called TOKEN, showcasing already the strength and sustainability of the technology and community built around it.

Another of LEDGER's goals is to keep its open-source developers' community alive beyond the duration of the project with Dyne planning for mentors and participants to remain in contact, enabling them to carry on interacting. One of the tools for this ongoing collaboration is precisely the mentioned shared repository on Github (<https://github.com/ledgerproject>).

Those are outstanding examples that people with a shared social-good vision, open source philosophy and proper support and documentation, can really have an impact within society, allowing digital social transformation to accelerate and bring effective change into the life of citizens.

Adopting Open source and Open standards methodology and models

The Open source model, Open standards and Open data are fundamental for technological independence, competitiveness and innovation and should be mandatory requirements for obtaining public funding as well as for providers of essential services and infrastructures. This is the only way to ensure interoperability, transparency and accountability, enhanced security and quality, and with it long term sustainability (by avoiding vendor lock-in).

With LEDGER's ambition to foster the development of free and open source software, Dyne, as an open source advocate, having been active for decades in the open source community, was able to provide specific technical, business and legal support (licensing and GDPR) to LEDGER beneficiaries.

Furthermore, all the infrastructure and tools Dyne provided on premises for the program, from the CryptoPad collaboration suit, to the Mattermost chat and jitsi VoIP, were based on open source projects, proving that an alternative way for proprietary software is possible, is functional and is sustainable.

These core values were announced and promoted from the beginning of the program, however only with the start of LEDGER's 2nd cohort did they become mandatory, based on lessons learned in the previous round.

The framework and templates were created so that all code produced during the program was to be published under the same workspace, with the same documentation structure and project presentation, so that all the community would be able to easily read, study and review the projects.

Standard presentation of the projects and common repo:

- Common repository: <https://github.com/LedgerProject>
- Projects presentation: <https://ledgerproject.github.io/home>

Lean development and program flexibility

The development cycle followed the MVP Builder Programme timeline, in which each beneficiary had to develop a valid and functional MVP. The MVP Builder Programme was divided in four quarters for the long version (applied in the first 2 cohorts) and two quarters for the short, more advanced version (in the third LEDGER cohort) adopting the same model. The difference between the two versions was that in the longer one, beneficiaries had one extra MVP iteration and a Business Ignition phase was delivered after the final MVP was released, while during the short version the Business Ignition rolled out in parallel with the development.

The 'quarters' were used from the beginning of the project, as a time period reference for defining and publishing in the LEDGER shared calendar all the milestone deliverables, the technical deadlines and for the performance assessment of each beneficiary.

On the Business side, the assessment was based on: Business Pitch and Business Case progress while on the technological side, the evaluation was based on:

- Tech Quality:
 - o Technology used: choice of components and architecture. Additional points are given to beneficiaries basing their development on software written in H2020 projects.
 - o Quality of software produced: code review based on open source readiness, maintainability, scalability.
 - o Quality of the documentation: evaluating how easy it is for a third party to work with the codebase.
- TRL Progress
- Impact and novelty:
 - o Evaluation of the impact of the product or service for the society along with how it is innovating an existing market niche or culture, or even shaping a new one.

Two criteria were assessed, both by Dyne and BLUMORPHO:

- Team strength and quality: bonds and track records between key team members, technical strength of the developers, strength of the team to drive the business
- Collaboration: Use of the LEDGER Chat especially for event dissemination and information sharing, number of engagements with other sub-grantees, number of initiatives to work together, progress and results of code written together, test, issues and feedback provided to other teams

In the long version of the programme, the beneficiaries had 4 technical Deliverables: the IMP – Individual Mentoring Plan (as the first deliverable used as a starting point in order to clarify the work plan and the KPIs for each project) and the 3 releases of their MVP.

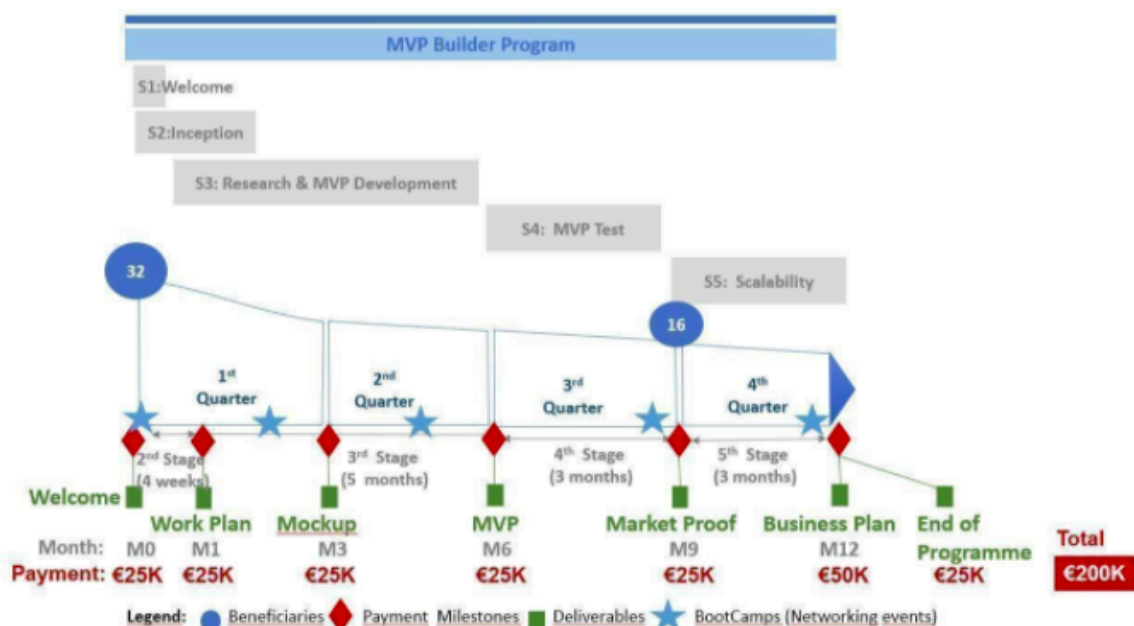


Fig. 3 - LEDGER program 1st and 2nd Cohort Milestones

In the 3rd LEDGER round, the short, more advanced version, beneficiaries had 3 technical Deliverables: the IMP and 2 MVP releases.

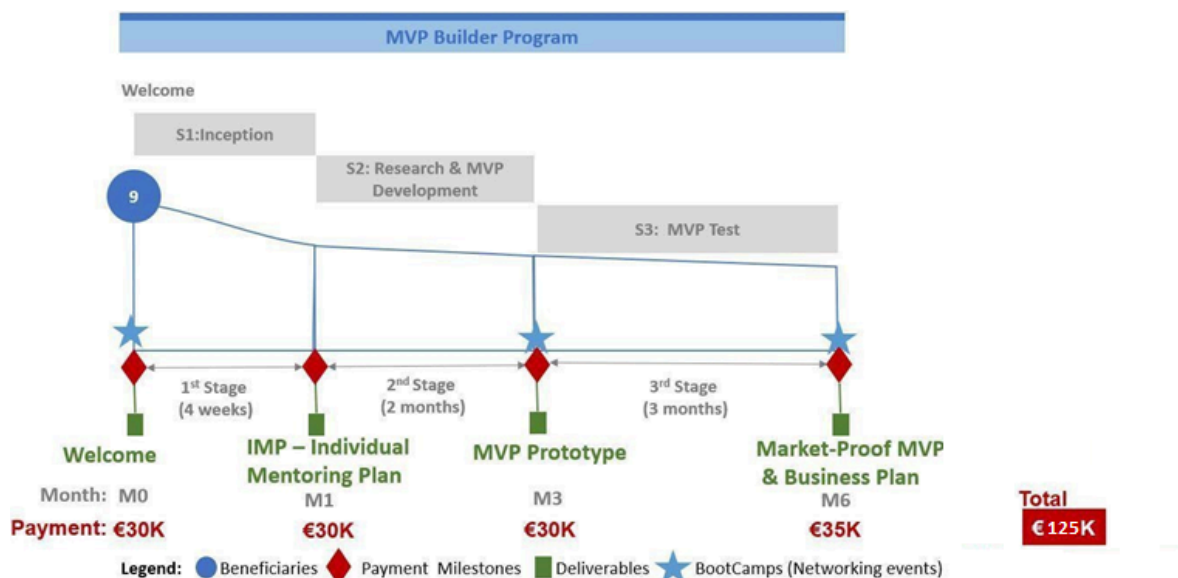


Fig. 4 - Ledger program 3rd Cohort Milestones

Following the Lean development model, each release of the MVP had to be functional and was to be showcased to the other teams and to the consortium partners, in order to obtain feedback and reviews.

Each new release aimed to be an improved version of the previous one, more stable and with new features.

In applying this methodology, even more in a program with an important research component, flexibility proved to have a key role. Teams were allowed to change tools, components and sometimes even features based on research results, tests and stakeholders' feedback, as long as the mentors were updated and consulted and everything was documented through a change log. Testing and adapting based on feedback was also emphasized and encouraged from the beginning of the project.

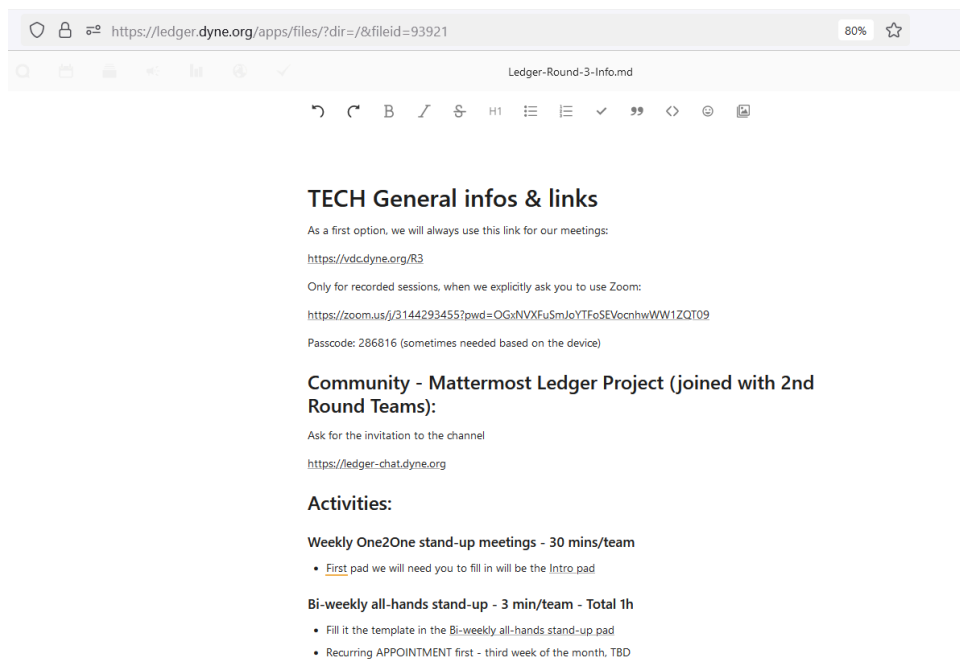
For more detailed information, see public business reports D4.1-4.3 and technical reports D3.1-3.3 [here](#).

Mentorship and ongoing support for the sub-grantees

The technical mentorship has evolved during the execution of LEDGER, by dynamically improving the planning and activities based on a “lesson-learned” attitude.

During the first round of the program, each team had an individual mentor, based on the matching carried out during the Welcome Day event. While this practice provided a closer interaction of each mentor with its assigned team, it also led to the tendency of both teams and mentors to operate in silos, limiting alignment with other mentors and collaboration among teams.

In order to improve the mentoring activities, in the next 2 LEDGER rounds, the teams-mentors matching was replaced by a team of “core-mentors”, who created a specific mentoring plan with all the day-by-day activities, tools, links and templates for teams to be able to start and follow the programme.



The screenshot shows a web browser window with the URL <https://ledger.dyne.org/apps/files/?dir=/&fileid=93921>. The document title is "Ledger-Round-3-Info.md". The content includes:

TECH General infos & links

As a first option, we will always use this link for our meetings:
<https://vdc.dyne.org/R3>

Only for recorded sessions, when we explicitly ask you to use Zoom:
<https://zoom.us/j/3144293455?pwd=OGxNVXEuSmJoYTfoSEVocnhwWW1ZQT09>

Passcode: 286816 (sometimes needed based on the device)

Community - Mattermost Ledger Project (joined with 2nd Round Teams):

Ask for the invitation to the channel
<https://ledger-chat.dyne.org>

Activities:

Weekly One2One stand-up meetings - 30 mins/team

- First pad we will need you to fill in will be the Intro pad

Bi-weekly all-hands stand-up - 3 min/team - Total 1h

- Fill it the template in the Bi-weekly all-hands stand-up pad
- Recurring APPOINTMENT first - third week of the month, TBD

Fig. 5 - 3rd round Mentoring Plan

The core mentoring team was backed up by experts from the entire Dyne team and its community as outlined in the publicly available Pool of Experts deliverables [here](#), whenever specific needs or issues were identified among teams.

The programme rolled out with weekly recurring individual meetings for each team, addressing the specific needs of each project, and weekly recurring all-hands stand up meetings, which lasted a maximum of one hour and were based on a fixed template, focused on 5-minute updates from each team on project progress and the needed support in order to foster collaboration among all teams.

A shared calendar with all the recurring meetings and program deadlines was created and slots were arranged and confirmed in conjunction with the teams. The calendar had a public url and instructions for integration with SMTP clients.

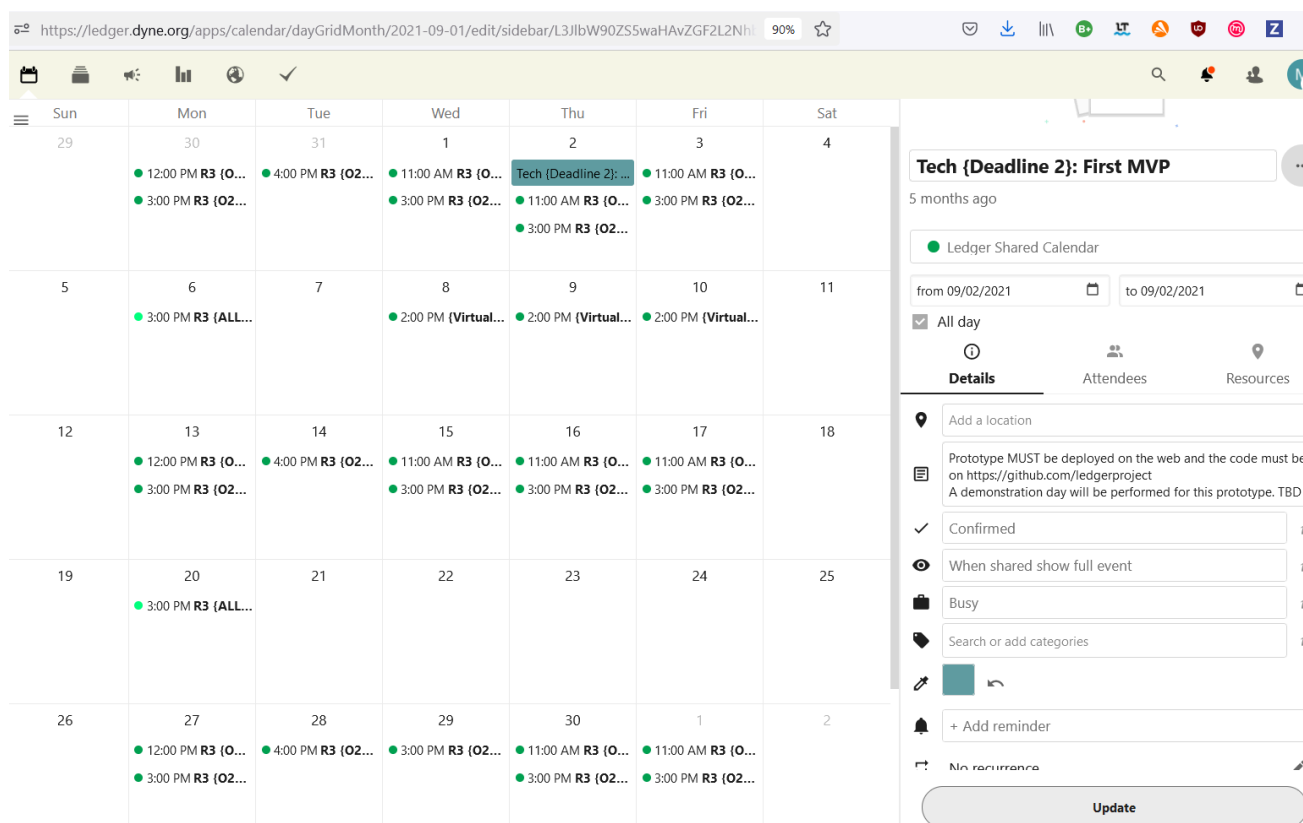


Fig. 6 - Shared Calendar screenshot

The weekly reports on work progress, together with ongoing communication channels, helped to create a relationship of trust between teams and mentors and allowed timely interventions whenever challenges were identified.

Topic specific webinars with experts, group sessions with other mentors and extra meetings with the core mentors were also provided based on analysis and findings during the day-by-day activities.

The first example about a common identified need, addressed with a specific webinar, was about 'GDPR with blockchain and cryptography' and happened shortly after the start of the 2nd Cohort program. It

was motivated by a common difficulty among most of the teams to understand the data management process in relation to DLT.

The Dyne team was joined by Marco Ciurcina, a GDPR expert for this webinar. In the hope that other people and projects can benefit from the vivid discussion, the webinar recording was published on Dyne's public YouTube channel (link here: <https://www.youtube.com/watch?v=kU-PhcsODjc>) under the LEDGER brand and is also available on the official LEDGER Website Library tab (link here: <https://ledgerproject.eu/video/>).

The strongest difficulty identified during the 2nd Cohort was adopting an open source approach and business model. Another specific webinar was organised by Dyne (<https://www.youtube.com/watch?v=DDQsASIYKDC&t=2s>) addressing the topic and presenting available models. Furthermore, the more experienced participants within the project were encouraged to share their expertise, which led to a constructive debate and knowledge sharing.

3 Lessons learned

What worked

Lean methodology and flexibility: setting a clear work plan for the entire cohort in question alongside the teams' Individual Mentoring Plans (IMPs), organised by milestones, each described using well-defined tasks, while leaving space for feedback integration and adaptation based on ongoing research and development.

Weekly reports on work progress, allowing for timely interventions of the mentors.

Community building: fixed bi-weekly time slots allocated for the teams to share experience and progress among themselves.

Calendar use: all the events and meetings were published on a common calendar. Recurring events (such as all-hands stand-up and one-to-one meetings) had fixed time slots, in order to help teams with planning.

The use of tools like Mattermost and Cryptpad: ongoing communication with the teams occurred mostly on a Mattermost instance (<https://ledger-chat.dyne.org/>) while documents co-written with the teams were produced using Cryptpad collaboration suite (<https://pad.dyne.org/>)

Common repository: all the source code of each project was published in a common repository on Github (<https://github.com/ledgerproject>) along with the projects' presentations and documentation (<https://ledgerproject.github.io/home/#/>).

What can be improved

Introductions, community and network building among the different cohorts. The need for more interaction and cross-pollination between cohorts became apparent during the 2nd cohort programme,

however, timeframes and the cancelling of all physical events due to the Covid19 Pandemic made it difficult to implement these findings more substantially.

Collaboration during the 3rd round raised some challenges due to its shorter duration and concentrated setup. Although all the teams were present during the joint meetings, they remained focused on their own projects and interest for other teams or projects was sparse. The incorporation of the business ignition phase along the entire 6 months of the project instead of in a separate phase with additional time and financial support for top projects, collaboration included as a criteria, as provided in round 1 and 2 might have added to the teams' limited drive to collaborate. In fact, during round 2 collaboration among teams started to really flourish around the 6th month of the program, after the teams had developed a first version of the prototype and had more time for feedback and for knowing each other.

More discussions about free and open source methodologies, models and social goals. Despite efforts from both mentoring teams, Dyne and BLUMORPHO, and additional support from [NGI Tetra](#), another European project of the NGI initiative aiming at providing further business guidance to NGI project beneficiaries, open source business models and the social impact and innovative potential they can have within our society, are still an element that a number of developers and entrepreneurs need additional guidance and support on.

More empiric experience applying decentralization models in real life scenarios. There is still a lot of confusion on how and when to use decentralization, its added value and potential. The most common tendency we've noticed within the projects is the use of the blockchain as a reinforced database.

4 Success stories

Components developed by teams in collaboration

During the 2nd Round of the LEDGER project, as we went on analysing the progress and the challenges of each project, a common issue related to the management of private keys was identified. More specifically if and how a service provider should backup the private keys of its users, a practice that security experts and Dyne actively discourage.

An alternative approach was proposed by the Dyne experts, based on the possibility to deterministically create private keys, using answers to specific questions to the user. This led to the creation of a working group and the development of the shared component "Keypairoom", where input was collected by all the teams and main contributions came from the Global Passport Project (GPP) and GeneCoop teams.

GPP project description

Global Passport Project is a pioneering initiative that leverages on decentralized technology to support migrants along their journey, helping them to protect their privacy while reporting human rights violations, and engaging them as citizens to be integrated into their new communities. The main functionalities offered are safely storing important documents, accessing information on the countries that have been crossed and the solidarity network in the area they are in, as well as reporting on abuses

they might be facing along the journey. All data is personal and inviolable, and it is saved on DLTs with a double-level encryption component.

During this project, the human centred design and interdisciplinarity played an essential role in testing and integrating feedback tasks as the team had to take into account digital literacy and the different cultural backgrounds of the migrants and also the different NGOs, social enterprises and public offices players.

Despite the intensive work plan (they started the program from scratch), they managed to dedicate time to explore and contribute to the Keypairoom working group.

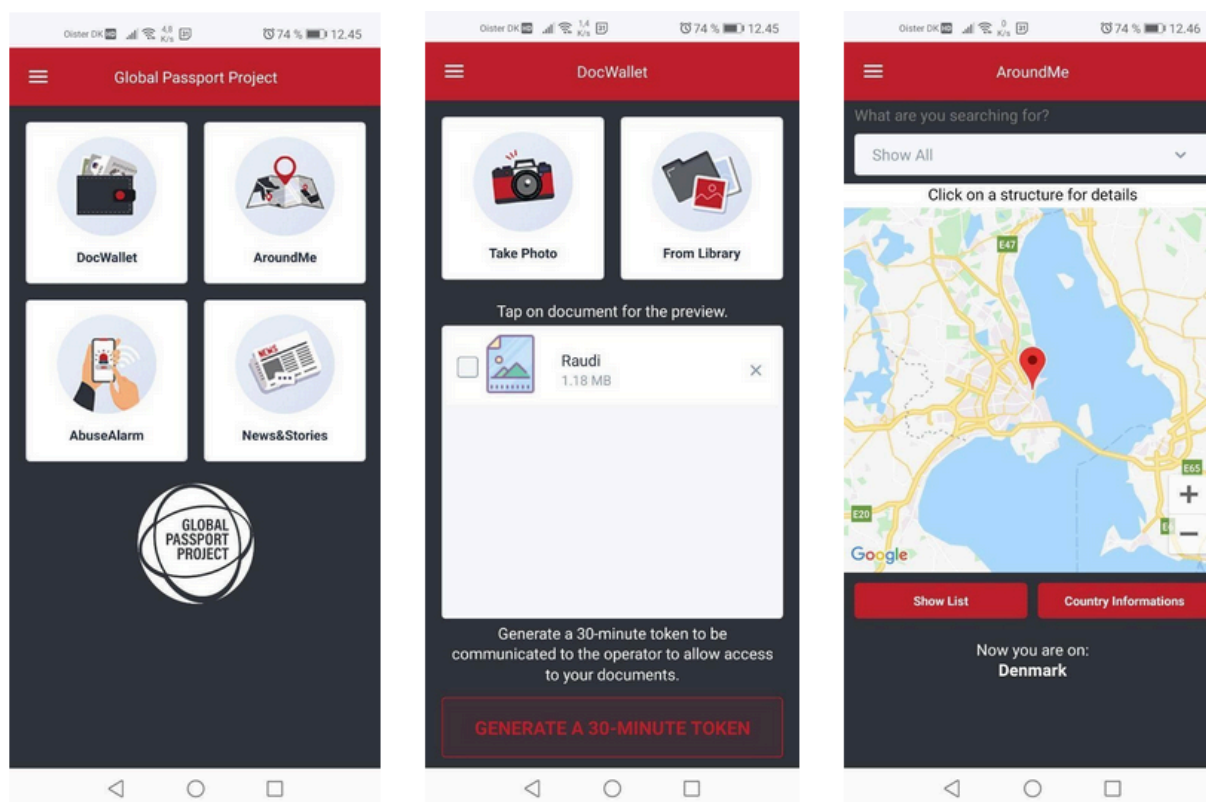
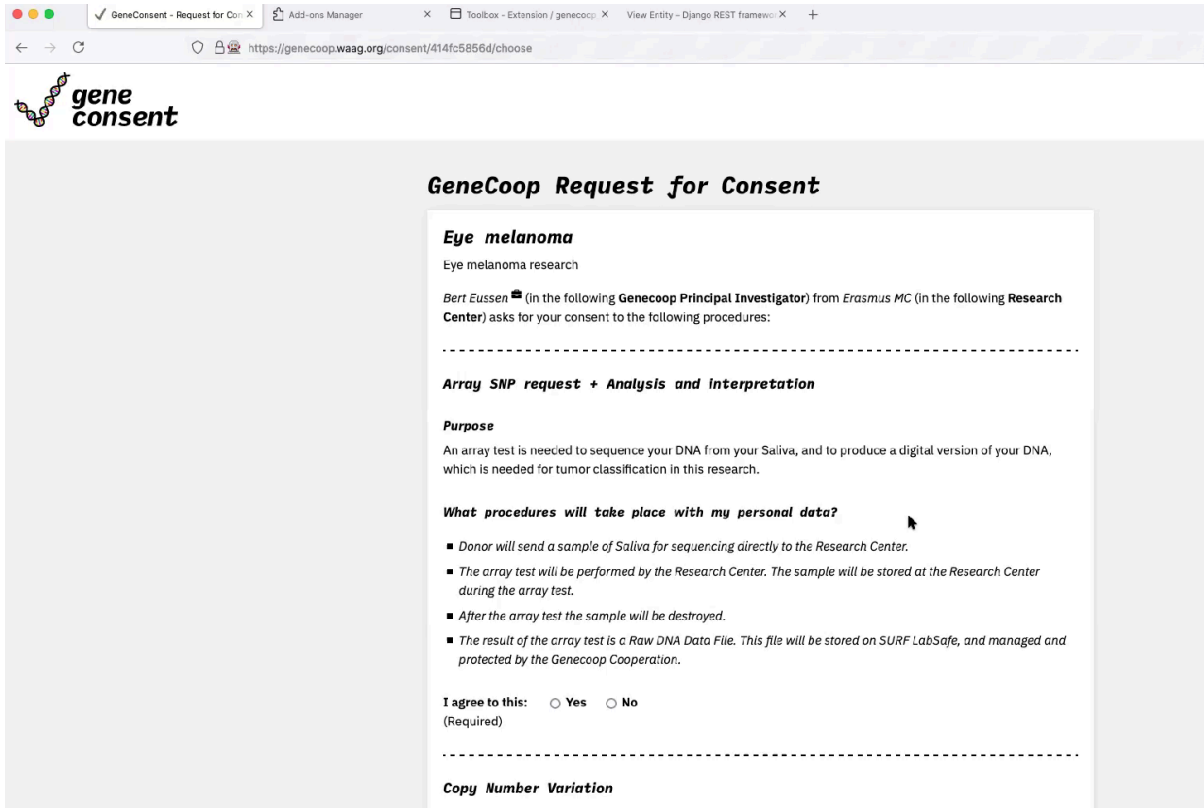


Fig. 7 - GPP mobile app features Screenshot

GeneCoop project description

GeneCoop worked on one of the most challenging topics in the security field: DNA data collection for genomic research, one of the top classified sensitive data. They developed a consent service for researchers and at the same time a mechanism allowing DNA owners to retain control on how their DNA is used in research. The entire process is transparent and a lot of effort has been dedicated to the formulas and language used to describe the data usage throughout the research to a non-academic audience. A key element of this process was writing smart contracts in Lua and Zencode in an English-like DSL (Domain specific language).



GeneCoop Request for Consent

Eye melanoma
Eye melanoma research

Bert Eussen (in the following **GeneCoop Principal Investigator**) from *Erasmus MC* (in the following **Research Center**) asks for your consent to the following procedures:

Array SNP request + Analysis and Interpretation

Purpose
An array test is needed to sequence your DNA from your Saliva, and to produce a digital version of your DNA, which is needed for tumor classification in this research.

What procedures will take place with my personal data?

- Donor will send a sample of Saliva for sequencing directly to the Research Center.
- The array test will be performed by the Research Center. The sample will be stored at the Research Center during the array test.
- After the array test the sample will be destroyed.
- The result of the array test is a Raw DNA Data File. This file will be stored on SURF LabSafe, and managed and protected by the GeneCoop Cooperation.

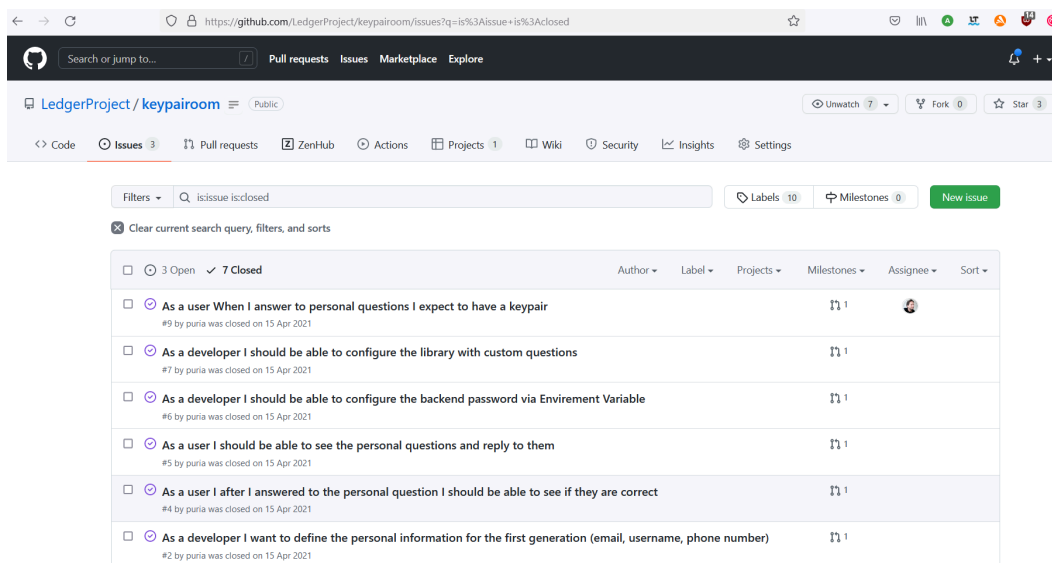
I agree to this: ☐ Yes ☐ No
(Required)

Copy Number Variation

Fig. 8 - GeneCoop MVP Front-end: Citizen human-readable consent screenshot

Keypairoom working group

The group met several times in order to define objectives, assigned tasks that needed to be performed, organized next steps and testing.



Filters: is:issue is:closed

Clear current search query, filters, and sorts

	Author	Label	Projects	Milestones	Assignee	Sort
☐ 3 Open ☒ 7 Closed						
☐ As a user When I answer to personal questions I expect to have a keypair #9 by puria was closed on 15 Apr 2021				1		
☐ As a developer I should be able to configure the library with custom questions #7 by puria was closed on 15 Apr 2021				1		
☐ As a developer I should be able to configure the backend password via Environment Variable #6 by puria was closed on 15 Apr 2021				1		
☐ As a user I should be able to see the personal questions and reply to them #5 by puria was closed on 15 Apr 2021				1		
☐ As a user I after I answered to the personal question I should be able to see if they are correct #4 by puria was closed on 15 Apr 2021				1		
☐ As a developer I want to define the personal information for the first generation (email, username, phone number) #2 by puria was closed on 15 Apr 2021				1		

Fig. 9 - Keypairoom working group tasks assigned via GitHub

At the end of the development, two distinct modules, based on DECODE technology, were produced and released as stand-alone components with free and open source licenses, ready to be adopted in other projects, as it indeed happened during the 3rd LEDGER round with the FairBnb and Moncon platforms.

Web extensions encapsulating Zenroom functionality:

<https://github.com/LedgerProject/zen-web-ext>

Keypairoom, multi-platform component to generate and regenerate a keypair, in a deterministic and private way:

<https://github.com/LedgerProject/keypairoom>

Keypairoom - Demo Project:

<https://github.com/LedgerProject/keypairoom-demo>

High Social Impact projects

We understand social impact as any significant or positive change that can solve or address social injustice and challenges that raise awareness of a particular issue and create public value in the process.

This was a core principle within the LEDGER program, and it can be observed as part of the vision and work of all the teams. Yet, in our opinion, there are two projects among the 3rd Cohort that stand out due to them challenging models adopted by some of the biggest tech companies, providing privacy by design alternatives, offered directly to the final users.



Figure. Mobile phone with /e/.

/e/ project

/e/OS is a deGoogled and pro-privacy mobile operating system compatible with Android applications.

On an average day, a phone with Google's Android sends personal data about its user to Google's servers 40-90 times per hour³[1] For iOS, this is 0.7-51 times per hour (to Apple). This results in many personal data being sent every day about cell phone users to the servers of these two companies in America. An example of this data: each Android phone transmits the user's location to Google 340 times per day.

/e/ develops a privacy-safe and open-source alternative to these two operating systems (OSs) for mainstream mobile phone users. Unlike other operating systems based on Android found on common phones (e.g. Google, Samsung, Xiaomi and Huawei), by default /e/ doesn't collect any logs, user activity or locations. Because /e/ is open-source, their claims are auditable: their OS can be and regularly is proven to be privacy-safe. See, for example, [this study](#).²

³ Douglas Schmidt. Google Data Collection Research. Digital Content Next, August 2018.
<https://digitalcontentnext.org/blog/2018/08/21/google-data-collection-research>

Android is open-source and therefore it is possible to 'fork' the OS. /e/ OS is an Android fork. /e/ has been completely 'deGoogled'. As a result, it is the only Android worldwide that collects zero data about its users⁴. The big advantage of using Android as a base is that all apps that work on Google's Android also work on /e/, thus giving users instant access to all the apps they know and love.

During the LEDGER programme the team extended its features by developing a "Privacy Central app", allowing Android users to analyse and block trackers using a customized DNS resolver, decide whether to reveal their real IP and/or geolocation or not, and also to manage the permissions for each application they use, directly from their device. An extra focus was dedicated to raising awareness among users about transmitted data by each app during real time usage, without blocking essential functionalities provided by the phone.

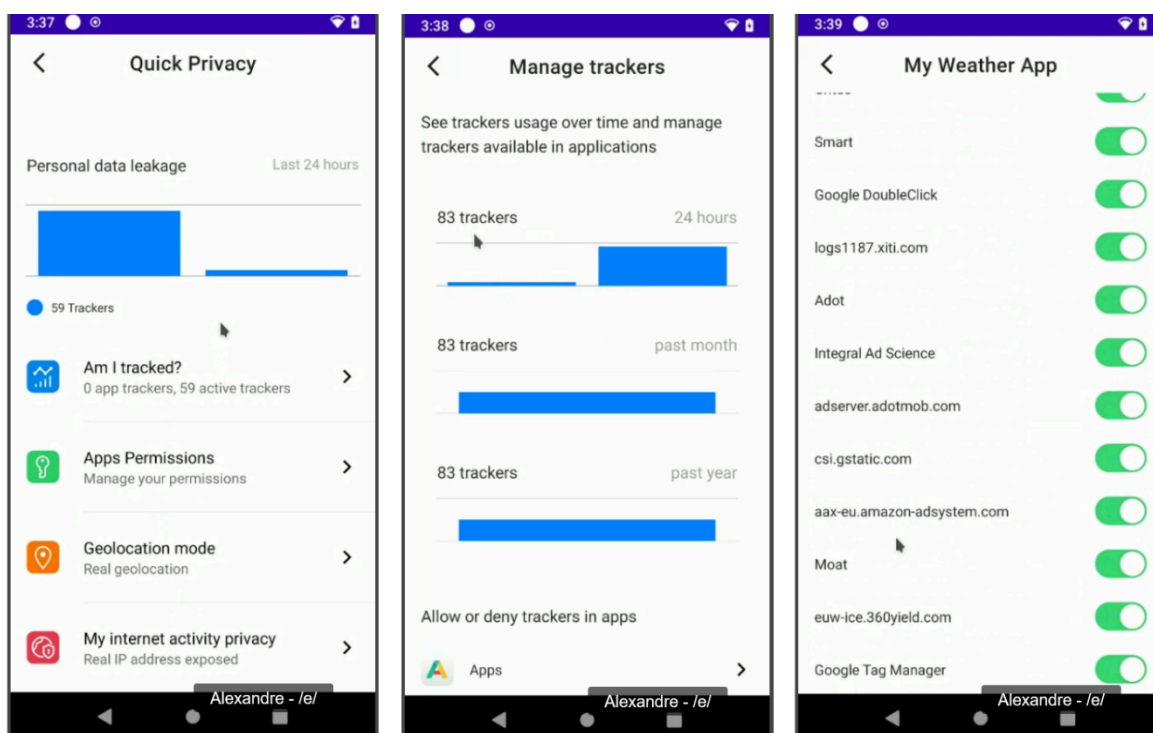


Fig.10 - /e/ Tracker Blocker on /e/ device screenshot

Details about the implementation and the release can be found here:

<https://ledgerproject.github.io/home/#/teams/e>

YouChoose

The problem YouChoose is trying to tackle is that various search and recommendation engines select more than 70% of the content viewed on the social platforms and the algorithms applied for these selections are triggering a series of drawbacks like: they favor "clickbaity" and sensationalist content, they are not accountable and hardly customizable, their results are confined within the engine itself, they are optimized to benefit the company's profit rather than the interests of the user.

⁴ Haoyu Liu et al. Android Mobile OS Snooping By Samsung, Xiaomi, Huawei and Realme Handsets. University of Edinburgh and Trinity College Dublin, 6 October 2021. https://www.scss.tcd.ie/Doug.Leith/Android_privacy_report.pdf

As a consequence, AI with misaligned interests decides most of what people watch.

There is a **growing frustration** on the monopolistic influence platforms have in shaping information flows. **Content creators** are at the mercy of an opaque AI which favours engagement over quality. **YouTube users** have their attention monetized and pushed towards addictive consumption patterns. **Regulators** are demanding more AI transparency and market competition.

Rather than purely relying on AI, **YouChoose leverages human expertise** to identify the best related content and offers a browser extension which enables users to choose alternative recommendation feeds, directly on [YouTube.com](https://www.youtube.com). Such specialized human expertise is found among: Content creators, existing online communities (feeding recommendations from Reddit / RSS feeds) and users' personal feeds on other platforms.

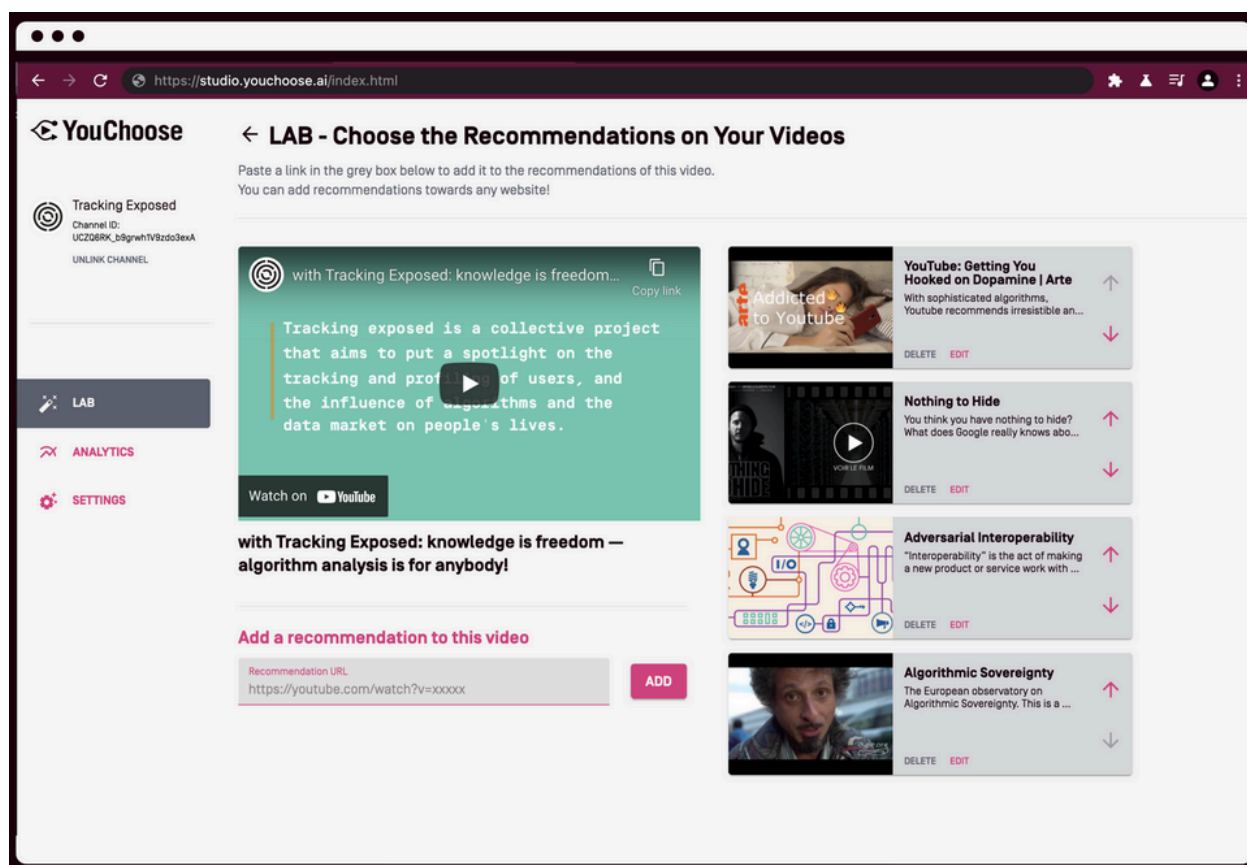


Fig.11 - YouChoose Content creator dashboard screenshot

Fig.

YouTube benefits from its nearly monopolistic position on the video sharing market to impose its recommendation algorithm. YouChoose challenges this de-facto algorithmic monopoly, by making third-party alternatives interoperable with the platform. Various options will soon be integrated, and accessible directly via the extension, including alternatives that rely on decentralized curation and moderation models.

YouChoose joined the Ledger program with a backend containing search results and recommendation collection and analysis, together with development of alternative metrics performed during the <https://tracking.exposed/> project.

During the program they focused on the user-facing functionalities, developing a browser extension able to modify and inject the recommendations displayed in the sidebar of the video player. This technology will also be used for integration with third-party recommendation systems. With this extension users get to choose which recommendations to follow, but very important for the social aspect, they are also asked whether they want to anonymously donate their data in order to develop a method to measure penalization and prioritization of content on YouTube and with that action to support the effort of making the algorithm more transparent and accountable.

The various types of advertising displayed on a YouTube page were mapped, and a parser was implemented to support their collection in the data donation program. The whole backend was updated and improved.

Moreover the Content Creators Lab dashboards were released, enabling them to add and organize their recommendations, add content from outside the platform and visualize analytics about the algorithmic behaviour with regard to their videos. This is a liberating change for content creators, who are currently forced to rely on YouTube's algorithm to distribute their content.

Those are critical steps towards digital sovereignty. Users should be empowered to choose and customize their recommendation system. By gaining back agency over the content delivery infrastructure, users can gain control back over their informational diets.

YouChoose is an early **attempt to end the era of algorithmic monopolies** and a step toward a **more open and decentralized internet**, with more user autonomy. Details about the implementation and the release can be found on their [website](#).

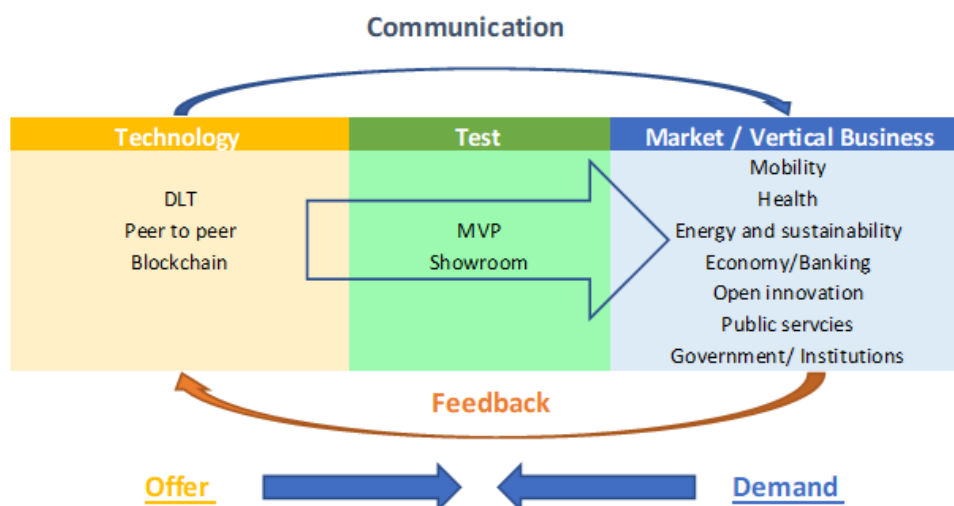
5 Implementation Benchmark Analysis

IMPLEMENTATION

This chapter will discuss the business perspective of the DLT framework for grant distribution toolkit. Part of BLUMORPHO's objective in LEDGER was to encourage the exploitation of the LEDGER approach by different public organisations. To do this, BLUMORPHO embarked on a benchmark analysis that is more clearly visible in Deliverable D5.2 Chapter 4 [here](#).

As stated in Deliverable D5.3, a key pillar for LEDGER's sustainability was encouraging a fertile ecosystem. This means gathering all relevant stakeholders from DLT enthusiasts and entrepreneurs, to large organisations, investors, research centres and more to push the development of DLT. A survey done by BLUMORPHO in 2018 concluded that the European Blockchain ecosystem was too "techno-push", meaning it was driven by technology more than it was by market actors. All consortium members, FundingBox, Dyne.org and BLUMORPHO engaged their networks to help grow this ecosystem.

Ultimately, LEDGER sought to attract early adopters and to do this they needed to be convinced of the utility of Blockchain and DLT.



Initially, D5.3, we had presented the intention to use showrooms and demonstrations to show the value of Blockchain and DLT to early adopters. The use of this method was to further facilitate adoption by presenting applications, broadcast success stories, demonstrate a proven track record and bring forward the differentiation of DLT. Impact Week 2020 had Showrooms and Blockchain Venture Day 2021 had live pitches. Both gave LEDGER companies visibility and attracted the interest of participants. These actions were mainly beneficial to LEDGER companies on an individual basis rather than on a project level.

Two actions were outlined in Deliverable D5.3:

1. Educating the future ecosystem
2. Demonstrating the value of DLT solutions

Through discussing the benchmark targets below, we will demonstrate how these actions were undertaken to develop the blockchain ecosystem further. The Education Action was to facilitate the awareness around distributed ledger technologies a specific communication on the LEDGER verticals will be done towards potential users and adopters.

The communication actions were done throughout the whole project. These communications include LinkedIn posts, articles and success stories related to Demo Days, trends assessments, and video creations that came in the form of online pitches, which were shared among the ecosystem and to potential users from a variety of industries

Next we shall discuss the benchmark targets that were reached for LEDGER, namely:

- Investors
- Institutions
- The Market

The only benchmark target from the initial list that was not reached was public organisations and regional entities. BLUMORPHO engaged with candidate European Digital Innovation Hubs for actions unrelated to LEDGER to discuss a number of topics, and although blockchain was meant to be included, the topic ended up being too far from the core discussion.

Investors

LEDGER and distributed ledger technologies as a whole were promoted by BLUMORPHO during many events between 2018 and the end of 2021 that counted with investors These actions include the INPHO Venture Summit 2018, Impact Week 2020 and Blockchain Venture Day 2021.

In the beginning of this process, the discussions concluded a lack of trust from private investors regarding the added value of Blockchain and DLT-based solutions. Subsequent feedback regularly placed emphasis on the added-value companies like those in LEDGER could bring in addition to the technology. Actually, through investigating the interest of DLT from private investors, we realised there was a divergence between the interests of public institutions like the EC, and private investors. The bottom line is there is high investment potential in Europe which in reality needs to be boosted to strengthen the entire European Blockchain ecosystem.

As a result, BLUMORPHO formed a Blockchain Investor Task Force of investors to increase the European blockchain VC ecosystem and promote more investments in start-ups that use DLT. The Task Force was made of Blockwall Management, Maven 11 Capital, Signature Ventures, Eden Block and Truffle Capital. The work done with this Task Force has culminated in a manifesto submitted to the European Investment Fund, clearly referencing LEDGER.

Some of the main conclusions to come out of these workshops:

- better education about Blockchain and DLT across all sectors
- investment is needed across the blockchain ecosystem with dedicated sums for early-stage and later-stage companies
- more standardisation and interoperability
- support venture builder programmes like LEDGER

Institutions

BLUMORPHO reached out to three institutions to see how to elaborate the business perspective of the The first institution was INATBA (chosen as part of the task to reach out to the European Blockchain Observatory) to see how, through their actions, LEDGER and similar acceleration projects can be taken to the next level once funding and acceleration end. First contact was made in January 2020 with Nadia Filali, the Chairwoman of INATBA's Board of Directors. This discussion saw the possibility of creating an association for start-ups wishing to join INATBA, the main question here to address is which entity would run the association and manage communications on behalf of the start-ups. Soon after the global Covid-19 pandemic caused a change in the course of our actions and discussions with INATBA would only start again in 2021.

In 2021, contact was made again with INATBA, but this time with the Executive Director Marc Taverner. The initial idea of an association was put on hold as there remains many managerial questions to address to make it feasible - associations need a president, treasurer and a secretary. Instead a second plan was set in place to have a sort of Demo Day mixing INATBA start-ups with LEDGER start-ups. This demo day could not happen before the end of LEDGER's calendar. In any case, INATBA was present at the Blockchain Venture Day where they witnessed the LEDGER companies' pitch and their Executive Director joined a round table to share more of their vision with the public and the LEDGER teams. Discussions are still taking place particularly for a joint action for LEDGER and to find a way to promote the uptake of LEDGER's acceleration model.

The second institution is the European Investment Fund, a pan-European fund of funds that provides money to VCs and banks to fund European start-ups in designated areas. A joint action with a Task Force of Blockchain VCs was launched in order to appeal to European institutions to increase funding to companies using blockchain and DLT. Led by BLUMORPHO, this Task Force was made of VC firms mentioned in the previous sub-chapter. The initial workshop and the final workshop were presided over by DG CONNECT of the European Commission. Over 6 months, the task force met to understand their needs, the needs of blockchain founders in Europe with the goal to come up with a list of recommendations to boost funding in the European Blockchain Ecosystem. Input was also obtained from a representative of BPI France and the French General Directorate for Enterprise. The workshop done with the Blockchain Investor Task Force led to the drafting of a manifesto with recommendations addressed to the European Investment Fund in January 2022 and secondly to the European Commission.

The manifesto presents NGI LEDGER as a case for accelerating start-ups explaining the goals of the project and giving some results on the performance of the start-ups.



Fig. 11- Cover page of the Manifesto submitted to the European Investment Fund

Finally, the European Blockchain Partnership was contacted to see what possible actions could take place for LEDGER's sustainability. More actions are to be reviewed in 2022 but a representative from the institution came to speak during Blockchain Venture Day.

The market: SMEs and Large Organisations (corporates)

More detail is available in Deliverables, D4.1, D4.2, D4.3 and D5.2 about the approach to various large organisations to meet with LEDGER companies and evaluate their market relevance and interest. It is important to note that a set of influential companies (names in D5.2 and Final Report Annex) were contacted to understand what they would require to take up innovative companies using DLT. They see low potential of adoption. These conclusions reinforced the necessity to reach out to investors to form the previously-mentioned task force.

We engaged large organisations in several ways to get their feedback. In 2018, we sent out a survey sent to 100 corporates to see how they viewed distributed ledger applications at the time. The results came back as follows as the **main limits to the adoption and diffusion of distributed ledger applications**:

- 42% said the technology was too complex for any application in the short-mid term
- 42% said a lack of standards and interoperability was a limit to adoption
- 38% said they did not see any real utility for blockchain and DLT

This feedback was typical of the early innovation stage where a lot of communication is centred around technology when it should be informing the market of the benefit DLT can bring to them. The results of this survey also influenced coaching to ensure the gap between market expectations and the technology and business cases developed in LEDGER.

The next action to engage the market came through BLUMORPHO's own business in which actors gathered for their expertise to discuss the pertinence and the development of Blockchain and DLT. For the biennial INPHO Venture Summit, representatives from TRUMPF, Benhamou Global Venture, Hyundai, EuroScan and VeChain talked about Blockchain and what to expect for the future during a round table.

One-on-one introductions made between individual LEDGER companies and specific market players brought insights to specific industries and ways in for each LEDGER company. In some cases, such as Usody (eReuse) and GeneCoop, many prospects came from individual meetings and the LEDGER Demo Days to discuss, but in some cases market players were not necessarily engage with LEDGER companies for a variety of reasons including 1) the companies were too early in their stage of development, 2) the added-value/value proposition are not clear or pertinent enough.

Compared to the survey done in 2018, there are still limits to the adoption of Blockchain and DLT today, but the work done in LEDGER has definitely contributed to educating the market that these technologies deliver an added value beyond just being a technology.

BUSINESS MODEL FOR LEDGER

The Venture Builder model and its added-value have been introduced to sovereignty funds like European Investment Fund and BPIFRANCE and will further be introduced to the European Commission. This model is still emerging in Europe and is raising interest to be further expanded beyond the LEDGER program.

The EIF has targeted AI and Blockchain in the same fund which has predominantly favoured AI. Part of the work done in the manifesto has been to encourage more funding to Blockchain across all layers. It is important to note that the EIF does have investment criteria and is only given a limited sum to invest in a variety of technologies, the work to increase the commitment to blockchain will require time and continued discussions between the EIF, VCs and other actors in blockchain to provide more financial support.

Moreover, BPIFRANCE expressed an interest to see how they can be involved in supporting an acceleration model like LEDGER's and to also support European start-ups focusing on Blockchain. The conversation is set to continue later in 2022.

To go back to INATBA, the idea of an association mentioned in the "Institutions" part of this subchapter is still on the books but the practical nature of how it will work still needs to be validated. A joint LEDGER-INATBA action for start-ups is part of these discussions.

The discussions are still ongoing to provide conclusive information but it will be expanded on during the LEDGER Review Meeting.