Health Information Traceability Foundation

A Blockchain-based Online Marketplace for Personal Health Data

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1 The icon shows a mitochondrion which is an organelle found in all eukaryotic organisms. It generates most of our cell's energy. Due to the fact that its DNA is inherited from the mother, it can be used to trace our ancestry and uncover the evolutionary history of populations.
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Important Notice

The purpose of this Whitepaper is to provide to potential participants (the "Participants"), also in connection with the proposed Token Generating Event ("TGE") of the Health Information Traceability (HIT) Foundation (the "HIT Foundation"), relevant and reasonable, even though not comprehensive, technical and operational information with regard to the projects set forth herein and their rationale in order for them to determine whether to undertake a thorough analysis of the HIT Foundation and its projects with the intent of acquiring HIT tokens.

For potential Participants it is essential to know, however, that the HIT Foundation and all its projects set out in this Whitepaper are currently under development and not in use yet. Therefore, no warranties or representations can be, and are made as to their successful development, implementation or deployment, or achievement of any other activities described in this Whitepaper, and any warranties implied by law or otherwise are – to the extent permitted by law – entirely waived.

Before participating in the HIT Foundation’s TGE, a Participant must have read and understood, too, the respective legal information contained in chapter 9 of this Whitepaper with regard to the aforementioned topics. Furthermore, the HIT Foundation published its Terms & Conditions for the TGE (the "Terms"), which are available on https://hit.foundation/tge/terms/. This information must also be read, understood and consented to by a Participant.
1 Abstract

The Health Information Traceability (HIT) Foundation offers a distributed online marketplace for personal health data that allows users and patients to trace data usage and participate in its monetization. The user/patient is the one granting access to his data under a smart contract that determines the conditions of the data usage by information seekers such as market researchers, academic institutions or hospitals. HIT Foundation is the first ecosystem that allows everybody to get rewarded for sharing health information digitally instead of paying others to process or store it. The HIT token is used as an incentive and aligns the motivation of all network participants. At the same time, blockchain technology allows to maintain the privacy of the user/patient. The distributed system supports the global execution of new or existing business cases for information seekers on top of the HIT platform without the need for intermediaries.
2 Value Proposition

The Health Information Traceability (HIT) Foundation is the proposition of a distributed online market place for health information that powers a global data driven healthcare system. This is only possible if users/patients are enabled and motivated to use digital solutions to share their health-related data. Therefore, the following prerequisites have to be fulfilled:

1. Interoperability: Motivating users/patients to digitalize their health-related data and share them according to established standards.
2. Incentives: Giving the user/patient the opportunity to a) earn a token in exchange for data and b) redeem bonuses for the tokens earned.
3. Privacy: Putting users/patients at its center and in control over their personal health data.

Such a distributed ecosystem can be implemented with blockchain technology, making transaction processes transparent and more efficient at the same time. A blockchain-based token system is predestined to align incentives among ecosystem participants, e.g. providers of health-information and those who want to analyze health data. It allows the latter to have direct access to providers of health information without the need for intermediaries. A non-profit foundation builds and maintains the HIT infrastructure in order to enable the distributed business model. At the same time it puts users/patients in control of the use and monetization of their health data.

3 Introduction

In healthcare tremendous amounts of data are generated by medical documentation, regulatory requirements, and patient care. In addition, precision medicine and the general trend to digitalization in healthcare lead to a constant rise of data being gathered on the individual user or patient’s level. Another driving force in this massive growth of data is the user/patient himself, e.g. when using a fitness app. According to PwC the global connected health market is worth 61 billion USD by 2020 with an annual growth rate of 33%. In a recent survey in Switzerland 43% of all people would be willing to give personal data to medical research, either for free or for a reduction of their health insurance premium. In France 99% of all internet user would share personal information if they receive cash rewards in return.

3.1 Lack of interoperability, incentives & privacy

But the reality is, that very often this data cannot be shared due to a lack of interoperability, i.e. it is being stored in one application or in a non-standardised format that cannot be utilized by other applications. Sometimes it is still on paper, although we know that sharing data digitally can save lots of money. The Health Insurance Portability and Accountability Act (HIPAA) or the Swiss national patient record (EPD) are examples of how the interoperability problem is being tackled with substantial investments from the government side.

Besides the lack of interoperability the missing incentives, for the creators of health data is the major reason why data is not being shared digitally or digitized in the first place. Cost saving effects of sharing data digitally often do not occur where the work has been done. In case of the individual patient it is hard to motivate him or her to transmit and share health data, unless there are clear benefits in doing so.

Privacy concerns are the third reason why users/patients are reluctant to share personal data. They either do not trust the data security measures or are concerned that businesses
hand on their data to third parties\textsuperscript{11}. Recent cases don’t help in that respect, where patient records were analyzed in order to improve AI applications via machine learning without the patients’ consent\textsuperscript{12} or where hospital systems have been hacked\textsuperscript{13}. Whoever deals with patient’s data should be concerned how to secure and audit data. Especially considering that from May 2018 the European General Data Protection Regulation (GDPR) is enforced and users/patients must be able to trace their data and exert the right to have data deleted.

It appears that the current healthcare system and the health-IT infrastructure are not prepared for the challenges that it faces in order to take advantage of a seamless data exchange. Moreover, under those circumstances it is not possible to reduce cost of operations by optimising processes or applying new business models in healthcare.

### 3.2 Value of health data

As mentioned earlier, the user’s/patient’s data is being used by companies to earn money\textsuperscript{14}, e.g. by pharmaceutical companies or by companies building decision support systems such as IBM Watson\textsuperscript{15}. An even bigger market seems to be fitness and health data collected with smart phones or with IoT devices such as Amazon Echo\textsuperscript{16}. Right now all FAMGA\textsuperscript{17} companies bet on healthcare as we can see by the products developed and companies acquired\textsuperscript{18}.

In the light of these developments, Nathan Eagle, CEO of Jana argues that the data economy offers few benefits to those who create valuable personal data:

*“Today, the individual users of the internet are at the bottom of a broken economy. Value that is generated from individual data is being collected by third parties, and sold on to any cash-rich organization that is willing to buy it. The data generator receives nothing for their input.”* \textsuperscript{19}

There are only estimates what personal health data are worth, but it can be deducted from what companies are willing to invest in order to gather those data. IBM bought Truven Health Analytics for $2.6 billion in order to train Watson on 200 million patient records, meaning that one record was worth 13 USD. Which is a low price if you take into account what pharmaceutical companies invest in order to gather real-world evidence (RWE). At the eve of an outcome-based drug pricing this kind of data becomes important for the pharmaceutical industry to prove that a medication is effective\textsuperscript{20}. In some RWE studies the price per patient data set can exceed GBP 28'000\textsuperscript{21}. These are just extremes of a distribution with the *real* value of health-related data somewhere in the middle. Prices that are being paid for so called post market surveillance might be a better indicator, with an average of 441 Euros per patient paid to the physician providing the data\textsuperscript{22}.

It is noteworthy that the lion’s share of the costs for gathering these data is caused by the process of collecting the raw data from the participating patients and health care professionals involved. Refining and standardizing those data to be able to run the data analysis is the other cost driving factor. This is the job of intermediaries that organize the study population and audit the data, in order to avoid fraud.

This is where a blockchain-based solution can lead to process optimization because it can be queried for study participants. The ability to directly access patients would dramatically lower administrative costs and speed-up the data collection. Transfer of data can be direct, secure and transparent by securing the identity of the person at the same time.

It should be stressed that research is only one use-case in healthcare where a blockchain-based system is able to directly connect creators of health-information and those who want to utilize health data (see chapter 5.3 Use Cases).
3.3 Blockchain Technology in Healthcare

A majority of decision makers in healthcare expect a rapid adoption of blockchain based applications. More than 80 percent expect a widespread blockchain adoption within five years, with research in the precision medicine field leading the way.\textsuperscript{23} First solutions in the area of secure exchange of healthcare-data are being implemented, e.g. MedRec project\textsuperscript{24}; or Guardtime securing Estonia’s national health record.\textsuperscript{25}

The potential of blockchain technology beyond cryptocurrency becomes apparent as Brian Behlendorf, Executive Director of Hyperledger indicates:

“There’s an opportunity to capture the holy grail of health IT, which is to put the patient back in the center of their care. We can provide much more transparency balanced against confidentiality. We can change the landscape of that by adopting blockchain – and hopefully cut the costs of bureaucracy and overhead that make healthcare so expensive.”\textsuperscript{26}

The major reason why the use of blockchain in healthcare is gaining support is security and privacy. Due to the distributed ledger technology nobody is the owner and it has no single point of failure. It is open and every transaction is stamped and recorded, which is important especially in medical research. Security and privacy are built into the system as well as smart contracts, where transactions are triggered automatically once certain prerequisites are fulfilled. Hence, transaction costs are dramatically reduced. “Smart contracts can be understood as software agents, which act deterministically and autonomously, within the scope of a given network, according to a predefined rule set.”\textsuperscript{27}

In the context of blockchain, a token is a digital identity for something that can be owned and exchanged in a smart contract system.

3.4 Transforming healthcare

Blockchain technology has the potential to change the healthcare system like it does in the world of finance. It is not another technology to optimize existing processes and leave all the stakeholders in place! Table 1 describes the fundamental differences how transactions, especially between the user/patient and other stakeholder are performed.

Table 1. Difference between traditional data exchange and HIT ecosystem.

<table>
<thead>
<tr>
<th>Traditional data exchange</th>
<th>HIT – patient centric data exchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralized IT-infrastructure</td>
<td>Distributed ledger with no single point of failure</td>
</tr>
<tr>
<td>Intermediaries manage the data transfer</td>
<td>direct transfer between data creator and seeker</td>
</tr>
<tr>
<td>privacy and security managed by provider of IT-infrastructure</td>
<td>privacy and security by design</td>
</tr>
<tr>
<td>no control of user over use of data by 3rd parties</td>
<td>User has full control over data access</td>
</tr>
<tr>
<td>Transparency depends on the intermediary</td>
<td>All transactions are transparent</td>
</tr>
<tr>
<td>Complex and expensive administration</td>
<td>Automated process execution by smart contracts</td>
</tr>
<tr>
<td>No or little incentives for data creator</td>
<td>incentives are an essential part of data exchange</td>
</tr>
<tr>
<td>Low level of digitalization of health-related data</td>
<td>100% digitalization of health-related data</td>
</tr>
</tbody>
</table>
All stakeholders that base their business model on transactions or gathering of data have to adapt or will be superfluous. Benefits and profits from the use of the user’s/patient’s health-related data will go directly to the user/patient. The token gives health information a value based on supply and demand. New business models can evolve with direct access to the user/patient, making healthcare more affordable and improve the quality of care.

4 Solution

The current version of the solution serves as a general description how the system is going to be implemented in a MVP until February 2018. The preparation phase (see 7.2 TGE Schedule) will be used to develop the technical specifications and perform system tests.

4.1 Online Marketplace for Personal Health Data

It should be stressed that the HIT-system is only the enabler of an ecosystem where users/patients can monetise their personal-health data and data seekers can access data in a much more efficient, hence faster and even cheaper way. Like Uber or Airbnb that are online marketplaces for mobility and accommodation, HIT it is an online marketplace for personal health data with the user/patient in control. However, unlike Uber or Airbnb the HIT platform is distributed and does not monopolize the data of its users. The user/patient is the one granting access to his data under a smart contract that determines the conditions of the data usage by information seeker.

The requirements for the HIT-system are:

a. Rights management giving access to the data with high granularity; including identity management
   - Users/patients control who uses the data.
   - Users/patients control how much of his or her profile is revealed
   - Users/patients control the duration for which his or her data is being used
b. Transfer information according to accepted standards
c. Token exchange for information
d. Exchange of token for a bonus

Participants must be able to exchange their tokens not only for information but also for a so-called bonus. This applies mainly for the user/patient but also to doctors who collect tokens. A bonus can be everything from a medical video-consultation to a wellness offer or a reduction in the health insurance premium. One of the main challenges will be to bring bonus provider in to the HIT system.

4.2 Functional components

a. App/Wallet
   - Identifier
     - Authentication
     - Transfer of basic data to others by scanning their QR-Code or accepting their request for data
   - hold and secure tokens
b. decentralized storage under the sovereignty of users/patients
c. External Medical Data Systems / Repository (existing ones)
d. Converter, APIs (Transfer health data)
4.3 Token-Information Exchange

Based on smart contracts the user/patient can receive tokens corresponding to the "value" of the data that is assigned by the token giver. The smart contract that is incorporated in the request determines the access to the data and the transfer of token under the agreed conditions.

Figure 1. Process of token transfer and data access recorded on the blockchain.

When registering for a wallet the users/patients are requested to give some basic information about their health status, e.g. weight and medication (see Figure 1). For this initial information they receive tokens. This basic health information is stored off-chain in the IPFS and their identifier is stored on the blockchain. In order to keep transaction costs low the on-chain transactions will be kept at a minimum.

Organizations that seek users/patients can query for certain user/patient profiles and send a message to the wallet of the user/patient offering tokens for the exchange of additional information, e.g. an X-ray or the recording of additional measurements like therapy side-effects. There will be different levels of data given and requested with respect to their validity, e.g. data that is pure self-report or medical data that is being validated by a doctor. HIT is an online marketplace where all different levels of information will be sought and given. A market research institute will be satisfied with self-report whereas blood sugar levels might have a different value when given as self-report instead of a measurement transmitted by a certified blood-pressure monitor.

If the user/patient decides to provide that information he can grant access to the storage of the data or enter the measurements directly into a questionnaire displayed in the wallet. In
return he receives the amount of tokens defined in the smart contract. With the tokens the user/patient can redeem bonuses or exchange it at one of the crypto-currency exchanges according the official exchange rate.

The HIT token can also be used by any third party application, thus giving app and chatbot developers the opportunity to incentivise their users for providing health-related information.

4.4 Membership

HIT has a strict 1-person-1-wallet policy and the wallet has to belong to a real person. Corporate members such as pharma companies, research facilities or health insurances must also be registered and verified.

The onboarding process for users/patients is automised. In the case of individuals it requires a photo of the front and back of the persons ID and a mobile telephone number where the verification code can be sent to. Services of identity providers will be implemented when suitable. New means of identification such as self-sovereign identity will be explored.

A bulk registration of previously verified members through a trusted partner, e.g. a health insurance is allowed. The information seekers and bonus providers can self-register but need to be approved by the HIT foundation.

4.5 Health data types

On the HIT platform different types of data can be exchanged. That ranges from pure self-report or data from fitness apps to medical data that can be verified as such by third parties like doctors. Generally, data can be entered on request or scanned (data capture) or provided via existing data bases.

The information seekers define what kind of data they are looking for. It is expected that users/patients can earn more tokens with validated data, e.g. a diabetic’s data might be more valuable if the disease has been verified by a health professional or the blood glucose measurement comes from certified blood glucose meter. At any rate, only structured and digitalized data is been transferred by the HIT platform.

4.6 Data transfer and interoperability

HIT offers an open data exchange connector that will incorporate the most common standards, like Fast Healthcare Interoperability Resources (FHIR) or allows to transfer data from the persons repositories to the data requester. Besides the technical interoperability the semantic interoperability of the systems is a key requirement, i.e. the meaning of the data must be recognized by the system in order to avoid mismatching of data between sender and recipient.

As another means of data exchange a QR-code will be implemented. Very few healthcare applications have used it to transfer medical data such as the Medication Plan in Germany or in Switzerland\(^28\). However, it is well established in the world of cryptocurrency, where wallets have a QR-code address and by simply scanning it the user can transfer cryptocurrencies from his wallet to another one without involving an intermediary. Instead of cryptocurrencies the health information can be transferred by scanning the address of the recipient, and in return a HIT token can be transferred to the wallet of the data sender according to the smart-contract executed.
On the basis of the HIT ecosystem, interested parties can build their use-cases by either transferring data directly through the system and execute the information-token-exchange based on smart contracts or verifying an off-chain data-transfer that leads to an exchange of tokens. Moreover, the token-asset exchange can be executed and recorded in the HIT-system.

4.7 Technology

Although most projects in healthcare prefer permission based blockchain solutions, the HIT foundation decided to use Ethereum as a public blockchain solution mainly for reasons of transparency and trust.

4.8 Application architecture

The HIT system is divided into an application infrastructure and a blockchain infrastructure. The basic architecture is shown in Figure 2. It is important to structure the application in a way that it does not become a single point of failure and that it cannot be corrupted by a central authority.

4.8.1 Application Layer

The HIT application can be accessed through a mobile client (Wallet), a web-client and a conversational chatbot. It contains the private keys and displays the token balance, medical profile, and tailored opportunities to earn tokens as well as bonuses that can be redeemed with the token. The information and token exchange functionality can be executed through the HIT application. Analysis of data can be executed through the application and artificial intelligence services can be used by the user/patient to improve his health based on his profile data.

Figure 2. System Architecture.
It is important to understand that HIT Foundation does not store or control any data of the users/patients. The data must be under the sovereignty of the user/patient. Metadata or profile data are stored in the distributed IPFS (interplanetary filesystem) and other data are only represented as links either directing to their (mobile) device or to an external storage like a medical archive or a personal health record.

4.8.2 Network & Data Layer

Transactions are stored on the Ethereum blockchain. The patients profile data, i.e. basic personal health data are to be stored in the IPFS. Larger datasets such as X-rays are accessed via the existing records systems or personal health records. Health data that is on smart phones or smart watches can also be accessed if the user/patient is granting the HIT application access to it.

In this way the HIT-system allows the users/patients to access their health data that are scattered throughout the healthcare system. The HIT system communicates with existing software solutions according to established standards.

Data is transmitted and stored encrypted. Only the public key is in the system. The private key is under the sovereignty of the user/patient. During the onboarding process the user/patient is advised to store the private key in a safe way, e.g. in a QR-code that can be printed.

5 A new deal for the healthcare system

In order to thrive, the online market place for personal health information must serve everybody in the HIT ecosystem. All participants must have an interest in exchanging information for tokens and those participants who are not only out for the data must have an opportunity to exchange tokens into a bonus, i.e. services, benefits or exchange tokens to other currencies.

5.1 Exchange of data, tokens, and bonuses

Motivating users/patients to share information especially about health-related behavior has seen many attempts. Recently, Sanitas, one of the leading Swiss health insurances, launched the App Active, where physical activity, as operationalized by daily steps, is being rewarded with coupons that can be traded at online stores. Up to this date, almost all projects are bilateral, failing to motivate all participants involved and often leave the user/patient with the least benefit and control of all.

The central asset to be exchanged in the HIT-ecosystem is information that has a token value attached to it. The token value depends on how much the network participant values the information in question. A third asset is the bonus, which can be given in exchange for tokens. For example, a bonus can be a discount from a health insurance or a second opinion by a hospital. Examples of the interchange of information, token and bonus will be given in chapter 5.3 Use Cases.

The exchange of these items between the participants in the system is complex. Although everybody is connected in the network, in the beginning the majority of transactions are expected to occur between the patients and research institutions. However, the nature of an
open system entails that an increased exchange of items will occur wherever the usage is highest.

5.2 Market Access

Nowadays, the central problem for healthcare applications is the access to potential users. In a highly regulated system this causes a considerable problem because existing stakeholders are very reluctant to give access to their users, either due to privacy issues or simple fear of losing customers. Moreover, currently there are no incentives for users/patients to digitalise their health data. When they are healthy they are not motivated and when they are sick the data flows through the existing channels of the healthcare systems that are not under the control of the patient.

Currently no patient-centered healthcare application has managed to get by the bootstrapping problem and leveraged the network effect due to a low application utility when only a few users are in the network. Introducing a token solves that problem because it gives the network an additional financial utility.

Besides giving a substantial amount of token for the first users (see 7.1.1) potential multipliers such as patient groups or social media influencer will be rewarded with tokens when they bring users into the HIT system. During the initial growth phase information seekers or entities building use cases (see 5.3) will be rewarded with tokens as well.

A central pillar of the initial growth phase will be the focus on a health problem with a high prevalence such as diabetes, where the HIT team has an excellent network of opinion leaders, patient groups and industry representatives. For that indication even data from healthy users are of high value because of the linkage of risk factors with an actual disease.

Therefore, the goal of reaching 1 Mio. users of the HIT platform in the first 12 months is realistic due to the reasons mentioned above but also to the low threshold of entering the system. Furthermore, a user only has to answer very few questions in the beginning and healthy individuals can enter the system as well.

5.3 Use Cases/Protocols

The HIT foundation is only the provider of the functionality of an online market place for personal health information as described in chapter 4.1. The HIT foundation is also responsible for the governance and functions as an advocate of the individual user/patient. The goal is to enable members of the network to implement their business cases in a much more efficient way as it is possible in the current healthcare system.

There are many use cases/protocols possible on the basis of the HIT-network. The following is a non-exhaustive enumeration:

1. Research
   Researchers have direct access to potential study participants by searching their metadata that match the inclusion criteria; patient-generated health data on-demand; electronic informed consent; audit trail for the research data
     - Involved parties: Patient, doctor, university/research, hospital, pharma/medtech
2. Surveys
Population survey and representative surveys can be conducted via contacting users/patients directly or by invitation through the QR code. Authentication of participants is guaranteed via their wallet.
- Involved parties: Market researchers, government, etc.
- Benefits: reduced cost and effort to recruit participants, participants remain anonymous

3. Pay-for-performance models
Insurances and industries get patient reported outcome data to control the effectiveness of treatments and hence the reimbursement of the treatment
- Involved parties: Health insurances, pharma/medtech industry
- Benefits: Only effective treatment will be reimbursed which results in cost savings and the allocation of resources where they are effective

4. Hospital check-in
Scanning of the QR code of a hospital when entering the hospital which initiates sending of the patients’ insurance data and health data to the hospitals ERP and CIS system. Patient gets token in return.
- Involved parties: Patient, hospital
- Benefits: Process optimization, reduced error rates

5. Prescription refill
The prescription can be sent to the wallet of the user/patient or stored in the user’s/patient’s repository and be filled in a pharmacy of the patient’s choice. Pharmacies can offer tokens and/or bonuses if the prescription is filled by them as a customer loyalty measure. Electronic exchange of medication data reduces error rate.
- Involved parties: Patient, pharmacy, health insurance
- Benefits: Increased patient safety, customer retention, process optimization

6. Second opinion Services
Doctors can earn tokens by giving feedback, answer to mail, review treatment decisions
- Involved parties: Patient, doctor, hospital
- Benefits: increased patient safety, avoidance of unnecessary treatments

7. DNA/ Biobank
Samples can be traced and consent of donors can be obtained.
- Involved parties: Pharma, research institutions, hospitals, patients
- Benefits: management of ownership, privacy and security of personal data/samples

8. Compliance Support
Users/patients receive a token when a predefined health goal which is incorporated into a smart contract is achieved. Verification can come from a third party, e.g. a doctor.
- Involved parties: Health insurance, patient, doctor.
- Benefits: Improved treatment adherence, reduction of administrative cost for bonus programs
9. Donation and sponsoring of treatments
   The HIT can be used as a means to support treatments or research, e.g. of orphan diseases. Users/patients can help others if they have surplus tokens.
   - Involved parties: Patients, doctors, hospitals
   - Benefits: No administrative costs for donations

10. Reimbursement system for developing countries
    HIT token can be established as an alternative reimbursement for healthcare provider in developing countries or as an alternative health insurance.
    - Involved parties: Patients, doctors, hospitals, insurances, government
    - Benefits: Affordable and transparent payment, tracking of personal health data which is often kept in different places

11. Volunteer work
    HIT token can be used as a reward for volunteer work. Vice versa token earned be volunteers can be used to get them health benefits.
    - Involved parties: user, hospitals
    - Benefits: Reliable reward system for volunteer work

12. Internet of Things (IoT)/Connected devices
    Tracking health data that is being generated without user’s/patients’ knowledge and consent by connected devices
    - Involved parties: user/patient, manufacturer
    - Benefits: management of access and use of personal data

13. AI services
    HIT token can be used as a payment for bot services, e.g. medication interaction control, symptom checker, explanation and interpretation of lab results
    - Involved parties: user/patient, service provider
    - Benefits: incentive for (start-up) companies to develop disruptive services aimed directly at the patient

14. Third party services
    Service Providers can get incentivized to tap into the HIT system, e.g. health coaches, labs that offer self-testing, service providers that digitalize paper records and documents, etc.
    - Involved parties: user/patient, service provider
    - Benefits: service providers can access their target group and offer tailored services

General business benefits are the ability to manage access to personal health information through smart contracts, building an incentive system and not having to rely on intermediaries. A dramatic reduction of administrative costs can be achieved. Privacy can be maintained, which is very important to those whose health data maybe of stigmatizing nature, such as HIV or mental health issues.

Direct access to users/patients allows start-ups to offer disruptive services without having to rely on the existing stakeholders in the healthcare system, as they usually don’t have an interest in sharing control and/or profit.
6 Organization

6.1 Foundation and Operational Entity

The HIT Foundation is a foundation established under the laws of Switzerland and registered in the commercial register of the state of Zug; its legal domicile is in Zug. It contemplates a corporate reorganization that may include the creation of one of several other independent or affiliated operational legal entities.

The organisational form of a foundation has strong credibility in the dealing with health data and being a patients’ advocate. Its aim is to create value for the people instead of maximizing individuals’ profit.

The HIT Foundation’s responsibilities are:

- Funding and supporting the HIT infrastructure
- Token creation and distribution
- Enable token exchange
- Governance and mediation body

Another purpose of the HIT Foundation, at a global scale, will be the facilitation, promotion and support of applications running on the HIT-system. Governance and standards of the HIT Foundation are documented in the bylaws.

For the purpose of running the HIT platform and its daily business, it is envisaged to establish an operational corporation under Swiss laws (the "NewCo").

6.2 Team

The HIT Foundation is driven by a team with a strong background in healthcare. Experience of many startups shows that a highly regulated market with strong stakeholders will not accept newcomers even if the idea is brilliant or the organisation behind it has been successful in other fields. In addition to the knowledge about the healthcare market the team has proven to understand how the analogue healthcare world can be connected to the digital universe.

Management Team

President/Founder
Dr. Eberhard Scheuer

Chief Organization Officer
Elizabeth Chee

CTO & Software Delivery
Aleksandar Nikov

Blockchain Expert
Callum McDonald

Chief Data Officer & Business Development
Quy Vo-Reinhard, PhD, MBA

Co-Founder, Market Education
Reto Gadient

Finance & Accounting
Roger Curchod

Communications & Marketing
tbd

Market Development
Jerry Jou, MBA

Advisory Board

Medical Informatics & Interoperability
Prof. Dr. med. Christian Lovis

Medical Law & Privacy
Prof. Dr. med. Dr. iur. Christian Dierks

User Experience UIX Design
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TGE & Strategy
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7 Token

The HIT token enables the HIT Foundation and NewCo to manage open services while serving as an incentive to the network participants. As a divisible utility token its functionality is granting certain rights and rewards provided the HIT Foundation’s projects can be successfully completed. It is essential to the system, as it quantifies the value of health information that cannot be achieved otherwise. In the medium and long term the HIT token will serve as a health community token.

Through the HIT-API the token can be utilized by third party apps, thus enabling them to give incentives via HIT without needing to access the data transfer infrastructure of the HIT-system. The goal of the HIT-foundation is to establish the HIT platform as a comprehensive ecosystem for transactions in the healthcare system. As mentioned in chapter 5.3 Use Cases/Protocols there are numerous scenarios where it can be applied.

Due to the fact that it tackles one of the fundamental problems in modern, data driven healthcare, its use will be widely spread. HIT addresses a wide range of people and institutions, as health is a topic everyone can relate to. Therefore it is most likely that it will have a much wider user base than other tokens, whose focus is of technical or speculative nature.

7.1 Token Generating Event

7.1.1 Token distribution

Participants in both the early fundraising and the crowdfunding will receive ERC20 tokens when the HIT application is released in spring 2018. The HIT token is a divisible utility token.

A total of 1 billion HIT tokens (cap) will be issued in the TGE. The number of tokens is justified by the potential number of users and the transaction volume in the healthcare market. The initial valuation of the token in the crowd-funding will be €uro 0.10.

Figure 3. Token distribution
As indicated in Figure 3 the initial token will be distributed in the following way:

- 50% of all tokens (500 million) will be distributed in the crowdsale. In the event that not all tokens issued in the TGE will be taken, the remaining tokens will be added to the foundations strategic reserve.

- 15% of the tokens (150 million) are going to be used as a reward when opening a personal wallet/account for the first time. There is a strict 1-person-1-wallet policy! The initial number of token per wallet depends on the time when the user/patient enters the HIT system. It starts with 50 tokens for the first person to onboard and decreases by a decreasing rate, theoretically lasting for the whole world’s population.

- 15% of the tokens (150 million) will remain with the HIT Foundation as a strategic reserve.

- 10% (100 million) consists of founder and team reward.

- 5% (50 million) of the tokens will be awarded to strategic partners that build use cases directly linked to the HIT network. Thereby:
  - a maximum of 25 Mio. tokens is reserved for strategic projects where 5 tokens will be awarded for each new single user brought into the system by the strategic partners.
  - a maximum of 25 Mio. tokens is reserved for the incentiviation of bonus providers that will receive additional 10% of their token transactions by the foundation.

- Prior to the TGE 5% (50 million) of the token will be given out to healthcare market stakeholder in an early fundraising with a discount of 50%. The equivalent of €2.5 Mio. will be used to build a minimal viable product, setting up the foundation operations and prepare the crowd-funding.

7.1.2 Token sale terms

The total fundraising goal is €48 Mio. During the early fundraising from December 2017 an amount of 50 Mio future HIT token will be given to early contributors at a 50% discount, i.e. €0.05 per token resulting in €2.5 Mio. The purchase method is bank transfer or ETH.

During the crowdsale in spring 2018 the following discounts apply:

<table>
<thead>
<tr>
<th>Purchase Method</th>
<th>ETH/BTC</th>
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<tbody>
<tr>
<td>Crowdsale Tier 1</td>
<td>150 Mio HIT (30% discount=€0.07) = €12 Mio</td>
</tr>
<tr>
<td>Crowdsale Tier 2</td>
<td>150 Mio HIT (15% discount=€0.085) = €13.5 Mio</td>
</tr>
<tr>
<td>Crowdsale Tier 3</td>
<td>200 Mio HIT (0% discount=€0.1) = €20 Mio</td>
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In order to maintain stability and reduce volatility in the system tokens will be widely spread, i.e. not only to buyers in the different stages of the early fundraising and crowdsale but also to different users/patients receiving tokens for onboarding the system. All founder tokens are subjected to a holding period of 9 months, whereas strategic partners and other Participants must be able to trade the token once the HIT-Wallet is released in the second quarter of 2018.

7.1.3 Foundation funding

In order to fund the operations of the HIT Foundation and NewCo after the initial amount raised during the TGE is exhausted, the strategic reserve of 15% of the tokens will be used.
7.2 TGE Schedule

In order to use the network effect it is imperative to be first to introduce a model like the HIT Foundation to the market.

Mid of September the project was publicly announced. Until the start of the early funding period the architecture of the technical platform was designed and the roadmap of its implementation until September 2018 outlined (see Figure 4). Detailed specification of the platform and pilot testing will be done in the fourth quarter of 2017 and the beginning of 2018.

Figure 4. Agenda

During the early funding period that started in December 5% of the future tokens will be given to selected stakeholders at a discounted rate, 2.5 Mio Euro will be raised to setup HIT foundation operations, build a prototype and prepare the crowd-sale of the tokens. Detailed technical specifications and prototyping of the HIT-platform (MVP) will be done in the fourth quarter of 2017 and first quarter of 2018.

The TGE takes place in spring 2018 in order to raise 45.5 Mio Euro through the crowd-funding of 500 Mio HIT tokens (see 7.1.2). All project progress and milestones will be communicated through the website and the community channels.

7.3 Use of funds

The funds raised during the crowd-sale will go exclusively to the HIT Foundation, with 6.2 Mio EUR being used for the initial setup and technical implementation of the HIT-infrastructure.

The majority of the funds will be used to grow the user base and operate the HIT Foundation, NewCo and their services for a minimum of 5 years. The distribution of the total funds raised in the TGE is displayed in Figure 5.

International offices will be established in Asia, Africa, Middle East, North and South America. Europe will be covered by the headquarter in Switzerland. The annual expenses for the HIT operations is 7.42 Mio EUR, 3.47 Mio EUR for the personnel, and 3.95 Mio EUR for the operational expenses.
Hence, the total costs for a five year period for the foundation operations and staff add up to 37.1 Mio EUR, which together with the initial costs for setting up the platform (6.2 Mio.) and preparation of the MVP and TGE (2.5 Mio) results in a total of 45.8 Mio EUR. The rest of the funds raised will stay in the foundation.
The use of funds (€ 6.2 Mio.) for setting up the HIT-platform is displayed in Figure 6. One fourth of the development budget will be used to fully develop the mobile app. Another fourth of the funds will be the development and setup of the data converting and transfer capability of the HIT platform.

8 Summary

The benefits of the HIT platform is the ability to give incentives to individuals to share their health data, the traceability of individuals’ data, and that those who seek data can access users/patients directly without the need for an intermediary.

The main risks are that not enough individuals will sign up to the platform and that there is a lack of bonuses available that can be claimed by token. The HIT foundation has to take adequate measures in order to avoid the occurrence of those risk factors.

Blockchain technology and the creation of a token that represents the value of the health information is a unique value proposition to all participants of the HIT platform. It is predestined to align incentives among all network participants, which in the past had not been possible regarding the essential data exchange that powers modern healthcare.

The HIT vision is a distributed online marketplace for personal health data that puts users/patients at its center with all the control over their health data and powers a global data driven healthcare system.

9 Legal disclaimer

Reference is made to the Important Notice at the beginning of this document and the TGE Terms & Conditions published by the HIT Foundation. In addition, the information under this chapter 9 must be carefully read by Participants.

Each Participant has to rely exclusively on his or her own knowledge, investigation, judgment, experience and assessment of the matters which are the subject of this Whitepaper, and to verify their accuracy and completeness. In any event, it is recommended to obtain expert advice from e.g. legal or tax advisors in case of any uncertainties.

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10 References