

Open Longevity Whitepaper

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1. Introduction

Open Longevity is a community of people united by a common goal – to find a cure against aging.

Based on the pace of technological progress, we assume that therapies that will slow aging down will be created in the coming years. The importance of these drugs cannot be overemphasized, because they will lead to healthspan and thus lifespan extension.

On the other hand, there is a huge risk for every single one of us that the necessary therapy will appear too late. This would be the greatest tragedy not to live up to therapy development, and we are counting years here. Our goal is to speed up the process.

Everyone can contribute by uploading their biomedical data, participating in clinical research, discussion and trials of new diagnostic methods, therapies, medical devices and software solutions.

To fund research in life extension is the most rational life strategy. There is a reason to believe that creation of a cure against aging will be the most profitable project in the history of the civilization.

Our project aims to develop Open Longevity community by creating an identically named Fund. The Fund will be spent on anti-aging clinical trials arrangement, both online and offline, as well as on the expert system development. The system will help run the trials and also work out youth extension personal strategy. The anticipated service will accumulate and analyze big biomedical data, evaluating valuable correlations.

All the collected information and developed materials, including trials' protocols and results, are to be absolutely open.

2. Industry review

2.1 Where's biology of aging now?

Aging is not a mandatory program for all living beings. There are several practically not aging animals. Their risk of death doesn't increase in time – they do not age. The most famous negligibly senescent mammals are [naked mole rat](#) and Brandt's bat.

Scientists were able to delay aging and extend lifespan of lab animals with different methods: from periodic fasting and drugs to gene therapy and

engineering. [Robert Shmookler Reis](#) managed to extend lifespan of a nematode worm 10-fold, [Rogina Blanca](#) increased the lifespan of a fly twice and [Andrzej Bartke](#) extended the lifespan of mice twice.

It has been shown in observational studies of large groups of people that diabetics, taking routine Metformin, are living longer than those free of the disease and not taking the drug. An interesting side effect is still not fully tested in clinical research despite the fact that FDA has approved the study. The reason is underfunding.

The science has also made significant progress in understanding the mechanisms of human aging: genomic instability, telomere attrition, epigenetic alterations, loss of proteostasis, deregulated nutrient sensing, mitochondrial dysfunction, cellular senescence, stem cell exhaustion, and altered intercellular communication.

There is a number of genes associated with aging and longevity: *ATP5*, *EP300*, *COX5*, *NUDUFA*, *NUDUFB*, *FOXO*, *PTEN*, *IGF1R*, *PRKAA*, *PIK3CG*, *CASP9*, *AKT*, *CYC1* and others. Changes in their expression lead to age-related diseases: Alzheimer's and Parkinson's diseases, several types of cancers. In general, age-related diseases often have a common genetic and epigenetic nature. This suggests that there is a [general mechanism](#) – we call it aging.

2.2 The main institutions and research groups

- [The Buck Institute for Research on Aging](#)
- [Institute for Aging Research, Albert Einstein College of Medicine](#)
- [Paul F. Glenn Center for the Biology of Aging, Harvard University](#)
- [Glenn Laboratory for the Science of Aging, MIT](#)
- [Yale Center for Research on Aging \(Y-Age\)](#)
- There are also UC Berkley, Gladstone Institutes, UC San Francisco, UC Davis research groups to mention in USA;
- [Institute of Ageing and Chronic Disease, University of Liverpool](#)
- [UCL Institute of Healthy Ageing](#)
- There are also 26 companies in [João Pedro de Magalhães's](#) list [Who's Who in Gerontology](#).

2.3 Conference on life extension

There are several dozens of scientific conferences and symposia on biology of aging held annually worldwide. According to our estimates they are visited by at least 15,000 people a year. The number of conferences and their scale grows likewise the number of labs and scientists involved in the research.

Gordon Research Conferences are a group of prestigious international scientific conferences covering frontier research in the biological, chemical, and physical sciences and their related technologies. Biochemical, genetic and physiological mechanisms of aging and age-related changes in humans and animals are presented at the [Biology of Aging Conferences](#) once in 24 months.

This year there will be the 12th annual [Harvard/Glenn Symposium on Aging](#) in Harvard Medical School. Scripps Florida [Symposium](#) on Biology of Aging is the one to mention. There's also [BAAM](#), Bay Area Aging Meeting, which is held every six months. And these are just some examples.

2.4 Databases

There are several [databases](#): 250 potential geroprotectors, which properties were observed on lab animals; thousands of human genes associated with longevity and aging, cellular senescence and response to different diets.

Many studies, which is often the case in biology, are very difficult to repeat, also some of them have been done on very small groups. In any case, all these data require further study and a larger number of experiments.

Among the drugs, shown geroprotective effects on humans, there's a few dozen to name, but they too require further research and what's more important, further research is required for their different combinations and personalized modes. Read more about these drugs [here](#).

In addition, there is for example [UK Biobank](#) database, tracking health of 500,000 older age volunteers for more than 10 years: blood and urine biomarkers, genomic and many other types of data, observed in dynamics, are of great interest for researchers of aging from all over the world.

The blog [Nestarenie.ru](#) is worth noting in Runet: thousands of scientific articles on correlation of various interventions and age-related diseases are analyzed and described.

3. Current industry problems

The major problem is that there is **no real cure against aging** on the market yet. Not enough laboratory research is being done, whilst clinical research, at best, is of geriatric nature. Pharmacies are flooded with supplements with unproven effects – those loud false promises damage the industry.

Problems that prevent our cure to appear can be divided into **scientific, infrastructure, awareness** and the resulting **political problems**.

3.1 Scientific problems

There is a lot biology of aging and medicine known already. We have success in life extension of lab animals, as well as significant progress in understanding of human aging mechanisms. But the search for a cure against old age is an incredibly difficult task. There are several issues that complicate the research impartially.

First, biomarkers panel. To conduct research on humans, i.e. clinical trials, we need a list of biological indicators to measure before and after the course of treatment. And the result should be seen within a reasonable period of time: several months to a couple of years.

Scientific groups from all over the world offer their methods of speed of aging and biological age diagnosis. [Horvath's Clock](#), the state of a cardiovascular system, patterns of locomotor activity, telomere length, [DNA methylation](#) patterns and more. All these [sets](#) of markers form a subject of complex scientific debate. The perfect panel of biomarkers is still to be established and it's a separate topic for research.

Second, it is still unknown to what state standard lab animals (mice, rats, nematode worms, flies, yeast, sometimes even apes and other) **are representative models of human aging.** For most (not all) diseases animal models which correlate with success in clinical practice are established. But for Alzheimer's disease, for example, such model is unknown – nothing has passed clinical trials, there are no statistics. It is not even clear what to measure in those cases. And it's the same for aging in general. No one knows how to test drugs.

Thirdly, there are a lot of drugs that extend lifespan of laboratory animals. These drugs affect common age-related pathologies mechanisms, i.e. mechanisms of aging, and are called prospective **geroprotectors**. Many of them have been in clinical practice for years already, they are prescribed and sold in pharmacies to treat people from diabetes, cardiovascular diseases, cognitive disorders and many more. Among them are well known Metformin, Aspirin, Rapamycin, a number of vitamins and many others.

But what is the problem then? **There are too many of prospective geroprotectors – more than 250.** And not only the drugs have to be tested individually but in combinations. The choice of the optimal combination is a complex task requiring algorithmic solutions and computational power.

3.2 Infrastructure problems

First, clinical trials.

Is there research of geroprotectors and their combinations on people? Trials to show the reduction of mortality from all causes? After all, the drugs have been on the market long enough to know everything about their pharmacokinetics, side effects are well known – there is so little to be done. But the answer is no, **no trials are being conducted.**

Science is also **aware of diets**, increasing lifespan and helping delay several age-associated diseases: there is data both on animals and in humans, the molecular paths are known, there are many observational studies. Are there clinical trials of these diets? No, or so little it's nearly insufficient.

Why is that? The thing is most of geroprotector drugs were discovered so long ago that one can not obtain the exclusive right to commercial use. **Pharmaceutical companies are not interested in trials we require**, especially, trials of diets.

Secondly, diagnosis of aging.

There are methods of early diagnostics for a wide spectrum of age-related diseases. Those that usually cause "death from old age": heart diseases, cancer, diabetes. It is a big mistake to assume that the risk of these pathologies is formed exclusively in the old age. That's why methods of diagnosis must be integrated in the clinical practice along with routine clinical examination and vaccinations. Unfortunately this approach does not seem to be crucial for medical community. From their point of view, the norm changes with age, so being sick becomes normal.

Thirdly, the difficulty of the launch of new lab research.

This is hardly a secret that talented scientists do not often have the capacity and resources in the field of marketing and legal support. A brilliant analytical mind does not always go with the talent of a speaker, blogger, sales manager or with money to cover all these gaps. Existing academic institutions do not always solve management problems but load scientists with them, distracting from the important lab work. And talented autodidacts involved in research activities on their own are devoid of even this minimal support.

So how does a person who has been studying biology of aging for the past few years, soaking thousands of scientific papers and relevant publications and happened to come up with multiple projects of creating therapy of aging, but who doesn't have the ability to self promote, implement his projects? No how. It is so difficult that almost impossible. And we are not referring to some hypothetical imaginary people here.

3.3 Awareness problems

We all know something about biology and medicine from school, some had biology classes in college, some have snatch reads in the Internet. But vast majority lacks basic knowledge and understanding, which is a paradox, since this is the basis of our own health!

And when it comes to the biology of aging, its achievements, meaning the possibilities that lay ahead – most people have never heard of non-aging animals, the genetics of aging and longevity and the fact that we have managed to extend animals' lives by two, ten times!

The majority of ordinary physicians also knows nothing about biology, nor anything about diagnosis of aging. Advanced training in this field for practitioners becomes vital for all of us.

Society does not require a cure for old age, because it is simply not aware of its possibility! Moreover, it is possible to create a cure in our lifetime.

At the same time people are interested in their health and anti-aging beauty procedures. Plastic surgery industry, fitness, diets, vitamins and supplements, mysterious rejuvenating treatments and expensive retreat clinics – all of it captivates consumers' attention and resources, giving them false hope.

We want people to have access to reliable information and to know how to analyze it.

3.4 Political problems

Let's call them political as problems that could be solved just changing the view, an official position. These problems often evolve from the previous class of issues – poor awareness.

Society does not recognize aging as a disease, perceiving it as something normal. Normal meaning that it has been and always will be, no reason to interfere. People often just don't know and don't bother to think about the fact that treatment of aging is possible. **Society doesn't create a social request for the cure against aging.** As for example it creates a request for a cure for cancer, infectious diseases and many others.

Biology of aging is gaining its momentum, but just a few allows themselves an open conversation on fight against aging – this wording somehow seems too radical, so it is not accepted. Even at conferences where potential therapies are discussed, scientific community is overly cautious in its statements.

As a voter does not require a cure, a scientist is not accustomed to raise his voice, the politicians are silent. Not to mention the fact that the politicians are ordinary people themselves. The same people that have never heard about the biology of aging. **It is very problematic being allocated state budgets in such conditions.** And non-state either.

4. Existing solutions and their weaknesses

4.1 FMD and Valter Longo research

It is a variant of [Valter Longo's](#) development FMD – Fasting Mimicking Diet – that we want to test in the first place. Several papers including the [results](#) of clinical trials have been published already. This is one of the few proven means of extending human lifespan.

What's the problem then? First, diet studies should still be conducted on larger groups (thousands, tens of thousands of people), ideally these studies should be multicentre – conducted at multiple independent centers and thus confirming their objectivity. Second, Longo commercialized his development by selling ready-made kits. But what about those who want to stick to a diet on their own? The recipes of the dishes are nowhere to be published, the amounts of ingredients are unknown. We want to make useful information available. And also test other variants of the recipes.

By the way, it's important to understand that certain substances in foods may also have similar geroprotective effect. What does extend lives of the patients exactly: reduced calories and the amount of protein or some ingredients in [Dr. Longo's composition of the diet](#)? We want to find out and to find the optimal geroprotective recipe of available products and supplements.

4.2 NIA (National Institute of Aging, USA)

National Institute of Aging, part of the National Institutes of Health (NIH), is the largest state organization sponsoring aging research in the world. [Here](#) is its budget distribution. Still mostly the focus of this institution is not preventive treatments research, but geriatrics, i.e. elderly treatment, terminal phase of aging.

It is worth noting the [Intervention Testing Program](#) of studying treatments with the potential to extend lifespan and delay disease and dysfunction, such as drugs, diets and other therapies or combination of therapies. It is usually a good choice of interventions, but that's just mice and just 3-5 interventions per year.

4.3 Chan Zuckerberg Initiative

CZI is going to [spend](#) a decent amount of money to cure, manage and prevent all disease. A new transparent research infrastructure is being created, The Cell Atlas Project and collaborations of all and everyone. But somehow, not a single word has been said that aging is the main cause of death and that the study of general mechanisms of age-related diseases could hold the key to “all disease”. To the most, at least. It’s unacceptable to talk about the fight against aging, though it is hard to imagine Mark Zuckerberg is not aware of the biology advances – Silicon Valley is monitoring biotech quite closely.

4.4 Calico

A Google-run health venture operates budgets comparable to the entire NIA’s funding, its official goal is to cure aging as a disease. Calico is not afraid of bold statements, since they’ve got computing power, money and access to the best scientists. What is the problem then? It has been four years already and still [nobody knows](#) if they managed to develop anything. The atmosphere of paranoid secrecy does not go with the modern trends of open collaborations, everything about Calico looks quite strange and suspicious.

Does Calico contribute to the fight against aging? No one knows for sure. The issue might be that **in a pursuit of a potentially highly profitable drug** the company has enclosed from the world and **is not receiving the necessary level of expertise**.

4.5 Patents involvement: Patients Like Me, Carenity, Human Health Research Project, Umotif

[PatientsLikeMe](#) platform is a social network of patients. Users upload their diagnoses, lists of medications, symptoms and external triggers etc. exchanging experience with other similar patients.

The company earns by selling aggregated depersonalized data to pharmaceutical companies, medical equipment manufacturers, clinical trials organisers and other business partners. At the same time, they provide information free of charge for academic and charitable institutions.

There is also a French, and now Italian, German, Spanish and English equivalent of PatientsLikeMe — [Carenity](#). The portal is exclusively applicable to companies conducting research.

In both services patients’ data is sealed for public non-academia projects.

[UMotif](#) is another app to help patients upload their information, accumulating a valuable research database.

[Human Health Research Project](#) (HHRP) is a nonprofit initiative and a mobile app, agitating everyone, healthy and sick, to enroll in clinical trials. This citizen science project is for those who want to benefit into research: fill out a mini questionnaire and get invited. The project is still under development, and the recruitment problem doesn't really seem acute to require a separate system. The developers hint longevity topic, but **it's unclear how they're going to solve the problem of the lack of studies.**

4.6 DNA tests and interpretation of their results

[23AndMe](#) and a number of other similar services offer affordable genome sequencing. The obtained data is interpreted for risk factors of hereditary diseases, reactions to certain drugs, food, physical features, etc. Not all companies give the interpretation in the form of health recommendations though. In these case services like [Self Decode](#) come handy.

The problem here is that these services consider genetic data in isolation from the ongoing analysis of the patient: blood, ultrasounds, etc. And they are not talking about aging.

4.7 Blockchain in Medicine

Gem, a company specializing in blockchain technology application, launched their [Gem Health](#) project in April to start cooperation with its first partner Philips. The company is also going to build a private blockchain for Ethereum in order to develop medical applications. The platform is focused on existing hospital infrastructure and business processes.

Australian startup **Brontech** is creating blockchain healthcare platform Cyph. It will be used to build a secure digital environment, allowing to store patient's personal data confidentially. Business model is based on users personal data resale for ad targeting.

[MedRec](#) (Israel) is a medical records management system using Ethereum blockchain that will allow access to medical documentation, including clinical trials data. The project is still in development; its goal is to create a log of electronic medical record and it aims to unite medical institutions, state institutions (in USA), pharmaceutical and insurance companies and medical startups.

Basically, this will be a decentralized storage of medical records generated by hospitals, government agencies and other traditional health system participants in order to make the data more accessible and understandable to an average user.

[Blockchain Health Co](#) uses blockchain to create a direct link between a medical researcher and a user. Unfortunately, this San Francisco based project gives the impression of a stalled one.

[PokitDok](#) is an online platform for integrating clinics and insurance companies. Optimization of insurance payments, the system backup schedule, shop and payment, including offline services, API for insurance companies, startups and other service providers – perhaps this one is the most advanced blockchain project of automating electronic health records and integrating different healthcare institutions data in the U.S. market. The project is focused on the United States exclusively.

Read more about blockchain in medicine [here](#).

5. What's Open Longevity?

Open Longevity is a Foundation initiating anti-aging clinical trials with fully transparent collection and expenditure of funds due to the application of blockchain technology. The Foundation will be replenished from different sources: at the initial stage due to ICO, then partially due to the functioning of the expert online system, partly through donations and contributions of the research participants – volunteers, interested in finding a cure for old age.

We are not going to protect therapies with IP's thus making research results publicly available. We want to channel energy of the patients into the research, and from our experience it is the policy of openness that has been attracting projects, funding and volunteers to us.

One of the most popular concerns in our industry is that once appeared on the market, a cure for old age will become an exclusive prerogative of the elite. Our open project is a possible solution to this problem.

Moreover, our openness and willingness to publish not only the results but also midway steps, including research protocols and all related materials, will give us **the highest level of expertise**. Cunningham's Law will perfectly work for us: *"The best way to get the right answer on the Internet is not to ask a question, it's to post the wrong answer."*

All clinical trials will be carried out strictly in accordance with the existing regulations. We will prepare brochures and experiment design descriptions, surveys and questionnaires, informed consent forms, permission of ethics committees; we will negotiate with laboratories, clinical institutions and biostatistician. **We will do what CRO** (Contract Research Organization), who traditionally conduct research for pharmaceutical companies, **usually does**. It's

just the client and the owner of the obtained data will be a completely different entity – a nonprofit patients organization.

Also **a distributed online platform for conducting clinical research remotely** will be developed under the Open Longevity brand. This will help to engage more participants, to simplify and reduce the cost of the trials themselves. Of course, not all the trials will take place online. But such a system will help us raise awareness about the Open Longevity project in particular and aging research in general.

The system will assist a client with a **personal anti-aging program**. Our goal is to transform each patient into a researcher. Whether you take medications, supplements or just experiment with your diet, we encourage you to run necessary tests and analyses before and after. We will help to carry out a correct diagnosis and suggest a list of interventions. **Paid service subscription will be an additional source of the project financing.**

It will give both you and us feedback whether the recommended intervention worked, while the platform will be gathering **big data on the effectiveness of potential therapies**. The data supposed to be stored on cloud storages or local drives connected to the Internet **providing access to research algorithms from all over the world**. We will have a large open database for bioinformatics enthusiasts willing to test their theories, but having no access to expensive information.

We want to involve patients in **global movement of research and trials of potential therapies**, that once proven their effectiveness, will immediately become a part of their own lives.

It is worth mentioning how our project contributes to the solution of the problems stated above:

1. **Scientific problems.** The very fact we push clinical trial industry will accelerate biomarkers panel development. The same with the representativeness of animal models. And our expert online platform will contribute to the computational solution of multiple combinations of geroprotectors on a certain stage of its development.
2. **Infrastructure problems.** Our project is an organizational solution itself. It helps run clinical trials as well as introducing diagnostics of aging into clinical practice. And yes, we would be happy to accept research projects from any sources. Of course with our expertise and voting of token holders.
3. **Awareness problems.** Are there many vegetarians who do not constantly talk about their diet you know? We expect our participants to become ambassadors of life extension. We will provide them with information. In particular, in the framework of our [Open Longevity schools](#). There's a video with English subtitles about our school [here](#).

4. **Political problems.** We will partly take over some government functions. Luckily cryptoeconomics allows it. We will protect the basic human political right – the right to life. At some point, it will be absolutely impossible to ignore a huge patients organization.

6. Groundwork

Open Longevity patients organization has been existing for more than a year already, uniting several hundreds of like-minded people from Russia and other countries. We managed to gather profiles of **hundreds of volunteers** in June-July of 2016 even with a very sketchy research plan description.

Team members personally and the project as a whole have its **loyal audience**. It has been formed through social media and related blogs, offline lectures and overall 9-year work of a public nonprofit [**Science for Life Extension Foundation**](#):

- The Foundation was created in Moscow in August 2008 to support and develop scientific research aimed at the development of methods for radical life extension.
- Since then four books were published, including quite a successful [Futurology](#) (M. Batin, A. Turchin), and a large [number](#) of brochures, leaflets, newspapers and other materials for scientific conferences were prepared.
- We love roadmaps, so have designed and published a [few dozens](#): from futurology and transhumanism to academic-level scientific maps like, for instance, Regenerative Medicine and the Mechanisms of Aging and Longevity, prepared with MIPT Center for Innovation and Komi Institute of Biology.
- There were two Genetics of Aging and Longevity international conference held: in 2012 in Moscow and in 2014 in [Sochi](#).
- Just previous year we gave about hundreds of [lectures](#) on anti-aging, not including [Open Longevity schools](#), one course of which holds a few dozens of classes, lectures, seminars and tests. We [discuss](#) biology of aging and involve students in various projects and collaborations. At school we also **conduct pilot studies**, serving meals matching content of our lectures and encouraging students to run blood tests before and after diet intervention. There already have been two schools with trials and several workshops.

Another important member of our team [NESTARENIE.RU](#) – meaning “not-aging” in Russian – is **the most popular Russian blog about anti-aging**: 4,000 unique visitors per day, 10,000-50,000 views per day on average.

Plus this is not only a blog but an expert system [prototype](#), which is based on the enormous work on the **analysis of scientific articles**. We plan to improve the prototype in the nearest future.

Leading Russian scientists cooperate with the project already. Together we've **planned our first studies**, including the combinations of [Sartans+Statins](#) drugs study as a potential therapy for atherosclerosis. Other projects are developing affordable analogue of an existing drug against atherosclerosis, testing variants of fasting mimicking diet, Metformin testing and verification of the senile dementia therapy effectiveness.

There is another working prototype our team has – a cloud service [CardioCloud](#) and a range of ECG Dongle devices, the cheapest ones in the world in terms of electrocardiogram registration and level of stress measurement. In addition, there is a developed and tested personal online medical record system, structured to store more than 100 health parameters. Geography of the project by may 2017 covers 63 countries and has more than 7,000 users. An automatically updating project worldmap is available [here](#).

7. Roadmap

7.1 Terms of fund expenses

Open Longevity fund can be spent on:

- Clinical trials conduction and all the needed preparation work;
- Open Longevity online expert system development and improvement;
- Open Longevity ideas popularization and promotion.

The functionality of the platform will vary depending on the fund collected. We'll elaborate in the description of the platform below.

Regarding the promotion of Open Longevity ideology, we are pledging 1% of the collected fund and subsequent income for it: running offline longevity schools and other lectures, visiting thematic events, like conferences, by team members, and other PR projects.

We are not setting the top border, as clinical research is enormously expensive. Preparation of the documents for a single clinical study costs \$50-100,000. But thanks to the professionals, loyal to our ideas, we can do this job for \$10,000. We estimate the costs of the diet study on 200 people to be worth about \$5M. But if we arrange a partial payment of the study by the participants, we will be able to reduce this amount to \$500,000.

Depending on success of the ICO phase, we'll implement the following steps:

1. If the fund is 10,000 to 15,000 ETH:
 - Documentation for the **first** clinical trial;
 - The launch of the Open Longevity platform, a personal online office for medical and biological records obtained from various sources (uploaded results of blood and urine analysis);
 - 15% of the collected funds will form the Open Longevity Foundation.
2. If the fund is 15,000 to 25,000 ETH:
 - Documentation for the **first two** clinical trials;
 - The launch of the Open Longevity platform, a personal online office for medical and biological records obtained from various sources (uploaded results of blood and urine analysis);
 - **The development of an expert system giving recommendations using obtained database;**
 - **20% of the collected funds will form the Open Longevity Foundation.**
3. If the fund is 25,000 to 35,000 ETH:
 - Documentation for the **first three** clinical trials;
 - The launch of the Open Longevity platform, a personal online office for medical and biological records obtained from various sources (uploaded results of blood and urine analysis);
 - The development of an expert system giving recommendations using obtained database;
 - **The launch of a pilot study on a group less than 50 people;**
 - **25% of the collected funds will form the Open Longevity Foundation.**
4. If the fund is 35,000 to 45,000 ETH:
 - Documentation for the first three clinical trials;
 - The launch of the Open Longevity platform, a personal online office for medical and biological records obtained from various sources (uploaded results of blood and urine analysis);
 - The development of an expert system giving recommendations using obtained database;
 - The launch of a pilot study on a group less than 50 people;
 - **The launch of the second pilot study on a group less than 50 people;**
 - **Adopted input interfaces development: mobile apps (iOS and Android), chatbots (WhatsApp, WeChat, Telegram, Snapchat, Facebook Messenger);**
 - **30% of the collected funds will form the Open Longevity Foundation.**
5. If the fund is more than 45,000 ETH:

- Documentation for the first three clinical trials;
- The launch of the Open Longevity platform, a personal online office for medical and biological records obtained from various sources (uploaded results of blood and urine analysis);
- The development of an expert system giving recommendations using obtained database;
- The launch of a pilot study on a group less than 50 people;
- The launch of the second pilot study on a group less than 50 people;
- Adopted input interfaces development: mobile apps (iOS and Android), chatbots (WhatsApp, WeChat, Telegram, Snapchat, Messenger Facebook);
- **The launch of the third pilot study on a group less than 50 people;**
- **Third-party medical services integration, including medical records, services, fitness bracelets and other electronic gadgets.**
- **13,500 ETH + everything above 45,000 ETH form the Open Longevity Foundation.**

7.2 Online platform for aging diagnosis and personal strategy to extend youth

First the user fills out the questionnaire to describe his basic medical history. In response, he receives a personalized list of recommended tests for his initial diagnostics. It's all free.

Next, the user is free to take the tests on his own and check whether his vitals are good from the common medicine point of view. And here we must say that geroscience considers the concept of 'good vitals' a little differently. In particular, we avoid the expression "You are good for your age". Our goal is to bring all the health indicators to the level of a younger organism.

Moreover, the reference values are refined regularly as new research papers are being published. We monitor those publications and provide different or more stringent interpretation of the test results.

In order to obtain the interpretation of the results and learn about existing options of therapies, the user can proceed to paid service. By subscription (\$10/month), the system will track the patient: transcript analyses, give and adjust recommendations according to current test results.

A patient will get a choice of options with probabilistic weights showing the percentage of efficiency and safety of a particular drug/diet/exercise. A person

will get a choice, whether to participate in a trial of a potentially more effective therapy or use clinically approved but less effective option.

As we'll give advice from aging treatment point of view, there won't be so many available effective therapies among the recommendations. We all know there's no cure for old age yet. But there will be proven therapies for age-related diseases and mostly – potential therapies. Thus people will be involved in clinical trials of therapies primarily useful for themselves.

So, once more, technical infrastructure of Open Longevity system:

1. Electronic medical records (EMR) for conducting personal information obtained from different sources. The system implies distributed and completely decentralized data storage.
2. The data of ordinary users and research participants processing system: information will be exported, compiled and analysed in a strictly anonymised manner. This will be an expert system giving recommendations and adjustments of therapies (diets and lifestyle including) for aging prevention.
3. Adapted data input interfaces: mobile applications (iOS and Android), chatbots (WhatsApp, WeChat, Telegram, Snapchat, Facebook Messenger).
4. Third-party medical services integration, including other EMR systems, fitness bracelets and other electronic gadgets. This will facilitate data cross-sharing with the purpose of thorough expert system training.
5. Project localization for the markets of USA, EU, China and South-East Asia, India, Middle East, Africa and Latin America. This will include system interface translation into main languages and integration with local services.

The stages of online platform development are add-ons of new types of data we will be able to process and interpret. At first we will be able to analyze the results of blood test, and then gradually add information from wearable devices, genomic data, etc.:

1. Standard laboratory tests: [blood](#), urine
2. The results of genetic tests
3. [Locomotor activity](#)
4. Somnography
5. Cardio-data
6. Microbiom structure
7. Image analysis: X-Rays, MRI, EEG, etc.
8. [Methylation signatures](#)

The list will be updating continuously with the diagnostic technologies development and biomarkers of aging clarification.

7.3 Why the types of biological data mentioned above are relevant to the diagnosis of aging?

The increase of intima-media thickness (IMT) of the carotid artery by only 0.1 mm increases the risk of heart attack by 15%, the risk of stroke by 18%, and also increases the risk of death from cardiovascular disease and death from all causes.

The level of IL-6 in plasma in the one-third highest values increases the risk of developing colon cancer up to 2.48 times, while lowering levels of IL-6 only by 1pg/ml reduces the risk of developing liver cancer by 12%. **High levels of IL-6 and high levels of C-reactive protein** greatly increase the risk of sudden death from heart disease. And their jointly high levels can predict a stroke with high probability. We can give more of these [examples](#).

Thus, through the analysis of many studies markers proven to reflect some of our aging rate and to predict risks of death from various diseases of aging have been selected.

We can examine these markers individually and determine the impact target for slowing down the development of signs of aging. These markers are also needed to evaluate the effectiveness of tested therapies. For example, we can evaluate the effectiveness of the cardiovascular system aging therapy or we can note the changes in probability of most common cancers emerging.

Thus, we can diagnose aging process and try to slow it down. [Read more](#).

7.4 First scheduled trials

We will immediately publish both midway and final trial results, all documentation, protocols and questionnaires, experiment designs of current and future research. Openness is our competitive advantage. It's hard to overestimate the idea of open trial protocols. Implementing this approach, we will receive the highest level of expertise in the world.

The first trials we plan to spend funds collected during ICO:

1. Longevity Diet-1 (LD-1). A variant of a fasting mimicking diet.
2. Alzheimer's disease and Vitamin B12
3. Atherosclerosis: Sartans+Statins

7.4.1 Longevity Diet-1 (LD-1)

Hunger has been a terrible disaster in the history of mankind. Hunger in nature is often detrimental, as it is not metered and is not allowing to obtain good nutrition.

However, short cycles of fasting with subsequent recovery feeding considerably extends lives of rodents and many other model animals. **The basic fasting mechanism of life extension** in animals is a temporary **decrease in the level of insulin-like growth factor of type 1 (IGF-1)** to reprogram stem cells with subsequent restoration of IGF-1 for turning reprogrammed stem cells for growth and renewal of tissues.

Not only fasting, but even reduced-calories extended lives of rhesus macaques, but not as much as lives of rodents. Why? In primates and humans, unlike rodents, low-calorie diet does not decrease the level of IGF-1 – it can only be decreased by hunger or reduced amount of animal protein in diet.

Interesting facts:

- Balanced low calorie diet for 2-4 years in Copenhagen and in Norway was associated with reduced human mortality by 20-34%.
- Cutting calories by 25-30% or fasting has shown reduced mortality in randomized controlled trials in young and elderly.
- One of the main mechanisms for achieving longevity and protection from cancer during fasting is the reduction of IGF-1 level. So people with Laron-type dwarfism, which is characterized by low level of IGF-1, do not get cancer. Mouse-dwarves with a similar syndrome, live 20-30% longer than average mice and develop cancer at much older age.
- Ashkenazi Jewish centenarians are known to have defect of the IGF-1 receptor.

So fasting can powerfully extend lifespan of many model animals. But fasting is not convenient. We can't take a 5-days vacation monthly. Plus while starving it's extremely difficult to work, there is a lack of energy.

A variant of fasting mimicking diet, Longevity Diet-1 (LD-1), is probably the safest and most effective way to temporarily reduce IGF-1 level without starving. And thus extend human lifespan and postpone a number of dangerous age-related diseases.

Studies have shown that fasting mimicking diet extended lifespan of long-living mice; mice improved motor coordination, memory, neurogenesis; it reversed (achieved remission) symptoms of multiple sclerosis in 20% of the cases; recovered pancreas cells in a model of type 2 diabetes; it reversed type 1 diabetes in the model of induced by streptozotocin type 1 diabetes.

These were all in mice, but fasting mimicking diet **also improved many markers of aging in clinical trials (human studies).**

[Read more...](#)

7.4.2 Alzheimer's disease and Vitamin B12

Vitamin B12 deficiency is associated with an increased risk of brain disorders with aging, including Alzheimer's disease. But as shown by meta-analyses and randomized controlled research on people aged 70 years and older, compensation deficiency of vitamin B12 does not improve cognitive functions.

As it turned out, it's not the level of vitamin B12 in blood that matters but its content in the frontal cortex. Even at its normal level in blood, the concentration of vitamin B12, especially its active form methylcobalamin, decreases in the frontal cortex after 60 years old 10 times and stays in deficit — even down to zero.

The thing is, transport (carriers and carrier mediators) activity reduces with age, so B12 cannot reach frontal cortex of the brain through the blood-brain barrier. The reduction of these conveyors begins to occur visibly already at the age of 40 and reaches critically low levels at around 60. Starting at 40 the brain begins to accumulate beta-amyloid and after 65 Alzheimer's disease starts to be diagnosed.

What are these carriers and carrier mediators? These are glutathione and megalin, which is partly involved in the amyloid brain liberation. Thus, increasing glutathione and megalin levels, as well as controlling the levels of vitamin B12 in the blood, it is likely to provide a sufficient level of B12 in the brain of older people and prevent a large percentage of cases of Alzheimer's disease.

[Read more...](#)

7.4.3 Atherosclerosis: Sartans+Statins

We want to test the effects of Sartans+Statins combinations in small therapeutic doses on the condition of vessel. Positive results will indicate a reduced risk of CVD in the near future and postponed pathologies development, which will become a direct opportunity to increase individual life expectancy.

A recently published [article](#) on biomarkers of aging has confirmed the right choice of indicators to measure. Researchers have shown that IL-6, C-reactive protein and cystatin C, which we have also chosen, grow with age. Adding intima-media thickness (IMT) to this list, we get the optimal biomarkers panel for this research.

Read more about Alexander Fedintsev research project on Sartans+Statins on the project [website](#).

8. Buyer's guide. Investment

To fundraise the development and to ensure the operation of the Open Longevity system, a fundraising phase, known as crowdsale, will be conducted. During crowdsale, people will be able to purchase YEAR tokens at fixed rate, granting token holders the right to get discounts for Open Longevity services and participate in voting.

YEAR tokens are developed using the Ethereum ecosystem, in particular, using the Token ERC20 standard. The ERC20 specification will be extended to allow voting.

8.1 Pre-ICO

The Open Longevity Smart Contract carries out the emission of YEAR tokens, the number of which is unlimited during Pre-ICO. Tokens are sold at a fixed price of $2,000 \text{ YEAR} = 1 \text{ ETH}$, i.e. twice cheaper than during the crowdsale. In case of a one-time investment of 150 ETH at once and more during Pre-ICO, there is a special price of $2,500 \text{ YEAR} = 1 \text{ ETH}$.

The purchase is carried out by transferring ether to the address of the smart contract, and the sender of the transaction becomes the owner of the purchased tokens. **Be careful and remember that you should not pay from an online wallet or from an account on a crypto exchange, which can lead to loss of control over the tokens you have purchased.**

The Pre-ICO duration is 14 days starting the launch moment. The minimum amount needed to complete Pre-ICO successfully is 1,000 ETH. If the necessary minimum funds is not collected during Pre-ICO, then all collected funds will be returned to investors, withholding commissions for transactions and gas costs.

All funds collected during Pre-ICO are transferred to the Team and should be spent on the following:

- Marketing and project promotion, preparation for crowdsale;
- Translation whitepaper into Chinese, German, French, Italian, Spanish and Ukrainian.

8.2 Crowdsale

The Open Longevity smart contract carries out the emission of YEAR tokens, the number of which is unlimited during crowdsale. Tokens are sold at a fixed price of $1,000 \text{ YEAR} = 1 \text{ ETH}$, i.e.

The purchase is carried out by transferring the ether to the address of the smart contract, and the sender of the transaction becomes the owner of the purchased tokens. **Be careful and remember that you should not pay from an online wallet or from an account on a crypto exchange, which can lead to loss of control over the tokens you have purchased.**

After the crowdsale is done, a one-time additional emission of 20% of total emission of tokens will be issued for the Team members. The crowdsale duration is 30 days from launch.

There is a system of discounts for early birds :

- 1,500 YEAR = 1 ETH during of the first day of crowdsale;
- 1,250 YEAR = 1 ETH during of the first week of crowdsale.

In case of a one-time investment of 300 ETH at once and more during the course of crowdsale, there is a special price of 1,750 YEAR = 1 ETH.

8.3 The expenditure of investment capital

The funds received during crowdsale are reserved to create Open Longevity infrastructure and conduct the first planned clinical trials. After that, no release of any new tokens takes place.

The minimum amount needed to run the Open Longevity project is 10,000 ETH. The distribution of the collected funds depends on their total volume, but in general it follows these rules:

- Part of the funds is allocated to the project team immediately after the completion of crowdsale by transferring funds to a multilevel address with the signatures of the CEO and CTO of the project. The funds are spent on the development of technical infrastructure (49.5%), the first planned clinical trials (49.5%) in accordance with the plan established in the roadmap, marketing and promotion of the project (1%).
- Part of the funds remains under the management of the Open Longevity smart contract and form the Open Longevity Foundation, the funds of which are allocated for clinical research and other projects in the field of radical life extension based on the general vote of YEAR token owners. The initial size of Open Longevity Foundation depends on the amount of funds collected during crowdsale:
 - 15%, if 10,000 to 15,000 ETH are collected;
 - 20%, if 15,000 to 25,000 ETH are collected;
 - 25%, if 25,000 to 35,000 ETH are collected;
 - 30%, if 35,000 to 45,000 ETH are collected;
 - 13,500 ETH + all collected funds above 45,000 ETH, if more than 45,000 ETH are collected.

If minimum necessary for launching Open Longevity project funds are not collected during crowdsale, then all collected funds are returned to investors, withholding commissions for transactions and gas costs.

Funds of Open Longevity Foundation can be spent on:

- Clinical trials conduction and all the needed preparation work;
- Open Longevity online expert system development and improvement;
- Open Longevity ideas popularization and promotion.

Any owner of at least 0.1% of the total emission of YEAR tokens can offer his project for free for the owners of tokens to vote within the framework of Open Longevity smart contract. If the initiator doesn't hold any or holds less than 0.1% of total emission of tokens, he can still propose his project for realization, after paying for project placement the non-refundable fee of 1 ETH, regardless of the result of the vote.

To place the project to the voting, its information card should be published on any public resource and a request for a smart contract should be made, specifying the required funding and links to a publicly available information card. If the requested sum of funding is not available in Open Longevity Foundation, the project is rejected by smart contract at the stage of placement.

The information card of the project, placed to be voted on, should contain a detailed description of the composition of the project, its objectives, design of the experiment, timing and budget. A necessary requirement for the projects being placed is their compliance with the goals and mission of Open Longevity project, that is, argumentation of a significant impact on increasing human life extension or developing and popularizing the Open Longevity service. All the results of the projects must be open and accessible to the whole of humanity.

Voting for the project is established to last 7 days from the moment of placing the smart contract request.

Owners of YEAR tokens vote for the placed projects, with the voice of each owner proportional to the number of YEAR tokens available in the total emission. If the project collects more than 50% plus 1 vote of the total number of voted tokens, the requested amount is transferred from the Open Longevity Foundation to the initiator's address.

8.4 Burning of tokens

There is a possibility to burn tokens by their owners. When burning, tokens are taken away from circulation (the total number of tokens), and their owner receives funds from Open Longevity Foundation to his address, in proportion to the number of burned tokens in the total YEAR token emission. This will ensure the minimum security of the YEAR token according to the level of the total

amount of money. The burning of tokens is allowed no earlier than 1 year after the end of the crowdsale.

8.5 Donations

Open Longevity Foundation can also be funded by donations from any individuals and companies.

9. Conclusion

Open Longevity project implementation has been possible due to development of blockchain technology, the emergence of a mass-market affordable diagnostic devices for personal use, analytical big data algorithms for early detection of a wide range of different diseases and to general scientific movement and understanding of slowing aging down.

Further big data technology, artificial intelligence and wearable devices development will radically change early diagnosis approach and the landscape of the healthcare system as a whole.

A global shift from the restoration of the lost health to disease prevention is inevitably, but is not possible without data processing automatization.

Our system will be designed to become the unseen health guardian of every resident of planet Earth, a sleepless eye, watching him and guarding from possible threats.

Not to mention the global contribution of our project to the development of blockchain community. Our system can become a driver of blockchain technology and cryptocurrency promotion among broad layers of the population of the entire planet, bringing millions of new users from all around the world to blockchain community, increasing the total volume and the relevance of a blockchain economy as a whole!

In the end the blockchain community will be able to live longer and then some enjoying all the benefits of the blockchain.

10. Team members

Mikhail Batin, CEO

President and founder of Science for Life Extension Foundation, entrepreneur, politician, president and co-founder of the [United Consultants FDP](#) company. Michael is a successful producer in Longevity area, has held several international

conferences, launched startups and reached significant results in promotion of transhumanism ideas in Russia as well as in English-speaking countries.

Ilya Svirin, CTO

PhD in Tech Science, technology entrepreneur, founder of the Nordavind group of companies, technology developer of digital video surveillance systems, personal equipment and health services, including the world famous Cardio Flash Drive ECG Dongle and Cardio Cloud service. The author of numerous scientific publications on issues of information security and theoretical foundations of programming.

Anastasia Egorova, PR

Vice-president of Science for Life Extension Foundation with background in biophysics (MIPT). A successful designer and architect in the past, also a certified specialist in the field of copywriting and art direction in advertising.

Ivan Pisarev, sales and marketing

A transhumanist, visionary, marketer, 15 years in IT product sales, head of international direction of the Nordavind group of companies.

Sergey Rostovikov, senior-developer

System programming, development of highly reliable client-server applications, development and implementation of cryptographic algorithms.

Alexey Rytikov, system architect

Designing architecture of complex software systems, implementation of applications and services based on web technologies.

Andrey Ilyukhin, junior-developer

Development and testing of smart contracts. Applied programming.

Lyubov Kuznetsova, tester

Developing test cases, testing, test automation.

Dmitry Veremeenko, science analyst

A valueology specialist, autodidact and an analyst of aging therapies recognized among the official scientific community.

Денис Варванец, science analyst

Researcher of anti-aging and functional medicine, biohacking. Specialist in strategic planning.

Sergey Kobelev, ux/ui-designer, developer

Development of prototypes, design layouts. Improvement of user interaction and interfaces.

Alexander Fedintsev, science adviser

Bioinformatician and biostatistician, research analyst; developer of [methods](#) for determining the biological age based on the indices of vascular health; author of several scientific publications and is a leading co-author of A. Moskalev's "[Potential geroprotectors](#)" book.

Nikolay Sidorov, adviser

Vice-President of the [PolyLab](#) company – biotechnology in the pharmaceutical industry. In the past, Vice-Governor of Primorsky Krai and the Deputy chief of Political Department of the Presidential Administration of Russian Federation.

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2. [Institute for Aging Research, Albert Einstein College of Medicine](#)
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11.3 Clinical trials

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9. [Sartans+Statins Project \(Open Longevity\)](#)

12. Open Longevity smart contract

/*

This file is part of the Open Longevity Contract.

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*/

```
pragma solidity ^0.4.0;
```

```
contract owned {  
    address public owner;
```

```
    function owned() {  
        owner = msg.sender;  
    }
```

```
    modifier onlyOwner {  
        require(owner == msg.sender);  
        _;  
    }
```

```
    function changeOwner(address _owner) onlyOwner public {  
        require(_owner != 0);
```

```

        owner = _owner;
    }
}

```

contract Crowdsale is owned {

```

    uint256 public totalSupply = 0;
    mapping (address => uint256) public balanceOf;

```

```

    enum State { Disabled, PreICO, CompletePreICO, Crowdsale, Enabled }
    State public state = State.Disabled;
    event NewState(State state);
    uint public crowdsaleFinishTime;
    uint public crowdsaleStartTime;

```

```

    modifier enabledState {
        require(state == State.Enabled);
        _;
    }

```

```

    struct Investor {
        address investor;
        uint    amount;
    }
    Investor[] public investors;
    uint public    numberOfInvestors;

```

```

    function () payable {
        require(state != State.Disabled);
        uint256 tokensPerEther;
        if (state == State.PreICO) {
            if (msg.value >= 150 ether) {
                tokensPerEther = 2500;
            } else {
                tokensPerEther = 2000;
            }
        } else if (state == State.Crowdsale) {
            if (msg.value >= 300 ether) {
                tokensPerEther = 1750;
            } else if (now < crowdsaleStartTime + 1 days) {
                tokensPerEther = 1500;
            } else if (now < crowdsaleStartTime + 1 weeks) {
                tokensPerEther = 1250;
            } else {
                tokensPerEther = 1000;
            }
        }
    }

```

```

    }
    if (tokensPerEther > 0) {
        uint256 tokens = tokensPerEther * msg.value /
10000000000000000000;
        if (balanceOf[msg.sender] + tokens < balanceOf[msg.sender]) throw; //
overflow
        balanceOf[msg.sender] += tokens;
        totalSupply += tokens;
        numberOfInvestors = investors.length++;
        investors[numberOfInvestors] = Investor({investor: msg.sender,
amount: msg.value});
    }
    //if (state == State.Enabled) { /* it is donation */ }
}

```

```

function startTokensSale() public onlyOwner {
    require(state == State.Disabled || state == State.CompletePreICO);
    crowdsaleStartTime = now;
    if (state == State.Disabled) {
        crowdsaleFinishTime = now + 14 days;
        state = State.PreICO;
    } else {
        crowdsaleFinishTime = now + 30 days;
        state = State.Crowdsale;
    }
    NewState(state);
}

```

```

function timeToFinishTokensSale() public constant returns(uint t) {
    require(state == State.PreICO || state == State.Crowdsale);
    if (now > crowdsaleFinishTime) {
        t = 0;
    } else {
        t = crowdsaleFinishTime - now;
    }
}

```

```

function finishTokensSale() public onlyOwner {
    require(state == State.PreICO || state == State.Crowdsale);
    require(now >= crowdsaleFinishTime);
    if ((this.balance < 1000 ether && state == State.PreICO) &&
(this.balance < 10000 ether && state == State.Crowdsale)) {
        // Crowdsale failed. Need to return ether to investors
        for (uint i = 0; i < investors.length; ++i) {
            Investor inv = investors[i];
            uint amount = inv.amount;

```

```

        address investor = inv.investor;
        balanceOf[inv.investor] = 0;
        if(!investor.send(amount)) throw;
    }
    if (state == State.PreICO) {
        state = State.Disabled;
    } else {
        state = State.CompletePreICO;
    }
} else {
    uint withdraw;
    if (state == State.PreICO) {
        withdraw = this.balance;
        state = State.CompletePreICO;
    } else if (state == State.Crowdsale) {
        if (this.balance < 15000 ether) {
            withdraw = this.balance * 85 / 100;
        } else if (this.balance < 25000 ether) {
            withdraw = this.balance * 80 / 100;
        } else if (this.balance < 35000 ether) {
            withdraw = this.balance * 75 / 100;
        } else if (this.balance < 45000 ether) {
            withdraw = this.balance * 70 / 100;
        } else {
            withdraw = 13500 ether + (this.balance - 45000 ether);
        }
        state = State.Enabled;
        // Emit additional tokens for owner (20% of complete totalSupply)
        balanceOf[msg.sender] = totalSupply / 4;
        totalSupply += totalSupply / 4;
    }
    if (!msg.sender.send(withdraw)) throw;
    NewState(state);
}
delete investors;
NewState(state);
}
}

```

contract Token is Crowdsale {

```

    string public standard    = 'Token 0.1';
    string public name        = 'YEAR';
    string public symbol      = "Y";
    uint8 public decimals     = 0;

```

```

modifier onlyTokenHolders {
    require(balanceOf[msg.sender] != 0);
    _;
}

mapping (address => mapping (address => uint256)) public allowed;

event Transfer(address indexed from, address indexed to, uint256 value);
event Approval(address indexed owner, address indexed spender, uint256
value);
event Burned(address indexed owner, uint256 value);
event DivideUpReward(uint total);

function Token() Crowdsale() {}

function transfer(address _to, uint256 _value) public enabledState {
    require(balanceOf[msg.sender] >= _value);
    require(balanceOf[_to] + _value >= balanceOf[_to]); // overflow
    balanceOf[msg.sender] -= _value;
    balanceOf[_to] += _value;
    Transfer(msg.sender, _to, _value);
}

function transferFrom(address _from, address _to, uint256 _value) public {
    require(balanceOf[_from] >= _value);
    require(balanceOf[_to] + _value >= balanceOf[_to]); // overflow
    require(allowed[_from][msg.sender] >= _value);
    balanceOf[_from] -= _value;
    balanceOf[_to] += _value;
    allowed[_from][msg.sender] -= _value;
    Transfer(_from, _to, _value);
}

function approve(address _spender, uint256 _value) public enabledState {
    allowed[msg.sender][_spender] = _value;
    Approval(msg.sender, _spender, _value);
}

function allowance(address _owner, address _spender) public constant
enabledState
    returns (uint256 remaining) {
    return allowed[_owner][_spender];
}

function burn(uint256 _value) public enabledState {
    require(now >= crowdsaleFinishTime + 1 years);

```



```

        require(balanceOf[msg.sender] >= _value);
        balanceOf[msg.sender] -= _value;
        totalSupply -= _value;
        Burned(msg.sender, _value);

        // Send ether to caller
        uint amount;
        if (totalSupply == 0) {
            amount = this.balance;
        } else {
            amount = (this.balance * _value) / totalSupply;
        }
        if (!msg.sender.send(amount)) throw;
    }
}

contract OpenLongevity is Token {

    function OpenLongevity() Token() {}

    event Deployed(address indexed projectOwner, uint weiReqFund, string
urlInfo);
    event Voted(address indexed projectOwner, address indexed voter, bool
inSupport);
    event VotingFinished(address indexed projectOwner, bool inSupport);
    event Payment(uint service, uint any, address indexed client, uint amount);

    struct Vote {
        bool    inSupport;
        address voter;
    }

    struct Project {
        uint    weiReqFund;
        string urlInfo;
        uint    votingDeadline;
        Vote[] votes;
        mapping (address => bool) voted;
        uint    numberOfVotes;
    }
    mapping (address => Project) public projects;

    function deployProject(uint _weiReqFund, string _urlInfo) public payable
enabledState {
        require(msg.value >= 1 ether || balanceOf[msg.sender]*1000/totalSupply
>= 1);

```

```

    require(_weiReqFund > 0 && _weiReqFund <= this.balance);
    require(projects[msg.sender].weiReqFund == 0);
    projects[msg.sender].weiReqFund = _weiReqFund;
    projects[msg.sender].urlInfo = _urlInfo;
    projects[msg.sender].votingDeadline = now + 7 days;
    Deployed(msg.sender, _weiReqFund, _urlInfo);
}

```

```

function projectInfo(address _projectOwner) enabledState public
returns(uint _weiReqFund, string _urlInfo, uint _timeToFinish) {
    _weiReqFund = projects[_projectOwner].weiReqFund;
    _urlInfo = projects[_projectOwner].urlInfo;
    if (projects[_projectOwner].votingDeadline <= now) {
        _timeToFinish = 0;
    } else {
        _timeToFinish = projects[_projectOwner].votingDeadline - now;
    }
}

```

```

function vote(address _projectOwner, bool _inSupport) public
onlyTokenHolders enabledState
returns (uint voteId) {
    Project p = projects[_projectOwner];
    require(p.voted[msg.sender] != true);
    require(p.votingDeadline > now);
    voteId = p.votes.length++;
    p.votes[voteId] = Vote({inSupport: _inSupport, voter: msg.sender});
    p.voted[msg.sender] = true;
    p.numberOfVotes = voteId + 1;
    Voted(_projectOwner, msg.sender, _inSupport);
    return voteId;
}

```

```

function finishVoting(address _projectOwner) public enabledState returns
(bool _inSupport) {
    Project p = projects[_projectOwner];
    require(now >= p.votingDeadline && p.weiReqFund <= this.balance);

    uint yea = 0;
    uint nay = 0;

    for (uint i = 0; i < p.votes.length; ++i) {
        Vote v = p.votes[i];
        uint voteWeight = balanceOf[v.voter];
        if (v.inSupport) {
            yea += voteWeight;
        }
    }
}

```

```

        } else {
            nay += voteWeight;
        }
    }

    _inSupport = (yea > nay);

    if (_inSupport) {
        if (!_projectOwner.send(p.weiReqFund)) throw;
    }

    VotingFinished(_projectOwner, _inSupport);
    delete projects[_projectOwner];
}

function paymentForService(uint _service, uint _any) payable enabledState
public {
    Payment(_service, _any, msg.sender, msg.value);
}
}

```