:DRHOP, A Platform Proposal for Online Charity

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Abstract: This short paper describes :DRHOP, a project proposal based on the idea of an "open interface" that aims to aggregate different types of "services" and to build around them a community of users who, without changing their usual online (and offline) habits, collect a *wallet of drops*, a sort of virtual currency that can be donated for charity purposes. The architecture of the system is introduced together with the present version of a proof of concept, currently implemented in the context of online advertising. :DRHOP is still in its initial design phase and important issues like trust, security, and privacy – that are fundamental for the success of a proposal like this – are only partially sketched. Nevertheless, we think the idea is worth to carry on as witnessed by some similar projects, which are also briefly introduced in the paper, showing the interest of the Internet community for online charity experiences.

1 INTRODUCTION

We daily access the web to communicate with friends, to publish photos, comments, and feedbacks, for education purposes, to download software. We also buy goods on platforms such as Amazon or Alibaba, use sharing economy platforms such as AirBnB or BlaBlaCar, participate to crowdfunding campaigns to sustain collaborative projects like Wikipedia.

All such online activities always generate revenues for companies providing the web content we use: this revenue can be *direct*, and this is the case when we pay for goods or services, or *indirect*, and this is the case when companies use our actions or data to earn money.

The latter model is typical of the online content we access for free, since we actually "pay" for the same content, for instance, by being exposed to online ads. Content creators convert traffic into a revenue stream when visitors see or click on their ads and this business model is now a dominant force on the Internet, with huge revenues mostly to the benefit of the two names that really matter, i.e. the duopoly of Facebook and Google.

Another source of indirect revenue comes from the massive collection and brokerage of personal data: Internet users are constantly tracked (Englehardt and Narayanan, 2016), their browsing habits are collected, detailed profiles are built, and often sold to companies not only for commercial purposes, as happened for instance in the recent scandal involving Facebook and Cambridge Analytica[1].

This practice is made possible by the so-called third-party trackers, also called tracking cookies, and it represents a serious threat to users' privacy. These trackers, in fact, make the cookie-syncing (Acar et al., 2014) possible since they are able to exchange user data (mostly by mapping user IDs) across different platforms used to sell advertising in an automated fashion.

Starting from middle 2018, however, things should have changed, since May 25th was the first day of enforcement for Europe's General Data Protection Regulation (GDPR), that imposes a set of rules that change the relationship between tech companies that gather personal data, and the users that are the sources of such data. By default, any time a company collects personal data on an EU citizen, it will need explicit and informed consent from that person. Moreover, users can request all the data a company has from them as a way to verify that consent, which can also be revoked. GDPR also sets severe penalties[2] to get the entire industry's attention.

As a result, sentences like the following *«We care about your privacy...and pageviews. This web-*

[1] https://www.theguardian.com/news/2018/mar/26/the-cambridge-analytica-files-the-story-so-far

[2] Fines per violation are set at 4 percent of a company's global turnover up to a maximum of 20 million Euros.

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site protects your privacy by adhering to the European Union General Data Protection Regulation (GDPR)...but we'd also like to see how many people visit our website by viewing analytics and conversion data. This means NO ads or retargeting. Please state below which processes you consent to. We will not use your data for any other purposes.» are commonly encountered while visiting new websites. However some recent studies have observed that the majority of (analyzed) websites do not respect the Directive and install tracking cookies before the user is even offered the accept button (Trevisan et al., 2017).

1.1 The :DRHOP Project

In this context we propose :DRHOP. The underlying idea is that anyone, by simply using the web, generates a variable quantity of "value" that contributes to the sustainability of those tech companies that form the web itself. Hence, the main question for the proposal becomes: *"What about return to the users a fraction the value they contribute to, so that they can donate it?"*

Taken individually this is a tiny quantity not significant for the single user but, when combined with that of many others, it can grow to become a sufficient amount to be used for charity purposes.

The name of the project comes from the words *drop*, *hop*, and *hope* to denote that many drops can be generated thus facilitating "jumps" (hop) in the social sphere (hope). The multitude of collected drops can indeed be poured to a *lake* whose water can help non-profit organizations. In this way this paradigm triggers a virtuous circle: web surfers donate a fraction of the (economical) value they generate on the web to non-profits, and they return it to the society, which also web surfers belong to, in form of a *social value* by fulfilling their goals.

Of course, such online solidarity paradigm can succeed only if different subjects support it, especially tech companies willing to donate a small budget to the initiative. Why should such companies adhere to the project? What are the possible benefits for them?

From the user perspective, both the earning models roughly described in this section suffer from a lack of transparency. In the direct model it is often difficult to understand how the price is computed, what the user is actually paying and how much is the margin for the company. In the indirect model the situation is even worse: essentially companies earn money exploiting user's goods (e.g. personal data) or user's work (e.g. online actions), while the user is often not aware of this and hence she has no control on it.

This lack of transparency may cause, and actually is causing, a loss of trust in the web economy ecosystem and users are more and more adopting countermeasures to contrast this situation. For instance, in the context of online advertising, we can observe the ad block phenomenon (Ad blocking, 2018). From the one hand, trackers collect and store detailed information in order to deliver more effective advertisements; from the other hand, users with a minimum of technical skills, who are increasingly averse to the collection of such data mining their privacy[3], install programs which block the trackers.

In this scenario we can imagine that a platform like :DRHOP could mitigate such a loss of trust, by promoting an increase of the reputation of the companies supporting it, and hence this could help stabilizing the system. The concept of reputation is as old as society, and monitoring and managing this intangible asset appropriately is of paramount importance. Currently, it is unclear how to forecast the return of investment for potential :DRHOP partners, since it is difficult to estimate the value of reputation (Feldman et al., 2014), and this is an important issue that needs more investigation.

From an economical point of view, another important point is the fact that the actors of the system can claim for tax incentives for the money spent in charitable donations. This is a crucial point that has more that a single solution, since it depends on national tax regulation and local charitable activities, and it should necessarily be addressed if a system like :DRHOP has to be adopted in a real context.

The organization of this paper is as follows. Section 2 describes the overall architecture of the system while some implementation details, together with few screenshots of the current proof of concept, are introduced in Section 3. Section 4 introduces some similar projects we are aware of, some more mature than others. Finally, Section 5 concludes the paper.

2 ARCHITECTURE OF :DRHOP

Today's web has evolved from the monolithic three layer architecture of the past, consisting of a client-side user interface, a database, and a server-side logic. A huge amount of data is now available, to be consumed by third-party applications, and the availability

[3] According to PageFair most recent report we are aware of (https://pagefair.com/blog/2017/adblockreport/), 11% of the world's navigators use ad blocking systems and this accounts for more than 615 million installations on desktop and mobile devices in 2016. The trend is growing, with a 30% increase worldwide in 2016.

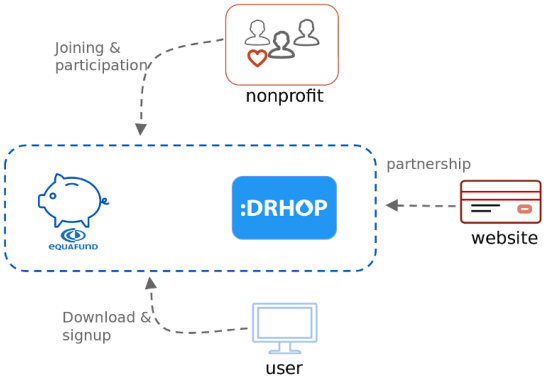

Figure 1: Abstract view of :DRHOP.

of web APIs has had a strong impact on the creation and fruition of new information following a mashup approach (Beemer and Gregg, 2009).

A web page rendered in a web browser is often built by integrating data coming from several heterogeneous sources, think for example to remote services offering information like weather forecasts o travelling schedules. Online ads are dynamically included into web pages too, as a result of complex bidding processes (Real time bidding, 2018). Modern web pages are indeed built by aggregating different contents, in a sense, mimicking the idea of an "open container" for data.

:DRHOP is more than a mashup or an open container for data, it is an "open interface" aiming at capturing the value resulting from multiple online as well as offline (see Section 5) activities, this value somehow *flowing* into a single platform, whose overall picture is discussed in this section.

To fix ideas, the first version of :DRHOP works with ads but, as anticipated in Section 1, the project is not limited to this ecosystem.

Figure 1 shows an abstract view of the current system. The blue box in the middle is the :DRHOP web platform, e.g. the core of the project. Different types of users can register: individuals (see the icon labeled user in the picture), companies (icon labeled website in the picture), and non-profits (♡).

- **Web companies** running websites, online newspapers, e-commerce services, etc. can establish a partnership with :DRHOP by providing an amount of money that will be distributed to non-profit organizations chosen by the users. As briefly noticed in Section 1, the amount of money and the benefit for each company is variable, depending on the company itself.
- **Individuals** are the users of the system who decide how collected funds are divided among non-profit organizations. More precisely, each user can decide on a fraction of the total collected funds, depending only on its online activity.
- **Non-profit organizations** are the recipients of solidarity. They sign up in the platform so that users can select to whom donate. Registration of a new non-profit is free but subject to acceptance by the administrators of the platform who will check its existence and status.

It is clear that we have the necessity to manage transactions inside the :DRHOP system. To be independent from the bank system, we introduce a sort of virtual currency to be used inside the system: *drops*. Hence all users have a *wallet of drops* to be used for different purposes depending on the user's type.

The money box on the left part of Figure 1 represents the body that manages FIAT currency movements accordingly to users' decisions made through the :DRHOP platform. We call this part of the system *Equafund* and this is a component of the system with two main tasks: it collects the funding offered by the companies that adhere to the project and is responsible of users' donations by converting drops into FIAT currency using a fix exchange.

Let us now describe in more detail the flow of money from companies to non-profit organizations through the application logic of the system. This flow is summarized in Figure 2 without considering logical errors that may occur.

Companies support :DRHOP by donating funds to Equafund and they receive back in exchange the corresponding amount of drops. Several types of donations are possible depending on the partnership established between :DRHOP and the company: unatantum donations or periodic donations or a combination of them.

The key concept of the :DRHOP system are *tags*. These are the mean through which drops owned by companies can be transferred to users. Companies can create a new tag in any moment and assign to it a certain amount of drops taken from their wallets. A company can use the tag to make a web content part of the system, by inserting the tag in it, thus marking it as a *supportive web content*. Then, when a user interacts with such tag during her navigation, a fraction of the drops owned by the tag is transferred to the user's wallet. Each company can own multiple tags simultaneously and, whenever a tag runs out of drops, the owner company can simply remove it or load new drops to it.

In order to interact with tags, after enrolling, an individual user needs to download some software: for desktop users this is a browser extension, while for mobile users this is a mobile app containing a browser. Such software tracks her online behavior and col-

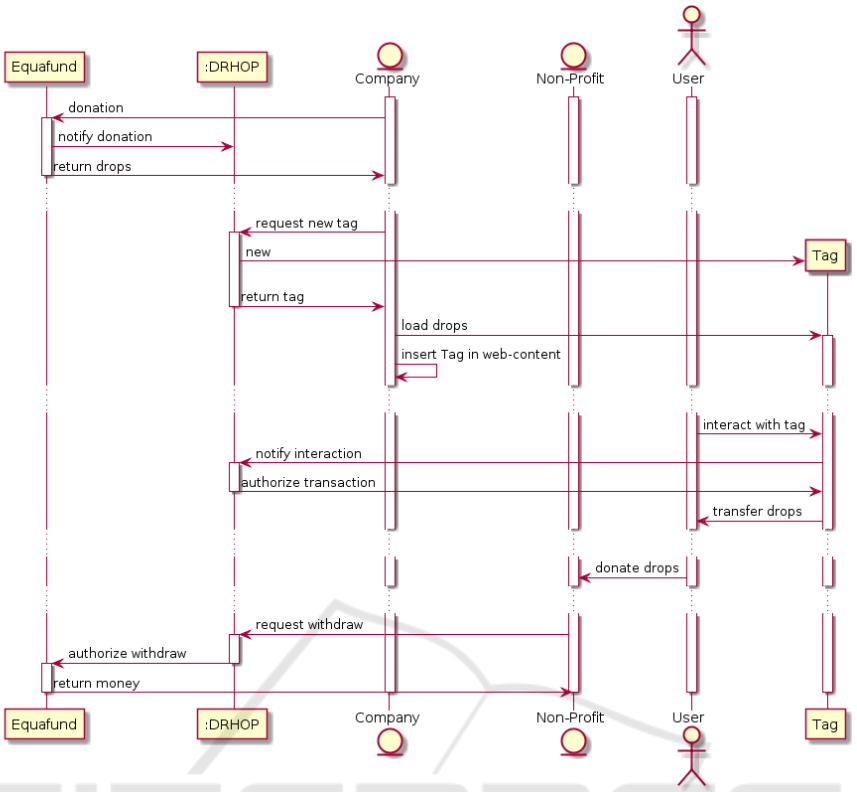

Figure 2: :DRHOP control flow.

lects the drops when she encounters tags during her navigation. The user can then donate her drops to non-profit organizations, to support their activities.

Note that there is a form of tracking also in this interaction model, and this cannot be avoided, since we need to know when a user interacts with a tag which can be anywhere in the web, hence we need to follow her. However, this tracking activity is conceptually different from usual tracking based on third-party cookies: the user is tracked through a piece of software she knowingly installs and on which she has complete control, being able to switch off it in any moment. Furthermore, having a software installed on the client side, we can use it to provide the user with the ability of blocking undesired third-party cookies, again increasing the user's control on her data.

Therefore, summarizing, the :DRHOP system has to manage three type of transactions: company-tag transactions (to load drops to a tag), tag-user transactions (to allow users to collect drops by their web navigation) and user-noprofit transactions (to donate drops to non-profit organizations).

Finally, a non-profit can withdraw drops from its wallet, by converting them into FIAT currency, declaring how it will use such money, and this closes the flow of money from companies to non-profit organizations.

The :DRHOP system, due to its nature and scope, is highly reputation sensitive, hence we need to enforce the highest possible level of transparency and security.

To ensure transparency all transactions, both in drops and in FIAT currency, will be certified and publicly accessible. Furthermore, we require non-profit organizations to declare how they will use funds raised through :DRHOP, and the system will provide features to allow such organizations to keep users informed about their activities, thus enforcing a sort of social "control" on them.

Security is a difficult issue on this system, mainly because it is based on data collected client-side, hence having no control on them. At a glance, we should enforce rigid policies mainly to discourage attacks on that side. For instance, we could impose that each user can interact with a given tag only once, so that a single user cannot "empty" a tag's wallet, or that there must be a certain interval of time between two interactions. Another issue is avoiding tag theft and this is even more difficult. In all cases security issues need a deeper analysis.

Another issue is the availability of collected funds, that is, guaranteeing funds collected by Equafund to

reach non-profit organizations in a reasonable amount of time. This can be done by requiring drops not to stay in a wallet (of a user or of a company) for too much time, worth losing such drops that will be automatically divided among other actors of the system.

3 THE PROOF OF CONCEPT

The current version of :DRHOP is a *pretotype*, e.g., it provides *«a way to test an idea quickly and inexpensively by creating extremely simplified, mocked or virtual versions of that product to help validate the premise that "If we build it, they will use it."»* (Savoia, 2011)

The project is built using Node.js[4], a platform for server-side JavaScript applications which has become quite popular in recent years, and uses MongoDB[5] as back-end. All data managed by the platform (different types of users and different wallets) are stored into JSON documents.

In order to collect drops, the registered user must download and install some software. In the current implementation this is a browser extension, e.g. a JavaScript, HTML, and CSS piece of code that can modify the functionality of a web browser by adding new features, or by changing the appearance or the content of websites. In our implementation the extension collects drops when the user encounters supportive ads, or reaches tagged websites, without interfering with the usual user behavior.

Tags are unique non-forgeable identifiers associated with a company and whenever a user encounters a tag, the pair $\langle tag, user \rangle$ generates drops and this information needs to be permanently stored to avoid the forgery of fake drops in response to the same tag encountered multiple times by the same user.

In absence of real tags we decided to use the EasyList[6] which collects a list of strings occurring in the most popular trackers. EasyList is used by many ad blockers to filter and remove ads which are delivered by trackers matching the strings in the list. Instead of filtering and blocking, the current version of the extension generates new drops whenever the user downloads these trackers while surfing the web.

The number of collected drops changes from page to page depending on how many trackers are encountered, and this number varies if the user views or clicks the ad, to somehow mimic the different Internet advertising payments models (for details see for example (Benjamin et al., 2007)). Of course, in the current version, the resulting drop count is an overestimation of the real number of drops that could be collected in response to tagged ads.

The extension sends back JSON data containing the number of drops, the visited website, and other information that are evaluated on the server-side to update the wallet of each user, in the tag-user transaction.

After authentication, the user can also access to her private dashboard offering different tabs: `DROP`, `DONATE`, `SOCIAL`. The information displayed on each tab are shown thanks to the D3.js[7] library.

The `DROP` dashboard of Figure 3 shows the collected drops. A small blue bubble on the left counts the total number of drops while a panel on the right shows the number of drops collected day by day (curves can be aggregated by week, month, year). Below the panel, a list of websites and the corresponding drops is shown.

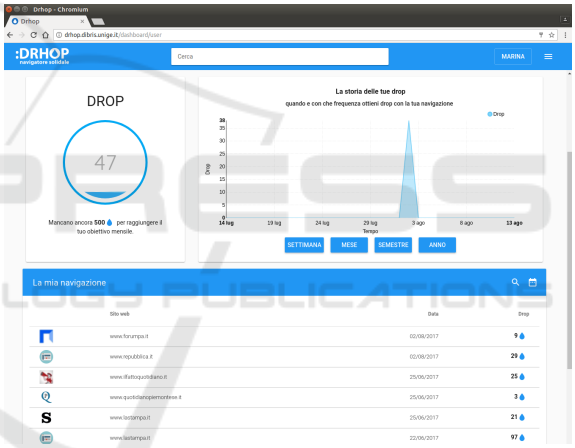

Figure 3: `DROP` dashboard.

The `DONATE` dashboard in Figure 4 summarizes the donations of the user. After collecting the drops, she can select one or more non-profit organizations and make one or more donations, thanks to the execution of the user-noprofit transaction.

Visually, the drops in the blue bubble are poured in a red bubble by using a simple slider. A detailed list of all donations, with the name of the organization, the date, the amount of drops is also available in the dashboard.

The `SOCIAL` dashboard is not available yet, but the main idea is that of providing information on the community of the system. Members profiles, statistics, graphs connecting users that have donated to the same non-profit will be built and shown to provide a

[4]https://nodejs.org
[5]https://www.mongodb.com
[6]https://easylist.to/
[7]https://d3js.org/

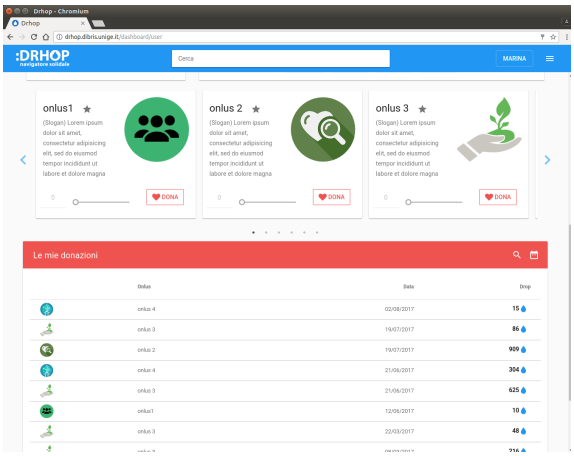

Figure 4: DONATE dashboard.

strong sense of community. Information on the projects made possible by :DRHOP will be collected and shared to guarantee a high level of transparency.

Ultimately, :DRHOP can work only by attracting the right users and deciding which aspects of their interaction with the platform report on is of paramount importance to build trust and sustain loyalty (Dellarocas, 2010)

4 RELATED WORK

While developing the first :DRHOP proof of concept we have come to know other projects, already deployed or under development, that share similarities with our proposal and we think they witness the interest of the Internet community for online charity experiences.

Ecosia[8] is a German search engine launched in 2009, which uses Bing and its own algorithm to rank pages. Ecosia shows ads in its search results: when users click on sponsored links, Ecosia gets a small amount of money. Ecosia also earns funds through EcoLinks, a browser extension that allows users to donate for free to Ecosia through their online purchases. Collected money is used to plant trees and Ecosia is funding green campaigns like for example reforestation projects.

Helpfreely[9] is a Spanish project that offers a website and a Chrome extension that turns online shopping into donations to support non-profit organizations. Partners of Helpfreely donate a small percentage of the value of the purchases (or online reservations) to users, and the users decide which organizations support, at no extra cost for them. Like in the case of :DRHOP, all non-profit organizations and users worldwide can sign up for free.

AIDChain (AidCoin, 2018), is a platform offering a set of services for the non-profit sector, developed to try to limit the continuous decline in trust from potential donors, due to the lack of transparency in the use of the collected funds. This platform uses Ethereum[10] blockchain-powered smart contracts in order to lower the cost of the fees required for donations, to improve traceability of the donations, their transparency and immutability. In addition to the platform, a cryptocurrency (AidCoin) is also proposed. This project has many points in common with :DRHOP, the main difference being the way funds are collected, which are direct donations in the case of AIDChain.

The Brave[11] project is located in Los Angeles and raised a significant funding to develop a web browser based on Chromium/Blink which blocks ads and trackers and include a micro-payments system to offer users a choice between viewing selected ads. The main goal is that of giving users a safer, faster and better browsing experience, while providing support for content creators through a new attention-based ecosystem of rewards (Brave, 2018). The developers introduce the Basic Attention Token that should improve the efficiency of digital advertising by creating a new Ethereum token that can be exchanged between publishers, advertisers, and users. The token can be used to obtain a variety of advertising and attention-based services on the Brave platform and users attention can be transformed into revenue for those using this new browser.

One of the claim on the project website says that *«Much more than a browser, Brave is a new way of thinking about how the web works.»* which is somehow close to our main motivation.

Online.io (OIO, 2018) is a brand new proposal which launched its ICO in July 2018; the associated token (precisely OIO) is *«an unique digital asset that will unleash the Internet from ads, malware and tracking software, leading to a more enjoyable and secure browsing experience, with sizable benefits for both web operators and end users.»*

The idea underlying this proposal is to make a healthy, ad-free, private and more secure internet ecosystem. In fact, less ads means more privacy and security since many ads might also come with hidden malware, scam ads, or mining scripts (Sood and Enbody, 2011).

Moreover, this proposal suggests a new monetization model in which web companies can give up online ads but still get a profit thanks to an increase in the

[8]https://www.ecosia.org/
[9]https://elpfreely.org
[10]https://www.ethereum.org/
[11]https://brave.com/

Table 1: Main characteristics of projects similar to :DRHOP.

Project	Category	Source of revenue	Recipient of revenue	Blockchain
Ecosia	search engine	ads and sponsored links	green campaigns	-
Helpfreely	browser extension	online purchases	non-profit sector	-
AIDChain	online platform	companies, individuals	non-profit sector	Ethereum
Brave	browser	selected ads	users	Ethereum
Online.io	online platforn	ad-free websites	users	Ethereum

time spent by visitors on their more valuable pages, whose quality is evaluated by the visitors themselves, who define a ranking of trust-worthy websites.

Also Online.io uses the Ethereum platform and the authors in their white paper propose the adoption of a new consensus algorithm, the Proof-of-Online, which does not require massive hardware resources and energy consumption. The rewards for website operators will be quantified by considering how many minutes users spend on each website. This idea seems similar to the Basic Attention Token of (Brave, 2018).

Table 1 summarizes some characteristics of all the aforementioned projects. The main difference between the first three projects (Ecosia, Helpfreely, AIDChain) and :DRHOP is that they are mostly focused on a single application - search online, buy goods or services online, donate easily - while we imagine a modular open platform in which different plug-ins could be added on demand to deal with new types of services, today still not known.

The two projects currently working on ads, Brave and Online.io, suggest to reduce or set ads aside by providing a different form of reward to users which is based on their online attention and voting (in the case of Online.io). In :DRHOP we suggest to make ads supportive, so that we can imagine a virtuous circle that returns a small percentage of revenue to those users that made such revenue possible. Also the target of the reward is different, being the user herself in the first two cases and non-profit organizations or specific fundraising champaigns in :DRHOP.

5 CONCLUSION

We have presented a high level description of the architecture of :DRHOP, a project aiming to redirect a fraction of the value generated by users' online activity for charity purposes. We have then presented the current proof-of-concept implementation of the system restricted to the context of online advertising.

:DRHOP is in its initial stage of development and therefore we cannot provide any usage data but the existence of similar projects is an indicator of the online community towards projects trying to redistribute the huge amount of money today in the hands of a few Internet (giant) companies.

In addition to improving the current pretotype we are also considering some further extensions. A crucial requirement of the system is the ability of managing transactions, in a secure, traceable and public way. To this aim it could be interesting to explore the possibility of adopting a *distributed ledger technology* to store and approve transactions. This emerging technology will provide another interesting feature: transactions will be approved by the users themselves, thus discouraging users to attack the system, because essentially they will damage themselves.

As already mentioned, another extension we could consider is in the *offline* context. The central element of the :DRHOP system are tags, hence to extend the system to the offline world it would be enough to find a "physical form" for tags, and then we can use the mobile app to interact with them. This physical form can be any physical object that can expose the tag to be read by the mobile app, for instance QR codes, NFC tags or others, depending on the type of physical object (tickets, supermarkets, sold products, ...) we want to mark as supportive.

Concluding, we can say that :DRHOP proposes an approach based on quite simple and standard web technologies, but with a radically new vision of the web ecosystem, as a community of actors exchanging contents to each other and collaborating for a common good scope.

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