Alice white paper

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Abstract

Alice is a decentralised social impact network built on the Ethereum blockchain. It helps social organisations (charities, NGOs, social enterprises) to run projects transparently, using smart contract-based incentives to ensure their impact is independently verified and accessible to everyone.

This makes it much easier for funders (philanthropic organisations, impact investors, small donors) to identify and scale social projects that demonstrably work, while reducing due diligence, reporting and other transaction costs.

Alice's first application is live at www.alice.si. Much of our code is open-source and available on our website in geek mode.

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I.   Summary

Alice is a social impact network built on the Ethereum blockchain. It incentivises social organisations to be more transparent about their impact, so that effective projects can raise the funds they need to tackle social and environmental problems at scale.

The problem

Charities, NGOs and social enterprises today face a tough funding environment: donations have long been stagnant in the West, and while impact investing is growing rapidly as a source of alternative social funding, it is still far from reaching its full potential.

This is mainly due to the fact that social organisations aren't transparent enough about their impact. As a result, donors are losing trust, and have become obsessed with the "wrong kind" of transparency: social organisations are under massive pressure to cut costs, which has led to under-investment in talent and infrastructure, and shifted the focus away from the much more important issue of delivering real impact.

In parallel, the lack of transparent impact data is problematic for institutional funders (grant-making bodies and impact investors): without it, they can't benchmark social projects and identify those that are the most effective, which leads to unnecessary inefficiencies and exorbitant transaction costs.

Alice's solution

Alice solves these problems by requiring that all social projects specify the goals they are trying to achieve and mandates that the achievement of these goals has to be independently verified and validated. Transparency is enforced by making funding conditional to impact: after receiving initial seed financing with which to start their projects, social organisations only receive additional funds if they can prove that they have achieved their goals.

The network also incentivises the systematic comparison and benchmarking of projects to help identify those that are the most effective.

Core protocols

Alice is built on the Ethereum[1] blockchain, and uses smart contracts[2] and tokenisation[3] to power the following functionalities:

- all impact data, i.e. information about projects, including their assumptions, operational resources and their impact goals, is recorded in a way that is immutable, tamper-proof and publicly accessible.
- all projects have a designated independent "validator", tasked with verifying that the social organisation has achieved its goals. Validators are selected via a dedicated validation market, and can be humans, machines, or a combination of both.
- project track records are publicly accessible, but sensitive information (e.g. the personal data of project beneficiaries), is encrypted and stored off-chain. Smart contracts secure selective disclosure rules that ensure that only authorised people can access this data.
- Alice's donation protocol is powered by smart escrow contracts that "freeze" funds donated to projects. A portion of these funds is then paid out to social organisations each time their project validators confirm that they've achieved a goal.
- Alice's impact investment protocol allows social organisations to tap into an alternate source of funding that can be connected to the donation protocol: impact investors in this model provide the working capital for social organisations to start their projects, and are automatically repaid from escrowed donations when projects achieve their goals.
- governance protocols allow social organisations to make project update proposals ("Pups") if they wish to amend their projects (e.g. to modify a goal or change a validator). These governance protocols also manage any disputes between social organisations, validators, beneficiaries and funders.

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[1] Ethereum is a public blockchain featuring scripting functionality, which facilitates online contractual agreements (called smart contracts). See Ethereum.org for more information.

[2] Smart contracts are computer protocols, generally built on top of a blockchain, designed to automate actions if certain conditions are met. One example is Alice's use of smart contracts to enable the conditional payment of donations when triggered by the instruction of a project validator.

[3] Digital tokens are used to represent different kinds of assets on a blockchain .

- supporting markets incentivise users to systematically compare and benchmark projects, hence reducing transaction costs.

Giving back & Alice's token economy

Fees on the network are paid in native Alice tokens, and part of these fees is reinvested back into the ecosystem in the form of grants to help social organisations - particularly smaller ones that may otherwise lack the adequate resources or expertise - to launch high quality projects. Grants are managed collectively by Alice token holders via a decentralised autonomous fund (DAF).

II. **Why the world needs Alice**

1. <u>Social sector funding is problematic</u>

Charities, NGOs and social enterprises - the organisations at the forefront of solving the world's social and environmental problems - are in a bind. These social organisations have traditionally relied on philanthropy (donations and grants) or public financing to fund their activities, but those sources of funding are stagnating, if not already starting to dry up. The numbers speak for themselves: charitable giving in the US has slowed to a crawl - 1% in 2016[4], lower than the GDP growth rate[5] - while in Canada individual giving has dropped to a 10 year low[6]. Meanwhile, substantial cuts in foreign aid are being planned in both the US[7] and the UK[8].

In the face of this reality, impact investing - which aims to generate social and environmental impact alongside financial returns - has been hailed as a solution to the social funding shortfall[9,10]. But while this source of financing is growing at an impressive 20% per year[11,12], it is still far short of its potential: J.P. Morgan and the Rockefeller Foundation estimated in 2010 that the impact investment sector could reach $1 trillion by 2020[13]...and yet the latest estimates put the market size at just $114bn[14], less than 0.1% of today's total capital markets[15].

So what's holding back social sector funding? As we'll see in the next section, two major causes are a lack of transparency and high transaction costs.

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[4] Blackbaud, *Charitable Giving Report*, 2017
[5] World Bank, *GDP growth data*, 2016
[6] Fraser Institute, 2016
[7] Washington Post, *Foreign aid under the ax in State Department budget proposal*, 2017
[8] Daily Telegraph, *Cabinet split opens up over foreign aid spending*, 2017
[9] Forbes, *Why Impact Investing Is An Emerging Paradigm Shift In Philanthropy*, 2013
[10] Guardian, *Impact investing could help plug $2.5tn funding gap for development*, 2015
[11] Big Society Capital, *The size and composition of social investment in the UK*, 2016
[12] Global Impact Investing Network, *Annual Impact Investor Survey*, 2017
[13] J.P.Morgan, *Impact Investments, an emerging asset class*, 2010
[14] Global Impact Investing Network, *Annual Impact Investor Survey*, 2017
[15] Forbes, *We're at a tipping point for impact investing*, 2015

2. It's the transparency, stupid

a. Donors are losing trust

Studies in the UK, where individual donations have been stagnant[16·17], at best[18], for the last few years, show that the level of public trust in the charity sector has dropped to historic lows[19]. This trend is replicated in many other countries: trust in NGOs has fallen below 50% in the U.S. - where calls for increased transparency have been ongoing for over two decades[20] - as well as China, Japan and Germany[21].

The cause for the drop in public trust in the charity sector is clear: it's down to a lack of transparency.

For at least the past five years[22], studies have shown that the main driver of trust and confidence in nonprofits are their ability to satisfy the public's need for transparency about their activities[23·24]. In the UK for example, it was estimated in 2013 that people would give close to $1bn more to charity per year if they understood where their money goes and whether the charities they support make a real difference[25].

Unfortunately for the sector, the transparency debate has tended to focus on charity overhead costs (administrative and fundraising costs, staff compensation, etc.)[26·27] rather than impact. This is an unhealthy trend: studies have shown that overhead cost ratios (generally expressed as a percentage of total income) aren't only a poor metric for assessing the effectiveness of charities, but are often in fact counterproductive: the obsession with cutting overhead costs restricts their ability to hire talented employees, and leads them to underinvest in their staff and

[16] CAF, *UK Giving*, 2017
[17] UK Fundraising, *Charity sector's income has "flat-lined since 2009"*, 2015
[18] Third Sector, *Individual donations fall to lowest level for seven years*, 2016
[19] Charity Commission, *Public trust and confidence in charities*, 2016
[20] Harvard Business Review, *Can Public Trust in Nonprofits and Governments Be Restored?*, 1996
[21] Edelman, *TRUST BAROMETER*, 2017
[22] Chronicle of Philanthropy, *Donors Say They Would Give More If They Saw More Results*, 2012
[23] Charity Commission, *Public trust and confidence in charities*, 2016
[24] Chronicle of Philanthropy, *How Nonprofits Can Gain the Public's Trust*, 2015
[25] The Guardian, *UK charities are missing out on £665m in donations every year*, 2013
[26] Tampa Bay Times & The Center for Investigative Reporting, *America's Worst Charities*, 2013
[27] True & Fair Foundation, *A Hornet's Nest*, 2015

infrastructure[28]. In fact, it has been definitively proven that high-performing charities spend more on administration costs than weaker ones do[29].

Even more damning is the fact that this "overhead myth" - the misleading belief that charities can be measured and compared solely by looking at their overhead cost ratios - has led to a culture of fear within charities, who now often make suboptimal spending decisions because they believe that it will impact negatively on how donors perceive them[30].

Many organisations and movements have taken issue with the "overhead myth". Three of the leading US sources of information about nonprofits published an open letter in 2013, arguing that donors should focus on impact (i.e. tangible results), not financial ratios, to measure charity performance[31]. The problem, however, is that measuring impact is much more difficult than analysing cost metrics and, on the whole, nonprofits are not doing this particularly well[32].

Another major problem linked to the overhead myth is that it forces charities to focus their increasingly limited reporting resources on making themselves accountable to their funders, rather than to the people who matter the most: their beneficiaries[33]. This often leads to beneficiaries having little or no say in how charities affect their lives, and no way to let them know how they could be more effective[34].

Ultimately, the misguided focus on cost cutting compounds the issue with donors: in the absence of meaningful impact metrics demonstrating how nonprofits improve the wellbeing of their beneficiaries, there is nothing to stop the erosion of trust in the sector.

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[28] IZA World of Labor, *Are overhead costs a good guide for charitable giving?*, 2017
[29] Giving Evidence, *Charities and Administration Costs*, 2015
[30] ICAEW, *Audit insights: charities - positive impacts in challenging times*, 2017
[31] GuideStar, BBB Wise Giving Alliance, Charity Navigator, *Moving toward an overhead solution*, 2013
[32] Marta Rey-Garcia, Kellie Liket et al., *Back to basics: revisiting the relevance of beneficiaries for evaluation and accountability in nonprofits*, 2017
[33] Note that this term is ill-loved in the charity sector, and many practitioners prefer the use of more empowering words such as "users", "constituents" or "customers" to describe the people who receive a service or are impacted by activities carried out by a charity. This whitepaper refers to them as "beneficiaries" for consistency's sake, while describing how the Alice network empowers them.
[34] New Philanthropy Capital, *User voice: putting people at the heart of impact practice*, 2016

The challenge for charities is therefore to be clearer and more transparent with donors about their impact. This will allow them to address the very real existential threat that the decline in public trust poses to the sector[35], and to refocus the public debate away from costs, and onto what really matters: how best to improve the lives of their beneficiaries.

b. The importance of transparency for institutional funding

The issue of transparency is as much a problem for institutional funders - grantmaking foundations, governments and impact investors - as it is for individual donors, particularly when analysed through the lens of effectiveness.

This is because impact data is siloed: performance data is often locked in the proprietary databases of institutional funders and unavailable to others. This makes it difficult for funders to share best practice and learn from each others' failures, ultimately leading to a wasteful duplication of efforts. Reports clearly show that greater transparency amongst grantmaking bodies (such as foundations and trusts) would greatly increase their effectiveness in generating impact[36·37], and yet just 5% of foundations share knowledge from projects that have not succeeded[38].

It is also important to note here that, even where there are efforts to increase transparency for institutional grants - such as the use of the IATI standards to track governmental foreign aid - it is overwhelmingly focused on financials (how and where the money is spent) rather than impact, leading to many of the same issues described above regarding the toxic effect of the overhead myth on individual donations[39·40].

Lack of transparency is also a major barrier to the growth of another form of institutional funding: impact investing. Impact investors have a double bottom-line: as well as tracking their financial returns, they must also track the social and environmental impact of their investments. But doing

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[35] NCVO, *How charities are responding to the fall in public trust*, 2016
[36] Grantcraft, *Opening Up: Demystifying Funder Transparency*, 2014
[37] The Center for Effective Philanthropy, *Sharing what matters: foundation transparency*, 2016
[38] *Idem*
[39] Devex, *Is IATI benefitting anyone yet?*, 2015
[40] Development Gateway, *Open Data And Agricultural Aid: The Next Step In Tackling Hunger*, 2016

so is incredibly difficult, because the lack of access to transparent, reliable, credible and comparable data has impeded the emergence of widely adopted impact measurement standards. Industry efforts to create them (e.g. IRIS) have largely failed: they are considered unwieldy and ambiguous[41], and 65% of investors still use their own proprietary methods[42].

This lack of transparency was first identified as a crucial issue a decade ago[43], but is still largely unresolved. There are recurrent initiatives within the community to help impact investors share their data[44], and in a seminal 2013 report, the Word Economic Forum urged the impact investment sector to increase collaboration and systematically publish their performance data to reduce due diligence costs across the board[45].

As recently as 2017, a key finding of the Financial Times *Investing for Global Impact report* was that investors need to "transparently and honestly share their experiences of impact investing – the good, bad and challenging," in order for the sector to grow[46].

2. The prohibitive cost of impact management

Demonstrating impact is the key to donor trust, and to scaling effective social projects. It has become so important that measuring and reporting impact (also known as impact management or performance management) is now almost always a requirement that grantmaking bodies and impact investors alike impose on social organisations (whether nonprofits or social enterprises) before they accept to fund their projects[47,48].

This trend has, in fact, resulted in the emergence of a new "payment by results" trend in government grantmaking[49] that aims to enforce systematic impact reporting: by this mechanism, social organisations are only paid in arrears, once they have demonstrated their impact. The UK, for example, has embraced a particularly innovative form of payment by results known as

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[41] Investing for Good, *Oranges & Lemons*, 2015
[42] Global Impact Investing Network, *Annual Impact Investor Survey*, 2016
[43] J.P.Morgan, *Impact Investments, an emerging asset class*, 2010
[44] The Case Foundation, *Culture of transparency: Putting impact investing on the map*, 2017
[45] World Economic Forum, *From the margins to the mainstream*, 2013
[46] Financial Times, *Investing for Global Impact 2017 Report*, 2017
[47] Nesta, Putting our money where the evidence is, 2015
[48] Pioneers Post, *Impact measurement: perspectives from the front line*, 2017
[49] GovLab, *Innovations in Granting: Evidence-Based Grantmaking*, 2014

"social impact bonds" (SIBs) that bring together grantmakers (who pay for social outcomes), social organisations (who run projects to deliver those outcomes) and impact investors (who provide loans to social organisations, effectively underwriting the risk of failure in exchange for an interest payment in case of success)[50].

But impact management is a costly administrative burden that many social organisations can't shoulder, and that often make impact investing financially unfeasible.

Indeed, while a general rule of thumb places impact evaluation and management costs at around 5 to 15% of total programme costs[51,52], they are often expressed in absolute terms, indicating that some set-up costs for measurement may be incompressible, putting smaller projects in particular at a disadvantage. The average cost of an impact evaluation for (usually very large) projects funded by the World Bank or the Asian Development Bank , for example, is $500,000[53,54].

Payment by results[55] programmes, and SIBs in particular[56], put less financially sturdy nonprofits at a disadvantage, as they simply do not have the capacity to measure and report their impact data. Due to their complexity, impact management costs of SIBs (combined with generally high legal costs) have meant that anything but the largest deals ($15 million and above) are economically unviable without significant public subsidies[57].

As a result, almost three quarters of impact investors find it difficult to monitor and measure the impact of their investees[58], and the impact data they collect is often unreliable: fully 90% of impact investors report having had difficulty in obtaining impact information from their investees. And where the data is available, it is rarely independently audited or verified[59].

[50] Third Sector, *Cabinet Office launches £80m Life Chances Fund*, 2016
[51] John Blomquist, *Impact Evaluation of Social Programs: A Policy Perspective*, 2003
[52] Paul Gertler et al., *Impact evaluation in practice*, 2011
[53] World Bank, *World Bank Group Impact Evaluations: Relevance and Effectiveness*, 2012
[54] Devex, *How much do impact evaluations cost?*, 2014
[55] The Guardian, *Payment by results fails to encourage smaller suppliers to bid for contracts*, 2014
[56] House of Lords, *Stronger charities for a stronger society*, 2017
[57] Centre for Public Impact, *Social Impact Bonds An Overview of the Global Market*, 2017
[58] Financial Times, *Investing for Global Impact*, 2014
[59] Investing for Good, *Oranges & Lemons*, 2015

They also struggle with many secondary issues such as avoiding the double-counting of impact data[60] (attribution is an issue where several investors are funding the same project for example), and making deals fit with their investment horizon, particularly when impact can only properly be measured after several years[61] (e.g. the increased likelihood of an intervention in early childhood helping someone obtain a college degree).

This is a chicken and egg problem: the cost of proper impact management and the resulting lack of track records amongst social organisations has kept deal sizes too small[62] and illiquid[63] for many institutional investors to enter the space, thereby further limiting the ability of social organisations to scale.

One thing is certain, however: sharing information amongst projects is likely to reduce the cost of impact management, as organisations learn from each other and adopt best practice[64].

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[60] Investing for Good, *Oranges & Lemons*, 2015
[61] World Economic Forum, *From the margins to the mainstream*, 2013
[62] *Idem*
[63] Impact Alpha, *Overcoming the 'Original Sin' of Impact Investing: New Approaches to Liquidity*, 2013
[64] Social Finance, *Investing in Social Outcomes: Development Impact Bonds*, 2013

III. The Alice solution: a social impact network built on Ethereum

Imagine a world where you could easily identify projects that are **demonstrably** effective at tackling social and environmental issues, and where you could help scale those projects until the issues are eradicated. That's Alice's vision, and the platform aims to achieve it through the use of cryptoeconomics. In simple terms, this means that the Alice platform creates a series of dis/incentives for social organisations to report on their impact reliably and in a transparent manner, and for funders (whether through donations and grants or investments) to scale the most effective projects.

1. Impact data you can trust

a. *Independently validated impact*

Alice's *raison d'être* is to help social organisations produce transparent , publicly accessible and reliable impact data. That's why social organisations wishing to run a project on the network must specify tangible goals that their projects aim to achieve.

Crucially, each project must also assign an independent validator to verify their claims regarding the achievement of project goals. Validation may be carried out either by humans, machines, or a combination of both.

This independent validation forms the cornerstone of the Alice network, ensuring that each project's impact is as reliable as possible.

b. *Regular progress reports*

In addition to the impact goals, each project must commit to a regular reporting schedule, with specific operational indicators against which it measures its progress.

Along with the independent validation of project goals, this requirements ensures that the focus of the Alice network is squarely focused on managing impact rather than tracking how money is

spent, even though, as we shall see, Alice does allow charities to be benchmarked in terms of their cost effectiveness.

c. *Auditability*

Alice uses the blockchain to record almost every parameter of projects run on the network, tokenising impact data into "impact facts" that live on into perpetuity, thanks to the blockchain's intrinsic qualities of data immutability and tamper-resistance.

This has the effect of creating a public track record for each project that is publicly available and auditable, hence further increasing project transparency and accountability.

d. *Comparability*

Finally, Alice adopts an open framework developed by the Impact Management project[65] that allows social organisations to break down their projects across five dimensions of impact, effectively "tagging" them so that they are easier to compare and benchmark. More information on this framework is given in section IV. 1. d.

Along with the granularity provided by the regular progress reports and validation of goals, this allows social organisations to learn from each other, and opens the door for third parties to lend their expertise and benchmark the different aspects of projects, such as the adequacy of their modus operandi, validation mechanisms, cost-effectiveness, etc.

2. Hyper-transparent funding

If transparency came naturally, there would be no need to enforce it using smart contracts. Alice therefore implements cryptoeconomic incentives provided by two separate, but interconnectable, funding protocols: one for donors (which includes small donors, major

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[65] The Impact Management Project has developed a framework in five dimensions that shares consensus on how to talk about, measure and manage impact, based on extensive research amongst practitioners in the fields of impact investment, grantmaking, non-profits, social science, evaluation, wealth management and policy amongst others.

philanthropists and grant-making bodies such as trusts, foundations and governments), and another for impact investors[66].

These protocols directly address the financing difficulties faced by social organisations, while addressing the pain points of would be funders, both of which are more explained in detail in section II.

a. *Payment by results*

Alice allows social organisations to obtain seed money to start running their projects, but their financing will only continue if they meet their goals. Practically speaking, this is achieved thanks to a conditional "payment by results" funding mechanism.

Conditional funding works by temporarily "freezing" part of the donations and investments made to a project, and paying them out only when project goals have been achieved and validated. In the absence of results, outstanding money is simply returned to the project's funders, who can then decide to finance other projects.

b. *Incentivised reporting*

As explained above, as well specifying project goals, social organisations must also commit to producing regular progress reports that measure their performance against a series of operational indicators.

If anything was made clear in the section dedicated to the problem of impact measurement in section II., it was that the current obsession with reducing overhead costs is particularly toxic when it comes to delivering truly effective social impact.

The Alice network therefore tackles this head on by rewarding social organisations that submit their regular reports on time. This means that projects must pre-define the payment they will receive for each report, so that funders know in advance how much of their money will go towards paying proper impact measurement and reporting.

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[66] C.f. previous section or here for a definition of impact investors.

There are, however, consequences to missing a reporting deadline: not only do the social organisations forfeit their reporting payment, but all future payments (e.g. resulting from validated goal achievements) are also blocked until the missing report is submitted.

c. *One platform, multiple sources of funding*

Alice allows social organisations to tap into both philanthropic money and impact investment. Even better, Alice allows projects to combine different types of funding, so that, for example, donations can be used to pay back investors automatically, as and when goals are achieved. This type of combined funding - inspired by, but eminently more efficient and scalable than, social impact bonds[67] - is described in section IV. 2. c.

Alice also provides the flexibility for adding matching funding to a project (described in section IV. 2. a.), and allows intermediaries to create managed funds, to which donors and investors can outsource their financing decisions in exchange for a fee (sections IV. 2. a. and b.)

d. *Scalable impact*

One of the benefits of Alice is that social organisations can raise funds on a continual basis. Unlike traditional crowdfunding applications that simply aim to raise a one-off sum, Alice allows social organisations to start small, by helping just a few beneficiaries, and scale their projects as long as they can prove they're making a real impact (and hopefully until they can solve the problem they're tackling for good).

3. Lower transaction costs

As explained in section II., transaction costs are a major barrier to the growth of social sector funding, mainly because of the multi-faceted administrative burdens of impact management. Alice helps alleviate this in a number of ways.

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[67] C.f. previous section or here for a definition of social impact bonds.

a. *Network effects*

On Alice, impact management is not considered a dispensable or unnecessary overhead cost, rather it is integral to the entire system.

As explained above (section III. 2. b.), this means that the cost of regular reporting is integrated into the overall project budgets, and incentives are built into the protocols to ensure that social organisations deliver: they are paid for each update report submitted, and punished if they miss deadlines.

Obviously, this does not, in itself, reduce impact management costs, but formalising the costs and imposing regular reporting in this way, combined with the independent validation of project goals, creates a mass of impact data that can be used to reduce the overall cost of impact management across the entire network.

The use of blockchain technology, in this respect, is essential, as it allows Alice to tokenise impact data into "impact facts" that live on into perpetuity, and are used to produce a number of cost-saving network effects.

These are:

- Cheaper due diligence: with Alice, impact data is no longer stuck in siloed databases, and therefore makes due diligence faster and cheaper: an impact investor needing to check the historical track record of a social organisation, and the operational set-up of its current projects, can do so instantly, and with a high level of trust.

- Shared learning: Alice allows the sector as a whole to learn from, and build upon, its collective successes and failures in a decentralised manner. Concretely, this means that if a specific approach to tackling a social or environmental problem is shown to be unsuccessful, it is unlikely to be replicated, while successful approaches can be identified and adopted by other projects, hence mutualising the cost of iteration and validated learning.

b. Comparison incentives

As explained in section II, the ability to benchmark and compare the impact of different projects is key to reducing the cost of identifying and scaling those that are the most effective.

Alice uses two main mechanisms to incentivise users to establish comparisons between projects, allowing for operational best practice to emerge stigmergically, while eliminating inefficient methodologies and reducing design and project administration costs:

- Contribution rewards: Alice rewards users for adding value to the impact data provided by the various projects on the network, effectively incentivising the creation of a huge, searchable database of information on any given impact area. Contributions can come in the form of ad hoc information, such as submitting a new empirical research report that reinforces or weakens the assumptions of a given project. Contributions can also provide more macro analytical input by aggregating impact data from a large amount of projects (using machine learning for example): this can be helpful to identify operational patterns that lead to projects succeeding or failing, for example, or identify projects that are achieving a high level of impact at the lowest cost. Users must pay a fee to access these contributions, part of which is sent to the authors.

- Prediction markets: as well as making contributions, users can place bets on the likely impact of any operational changes proposed by social organisations in their regular progress reports. This further incentivises correlation between projects, by crowdsourcing expertise.

These protocols are described in more technical detail in section IV. 4. B. and c.

c. Automated payment flows & legal structuring

Alice uses smart contracts to automate payment flows between all stakeholders participating in the network. This functionality dramatically reduces the administrative burden of financial redistribution, and is particularly helpful when multiple funders and intermediaries are involved in the same project: when a social organisation achieves one of its project goals, for example, it

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will automatically receive payment from the pot of escrowed donations made to the project. If any impact investors funded the project, part of these donations are automatically siphoned off to make their interest payments, and if these investments are managed by an intermediary fund, then it automatically receives its management fee from the interest payments.

By automating payments, it is important to note that Alice also streamlines the legal costs of setting up projects, and of establishing contractual agreements between the different parties involved. Thanks to network effects, the more similar set-ups are launched on the platform, the more they become streamlined and standardised. We expect that the cost savings on complex funding instruments, such as social impact bonds for example, which typically re-invent the contractual wheel for every deal as explained in section II, will be particularly drastic[68].

All these use cases and more are explained in technical detail throughout section IV.

d. *Secondary impact investment market*

While not a transaction cost in the purest sense of the term, the lack of liquidity of impact investments is an obstacle to the growth of this type of funding. This is because some social outcomes can take years to measure, but investors typically only have a 3-5 year investment horizon. The lack of clear exit opportunities for their investments therefore makes it difficult to find suitable deals[69].

Alice solves this issue by tokenising impact investments and making them tradable as securities on a secondary market. This means that impact investors no longer have to worry about fitting deals with their investment horizon, as the secondary market allows them to exit investments before they have run their course. As this is run within the Alice platform, potential acquirers have perfect visibility on how these investments have performed, and how likely they are likely to continue performing, before buying them, which facilitates price discovery. The automatic re-routing of interest payments to the new owner of an impact investment security further reduces transaction costs. These secondary markets are detailed in section IV. 2. B.

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[68] It is estimated that SIBs typically cost 20% more than other social projects due to their complexity and the lack of standards (source: Centre For Public Impact, 2017).

[69] For more information on this issue, refer to footnote 61 above, and Openwell Oxford, *Social Impact Investing: Challenges and Opportunities*, 2016

4. Giving back

Alice is built in such a way that a portion of the network fees flows back to social organisations in the ecosystem. This section explains why and how.

a. *Grants DAF*

Conditional payments (where social organisations are paid only after they achieve their goals) can be a major barrier for smaller organisations, as they often lack the financial resources and/or the expertise to adequately design, run and raise funds for impact-based programmes, and may not have enough of a track record to inspire the confidence of funders when they first join the network.

It is equally problematic when a social organisation - whatever its size - wishes to trial a new and highly innovative solution: because it is by definition untested, finding the seed funding to launch it can be a struggle.

Alice therefore reserves part of its network fees[70] as a source of grants to fund feasibility studies, design development and/or marketing costs for the launch of promising but untested or under-resourced projects. The allocation of these grants is managed by a decentralised autonomous fund (referred to in this whitepaper as a DAF - which is a similar concept to the better known DAO[71]) managed by Alice token holders in proportion to their holdings.

This is explained more in depth in sections IV. 4. d. and VI. 4.

b. *Transparency rewards*

Sharing impact data is mandatory for social organisations using the platform to run their social projects, so Alice has a built-in mechanism to reward them for doing so. If a user wishes to

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[70] All fees are listed in section VI.

[71] DAO, in the sense that is understood here, is an acronym for a Decentralised Autonomous Organisation. DAOs are decentralised entities that possess independent sources of funding and clear objectives around which they organise human interactions according to protocols specified by smart contracts. Vitalik Buterin, one of the founders of Ethereum explores the concept more in depth in this post. Alice's DAF lives only within the network and has a narrow grant-making purpose, hence the name.

access the data of a specific project (to compare it to another project in the sector, or for due diligence purposes for example) she must pay a fee in proportion to the level of granularity that she wants to obtain, which Alice shares with the social organisation that produced the data. This allows social organisations to reap the rewards of their transparency long after their projects are over.

5. Adapting to "real world" use cases

Here we will briefly mention some of the mechanisms that Alice uses to adapt the use of the Ethereum blockchain to real world situations. These fall into two categories: mechanisms that allow projects to evolve, while respecting the immutability and radical transparency of the blockchain, and services that support mainstream users with little to no experience of using the blockchain.

a. *Governance & obfuscation protocols*

The data recorded by the Ethereum blockchain is both immutable and transparent. These qualities form the basic building blocks of the Alice platform, but in some cases they can pose a challenge to good project governance, and in others can be dangerous to the beneficiaries of social projects. To address this, Alice:

- allows social organisations, and in some cases funders, to propose updates to projects run on the network. This can be done for a variety of reasons, such as modifying project goals and replacing validators. These project update proposals ("Pups") are described in section IV. 3.
- uses obfuscation and selective disclosure mechanisms to protect the privacy of beneficiaries of social projects. These mechanisms are engineered to ensure compliance with data protection regulations, and to protect potentially vulnerable populations. Details are given in section IV. 1. e.

b. *Supporting mainstream users*

In its current state, using Ethereum still requires a number of skills and precautions that can make it inaccessible for casual users. This is why we have taken a platform approach to allow

third party developers to build services that will cater to these users. In a first instance, the Alice team has, and will continue to, develop facilitation services of its own. These include:

- A service that allows donors and impact investors to fund projects using fiat currencies (such as British pounds, US dollars, etc.) instead of cryptocurrencies[72].
- A project designer tool that facilitates the contractual and operational set-up of projects, and automatically creates their smart contracts on Ethereum.
- A concierge service that manages fee payments and hosts Ethereum nodes on behalf of users.

All these services, and more, are laid out in section V.

6. Powered by Alice tokens

Most interactions with the Alice platform require the payment of fees in the form of Alice tokens, which are the network's utility token, and are used to manage the Grants DAF. They must however be differentiated from other, more operational tokens used by Alice, such as those that help account for, and transfer donations (and particularly donations made in fiat), those that allow impact investments to be traded, and those that create "impact facts".

The Alice token economy is described in more detail in section VI.

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[72] Aka a stablecoin

IV. Technical architecture

The Alice social impact network is a set of protocols implemented as smart contracts on Ethereum and composed of three main parts: impact management (the AIMS protocol), donations and impact investments (together, the Alice funding protocols). While these protocols can, in some cases, be used on a standalone basis, they are designed to be used in conjunction. At a high level, their combined use can be represented with the following diagram:

Diagram 1
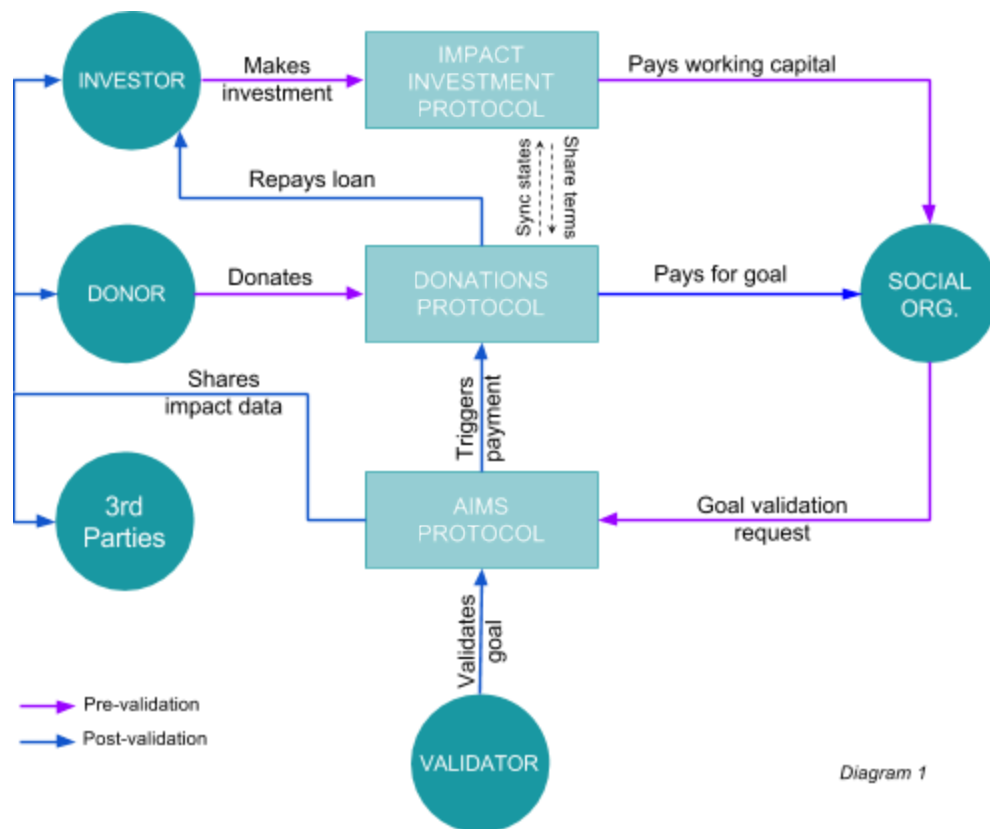
The AIMS protocol and the funding protocols are supplemented by governance systems and a number of supporting markets, which will also be described in this section.

1. Alice Impact Management System (AIMS protocol)

At the core of Alice is an impact management protocol that allows social organisations to design and manage projects, and share their performance with Alice users. Its main objectives are the following:

- Make impact data transparent and publicly accessible.
- Ensure that data is of a high quality and trustworthy.
- Allow users to track the performance of each project as it evolves over time.
- Allow impact data to be compared and benchmarked across all projects on the network.
- Give beneficiaries a voice in how projects that support them are run.
- Make it easier for social projects to collaborate with each other when serving the same beneficiaries.

It is important to note that the AIMS protocol cannot, on its own, achieve these objectives in a trustless manner. To do so, it must be combined with the incentive structures provided by Alice's funding protocols and supporting markets which are described in sections IV. 2 and IV. 4.

a. *Core infrastructure overview*

The AIMS protocol is composed of a series of smart contracts that govern how the impact data of each social project is created and shared. In their initial state, project contracts must contain the following:

- Initial facts about the project (called here "impact facts"): arbitrary data about the project, and particularly its description, performance indicators, how beneficiaries are referred to the project, etc. In practice this information is hashed and stored off-chain.
- Validation logic: the list of project goals, and the rules that govern how their achievement is independently verified.
- Progress reporting logic: the rules governing the frequency with which the project must report on its progress.

Graphically, the AIMS protocol can be represented as follows. The rest of this section will break down its mechanisms in more detail.

Diagram 2
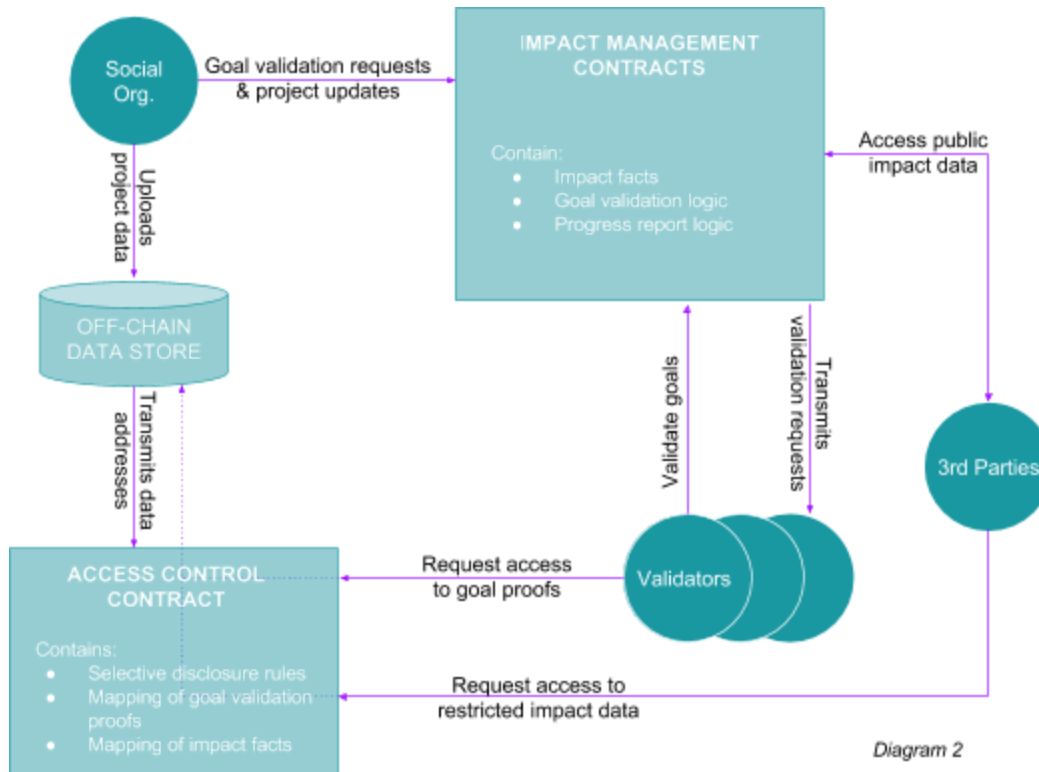
b. *Project goals and indicators*

Every project run on Alice must specify both its goals and its operational indicators:

● Goals are the ultimate outcomes that a project seeks to achieve. Taking Alice's first pilot as an example, the goals specified by St Mungo's include helping the rough sleepers supported by the project to find accommodation, and then stay housed for a number of months, to carry out mental health assessments and therapy, and to deal with substance abuse issues.

● Indicators are operational measures of a project's progress. These typically include general indicators that are common to most projects, such as the target number of people to be referred to (supported by) a project, or project's the retention rate (people

staying in the project till the end). They also include indicators that are specific to each project - for example, a training programme aiming to help young adults find jobs (the ultimate project "goal") may track indicators measuring the attendance levels in each module, or improvements made by individuals in each skill area.

c. Independent validations & project updates

On Alice, goals and indicators are treated slightly differently. Goals can be achieved at any time, but must be systematically and independently validated in order to be accepted as completed by the network. On the contrary, indicators can be (and we expect in most cases will be) self-reported, without any independent oversight, but must be submitted by the project on a regular basis.

Goal validation mechanisms

Alice allows for two types of validations:

- **Human validation**: let's take as an example a project run on Alice by a charity helping rough sleepers find a home so they no longer have to live on the streets. In order to demonstrate it has achieved its goals, the charity must send proof - a signed tenancy agreement for example - to an independent auditor that has been nominated as the project's validator. In practice, this proof is encrypted and stored on an off-chain data store[73], with its access managed by the project's access control smart contract. The validator then retrieves the proof, reviews it, and, if everything is in order, sends a signed message to validate it.

- **Automated validation**: a human validator isn't necessarily required to verify proof. Projects can use secure data feeds (e.g. from databases, APIs or IoT sensors, which are increasingly being developed in the blockchain space[74]) as oracles to verify goals. A project aiming to clean up air pollution, for example, could use data provided by air quality sensors for validation.

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[73] Preferrably decentralised, e.g. Filecoin, Swarm, Storj, etc.
[74] See for example Oraclize, Provenance, Slock.it

It is important to note here that projects may require validations from multiple sources, and in fact can combine both human and automated validations, depending on their needs.

Mandatory progress reports

As indicated above, projects must commit, when they are created, to produce regular progress reports. These reports focus on:

● Operational elements: reports may indicate that the social organisation has made small changes to their modus operandi - e.g. by adding a course module to a training programme, changing the time at which courses take place, or a change of the eligibility criteria used to admit beneficiaries into the project.

● Project indicators: reports can provide updates to the state of operational indicators such as attendance and retention rates.

● Beneficiary feedback: reports must, where relevant, include some form of beneficiary feedback, to ensure that the projects take into account the opinions of the people they serve. The modalities of this feedback can vary: some projects may prefer using quantitative surveys amongst a representative sample of beneficiaries (in cases where a project caters to a large number of people for example) while others may use qualitative feedback amongst all beneficiaries (if the cohort is small), or any methodology in between.

Any delay in submitting progress reports are registered indelibly into each project's track record and are publicly auditable. Progress reports may also engender punishments (when AIMS is used with Alice's funding protocols), and may be used as data points for Alice's supporting markets. These use cases are described more in sections IV. 2. and IV. 4.

d. Impact data structure

One of the key roles of the AIMS protocol is to break down information about social projects so that it can be searched and processed. This section explains how.

Tokenisation

The AIMS protocol tokenises impact data into "impact facts" in order to make projects consistently searchable and comparable, and in some cases, to connect data to Alice's funding mechanisms and supporting markets.

For each project, different categories of data are tokenised:

- Description blob: these are arbitrary chunks of data, such as text, images, graphs or videos that describe a project's modus operandi. Any updates to these blobs (e.g. following a progress report) are also recorded as impact facts.
- Achievement of goals: each goal request and achievement is registered as an impact fact by the AIMS protocol
- State of project indicators: as with project goals, updates to each project's indicators are tokenised as impact facts.

Metadata

Each impact fact contains a certain amount of metadata, which may vary according to its nature. Typically, every token will contain information about the social organisation and project that generated it, and a timestamp of its creation. Some metadata may also be specific to certain types of impact facts: the achievement of a project goal, for example, contains additional metadata about its state (e.g. validation request submitted, validation confirmed), the identity of its validator, a validation timestamp, a hash (proof of existence) of the document or data that the project's validator used to verify it, access permission rules, and a url pointing to where this document can be accessed.

Most impact facts will also contain "tags" relating to five impact dimensions, as described below.

Impact dimensions

The AIMS protocol requires the components of each project to be classified across five broad dimensions. AIMS has adopted these dimensions from the Impact Management Project, an extensive, global, open-sourced empirical research project on impact management[75].

The rationale for such a classification is that it allows project impact data to be properly benchmarked, compared and correlated - in granular detail - hence allowing social organisations to learn from each others' successes and failures, while making it easier for project funders to conduct due diligence and identify truly effective projects. In effect, the impact data for each project is "tagged" across these five dimensions, which are:

- The "what": this dimension relates to what a project seeks to achieve, and how important it is to the people (or the planet) that the project it is targeting. This will typically include information about the assumptions and evidence that guide a project (e.g. helping rough sleepers tackle mental health issues improves their chances of finding a home), as well as its operational modus operandi (e.g. the components of an individualised rehab programme for each beneficiary)
- The "how much": this dimensions relates to the depth and breadth of each project's impact. It contains information about the number of people that a project caters to, how long the impact lasts, and how quickly the project can achieve its goals. For example, it differentiates between a project that provides short term relief for thousands of people, and one that provides deep and lasting support for a small group of people.
- The "who": this is information about project beneficiaries, and how underserved they are in relation to each project's goals. For example, a project may help poor farmers in Nigeria develop the skills they need to obtain financial security, while another supports financially secure retired farmers in rural Missouri suffering from social isolation.
- "Contribution": this frames how a project makes an impact beyond what is likely to occur anyway. For example, a project may provide health services to people who did not previously have access to any, or provide a similar service to those already available, but reduce greenhouse gas emissions while doing so.

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[75] For more detailed information, visit the Impact Management Project website.

- "Risk": rather intuitively, this dimension relates to the risk factors for each project, and helps monitor if they materialise over time.

e. *Data access*

The AIMS protocol is structured in such a way that each project's performance data is publicly available, in varying degrees of granularity depending on each user's permission level.

Typical use cases

We expect the AIMS protocol to be used for the following reasons:

- Funder notifications: funders of each project receive automatic notifications whenever goals have been achieved (validated), as well as regular progress reports. This allows them to track the impact their money has made, and to take informed decisions when they are called upon to approve any major modifications of a project (cf. the "Pups" mechanism in section IV. 3.)
- Project design: AIMS allows social organisations to learn from the successes and failures of other projects when designing their own, hence reducing research costs and putting an end to the endless repetition of ineffective solutions in the social sector.
- Due diligence: AIMS dramatically reduces due diligence costs for funders by making the historic track record of social organisations, as well as their performance on live projects, completely transparent.
- Knowledge sharing: the availability of performance data to third parties such as charity evaluators, research organisations, journalists and think tanks allows for the creation of a knowledge sharing market that incentivise the benchmarking and comparing of projects amongst themselves. (cf. section The mechanics of these markets are described in section IV. 4. b.

Access control

The transparency offered by the AIMS protocol can be undesirable in many cases for data protection reasons. For example, a social organisation running a project to help vulnerable

children find adoptive families would not want to make any of the specific proofs of achievement of their goals available to the public, as they could reveal a child's new address, the identity of her adoptive parents, etc.

A separate "access control" smart contract therefore contains selective disclosure rules that lets authorised parties access confidential data on a need-to know basis. Typically, this might include the project's validator, or other social services with which the social organisation has been authorised to coordinate complementary support. The rest of the world, meanwhile, will only have access to a cryptographic proof of the data's existence.

f. *Universal beneficiary ID (UBID)*

The AIMS protocol implements a secure, self-sovereign[76] identity management system ("Secure ID") for beneficiaries, which allows social organisations to keep track of the people they are serving, and to give beneficiaries a proper voice in how their project is managed. It also gives funders reassurance that projects are supporting real people, and allows different social organisations that are serving the same beneficiaries to collaborate more effectively, while ensuring that each beneficiary's privacy is fully protected.

There are already numerous blockchain and non-blockchain based self-sovereign ID systems available[77], as well as blockchain based identity coalitions[78]. Alice is agnostic on the specific tools used by each project, and instead layers UBID on top of these tools, in order to:

● Implement obfuscation tools that allow social organisations to link sensitive information about each beneficiary to their identity, and control access to that data.

● Use zero-knowledge proofs to allow social organisations to prove they are helping a beneficiary without revealing any specifics, provide anonymised, aggregated data on how their cohort of beneficiaries of a project is progressing, and alert social

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[76] Self-sovereign identity is the concept that people have full control of their own identity data, and can choose to provide only relevant parts of it to those who need it on a case-by-case basis, without relying on a central data repository.
[77] See uPort, Civic and Yoti, for example.
[78] E.g. the Decentralized Identity Foundation

organisations when there are overlaps in their project beneficiaries, so that they can establish contact and identify ways of working together.

- Allow beneficiaries to provide feedback on their projects, which charities can use for their progress reports, and participate in anonymously in the governance process of their projects (cf. section IV. 3.)

2. Funding applications

Alice's funding protocols provide the cryptoeconomic incentives that allow the AIMS protocol to function effectively. There are, broadly-speaking, two types of social funders on the network:

- Donors: this comprises small donors (the general public), philanthropists (high net worth individuals, family offices), grant-making organisations (trusts and foundations) and government bodies (both national and supra-national)

- Impact investors: these investors make investments into companies, organisations, and funds with the intention to generate social and environmental impact alongside a financial return[79]. Impact investors tend to be either family offices or dedicated institutional funds, although trusts, foundations and more mainstream investors may also make impact investments.

These different types of funding are not incompatible, and both types of funders have in common that they want to ensure that their money makes as much of an impact as possible. But each also has specific needs, which is why Alice manages their funds through two separate, but interconnectable, protocols.
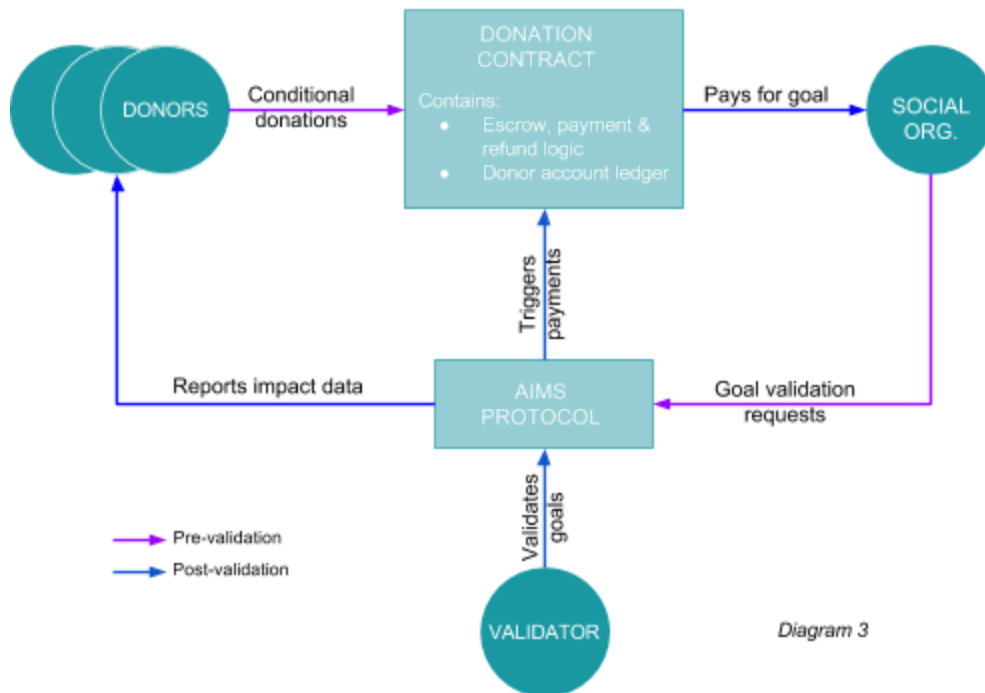
a. Donations protocol

This protocol is live on the Ethereum mainnet, and can be explored on www.alice.si.

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[79] For more information on impact investing, visit the Global Impact Investing Network

The Alice donations protocol implements a "payment by results" system, whereby social organisations only receive money from donors if they can prove that their project has achieved its goals. If they fail to do so, donors receive a refund. Graphically, the system can be represented as follows:

Conditional donations: core incentive mechanism

The donations protocol layers a conditional funding mechanism on top of the AIMS protocol, which social organisations can use to raise donations with a transparency guarantee.

When donors give to a project on Alice, their gifts are held in escrow, that is to say, they are frozen by a donation smart contract, and are only released as and when the social organisation running the project achieves its goals.

It is important to note here that not all social organisations have the financial strength and working capital necessary to start running a project before receiving any funding. In practice therefore, and particularly in the absence of complementary impact investment (cf. following section), the conditionality of donations is often only partial: part of the donations are paid immediately to the social organisation, with the remainder paid as and when the project achieves its goals.

When setting up a donation appeal for a project, social organisations must therefore specify, in addition to the basic requirements of the AIMS protocol:

- the amount they receive for each validated goal (its "price")
- the amount of each donation it receives upfront (the donation's "unconditional portion")

For the purpose of this example, let's assume that a homelessness charity is setting up a project, the main goal of which is to help rough sleepers find a permanent place to live. In this case, it will specify that the price of each goal is £750, that the term of each donation is 9 months, and that the unconditional portion of the donation is 50%. Here is how the appeal will play out:

- Every time a donor gives to the project, 50% of their donation is immediately paid to the social organisation. The remainder is held in escrow.
- Each time the charity achieves one of its goals (as verified by the project's validator), it receives half of the goal's price as payment, in this case £375.

Progress reporting incentives

As described in the section dedicated to the AIMS protocol, social organisations are required to provide donors with regular progress reports regarding their projects. The donations protocol provides financial incentives, one positive and two negative, for them to do so.

The positive incentive is that social organisations are rewarded with an additional payment for each of their reports. The rationale behind this mechanism is that it makes the cost of impact monitoring and reporting transparent and explicit to donors, while actively addressing the toxic

effects of the overhead myth (i.e. the misguided idea that charities should spend as little as possible on project administration) described in section II.

In order for this to work, social organisations must specify, for their project, the cost of each report, which they receives each time they submit one on time (reminder: the frequency with which reports must be made is imposed by the AIMS protocol itself).

The negative incentives are:
- social organisations forfeit their report payments each time they miss a deadline
- no new payments (e.g. for validated goals) can be received until the social organisation submits its missing progress report.

Donation payments & notifications

Payments to a social organisation, whether for the completion of goals, or for the submission of progress reports, are always made from the pot of escrowed donations, as long as it contains enough funds.

The payment algorithm iterates over each donor's balance, withdrawing small "chunks" from each until the amount due to the social organisation is paid in full[80]. This means that each goal payment is typically funded by multiple donors, and as a corollary, each donor's gift is likely to be split across multiple goals, with their donation "balance" declining over time.

In order to avoid too much fragmentation however, the "chunk" variable calculates, for each goal payment, the minimum amount to be taken from each donor's balance. If their balance is below the value of this chunk, their donation account is fully drained:

```
while (paymentNotComplete()) {
        donor = takeNextDonor();
        contribution = min(CHUNK, donor.balance());
        updatePayment(contribution);
        updateDonorBalance(contribution);
}
```

---

[80] This to avoid a "first come, first served" mechanism where early donors always see their impact first.

Each time a donor's money is used to pay for a goal, that donor receives a notification, and can track, at any time, what goals their gift has helped to achieve, and how much is left on their donation balance.

Donation refunds

What if a project simply does not achieve its goals, or takes an exorbitant amount of time to do so?

The donations protocol addresses this by requiring that each project, specify a "term" for each donation, which is the maximum amount of time that a donation can be held in escrow for. If a donor's gift is not fully paid to the social organisation by the end of its term, the donor will be given the option to either receive a refund for their outstanding balance, or re-donate it to another (or the same) project.

Donors may also choose to send their outstanding balance to the charity unconditionally (if the charity's impact has earned enough of their trust, for example).

Alternative use cases & additional functionalities

The donations protocol can be tailored to each project to accommodate for the following alternative use cases:

- Donor-led projects: instead of a social organisation launching an appeal, donors themselves can create projects. A large philanthropic foundation could, for example, set goals and escrow funds on the Alice platform, which any social organisation could compete to unlock, as long as their proof is verified by an appointed validator[81].
- Match funding: social organisations may create a match-funding pool for their projects, allowing certain major donors to match part or all of the gifts made by others. This has

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[81] Note that this is not necessarily a desirable use case, as it can lead to a bias towards picking low hanging fruit, i.e. where the easiest goals are achieved first, and the rest become uneconomical to tackle. Donor-led projects, as with all network mechanisms, will therefore require stringent testing.

been shown as an effective way to increase donations, and is often used by corporations to incentivise their employees to give[82]. A typical example would be a major donor's gift being initially held in a match-funding smart contract, and drip-fed to the main donation contract as and when other donors give, according to the contract's rules[83].

- Donor-advised funds: Alice allows for the creation of "donor advised funds", which allows an external "manager' to handle donations on behalf of others, according to their preferences. In this case, individual donors can pay into an intermediary fund secured by a dedicated smart contract, which authorises the manager to make allocations to the projects she sees fit, and receive a fee based on her track record, which donors can track in real time.

These alternative use cases and functionalities can be represented as follows:
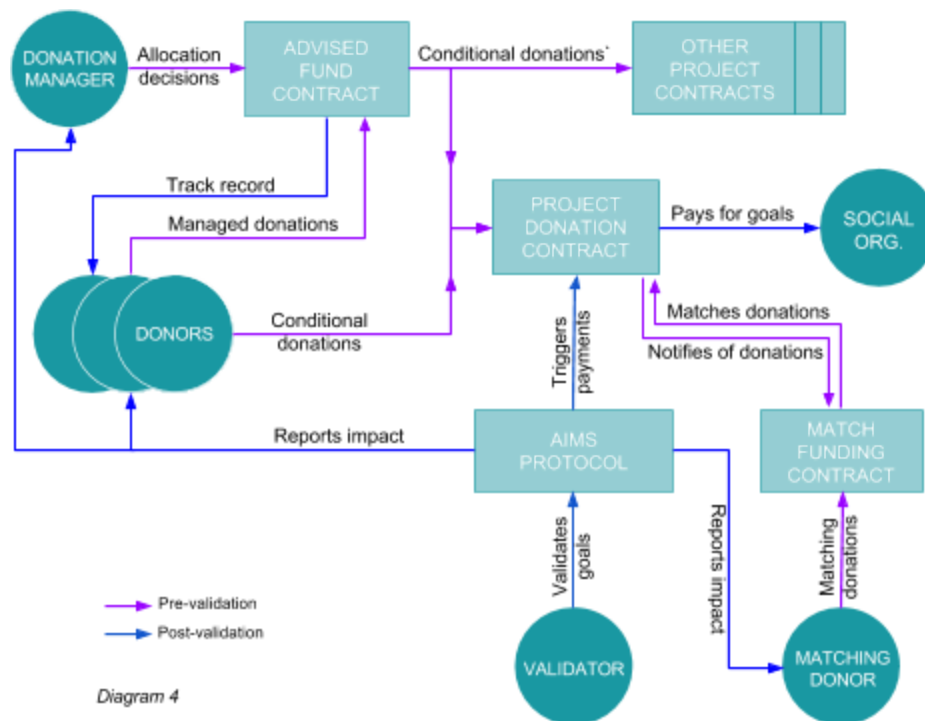
Diagram 4

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b. *Impact Investment protocol*

Many of the growth barriers faced by the impact investing sector - especially the cost of due diligence, and the reliability of impact data - are addressed by the AIMS protocol. Alice's impact investment protocol goes one step further towards reducing transaction costs by creating "bonds" that automate payments.

Thanks to a secondary market on which these bonds can be traded, Alice also increases investment liquidity, and makes it easier for investors to fit project funding within their specific investment horizons.

It is important to note here that the impact investment protocol is at its most powerful when combined with the donations protocol. This combination is more fully described in section IV. 2. c. below.

At a high level, the inner workings of the impact investment protocol can be represented as follows:
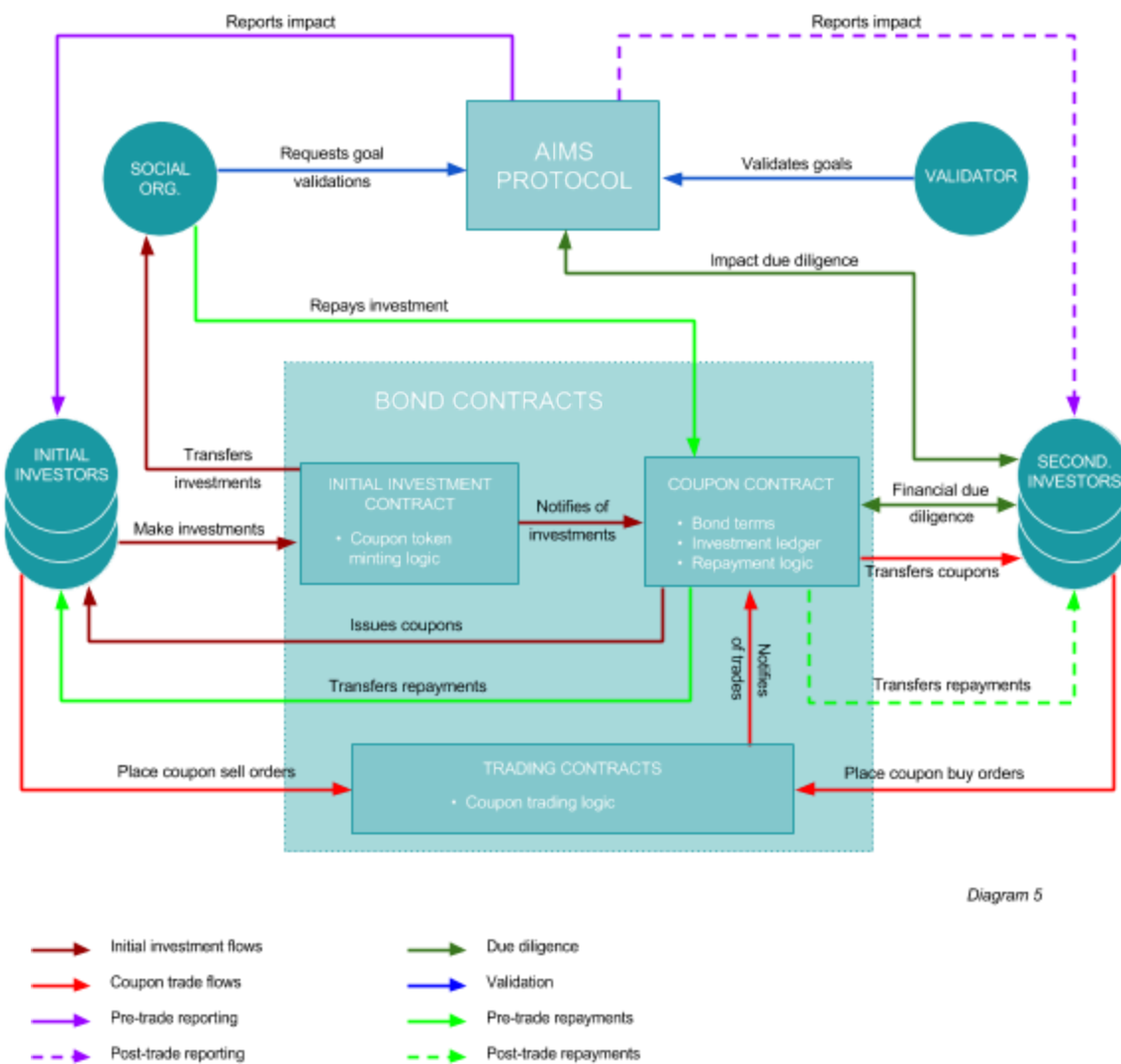
Main use case: impact loans

The investment platform allows social organisations to launch appeals for impact investments in the form of loans. The protocol tokenises these investments, allowing investors to trade their positions on a secondary market.

In this scenario, the investment process contains four phases:

- Bond creation phase: this process is very much tied to the basic project creation process of the AIMS protocol, but adds a few variables. In order to launch an investment appeal, the social organisation must define the financial terms of the "bond" that investors will buy, including:
  - Minimum investment commitment required
  - The type of interest payment: fixed, floating, etc.
  - The interest rate
  - The bond's maturity
  - The repayment schedule

  From a technical perspective, once launched, bond are composed of two main types of smart contracts: "initial investment" contracts that mint each bond's coupons and the "coupon token" contracts proper. They also interact with a third set of "trading" contracts that constitute a secondary exchange for all bonds.

- Initial investment phase: once a bond is live, investors can participate in the project by sending funds to the initial investment contract. In exchange, investors receive a "coupon" token issued by the coupon contract[84], which entitles them to repayments as per the bond's financial terms. Unlike the donation platform, the invested funds are transferred to the charity for immediate use. It is important to note here that investors rarely pay their entire commitment upfront however. The next section describes how this can be done in installments instead.

- Delivery phase: once the project is underway, the social organisation must stick to its repayment schedule, and deliver on its goals, as defined in the section dedicated to the AIMS protocol. The basic incentive for social organisations to respect their bond terms is that failure to do so will tarnish their track record (which in this case is similar to a credit rating), which is available to all potential future investors.

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[84] Note that the extraction of the token minting process away from the coupon contract is to avoid placing the computational burden on just one contract and the risk of exceeding maximum gas limits. For more information on Ethereum's gas mechanics, please refer to the network's wiki or whitepaper.

- Trading phase: investors are free to sell on their coupon tokens at any time on the network's secondary exchange market, powered by a series of "trading" contracts . This is meant to provide liquidity to investments, given the well-documented dearth of clear exit events in the social impact sector, and makes it easier for investors to fit projects within their investment horizons. Trades are facilitated by the fact that any prospective buyer has absolute transparency over how a bond has performed to date, in both impact and financial terms. Once a coupon has been transferred by the selling investor, payment flows are automatically rerouted to the buying investor.

Alternative use cases

Bond contracts can be modified to accommodate for the following alternative use cases:

- Tranched investments: tranched investments are an additional incentive for social organisations to respect the terms of their bonds. With tranched investments, only part of the funding is released upfront, with the rest released if certain conditions are filled. For example, subsequent tranches could be released if/when the charity successfully completes project goals, submits its regular progress reports, or after it has made enough repayments on the initial investment. Conversely, if conditions aren't adequately met, tranched investments may be returned to investors.

- Investment installments: to conform with usual investment practice, the investment protocol allows for investors to make commitments rather than provide funds upfront. In this case, investors must commit to specific dates at which the funds will be sent, and failure to do so will be indelibly recorded on the blockchain, so that other social organisations may be warned.

- Equity investments: Alice will, in time, allow impact investments to be made as equity investments rather than loans. Under this scenario, investors would no longer receive coupon tokens in exchange for their funds, but tokens representing equity in the social enterprise running the project (this mechanism is not adapted to charities and NGOs for obvious reasons). Although the current regulatory environment still presents substantial

barriers to the tokenisation of equity, promising initiatives do exist[85], and Alice will seek partnerships in order to facilitate this.

- Managed investments: as in the donation platform, Alice enables the creation of intermediary funds, and even funds of funds, where individual investors delegate decision-making power to a fund manager, who allocates funding on their behalf. This further cuts down on due diligence costs (as it is done for multiple investors in one go), while still giving end-investors perfect visibility on their social and financial returns. It also gives the freedom to managers to determine their own management and performance fees, and build a transparent track record over time[86].

c. Combined donation & investment funding

The donation and investment protocols can both be used on a standalone basis, but they realise their full potential when used in conjunction. Indeed, one issue with the Alice donation application is that it requires social organisations to spend upfront resources to run a project, while only getting paid further down the line, once their goals have been validated. This is a level of financial risk that many social organisations, especially smaller charities and social enterprise, simply cannot shoulder, even if the donation application offers some flexibility on this front[87].

Meanwhile, a standalone use of the impact investment platform puts a lot of pressure on social organisations to honour their loans, and therefore requires them to have either a way of generating revenue from their project (e.g. by selling products or charging for services) or alternative sources of funding.

The combination of the donation and investment protocols removes these issues, by allowing social organisations to raise two types of funding simultaneously. This allows them to secure the resources to start running projects immediately, hence removing the financial risk of failing to

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[85] See, for example, Neufund.
[86] Note that these intermediary funds could be managed by dedicated external protocols such as Melonport.
[87] Cf. how donations can be tranched, with parts paid upfront in the "*Alternative use cases*" of this whitepaper's description of the donation application (section IV. 2. a.)

achieve their goals. It also reduces the pressure to monetise projects because investors can verify that there are enough donations in escrow to cover repayments. Additional benefits are that it avoids the administrative burden of double-reporting to both types of funders, and automates payment flows.

The full, combined set-up is represented as follows:
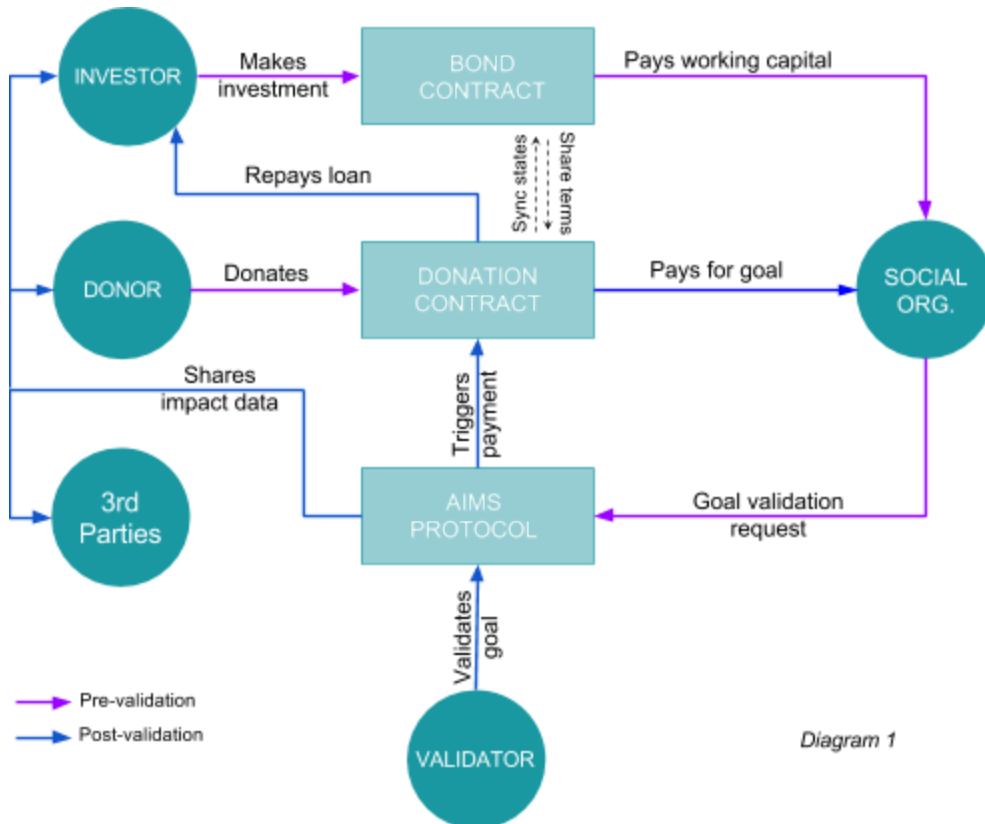
Use case

In a combined set-up, impact investors provide the working capital needed to run a project, essentially underwriting the risk of it failing. In exchange for taking on this risk, investors are guaranteed to receive part of the donation payments as interest, when the social organisation achieves its goals.

In sequential terms, a combined set-up unfolds as follows:

- Phase 1 - raising donations: the social organisation starts by creating a donation appeal and starts collecting funds from donors. The money sits in escrow in the donation smart contract, waiting for the validator to approve the project's goals.

- Phase 2 - raising investment: the social organisation can then create a bond using the impact investment protocol. In this case, the bond's goals, validator and progress report requirements are the same as those of the donation contract. Note that phases 1 and 2 can happen in any order.

- Phase 3 - Validation & payment: whenever the validator approves the completion of a goal, part of the payment taken from the escrowed donations is automatically paid as interest to the bond's investors, with the remainder sent to the social organisation. The bond may be structured with a dynamic interest rate, so that, for example, the repayment rate rises in line with the amount of donation payments received by the social organisation in any given month, and vice versa.

- Phase 4 - trading & rerouting: as with the standalone use of the investment platform, coupons can be traded. In this case, repayments made from escrowed donations are automatically rerouted to the new coupon holders when goals are achieved.

3. Governance protocols

By its very nature, blockchain technology ensures the immutability of the data it stores, but social projects need to be able to iterate over their lifecycle. This can happen, for example, if a social organisation wishes to integrate learnings and adapt its modus operandi, or comes to the conclusion that some of its project goals, for whatever reason, simply can't be achieved. Similarly, if a social organisation realises that achieving certain goals will cost more than it originally projected, it may want to increase the amount of donations it receives for each. It may also want to correct any mistakes made when first deploying a project on the blockchain - an omitted goal for example.

Flexibility must be provided to adapt goals and compensation to operational realities; failure to do so would otherwise risk worthy projects being abandoned. Alice therefore provides a governance mechanism that can update project parameters.

a. *Project update proposals (Pups)*

A social organisation may, at any time during the course of a project, submit a Pup to its funders and beneficiaries. If it wanted to amend one of the project's goals, for example, it would submit a Pup with the following parameters:

- The ID of the goal that the proposal aims to modify (the name of its variable encoded in the impact registry contract), or the ID of an additional goal that was not included in the original project contract.
- The proposed change, for example:
  - deletion of a goal
  - description of an additional goal
  - modification of a goal's price
- The rationale for the change, in long form, that is cryptographically linked to an off-chain data store and accessible to all interested parties (funders, validators, beneficiaries, etc.)

Pups can be submitted to propose many types of changes, including replacing a validator, modifying bond terms, or creating additional validation mechanisms. In some cases, Pups can also be submitted by funders or beneficiaries, as described in the "Supporting markets" section of this whitepaper.

b. *Pup approval mechanism*

Once a Pup has been submitted, funders of the programme (whether donors or impact investors) and its beneficiaries are issued voting tokens, with each group representing 50%[88] of the vote. Beneficiaries each receive an equal vote within their pool, while funders are issued voting rights in proportion to the funding they provided. The vote is then carried out as follows:

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[88] Note that this split may change as Alice iterates the network.

- Each voter is given a certain time period within which it must cast its vote (the "casting period")
- Voters may delegate their votes either to each other (within their respective categories). Votes cannot be delegated to project validators, a different category of voter (e.g. a donor delegating to a beneficiary), or any third parties.
- Votes are counted at the end of the casting period. Any abstentions are counted in favour of the Pup, to the social organisation's advantage.
- At this point, three events may occur:
  - If the Pup obtains a super majority[89] of votes in favour, then the Pup is approved, and the goals are updated accordingly
  - If the Pup obtains a simple majority, the Pup is approved and the goals are updated. However, funders who did not vote in favour are given the choice of either approving it and siding with the majority, or requesting a refund (note that this is only possible if the Pup was submitted by social organisations, rather than funders, to avoid "early-withdrawal" abuse). If they do not make a decision within a specified time period, it is considered that they have sided with the majority and approved the Pup
  - If the Pup does not obtain a simple majority, it is rejected, and the social organisation must continue to run the project in its existing state
- In the case of a project with combined funding (both donors and investors) each group votes separately according to the above rules
- No new Pup may be submitted within three months of the end of the casting period, unless it is done so by a super majority of funders or beneficiaries.

4. Supporting markets

Beyond the core AIMS and funding protocols, the Alice network includes three "supporting" markets that complete the social impact ecosystem, and support the creation of high quality projects and impact data on the network. These are: the validation market, the knowledge sharing market, and the predictions market.

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[89] Tentatively set at 75%, although this may change based on testing.

a. Validation market

The validation market allows social organisations to find appropriate validators for their projects, defines their remuneration, and provides an arbitration mechanism in case of disputes.

Selecting validators

When a social organisation creates a project on Alice, it must define one or several validators - either human or automated - that will take on the role of verifying the proof that it has achieved its goals. In order to do so, it can post a request for proposals, and invite validators to compete for the role. It can also search for validators that meet its criteria in terms of sector experience, reputation (track record) and fee range, for example, to become a part of the project.

Validation fees

Before the appointment is finalised, the social organisation and the chosen validator(s) must agree on a fee that the latter will be paid for their services, and which will be applied each time a validation request is made by the social organisation. In the case of multiple validators, all parties must also agree on the parameters (m of n decisions) that are needed to validate a goal.

Once agreed, the fee and validation parameters are encoded into the project's contracts, and payment is made in one of two ways:

- Where funds are held in escrow for the project - e.g. a donation appeal - validation decisions made by the validator (whether positive or negative) trigger a call from the AIMS protocol to the donation contract, which releases the corresponding fees directly to the validator.

- Where funds are not held in escrow for the project (e.g. in a project funded solely by impact investment), the social organisation's request for validation must be accompanied with the agreed payment, which will be held in escrow until the validator returns its verdict. In the case that a validator does not return a decision within a given deadline, the fee is returned to the social organisation, at which point it may submit a new request

for validation of the same goal. Any delays by validators are indelibly added to their track records.

Validation Pups

The social organisation, the project's funders or the project's beneficiaries may submit a Pup to remove a project's validator. This is particularly helpful either when a validator becomes unresponsive to validation requests, or when there is a suspicion of biased validation (e.g. collusion between a social organisation and a validator, or sensors that have been tampered with[90]). In this case, the Pup will invite funders and beneficiaries to vote on the removal of the validator. If successful, the social organisation will need to restart the validator selection process.

Dispute resolution

By the nature of their role, validators hold a very large sway over the success or failure of a project. It is therefore important to have dispute resolution mechanisms in place allowing charities to appeal validation decisions. It must also be possible for funders or beneficiaries to be able to challenge a validation decision if they suspect it to be wrong. This must be balanced, however, with the need to avoid malicious challenges that simply aim to damage a validator's reputation, or a project's chance of success.

The resolution process works as follows:

- In order to be registered on Alice, all validators (including automated validators) must be insured against any disputes, either by posting an upfront stake, or by connecting a compatible on-chain insurance system[91,92].
- Anyone may challenge decisions made by the validator, though the modalities of this challenge vary according to the type of Alice user:

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[90] Note that we may adopt automated mechanisms to "test" validator honesty, such as introducing randomised and intentional validation request errors, a process pioneered by TrueBit.

[91] Potential Ethereum-based insurance systems under development include Etherisc & Dynamis.

[92] Defining the appropriate level of staking will be an iterative process that will be tested and amended as the network scales.

- ○ "Free" challenges, that require no stake or insurance, can be issued by 10% of the project's beneficiaries, or by funders (donors or investors, either as individuals or as a group) who have contributed more than 25% of a project's cost at the time of the challenge.
- ○ Other users must themselves post a stake to issue a challenge[93].
- In order to resolve the dispute, the social organisation, validator and challenger nominate an arbiter who will verify the challenger's claim.
- If no agreement is found, the arbiter can be proposed by the project's funders or beneficiaries, following a mechanism similar to the Pup system described above.
- Depending on the outcome of the arbitration:
  - ○ if the challenge is upheld, the validator's insurance stake is transferred to the challenger, minus any validation payments that have been judged erroneous, which are returned to the social organisation. The validator must then post a new insurance stake to continue validating the project.
  - ○ if the challenge fails, the challenger's stake is transferred to the grants DAF
- The results of these challenges are immutably added to the validator's track record, and form part of that validator's reputation on Alice.

A word of caution

We must highlight here the very real challenges of creating such an arbitration system. Human disputes always entail at least some degree of subjectivity, making it difficult to resolve them in an unbiased way on-chain, without recourse to a centralised system such as a government court system. This is orders of magnitude more difficult when the object of a dispute involves a project that provides support to potentially very vulnerable people, and where strict data privacy must be observed: in this case, an arbiter may not have access to the data it needs to resolve a dispute.

Several Ethereum-based projects, particularly Mattereum and Aragon, are developing decentralised arbitration solutions, and we will seek to develop partnerships as we build and iterate the platform.

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[93] *Idem*

b. *Knowledge sharing market*

Alice's knowledge sharing market is designed to attract expert assessments on the data produced by social projects, from the likes of charity evaluators, research organisations, journalists and think tanks. These "contributions" are particularly useful to:

- mutualise the cost of due diligence, by crowd sourcing expert evaluations on whether new projects are well designed, and are likely to achieve their goals.
- add value to the assumptions made on any given project, by appending relevant research and reports that the social organisation was not aware of
- compare similar projects amongst themselves, to compare their cost effectiveness for example, or to help social organisations learn from each other's experience.

Basic mechanism

At a basic level, the knowledge sharing market works very simply by allowing knowledge shares to publish contributions, and then charge others to access it.

Five dimensions

As with projects more generally, knowledge sharing contributions are tagged across the five dimensions of impact, allowing users to filter contributions according to their needs or interests (e.g. specific issues such as homelessness or education, specific geographies or types of interventions, contributions on a particular project, etc.).

Reputation system

To avoid spamming and malicious or low quality contributions, users can up or down-vote contributions once they have accessed them, hence building a public reputation for each knowledge sharer. As well as exposing poor knowledge sharers, the reputation system also defines how much each can charge for their content. Reputations are also broken down across the five dimensions.

Commissioned contributions

Users may commission contributions on a specific project or impact area, as part of a due diligence process for example. The mechanism for doing so is very similar to that of choosing a validator, in that users can post requests for contributions, and search for knowledge sharers who meet their criteria. They must then agree evaluation fees with them.

Commissioned contributions can be made available to other users for a fee, which in this case is paid to the commissioner rather than the knowledge sharer.

c. Prediction market

The prediction markets[94] on Alice are linked to the regular progress updates made by social organisations on their projects. They are meant to pool the network's collective knowledge to help iterate the operational aspects of projects as efficiently as possible[95].

As explained above, progress reports contain regular updates on how projects are performing against their internal performance indicators, and contain information about operational changes implemented in each reporting cycle. Alice's prediction markets allow users to bet 1) on the likely operational changes that a project will make in the future based on its latest performance indicators, and 2) on the likelihood of that changes announced in a report will increase or decrease the project's ability to achieve its goals.

To take an example, a project running an intense training programme to help young marginalised adults find jobs may have found that its morning classes are much less well attended than its evening classes, and announced a shift of all classes to the evening in its most recent progress report. Based on this, Alice users can make bets on whether this will lead to an increase or a decrease in beneficiaries finding jobs within six months, for example, as verified by the project's validator.

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[94] It is outside of the scope of this whitepaper to discuss the benefits (and drawbacks) of prediction markets. Consensys published an (admittedly very bullish) overview of their potential in 2015.
[95] In the elaboration of these prediction markets, we will obviously seek to leverage specialised protocols such as Gnosis or Augur.

c.   Grants market

Launching well designed, measurable projects on Alice requires expertise and resources that many organisations, especially small ones, may not have off-hand. To avoid making Alice a rich boys' club, the network funnels part of its network fees to a decentralised autonomous fund (DAF), whose role is to provide capacity-building grants as seed capital for worthy projects that would otherwise not see the light of day.

In order to secure a grant, social organisations must submit grant proposals to the fund. Alice token holders then review these proposals and vote on whether to award them a grant, in proportion to their holdings. As with Pups, token holders have the option to delegate their votes to others on a case by case basis.

Initially, grant proposals will be stringently vetted by an advisory board composed of social impact professionals, according to rigid grant-making guidelines. As the network matures, this centralised leash will be progressively lengthened until the fund becomes truly autonomous and fully run by token holders.

V. **Facilitation services**

The Alice team has developed, and will continue to develop, a series of "facilitation" services that make it easier to interact with Alice's protocols. While important to drive adoption of the platform, these services are peripheral, and this whitepaper will only give them a cursory overview. We expect that, in many cases, other organisations or individuals may build (and monetise) rival and/or complementary services. We welcome these developments, and will provide all possible assistance to ensure they can connect to the Alice token system and thrive.

1. Fiat pegging service (stablecoin)

A first version of the Alice donation platform is currently in production on the [Alice](#) [website](#). One of our early decisions was to allow users to make donations in fiat[96] in order to reach as broad a donor base as possible, given that the adoption of cryptocurrencies is currently still far from mainstream. We also took into account that the costs incurred by social organisations (salaries, external service providers, etc.) are overwhelmingly denominated in fiat, and that the exchange rates of even the major cryptocurrencies (against the dollar, the euro, the pound, etc.) can be incredibly volatile. Given that social organisations on Alice are often only paid after they have made an impact, and that their goals can take a long time to achieve, it would be impossible for them to plan ahead with any certainty, if their funding were not pegged to their local currency. In fact, to date, Alice does not yet allow donations to be made in cryptocurrencies.

Similarly, we expect that institutional funders will be reluctant, at least in the early days of the Alice network, to make grants or investments in cryptocurrencies, and so the use of stablecoins, i.e. tokens whose value is pegged to a fiat currency, plays an important role in driving adoption.

When Alice was first launched, we participated in a pilot run by Tramonex Labs, within the Financial Conduct Authority's regulatory sandbox[97], to issue e-money (tokens that represent the value of fiat donations) on Ethereum. We are currently integrated with MangoPay to ensure the

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[96] Fiat money is a currency established as money by government regulation, e.g. pound sterling. It is opposed here to cryptocurrencies such as Bitcoin, Ether...and Alice tokens.
[97] See here for more information on our [trial with Tramonex Labs](#), and on the [FCA's regulatory sandbox](#).

stability of donations in European currencies, and our smart contract infrastructure allows us to use different stablecoin providers depending on the currencies projects are denominated in.

Status: in production

2. Project designer & reporting dashboard

It's unrealistic to expect social organisations will interact directly with our smart contracts to set up and monitor their projects. We are therefore building a simple drag-and-drop "project designer" interface and reporting dashboard that will allow non-technical people to do this from a normal web interface.

Status: partially developed

3. Conciergerie

As explained in section VI., use of the Alice platform requires paying fees in Alice tokens. Most users, particularly institutional investors, grant makers and large charities are unlikely to have the expertise (or the will) to manage an Ethereum wallet or pay fees in anything but fiat. Alice will therefore buy the tokens for them on the open market, and manage their Ethereum accounts on their behalf. This service will be automated, and come at a premium to the spot price of Alice tokens.

Similarly, for organisations with more advanced technical expertise, but who may not want to host their own Ethereum node, or risk losing their credentials, Alice offers a secure Ethereum gateway, operated via a standard web app, which processes their signed transactions asynchronously.

Status: partially developed

4. Smart contract explorer

One of Alice's core values is to make social impact projects more transparent. This is one of the main reasons for which the system is built on the blockchain: so that anyone with an Internet connection can audit projects. Currently this is difficult, however, without advanced technical skills. We are therefore developing a smart contract exploration tool, that allows non-technical users to visualise the inner workings of smart contracts on Ethereum, and their state history.

Status: proof of concept

5. Plug & play measurement tools

Social organisation use a variety of tools from multiple service providers to collect impact data, such as beneficiary polling apps and data input software. It would be counter-productive to reinvent the wheel on this front. Rather, Alice is developing a simple API allowing social organisations to plug in their tools of choice to the system, and providing a reliable connection secured by cryptographic proofs.

Status: under development

VI. **Alice token economy**

Interacting with the Alice platform requires the use of Alice tokens that will be distributed in an upcoming token sale. This section explains how they are used, and the additional benefits they give to holders. Note that it is outside the scope of this whitepaper to provide any information on the modalities of the token sale, which will be communicated separately.

1. Alice tokens vs. "operational" tokens

On a technical level, much of the innovation created by Alice lies in the full tokenisation of social impact funding, delivery and reporting, and the synergies that this tokenisation allows for. Against that background, it is important to differentiate between the various "operational" tokens on the platform, which are not fungible, and the generic Alice tokens, which allow users to participate in the network. For the sake of clarity, we explain here the difference the two.

Alice tokens are not:

- Donation tokens: as described in sections IV. and V., donations made to projects on the Alice platform, particularly those made in fiat, are represented as tokens within the project's donation contract. These tokens are not Alice tokens: they are simply tokenised representations of donations, which are used to manage conditional payments from donors to the project's social organisation, and cannot be transferred outside the project's contract.

- Coupon tokens: these tokens give the bearer the right to a specific bond's interest payments and the reimbursement of its principal. They can be transferred between impact investors within Alice's secondary market environment (with repayments by the social organisation then automatically rerouted from the seller to the buyer), but cannot be used for any other purpose.

- Data tokens: these tokens represent "impact facts", defined in section IV. 1. D., and serve only to provide information about a given project.

2. Network usage fees

Most interactions by users with the Alice network require the payment of a fee in Alice tokens. Below is an extensive list of when and how Alice tokens must be paid. Note that "Alice" below denotes that fees are paid for network maintenance and to the DAF (cf. section VI. 3.).

Protocol	Paid by	Fee type	Paid to	Usage
Core applications				
AIMS	Third parties	Access fee	Social orgs (+ a % to Alice)	Paid to access a project's impact data.
Funding protocols	Social orgs	Service fee	Alice	Paid to launch fundraising project on Alice.
Funding protocols	Funders	Management fee	Fund managers (+ a % to Alice)	Paid to the managers of donor-advised funds and investment funds.
Donation protocol	Social orgs	Service fee	Validators	Paid for each validation decision.
Investment protocol	Impact investors	Tx fee	Alice	Paid each time an investment is made into a project.
Investment protocol	Impact investors	Tx fee	Alice	Paid by both the seller and buyer in a coupon token trade.
Validation market	Validators	Registration fee	Alice	Paid to register as a validator on Alice.
Validation market	Losing party	Arbitrage fee	Validator or Alice DAF	Paid by losing parties in an arbitrage decision, and deducted from the loser's stake.
Knowledge sharing market	Low reputation sharers	Guarantee	Alice (if reputation too low)	Used to avoid malicious or poor contributions.

Knowledge sharing market	Third parties	Access fee	Author of contribution (+ a % to Alice)	Paid to access a knowledge sharer's contribution. Very similar in practice to the basic AIMS protocol data fee system.
Facilitation services				
Fiat pegging	Social orgs	Service fee	Alice	Paid by any Alice user (apart from donors) wishing to interact with the platform in fiat.
Other services	Relevant users	Service fee	Alice Service providers	Alice will monetise its proprietary tools, and invite other service providers to build and monetise their services.

Please note that certain interactions with the platform do not require the payment of fees in Alice tokens. These are:

- Funder and beneficiary access to impact data: a project's donors, investors and beneficiaries do not pay for access to its data.

- Donations: unlike impact investors, and in order to encourage philanthropy, Alice does not charge donors for the privilege of giving to a project, even when using the fiat pegging service.

- Validation & challenger stakes: no fee is charged to validators or challengers when they post a stake as collateral for a dispute. A fee will be deducted from the losing party's stake, however, once an arbitrage decision has been made.

3. Grant DAF funding

The DAF will be systematically funded by fees paid to Alice. The exact percentage of Alice tokens funnelled to the DAF at any given time will be determined dynamically, in function of several variables, including the current amount of revenue flowing through the platform (so that

this does not affect the network's ability to pay for its running costs) and the exchange value of Alice tokens against a basket of currencies.