



rloop

A Decentralised and Crowdsourced
Engineering Organisation

rWhitepaper

Version 0.9

The rLoop Network



The rLoop Network is a decentralised research and development organisation, engineering solutions to some of the world's greatest challenges. It is designed to enable anyone, anywhere, at any time, to participate in the creation, development, and scrutiny of potentially world-changing technology. Our mission is to develop and launch innovative technology fueled by a genuine desire to improve the world and humanity. The rLoop Network mitigates the risk of early stage R&D by leveraging an untapped global pool of talent and resources, harnessing the wisdom of the community, and facilitating and optimising amorphous group coordination. It encourages participation at the intersection of an individual's passion and interests, removes geographical barriers to participation, and opens up an entirely new and previously untapped workforce.

This document provides an overview of the intended preliminary implementation of the rLoop Network, as well as potential future growth avenues. The network features community participation in the creation, development, and scrutiny of innovative technology projects, coupled with a bounty system for challenges and tasks related to challenges. Both systems work to leverage and maximise the wisdom of a global community of engineers, scientists, makers, and enthusiasts. The systems are supported by an experienced engineering team and advisors who provide structure and effective engineering processes. Resources are allocated to projects based on milestones and community consensus. In this model, influence will flow from the bottom up and not from the top down, while creating an economic movement focused on co-developing innovative technology for the greater benefit.

IMPORTANT INFORMATION

Your attention is drawn to the disclaimers and exclusions as set out on page 35.

This paper sets out the views of rLoop Limited concerning the rLoop Network and the proposed token generation event. This paper may from time to time be revised as to its form, content or in any such other way as the directors of rLoop consider appropriate, without further notice being provided. The information set out in this paper is intended to be indicative only, and is not legally binding in any respect on rLoop Limited, its directors or any other party. This document is for information purposes only and does not constitute and is not

intended to be an offer to sell, an offer to buy, or a recommendation of the rLoop Token or the rLoop Network.

Participation in any token offering carries a significant level of risk that could ultimately lead to a loss of all of any contribution made. Unless prospective participants fully understand and accept the nature of rLoop's business and the potential risks associated with the acquisition, storage and transfer of initial token offerings and the rLoop token, they should not participate in the token offering.

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rMotivation

Humanity's progress has been driven by scientific and technological innovation. Traditionally, investments in innovation have come from government or corporate interests. Centralised research programs have led to revolutionary technology, but the investment pace has slowed dramatically over the past four decades as traditional investors seek targeted research that can be quickly converted into profits. This shortsightedness has resulted in an innovation bottleneck, where technologies that can have incredible impact on humanity have been impeded or entirely ignored.

There is no shortage of talent and passion in the global workforce. This talent largely goes untapped as existing organisational structures cling to antiquated concepts of personal motivation which have been shown to actually inhibit performance, creativity, and drive. Furthermore, opportunities to participate in innovative projects have become increasingly geographically localised. The result is a global acceptance of the status quo, resulting in an artificial limitation on the success of a person, an organisation, and society.

“Our future depends on maintaining and increasing our rates of innovation.”

- Ramez Naam, The Infinite Resource

The rLoop Network connects globally distributed talent and resources with historically localised opportunities in pursuit of radical breakthroughs for the benefit of humanity.



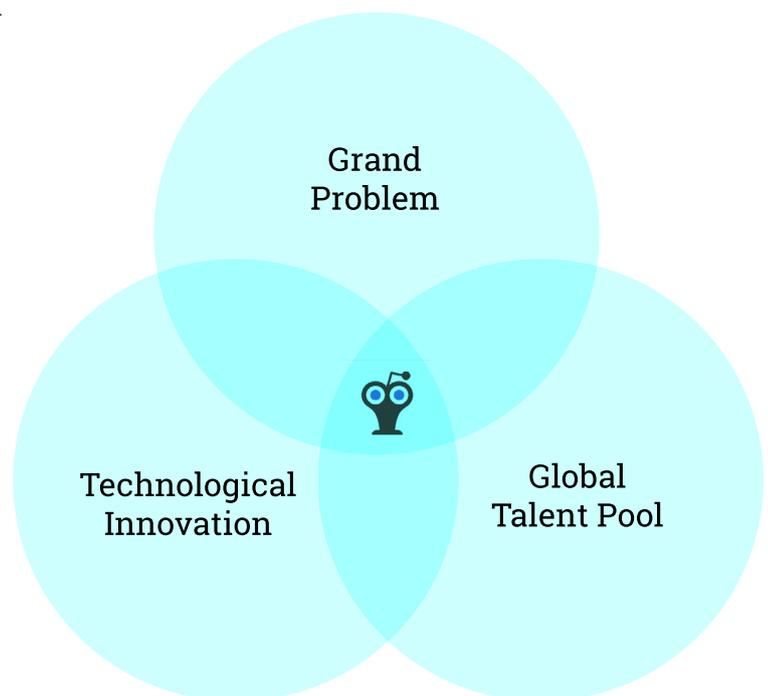
Technological Innovation Drives Economic Growth

One of the most consistent findings in macroeconomics is the growth that innovation drives - and this has remained true for centuries. In the U.S., economists have calculated that approximately 50% of annual GDP growth is attributed to increases in innovation.¹ There is also a clear statistical link between innovation and gains in the standard of living.²

Support from government for R&D spending is critical to innovation, as governments can sponsor the kind of basic research projects that seek wide-ranging scientific understanding and which can affect entire industries. Private sector firms prefer to focus their R&D on “applied” projects, where they can capture the entire payoff. Their role is not to undertake broad R&D for the general benefit of humanity.³

The U.S. federal government played a critical role in financing the basic research underlying earlier innovations such as computing equipment, the internet, GPS, and “space age” materials. Much of this occurred through direct research at government agencies such as NASA, as well as funding provided to universities. But, to highlight the extent of the issue globally, the FSA shows that U.S. government investment in R&D as a percent of GDP has declined from a high of 2.2% in 1964 to 1% today.

The private sector has also shied away from funding basic research, which is critical to true breakthroughs - less than 5% of the R&D performed by companies is in basic research. The declines have been notable in industries such as healthcare, which are less able to protect their intellectual property rights in global markets.



1 <https://www.uschamberfoundation.org/enterprisingstates/assets/files/Executive-Summary-OL.pdf>

2 <http://www.goldmansachs.com/our-thinking/archive/archive-pdfs/gsr.pdf>

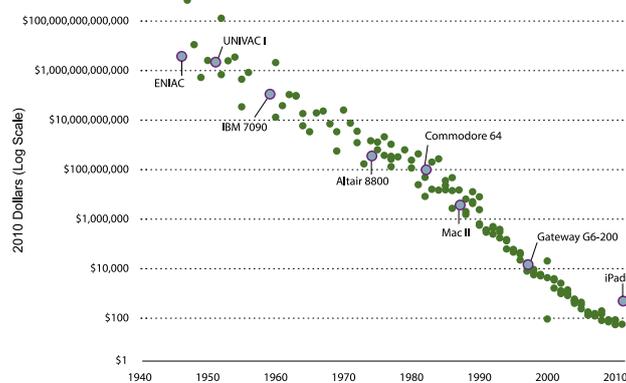
3 <http://brook.gs/2hHm0i>

Innovation Makes Technology Accessible

Today we have the ability to access almost all of the world's knowledge in our pocket, and the cost of computing power to consumers continues to plummet.

“You live in a world where an entire operating system can fit on a wafer thin piece of plastic smaller than your finger tip [sic]. And you can run this on a \$5 (or \$10) computer that is small enough to give away on the cover of a magazine. You should be amazed, excited, and happy about this.”⁴

FIGURE 3.
Cost of Computing Power Equal to an iPad 2



Credit: Michael Greenstone and Adam Looney
<http://brook.gs/2hHm0i4>

Innovation is not limited to technological discoveries - innovations to process and organisation increase efficiency and productivity. Over the past few decades, retailers have innovated to streamline their supply chain and require less work to achieve higher output. The benefits, to some capacity, flow to consumers through lower prices which typically benefit low-income households who spend more of their income on basic necessities.

4 <https://learn.adafruit.com/raspberry-pi-zero-creation/install-os-on-to-sd-card>

The Innovation Bottleneck

Despite all of this, traditional corporate structures have demonstrated a complete disregard towards discovery and innovation. One study, aptly named 'Killing the Golden Goose',⁵ found that the number of publicly traded companies publishing research in scientific journals has dropped nearly two-thirds from 1980, down to only 6%. The study states:

“Large firms appear to value the golden eggs of science (as reflected in patents) but not the golden goose itself (the scientific capabilities).”

Scientific advances and acknowledgement may earn a company prestige but does not always result in profit, and difficulty in exploiting technology dissuades traditional investors from opening their pockets.

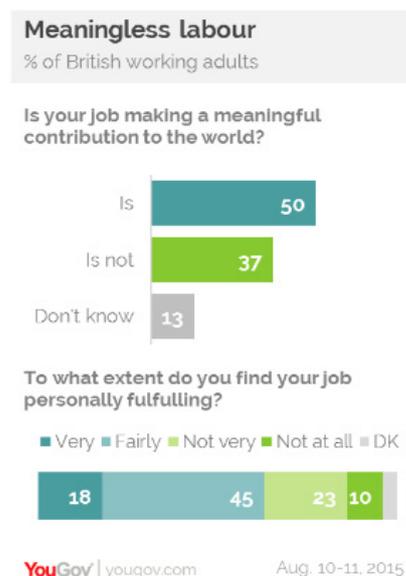
“...people who might have become scientists, who in another age dreamt of curing cancer or flying to Mars, today dream of becoming hedge fund managers.”⁶

A study on the negative relationship between the rate of growth of the financial sector and the rate of growth in total factor productivity found that the finance sector attracts high-skilled workers from other industries. The finance sector then lends money to businesses, but favours firms that have collateral they can pledge against the loan. This usually means builders and property developers. Businessmen are lured into this sector rather than into riskier projects that require high R&D spending and have less collateral to pledge.

The Disengaged Workforce

A 2015 poll in the United Kingdom revealed 37% of people believe they have a job that is “utterly useless” and which makes no meaningful contribution to the world, and 33% do not find their jobs personally fulfilling.⁷ In a 2013 survey of 12,000 professionals by the Harvard Business Review, half said they felt their job had no “meaning and significance,” and an equal number were unable to relate to their company’s mission. Another poll among 230,000 employees in 142 countries showed that only 13% of workers actually like their job.

If we want to truly unlock the human capacity for innovation, we need to radically rethink how people work together and the very definition of “work” itself.



5 <http://www.nber.org/papers/w20902.pdf>

6 <https://www.bis.org/publ/work490.htm>

7 <https://yougov.co.uk/news/2015/08/12/british-jobs-meaningless/>

Geographical Localisation of Opportunities

Opportunities for an individual to participate in high technology have become increasingly geographically localised. Relocating to these tech hubs requires substantial investment and sacrifice for an individual, creating a barrier between an organisation or project and the global pool of talent. Even in the case that an individual can relocate, participation for them is still far from guaranteed.

The rLoop Network enables anyone, anywhere, at any time, to participate in the development of potentially world-changing technology.

It is designed to encourage participation where the passion and interests of an individual overlap. It removes geographical barriers to individuals and opens up an entirely new and previously untapped workforce.



Is There a Science to Innovation?

Over the past three years, rLoop has mobilised a globally distributed community to develop Hyperloop technology. We organically organised and evolved to optimise the strengths of a diverse and largely virtual team, as well as to identify and mitigate associated challenges. Throughout, we tracked and measured every process. Our research and practical findings indicate there is indeed a science to innovation, and that the process is repeatable. And our findings are not unique.

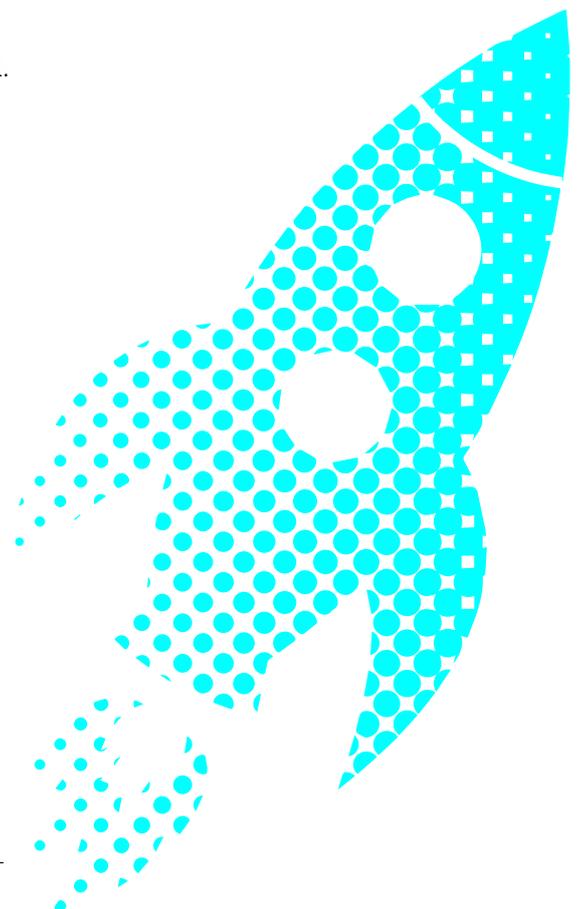
A study published in the Harvard Business Review⁸ examined five years of data from over 150 companies, covering 3.5 million participants. The key variables they identified that drive innovation largely resonate with our experience:

More Participants - A large group of participants will always out-ideate a small group of smart people. This concept is known as the 'Wisdom of the Crowd'. But a homogenous group will trend towards consensus, which is undesirable and detrimental to innovation.

Greater Diversity - The greater the diversity within the crowd, the more depth and resilience of the solutions produced. We benefit from participation and engagement from a diversity in age groups, nationalities, genders, geographical locations, education, experiences, and more. However, it is important that there is no consideration to individuals based on these diversities.

More Ideas - To really foster an ecosystem of innovation, more opportunities for individuals to propose solutions is needed. If an individual is challenged frequently they remain engaged and offer more and higher quality contributions. But offering solutions to challenges is only one component of the collaborative process.

More Engagement - Beyond merely providing solutions, a large and engaged community scrutinising and discussing ideas in the pool will naturally identify and evolve the best ideas. This allows the community to identify the most actionable ideas at a steady pace.



8 <https://hbr.org/2017/10/data-from-3-5-million-employees-shows-how-innovation-really-works>



rVision

The rLoop Network is a decentralised research and development organisation, engineering solutions to some of the world's greatest challenges. Our mission is to develop and launch next-generation technology in a decentralised manner, fueled by a desire to improve the world and humanity. The rLoop Network facilitates the collaboration of global talent and resources on opportunities that have historically been localised, enabling anyone to contribute to potentially world-changing technology.

Our intent is to harness the human passion and capacity for innovation to solve some of our greatest challenges.

We believe innovations in technology will allow humanity to make exponential societal, economical, political, and cultural advancements. We believe that for radical innovations to be truly radical, they must be decoupled from profit motives.

We believe there is a better way for people to work together, driven by an evidence-based approach to personal motivation. Collaborators on the network are unimpeded by organisational barriers, can invest their time on projects that ignite their passions, and can develop skills through hands-on work, education opportunities, and networking with other collaborators.

The world's biggest problems are the biggest business opportunities. We are creating the network to democratise high technology, and we've already started with the Hyperloop.

Track Record

rLoop has demonstrated success with our distributed and crowdsourced community, as well as our award winning Hyperloop designs and Hyperloop prototype pod. Since our founding in 2015, rLoop has attracted over 1,300 collaborators from more than 50 countries, successfully self-funded the manufacturing of our prototype pod, and won multiple international awards including:

- **“Best Non-Student Hyperloop Design”** from SpaceX at World’s First Hyperloop Design Competition
- **“Best Hyperloop Design, Drama, and Excitement: Best Architectural Design and Presentation”** from BuildEarthLive, Asite, and the Dubai Future Foundation
- **“Next Big Thing”** from Basware and IndieGoGo
- **“Innovation Award”** from SpaceX at World’s First Hyperloop Pod Competition

Our global community designed and manufactured hardware that achieved numerous firsts in the Hyperloop space, including:

- **First** Hyperloop prototype vehicle with pressure vessel capable of supporting human life, holding 1 bar when tested at 1% atmosphere in a vacuum chamber
- **First** Hyperloop vehicle levitating in place at partial vacuum, tested at 1% atmosphere in a vacuum chamber
- **First** Hyperloop vehicle levitating independent of a Hyperloop tube
- **First** engineering system entirely designed and built by the crowd

The Team

rLoop was born on reddit⁹ in June 2015, when a handful of individuals answered a challenge from Elon Musk and SpaceX to reimagine transportation via the Hyperloop Competition. Today, over 1,300 people from more than 50 countries have rallied behind the rLoop concept. This community is diverse in geography, education, experience, and interests. Students, industry experts, and retirees collaborate together as equals. Free to contribute in whatever capacity they choose, individuals with an education in Physics chose to helm the Public Relations team, and white collar workers chose to manufacture components. We are united in a belief that together we can create a better world for humanity through innovations in technology.



⁹ <https://en.wikipedia.org/wiki/Reddit>

Partners



TE Connectivity

TE Connectivity is a technology company that designs and manufactures connectivity and sensor products for harsh environments in a variety of industries, such as automotive, industrial equipment, data communication systems, aerospace, defense, medical, oil and gas, consumer electronics, energy and subsea communications.

Autodesk

Autodesk makes software for the architecture, engineering, construction, manufacturing, media, and entertainment industries.

Precision Building Group

Precision Building Group is leading the global effort to construct the infrastructure of tomorrow.

TATA Steel

TATA Steel is one of the top steel producing companies globally with annual crude steel deliveries of 27.5 million tonnes (in FY17), and the second largest steel company in India (measured by domestic production) with an annual capacity of 13 million tonnes.

Arx Pax

Arx Pax Labs is a Silicon Valley technology company that invented Magnetic Field Architecture technology and a three-part foundation system for safer building in flood zones and coastal areas.

Digi-Key

Digi-Key is the fourth largest electronic component distributor in North America and the fifth largest in the world, and is a broad-line distributor of board level components.

Slack

Slack is a cloud-based set of proprietary team collaboration tools and services.

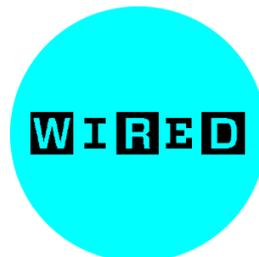
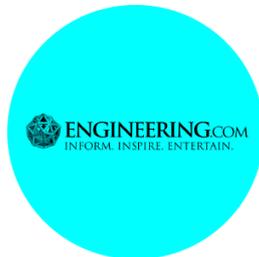
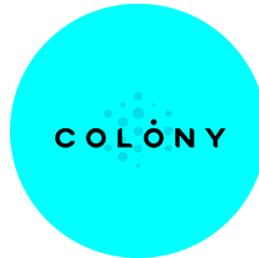
R Systems

R Systems is a service provider of high performance computing resources. The company empowers research by providing leading edge technology with a knowledgeable tech team, delivering the best performing result in a cohesive working environment.

ANSYS

If you've ever seen a rocket launch, flown on an airplane, driven a car, used a computer, touched a mobile device, crossed a bridge, or put on wearable technology, chances are you've used a product where ANSYS software played a critical role in its creation. ANSYS is the global leader in engineering simulation, helping the world's most innovative companies deliver radically better products to their customers.

Press



Please click on the logos to view articles or go to rloop.org/press





rAdvantages

The rLoop Network constantly strives to adopt the best tools to enable our community. Developing a strong community foundation based on emerging blockchain technology brings many advantages previously not available. These include but are not limited to:

Wisdom of the Crowd

The rLoop Network virtually connects passionate and skilled individuals as never before possible, empowering community collaborators with experienced support and guidance to create the most dynamic and effective network of minds.

Expert Knowledge

Cognitive science has shown that engaging experts and collective groups is more effective than centralised alternatives. The rLoop Network combines experienced engineering experts, processes and procedures, as well as an involved and engaged community in the innovation process. This works to provide a balance of data, integrity, and prudence - all of which contribute to the overall success of the ecosystem.

International Community

The rLoop Network is a global platform that aggregates distributed talent and resources in the innovation process. This model leverages individuals who have local experience and industry expertise, and enables innovation through effective resource allocation in all phases of project development. Ultimately, it encourages experts, project leaders, and the community to invest and participate in a capacity that advances the development of a particular project.

Diversity

Diversity of age, ethnicity, gender, and perspectives leads to increased creativity and productivity, as well as overcoming confirmation bias. Studies show a diverse group of problem solvers is more likely to outperform a team of experts.¹⁰ The rLoop Network is agnostic to your geographical or social status, and removes organisational barriers between collaborator and the work they want to contribute.

¹⁰ http://www.ur.umich.edu/0405/Nov22_04/23.shtml

Total Autonomy

Collaborators to the rLoop Network have complete autonomy over their contributions. The rLoop Network encourages self-direction and participation at the intersection of ones passion and interests.

Innovative Organisational Processes

Our global and community-focused model eliminates social biases, political ideologies, and traditional economic beliefs - preconceptions which can negatively influence innovation.

Open and Transparent

Community-driven oversight accompanied by open and transparent policies allow for increased agility, decreased overhead, greater compliance and accountability, and eliminates reliance on external agencies.

Skill Development

Self-guided participation within the network, coupled with access to the community and the knowledge base, allow contributors to develop skills in a real-world environment. Community members can learn through doing by participating in challenges and related tasks as well as through networking with other community members. Education through tutorials and webinars exist to directly accelerate learning in a specific field.

Purpose Driven Work

The focus of the rLoop Network is on innovative engineering projects with potential for positive global impact. These strides are achieved in a decentralised manner with a view to implement in the most impactful and accessible way possible.

Immutability & Auditability

The work performed by Cognitive Suppliers and the rLoop Network is to be recorded on-chain, creating an immutable and auditable ledger of work performed as well as knowledge accrued.

Milestone Based Resource Allocation

A project resource allocation model based on milestones and community consensus enables efficient and transparent distribution of network resources and funding.



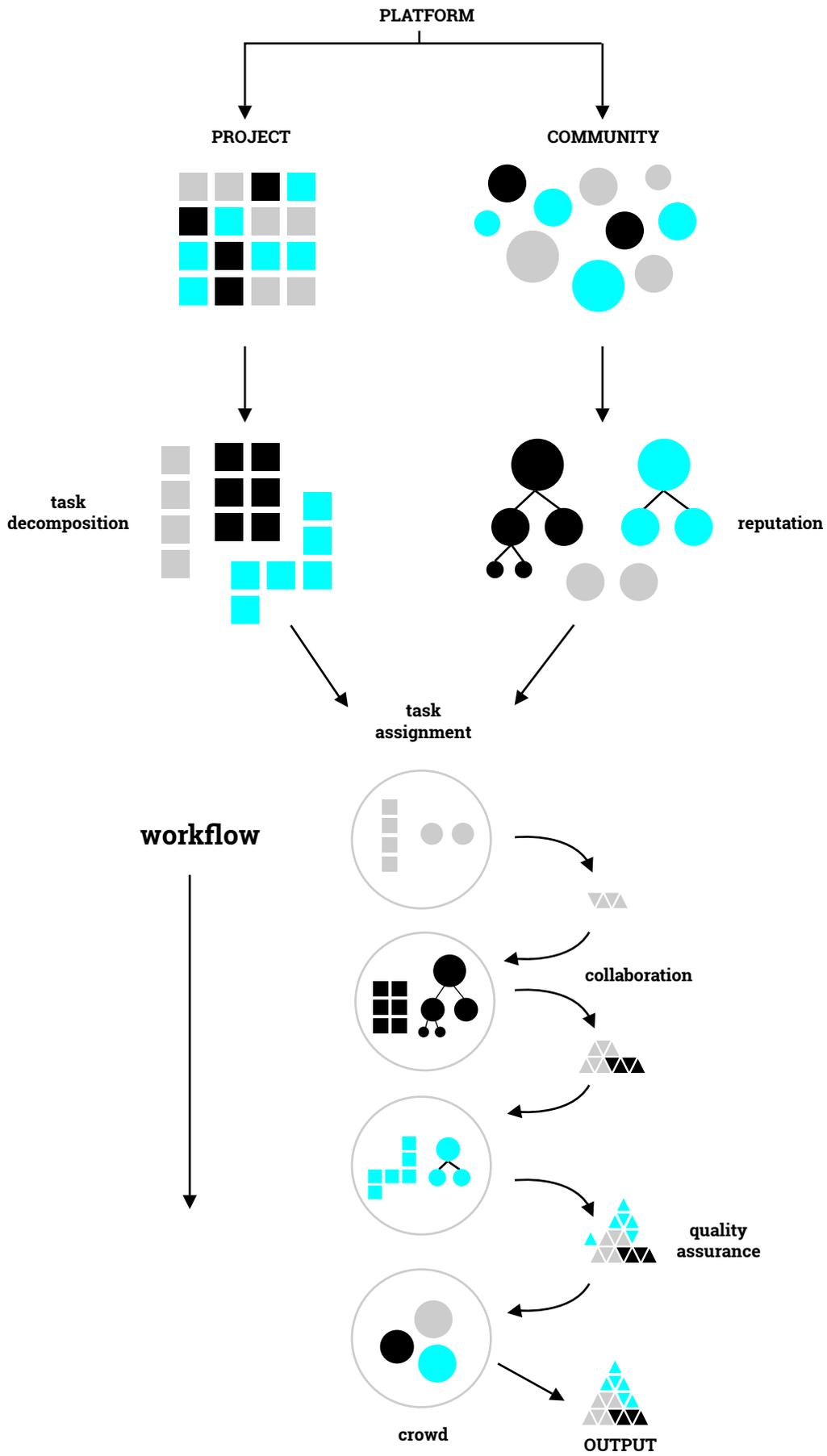
The rLoop Network

Overview

Current crowd work usually consists of small tasks paired to workers who produce an output. This structure is insufficient to support complex and creative work, and has led to low reward structures and lack of skill development for workers.

The purpose of the rLoop Network is to create a framework to support more complex, creative, and specialised work within an amorphous community. The platform is used to assess and manage projects, as well as the pools of talent and resources within the community. Complex tasks are decomposed into smaller 'microtasks', designed with particular needs and outcomes, which can then be structured into workflows to allow for broad collaboration. Quality assurance and peer review is required throughout to ensure work output is concatenated and of high quality.

The rLoop Network has an off-chain platform to support project management, tasks, and reputation, and an on-chain smart contract system as a ledger of tasks, solutions and output.



rLoop Community Roles

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Cognitive science has shown that engaging both experts and collective groups is more effective than existing centralised alternatives. The rLoop Network is designed to decentralise development of innovative engineering projects that have the potential for positive global impact, to promote and excite interest in STEM related fields, and to empower individuals to learn, develop, and showcase their skills among a network of their peers. The network enables individuals to identify and participate in challenging technology projects that are strongly aligned with their talents and interests, while an experienced Board of Advisors and Core Team provide structure, engineering processes, experience, and guidance.

Board of Advisors

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The Board of Advisors serve as the primary resource for the Core Team and the rLoop Community to consult for help and guidance. Members of this advisory board are trusted individuals who offer professional skills and talents to the organisation. Advisory board members have established expertise or credentials in a relevant field. They should also increase rLoop's credibility and public relation efforts.

Core Team

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The rLoop Core Team is rLoop's leadership, permanent engineers, and experts who will lead the research and engineering activities up to the point the technologies mature and can be commercialised through designated entities (portfolio companies), and support the portfolio companies from a technological and commercial perspective. The Core Team consists of high caliber individuals with cross-disciplinary skills and a demonstrated track record for developing and executing engineering projects from concept through to launch. Starting lean, the Core Team will bring their expertise and experience to the rLoop Network with a view to grow the reputation as a powerful engineering organisation. They are responsible for driving development of community curated engineering projects, providing structure, and fostering positive processes and practices from sound technical design approaches to project management and proper lab practices. This team enables and leverages the rLoop community to the best of their ability.

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Cognitive Suppliers



A collaborator, known as a 'Cognitive Supplier', may be anyone, anywhere, at any time that volunteers their cognitive skills and abilities to innovative projects, in order to solve challenges and perform certain related tasks.

Cognitive Suppliers have self-determination over their participation in the network. They volunteer their skills and abilities in whatever capacity they desire without being forced by the network to fulfill a particular role.¹¹ The rLoop Network encourages participation at an intrinsic level - that is, at the intersection of a Cognitive Suppliers passion and interests. While this very well could be aligned with their existing employment or education, we find that many choose involvement outside of their current profession or beyond their existing skills and abilities.

A Cognitive Supplier builds a reputation within the network based on a variety of metrics. The reputation mechanism is designed to incentivise productive contributions and activity while discouraging counterproductive and malicious activity. The reputation value is dynamic and non-transferable, and is subject to decay for inactivity.

Work performed by a Cognitive Supplier is to be recorded and accredited on-chain, allowing an individual to build a personal and professional portfolio based on true 'Proof-of-Cognition' rather than social proof.¹² As collaborators participate in challenges and tasks which are attributed to them on-chain, their solution(s) become publicly indexed, immutable, and externally verifiable.

Cognitive Suppliers can accumulate a utility token, called the rLoop Network Token (RLP), for their contributions. The rLoop Network Token has utility within the network and, in the event of a Cognitive Supplier being recruited to the rLoop Core Team or a portfolio company, a mechanism will be provided to convert the accrued utility tokens into a future security token. As the rLoop Core Team grows and portfolio companies develop, internal recruiting from Cognitive Suppliers will be prioritised before recruiting externally.

¹¹ Note: The economics introduced by the rLoop Token do allow the network some methods to balance cognitive supply and demand.

¹² https://en.wikipedia.org/wiki/Social_proof

Token Holders



The rLoop Network Token (RLP) is a utility token which authenticates completion of project tasks and permits certain privileges to its holder. The token ecosystem is designed to allow creativity to flow and many voices to be heard, but to facilitate and optimize online coordination among an amorphous community. Token Holder privileges include, but are not limited to, submitting ideas for projects to be adopted by the rLoop Network, curating information relevant to projects, staking on projects for adoption, and as participation fee for certain high-value tasks. The tokens will also be able to be used within the rLoop Network in exchange for services and products related to rLoop and portfolio companies.

The RLP Token's specific utility is its ability to represent the network and the ability of the network to facilitate coordination.

rLoop Charity Board



The rLoop Charity Board is charged with oversight of the rLoop Network charitable distribution. The board will consist of volunteers who are best placed to undertake the required due diligence on any potential beneficiaries as signalled by the community. They will also be tasked with ensuring that the funds are distributed appropriately.

The Charity Board will respond to signalling from community members. A focus on STEM promotion and education is favored but not mandatory in order to be a beneficiary of the rLoop Network Charitable distribution.

rLoop Basic Research Board



The rLoop Basic Research Board is charged with oversight of the rLoop Network grant distribution. Initially they will be charged with developing a framework to provide grants for basic research to PhD and Postdoctoral scholars. A "moving window" approach is suggested to define topics of interest for the grant in the current grant period, as well as the upcoming period. The exact grant period window length is currently undefined. Potential beneficiaries will be required to submit a paper for review by the board.



Projects

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In order for a project to be adopted by the rLoop Network, a rigorous process to assess the potential impact and associated risks must be performed. While every project is expected to have a unique path, certain criteria must be met in order to provide sufficient information to the community so that an informed decision to adopt the project and allocate resources can be made.

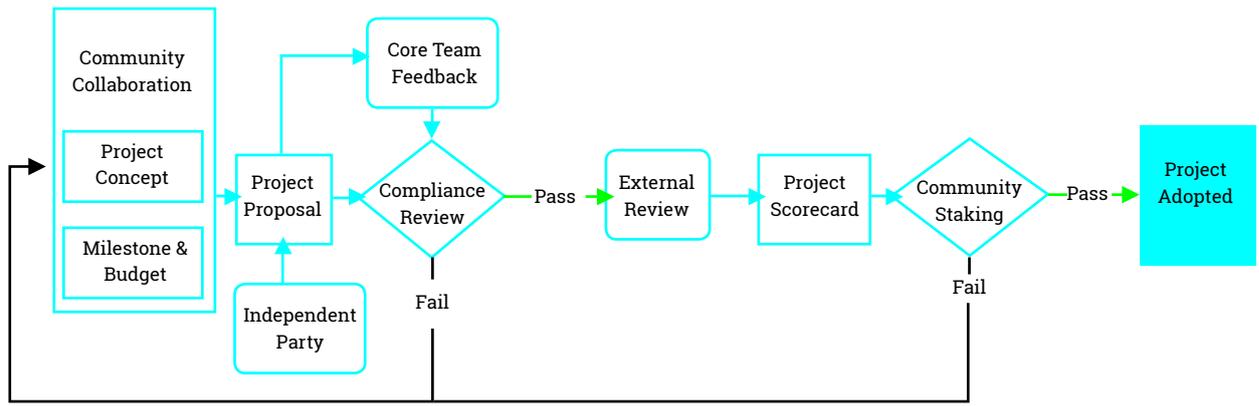
The first step for a project is the creation of a proposal. The proposal must include milestones with associated budgets to structure a logical development path. The proposed mechanism for this is similar to NASA's COTS¹³ approach. This would permit the rLoop Community and Core Team to agree on fixed milestones with success criteria to evaluate the lifecycle of the project, with associated resource and financial allocations. This requires the potential project to undergo a thorough amount of preliminary study, with particular focus on making milestones feasible and the project sustainable. There are three ways a proposal can be created: collaboratively among the entire rLoop Community, created independently and opened to the community for collaboration, or created and submitted independently. Initially, the network will focus on community driven projects.

Once a proposal is complete, it must be submitted for compliance review. Prior to being submitted for compliance review, consultation from the rLoop Core Team can be sought for input. In order to ensure high quality proposals and to reduce proposal spam, a number of RLP must be bonded to the proposal at time of submission. If the proposal passes compliance review, the bonded tokens will be returned to their owner. If the proposal fails compliance review, the tokens are forfeited to the rLoop Network.

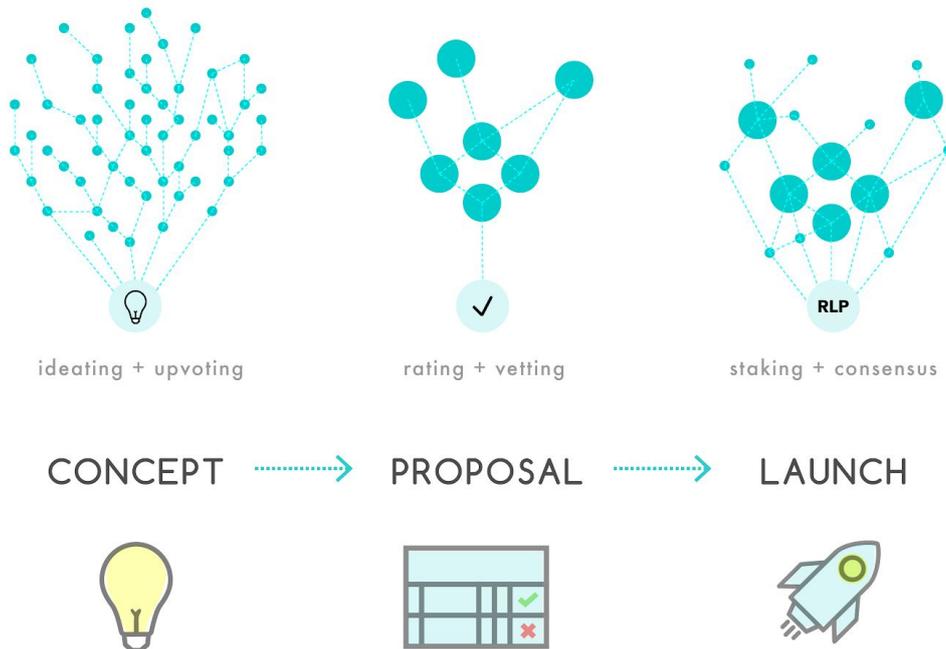
After a successful compliance review, the proposal is brought to relevant domain experts who are sourced externally for review. These reviewers will provide feedback on the project across a variety of categories. The result is a project scorecard available to the rLoop Community.

Armed with the project proposal, the milestones and associated budgets, along with the scorecard from the external review board, the rLoop Community can now make an informed decision on which projects the network should adopt and allocate resources towards. The rLoop Community votes on a project by staking their RLP Tokens to the proposal, which can be weighted against the milestones for the project proposal. A token pool is created for the project proposal and, once sufficient tokens are in the pool to achieve the first milestone, the project is successfully adopted by the rLoop Network.

¹³ <https://www.nasa.gov/commercial-orbital-transportation-services-cots/>



Members who staked tokens to the project have their tokens locked to the project. If more tokens are in the pool than required for the first milestone, a proportional quantity of staked tokens from all members in the pool is locked. A premium on the RLP can be distributed to stake holders based on projects achieving those milestones, thereby creating 'skin-in-the-game' for members who supported a particular project.



Work within a Project



Decomposition of work and tasks within a project will depend on the project itself. Work can then be opened to the rLoop Community by way of the bounty system.

The bounty system is one way for projects to leverage the knowledge and expertise within the rLoop Community. Rewards for bounties are calculated based on the reputation of an individual contributor as well as a difficulty or urgency rating. This allows tasks on a critical path to be rated higher than less critical tasks. A bonus for successful early completion of a task can be set along with a decay rate beyond a desired completion time. A participation fee can also be associated with a task, usually associated with a higher reward - this is a type of bond a member must submit in order to undertake a task. Should the task not be completed, the participation fee is forfeited to the rLoop Network. When the task is completed, the participation fee is returned to the member along with the bounty value. These mechanisms work to encourage Cognitive Suppliers to only undertake tasks they have a reasonable expectation of being able to complete on time (or early), dissuades members from taking more tasks than they can reasonably be expected to complete on time, mitigates potential malicious activity, and allows a project to adhere to reasonable timelines.

rLoop Knowledgebase

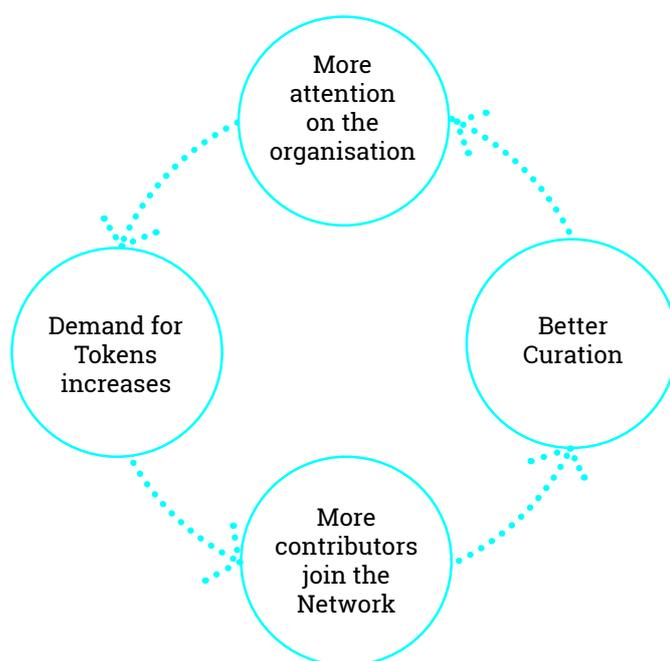


The rLoop Knowledgebase is a library of all work created by community-driven projects within rLoop. The library will contain research papers, design reports, tests, simulations, and other relevant content created in a community-driven project. The knowledgebase is curated by the community and serves as a shared resource to be leveraged by all projects on the network in order to accelerate development, decrease duplication of work, and prevent information silos. Access for individuals to premium content within the Knowledgebase can require RLP.



Signalling & Curating

Community members can collaborate on potential project concepts openly on the platform. The signals generated during this process help to define and solidify specifications within the project, as well as to identify support within the community for a particular project. They also affect an individual's reputation score, outlined later in this document. Having signalling affect reputation incentivises productive contributions and discourages counterproductive or malicious activity. Members curate information relevant to projects in the same manner. Effective curation increases value to the projects and the network, which attracts future collaborators and creates a positive feedback loop.



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Bounty

The rLoop Network will employ a technical bounty system. A bounty is earned for successfully solving challenges and/or performing certain tasks related to projects on the network. The Cognitive Supplier(s) solving the challenge or carrying out the task can have their contribution recorded on chain, receive the associated bounty, and earn reputation within the network.¹⁵

Two primary factors determine the reward for an individual collaborator on a bounty: their reputation and the difficulty or urgency allocated to a task. A members reputation is dynamic (in that it can increase or decrease based on activity within the network, as well as being subject to decay) and is non-

14 This feedback loop graphic is inspired by the work of Maciej Olpinski

15 Note that not all challenges or tasks performed by the community require a bounty. The process for creating a bounty is currently conceptual. Further testing will be necessary for validation, and the methodology is expected to evolve with the network.

transferable. The required definition for a bounty, then, is the theoretical difficulty or urgency associated with the task. A bonus may also be offered based on earlier-than-expected completion, and a decay rate can be set to diminish the potential reward should the task not be completed in a reasonable time. A participation fee can also be set for a bounty. This could be used for a 'high-risk, high reward' task, as well as to limit potential for Sybil attacks.¹⁶ Cognitive Suppliers wanting to undertake a bounty can be required to submit a fee of RLP Tokens to be held by the smart contract until the completion of the task, at which time the fee is returned. If the task is not completed before the end of the decay period, the participation fee is forfeited to the rLoop Network.

When a Cognitive Supplier(s) indicate a challenge/task is complete, a phase for Peer Review is opened. rLoop Token Holders, the rLoop Core Team, and other Cognitive Suppliers can review the work output and either deem it complete or incomplete and provide specific feedback. In the current model an element of trust is introduced by this peer review system. Cognitive Suppliers need to trust that the Core Team or other reviewers are both capable of adequately understanding and testing the solution, and are not acting maliciously - such as a scenario where the reviewers can see the work output but deny the approval to prevent the bounty from being distributed. The Core Team and the rLoop Community are trusting the contributing Cognitive Supplier(s) in that they are not using any alternate means to sway peer reviewers to their support. There are inherent incentives for good behaviour that will be discussed in the Reputation section, and other methods are being analysed to reduce or eliminate the need for trust and to mitigate potential attacks.

Should a peer reviewer correctly deem the work incomplete and provide actionable feedback, they will be allocated a small percentage of the bounty. If a peer reviewer deems the work incomplete but the submitter(s) can adequately defend their work, no percentage of the bounty is distributed outside the contributing member(s).

This bounty system accomplishes several goals:

- Incentivise work on a problem/task
- Encourage high quality output from the team, requiring solution to be adequately defended
- Incentivise peer review of work output
- Reward peer reviewers for correctly identifying issues with the output and providing specific and actionable feedback to the team
- Discourage false/incorrect claims against the work output

¹⁶ https://en.wikipedia.org/wiki/Sybil_attack

Quality Assurance



In the current model, a modest percentage of the bounty is dispersed to a community member who performs peer review and quality assurance on submitted solutions and their reputation score will increase. It is in the interest of all rLoop community members for a rigorous and thorough quality assurance method to be adhered to, as the quality of the work output will have direct impact on the success and growth of the community. As we test and implement the network, further mechanisms and dynamics that incentivise peer review and quality work output will be introduced.

Reputation



Cognitive Suppliers within the rLoop Community develop a reputation within the network based on a variety of metrics. The intent is to encourage productive activity and contributions as well as discouraging counterproductive and malicious activity. The reputation value for members is dynamic in that it can increase and decrease based on activity within the community, it is subject to decay for inactivity, and it is non-transferable.

The value of contributions to the network for a member is reflected in their reputation value, and helps to develop a merit-focused hierarchy. It may also take into account prior expertise that a member brings to the community, such that a 20-year veteran of Aerospace Engineering would begin with a higher reputation value than a first-year Aerospace Engineering student entering the community at the same time. This will help to onboard experts and fairly value their prior education and experience. Reputation has a universal cap and is primarily earned and lost in the collaboration phase of project development, in curating information relevant to projects, by participating in tasks within a community-driven project, in participating in quality assurance/peer review, in staking tokens to a project, and more.

Reputation value will have a time-based decay rate, providing incentive for members to remain active within the community. In the initial implementation of the network, the reputation mechanism is expected to be basic, with further intricacies introduced dependent on growth and development of the community and platform.



Cognitive Supplier Profile

Cognitive Suppliers can build a personal and professional portfolio based on true 'Proof-of-Cognition', rather than relying on social proof.¹⁷ The rLoop Network leverages distributed ledger technology to build an immutable and auditable record of the work performed by each Cognitive Supplier, allowing them to:

- Establish auditable expertise
- Build an immutable portfolio of cognitive work
- Network with collaborators of shared expertise
- Identify Cognitive Suppliers in a sector of interest
- Identify available work that matches their skills

While the reputation mechanism is an integral component of the rLoop Network, the on-chain ledger of work and proficiencies act as further incentive for Cognitive Suppliers. In its basic implementation, tags related to skills or tools are assigned to challenges and tasks. As a Cognitive Supplier completes challenges and tasks, the relevant tags are added to their profile as 'validated', along with a hash of the actual work output. In this way, 'Proof of Cognition' is established and reliance on social proof is eliminated. Initially, a profile can have self-identified skills and proficiencies which become validated as relevant work and tags are assigned to the profile. As the network grows and expands, further depth will be added to a Cognitive Suppliers profile.

Competitions

The Competition is an incentive prize for a clear and measurable goal that is awarded to the first person/team to achieve it. A Competition is similar to a project adopted by the rLoop Network, but with several notable exceptions. Where a project inherently targets a solution, a Competition defines a problem and has no solution bias. A Competition can be launched by the rLoop Network in conjunction with external partners who sponsor a Competition. The Competition is open externally to the network and no teams are formally organised within the rLoop Network. Depending on the specific competition, certain resources may be made available by rLoop or external partners to the Competition participants. A prize is assigned to the Competition (which could be in RLP, another cryptocurrency, fiat, or a combination thereof), and the team successfully satisfying the goals of the competition are awarded the prize.

Using the competition mechanic, innovation and creativity is encouraged both internally and externally, and groups of collaborators form organically to solve incentivised problems. Because a competition is open externally to the rLoop Network, it provides an alternative opportunity to earn RLP Tokens.

¹⁷ https://en.wikipedia.org/wiki/Social_proof

Projects

Hyperloop

The same methods of travel available to us today were also available to our great-grandparents. These modes of transportation remain inefficient, unsafe, and environmentally destructive. Rather than pursuing incremental improvements to outdated systems, rLoop is disrupting the paradigm by creating fast, safe, efficient, economical, and sustainable travel with our Hyperloop technology. rLoop is democratising the Hyperloop, making its development accessible to the world - as it was intended to be. We've set new records in this field, winning global competitions and earning worldwide attention. rLoop has produced the first scalable prototype in the world using a completely crowdsourced model: from concept to design to manufacturing. This prototype is called the 'rPod'. The rPod uses an active magnetic levitation system in place of wheels to eliminate rolling resistance. The Hyperloop Tube is a controlled environment in which the rPod can operate. Reduced air pressure in the tube eliminates almost all air resistance. The result is an energy elegant system that is safe, sustainable, and fast.

The rPod has achieved several firsts for a Hyperloop prototype pod, including the first vehicle to demonstrate static levitation in a vacuum and the first vehicle with pressure vessel tested at vacuum and deemed capable of supporting human life. The rPod is also the first engineering system entirely designed and built by the crowd.

The rPod is a car without a road. In order to continue testing, certain facilities are required, namely a vacuum chamber and an open air track. The vacuum chamber is used to test compliance and performance in the vacuum of the Hyperloop. An open air track is the same as a Hyperloop tube, but without the tube. This is needed to test performance of the vehicle and its systems at speed. Pending results from testing and simulation, a full scale test track would be required to perform full systems testing. In order to secure these facilities, rLoop has partnered with Precision Building Group, who facilitated the same facilities for SpaceX.



rBridge

The rLoop Network is developing a new way to connect the online engineering community with offline makers and factories. The project, named 'rBridge', has a vision to create a world-wide prototyping platform enabling anyone to make any innovation a reality. Where the rLoop Network focuses on the design and engineering of radical innovations, rBridge will focus on prototyping, testing, and small series productions of these innovations. Together, the whole process from idea generation to market launch will be covered. rBridge will create a network connecting innovators to makers, focused on scalability, and capable of adapting with the technology of today and tomorrow. This model allows us to minimise capital expenditures, reduce our physical footprint, intelligently manifest geographically, source locally, and leverage local small and medium-sized enterprises (SME's).¹⁸

In order to permit collaboration of distributed rLoop members during manufacturing and testing, the development of remote mixed reality collaboration capabilities leveraging VR/AR technology and robotics is also being investigated for development by the rLoop Network. For more information, please visit: www.rloop.org/rbridge

rFlight

With advances in propulsion, energy, light-weight materials, and control and stability systems, the ability to create a personal flight device that is safe and accessible is within reach. rFlight is a project aiming to deliver a unique vehicle allowing anyone to experience true flight. The rFlight team offers a design that is safe, quiet, compact, and features vertical takeoff and landing (VTOL). In the matter of a few months, the rFlight team logged hundreds of hours in design and simulation to produce a thrilling design, dubbed 'a motorcycle for the sky'. For more information, please visit: www.rloop.org/rflight



¹⁸ https://en.wikipedia.org/wiki/Small_and_medium-sized_enterprises

The rLoop Network Token

The rLoop Network Token (RLP) is an ERC20 compliant token distributed on the Ethereum blockchain. It is designed for utility within the rLoop Network, capable of authenticating work, providing its holders the ability to submit project proposals, staking to projects for adoption by the rLoop Network, as participation fee for bounties, and for access to premium content. RLP will also be used to purchase services and products from rLoop Network portfolio companies.

Portfolio companies, such as the Hyperloop, are technologies that were developed in the rLoop Network and reach maturity or commercial viability, at which point they can be transferred along with the relevant team into new wholly owned entities and developed as independent portfolio companies. The rLoop Network Token (RLP) can be accrued by contributors and, in the event of a contributor being recruited to the rLoop Core Team or a portfolio company, a mechanism will be provided to convert the utility token into a future security token.

The rLoop Token Offering

RLP is designed to foster a decentralised ecosystem of innovation and community-focused collaboration, reimagining how amorphous communities can coordinate, and challenging modern organisational principles.

The Hyperloop and other projects intended to operate on the rLoop Network are cost intensive and low technology readiness level.¹⁹ We must develop the infrastructure to support hardware development: research & development facilities, manufacturing and testing capabilities (“rBridge”), component procurement, scaled and full size prototypes, and much more. We must also develop all of the necessary software for the rLoop Network itself: user interfaces, network infrastructure, monitoring, security, software support, and more. We must deploy the network, facilitate its growth to large scale, market to and onboard the Core Engineering Team, Cognitive Suppliers, external reviewers, attract key partners into the ecosystem, and more.

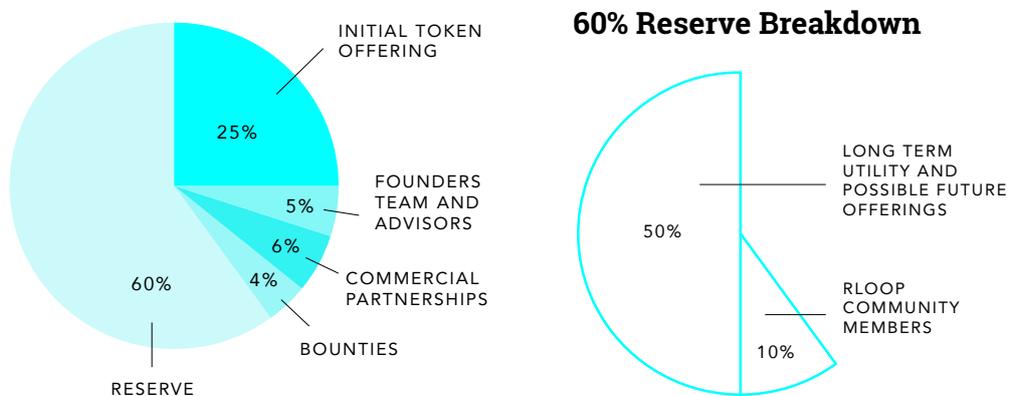
¹⁹ https://en.wikipedia.org/wiki/Technology_readiness_level

In order to bootstrap development, rLoop will conduct an Initial Token Offering. We hope to bring together a large, diverse, and distributed group of individuals. We want individuals to work closely with us to build a powerful network of minds. We want organisations from all over the world, who work in many different industries, who will work with and for the network. We want individuals and organisations who will add their skills, their knowledge, and their own networks to achieve long-term growth and success of the rLoop Network.

rLoop Token Offering Allocation



There will be a maximum lifetime supply of RLP tokens, set at 1,000,000,000. The token distribution is visible in the following chart:



The initial token offering phase is intended to propel development of the rLoop Network as well as several ongoing projects, most notably the Hyperloop, Hyperloop-derivative technology, and the rBridge project. While the entire ecosystem is designed to be sustainable, future RLP offerings from the reserve may be used to support increased growth. Potential future offerings from the reserve would only be approved pending consensus from existing RLP holders and the rLoop Core Team.

Resources from the RLP token offering are to be released in a phased, project-centric, and community-driven manner, with milestone-oriented allocation of funds and resources. This is intended to promote a focus on planning and process rather than capital collection, and mitigate a single person or small group from manipulating the community.

Following the end of the RLP token offering, there is a rest period before RLP is distributed. This allows for action to be taken in the unlikely event of an issue during the offering.



RLP allocated for the Founding Team will be distributed equitably among historic and existing team members based on historical collaboration and participation. This is a one time issuance. These tokens are subject to a vesting schedule as described later in this document.

Charitable Distribution



rLoop believes strongly in promoting and exciting future generations towards STEM²⁰ education. To this end, an allocation of profit rLoop earns is being distributed towards STEM charities, initially set at 2% of net profit. The respective beneficiaries of the rLoop Charity distribution are determined through signalling from the rLoop Community. The rLoop Charity Board is charged with performing due diligence on chosen beneficiaries as well as facilitating appropriate dispersal of funds.

Grant Distribution



An allocation of profit rLoop earns is being distributed as grants to fund basic research for PhD and Postdoctoral scholars, set at 1% of net profit. A “moving window” approach is suggested to define topics of interest for the grant in the current and upcoming periods. The exact grant period window length is currently undefined, and will be one of the initial tasks for the rLoop Grant Board.

Founding Team Vesting



The rLoop Network exists thanks to years of work from a diverse and distributed community of volunteers. These historical community members will be equitably distributed a number of tokens out of the Founding Team allocation. The rLoop Network will continue to enjoy success and growth through the continued work and participation of this community. Long-term vesting will incentivise members to improve the network and continue to add value for years to come. The Founding Team allocation will be subject to the following vesting schedule:

- At time of rLoop Network private launch, 30% of total Founding Team tokens will vest.
- At time of rLoop Network public launch, a further 30% of total Founding Team tokens will vest.
- One year after the rLoop Network public launch, 20% of total Founding Team tokens will vest.
- In the years that follow, 5% of total Founding Team tokens will vest annually until all Founding Team tokens will have been released.



²⁰ https://en.wikipedia.org/wiki/Science,_technology,_engineering,_and_mathematics

rLoop Token Offering



A multi-stage, tiered structure for the rLoop token offering will allow a wide variety of participants while ensuring the most interested and supportive individuals will have access to RLP. For more details including discounts and / or bonuses please see the rLoop website www.rloop.org

Roadmap



Details on the Roadmap will be available on the rLoop website: www.rloop.org

Future



rLoop believes there is exponential opportunity in the nascent blockchain space, and will play an active role in its future. Several areas of development would be of particular interest to the growth of the rLoop Network, and there are certainly others that remain to be identified.

Most notably, contracts and legal tasks are logical areas for on-chain management. Using distributed ledger technology, we can leverage the immutability of the blockchain to establish proof of authorship, as well as to manage the license, transfer, and acquisition of intellectual property on-chain. This is a nascent capability for blockchain technology, and one rLoop will play an active role in developing. Once it becomes possible to account for every piece along the chain of creation, we can measure the performance outcome of work contributed as well as the economic use and impact, and potential future rewards can be based on participation on a particular element. All of this can be enforced on the blockchain, and would optimise the process for protecting and rewarding intellectual property. Some existing work towards this is ongoing, such as the Mattereum project,²¹ which is working to bridge the digital-physical divide.

Another exciting potential opportunity exists in the integration of blockchain technology into the distributed manufacturing process. Some musings on this were recently made by Rob Thompson, a technology strategy consultant at Booz Allen Hamilton²² who worked on a blockchain case study for Airbus:

“Sensitive design data could be sent to any 3D printer in any country that wants to build Airbus’ 3D-printed parts, as long as it guarantees the quality and security standards as verified by the embedded smart contract. The same contract could enforce the immediate deletion of the data upon printing.”²³

²¹ <https://mattereum.com>

²² <https://www.boozallen.com>

²³ <http://www.airbus.com/newsroom/news/en/2017/03/Blockchain.html>

As further analysis, development, and testing of the rLoop Network, as well as favorable legal and regulatory environments develop, many opportunities aligned with our vision will become feasible. A constant view to identify, promote, and support growth in the blockchain space will be fostered by the rLoop Network.

Conclusion



Humanity's future will continue to be driven by technological and organisational innovation. The rLoop Network is designed to decentralise high technology, allowing individuals with shared interests to coordinate around projects, curate information and proposals, and actively participate in the development of potentially world-changing technology. We can realise exponential societal, cultural, and economical advancements through technological innovation, and we believe the best way to achieve these goals is by making it accessible. We are at the frontier of decentralised hardware development. We are connecting globally distributed talent and resources on historically localised opportunities. We are pioneering processes in collaborative virtual design and remote manufacturing. We are re-imagining how people work together, how they are recognised for their contributions, and how they are rewarded for their work. What is outlined above is based on our years of experience, but remains purposefully high level. The needs of each project will be unique, and we anticipate that as the community grows and collaborative technology matures the network will need to remain fluid and adaptive. Modularity is critical to sustainable growth.

When the untapped talent of millions of people has an outlet, the results are incredible. The rLoop Network is well situated to be at the forefront of technological innovation, and the global economy as a whole.



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