Overview

A blockchain based health social network that empowers patients by securely storing health information, including integrated IoT device streams. The network can send proactive real-time notifications based on individual configured settings.

Alignment with the theme

We use blockchain to address the concerns with cyber security and data confidentiality that have prevented the use of online social networks for healthcare. The current contentious fee-for-service model will be replaced with a long-term coordinated outcomes-based model. Patients will be better informed about treatment plans, outcomes and pricing.

A private, permissioned, proof of stake blockchain will empower patients to fully control the data that they share. Using circles of trust patients can determine data access for other network members, including whether to provide anonymised data to researchers to earn health coins. Encrypted data will only be accessible to approved network members.

Patients earn health coins by adhering to prescribed treatment plans. Adherence is tracked using data from integrated IoT devices and this is used to change the value of the heath coins. Continuous monitoring via IoT allows the network to notify support circles of behavioral changes in real-time.

Benefit of the service for end-users

End-users for the health social network include patients and families, clinicians, health services and researchers. The ability to continuously monitor an individual's health provides accurate information about their health status as it fluctuates throughout the day, as opposed to periodic "snapshots" during clinical visits.

There are currently no apps on the market that utilize continuous sensing in smartphones or smartwatches to accomplish what we propose.

Patients and families

Patients can store and forward their electronic medical records to different clinical organizations. Providing a timely and accurate medical history will lead to more informed care. Continuously monitoring can provide us with unprecedented insight into a patient's behavior, e.g. a depression patient. Notifying the individual's support circle of significant changes can help get the required support when it is needed most.

Clinicians

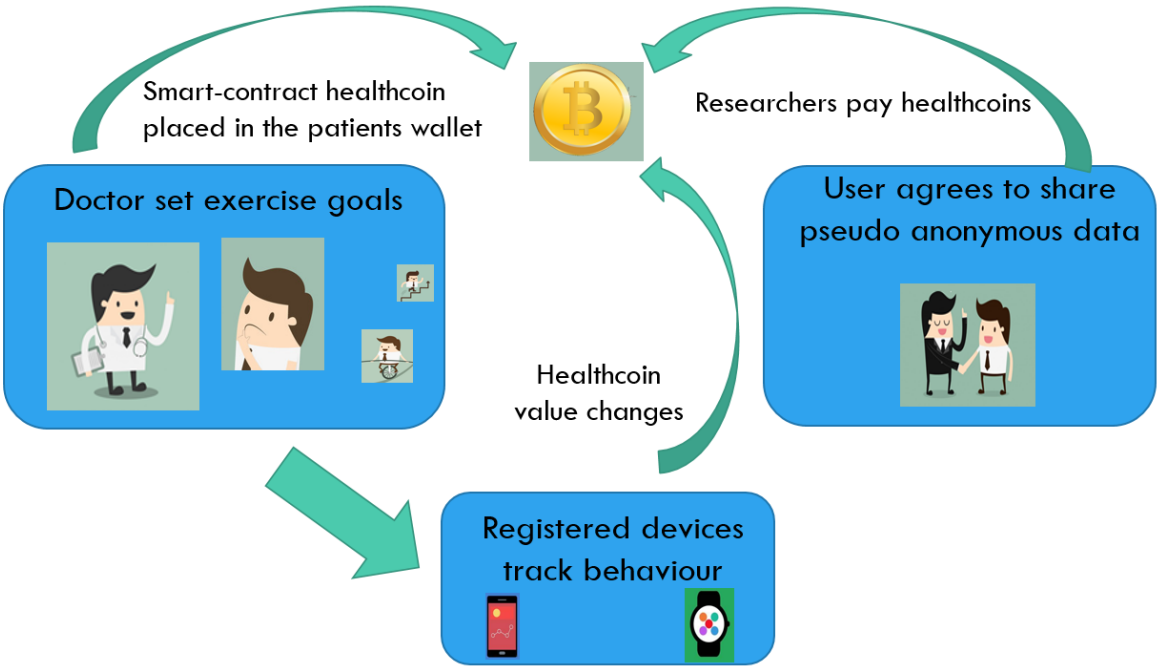
The ability to continuously monitor an individual's health provides accurate information about their health as it fluctuates throughout the day, as opposed to periodic "snapshots" of an individual's health during clinical visits. Besides providing better quality data, the number of clinical visits can be reduced as appointments can be scheduled as needed, rather than mostly for monitoring purposes, leading to lower overall medical costs.

Community health services

Monitoring the behavior of elderly patients can allow us to identify situations in which they may need medical attention or every-day assistance, for example, after a fall, or when they have not moved out of bed during the whole day.

Researchers

Using IoT devices to track changes in movement patterns, e.g. walking gait and stride, of an individual with a movement disorder allows us to detect the change of movement abnormalities in their activity. This data can be provided to clinicians and researchers trying to understand their response to the current treatment plan.



Benefit of the service for business partners

Organizations that store and provide electronic medical records can make this information available to patients using the medical social network, empowering patients to provide an accurate medical history and should lead to more informed care.

Continuously monitoring provides a more accurate picture of an individual's physical and mental wellbeing over a long period. This is crucial as symptoms can fluctuate considerably throughout the day and may have various triggers which may not be captured during 'snapshot' assessments of individuals in clinic. In addition to this, remote monitoring can provide health care professionals with an unprecedented insight into an individual's lifestyle allowing them to tailor treatment accordingly.

Pharmaceutical companies

Pharmaceutical companies can benefit from long term, continuous monitoring of patients to better understand patient response to treatments, as well as understanding what other factors, such as an individual's emotional wellbeing or physical activity that interfere/factor in with treatment/patient recovery. Again, there are currently no apps on the market that provide continuous information to pharmaceutical companies.

Medical researchers

Medical research groups are utilizing information from wearable sensors for a variety of purposes including activity recognition, screening individuals for specific diseases and classifying emotional wellbeing. Wearable sensors and remote monitoring devices mean large amounts of data can be recorded from individuals without them ever having to go into the clinic. Moreover, since the data is collected in the real world as opposed to being collected in a controlled laboratory, research groups

can test the applicability of their methods in the real world. Currently, data from Research Kit, an app created by Apple which makes use of the smartphone's embedded sensors to collect information about an individual's health while users conduct various tests, is available to researchers to test their proposed methods. However, passive monitoring data is currently not available to researchers or other business partners. We believe that continuous monitoring can provide a more accurate picture of an individual's health and thus this information would be crucial to all business partners. We emphasize on having this information made available to all business partners, specifically community based care institutions and pharmaceutical companies. Currently, wearable sensing technology is being investigated by research institutions. By attending to the needs of ALL the business partners, there is potential to revolutionize the field of wearable sensing technology and improve its usability across different fields.

Reality of business model

We will offer a presale 'IPO' to business partners and use the proceeds of the cryptocurrency creation to fund future development efforts. Due the nature of the offered service and the multiple types of users and business partners, we believe a subscription model, coupled with transitional revenue and the presales IPO would work as a well-diversified strategy for generating revenues.

Institutional and commercial subscriptions are straightforward to implement. Social media subscriptions for private users would be free of charge, but users will also have the option to share parts of their data, or their circle's data to external organizations. Revenues would be generated through transactional charges each time data sharing or an exchange has been completed.

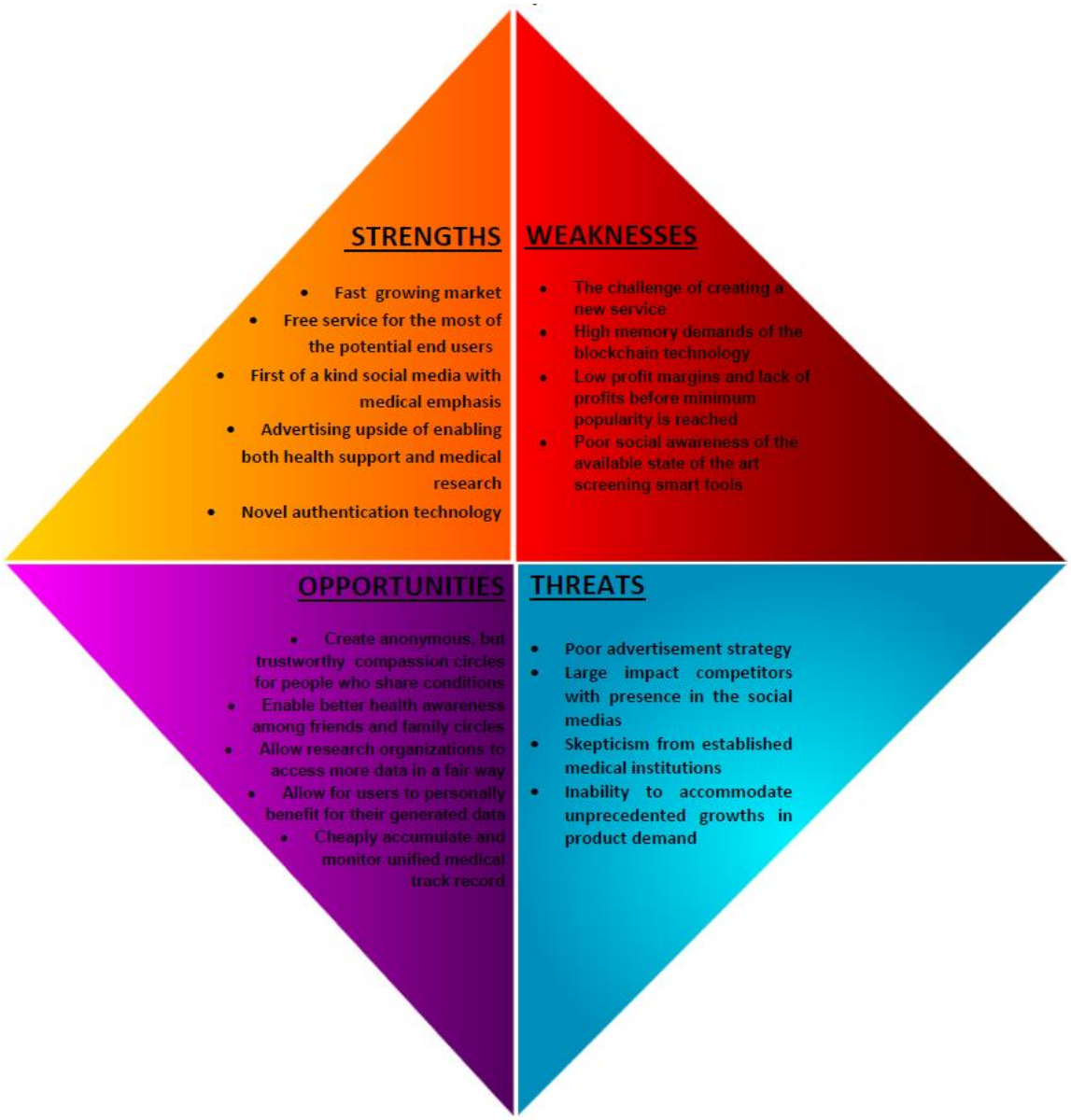
Current market value of continuous data varies significantly between subjects, gender, social status and conditions they have. In addition, data from larger circles which are based on common location, common medical conditions, common activities and family situations would be of serious interest to research organizations, drug producers and insurance companies. Through blockchain technology, we will allow for single users to perform data exchange transactions, but also for large circles to collectively allows institutional subscriptions to their circle.

Institutional subscriptions will fall in a different tier, easily assesed due to the different verification procedure and those will be charged. Charges will vary based on the size of the circle being joined and the data warehouses it enables. For example, a circle of 250 UK diagnosed Parkinson patients would be allowed to share part of their data relevant to progression of the disease with an institution, saving that institution tens of thousands of pounds in data collection. In return, the customers and the platform will profit from their valuable data. 1 year continuous study of 250 patients diagnosed with Parkinson's would cost NHS, or the corresponding private research institution anywhere between £250,000 and £10,000,000 and this is excluding research involving expensive screening technology and advanced clinical trials.

Finally, our medically oriented social media platform has the potential to significantly improve the customer experience and interaction with their health service provider. Its functionality can allow for better interaction of the users with their electronical medical records and their GPs. In the fast-growing market of healthcare technology, such a product can provide a competitive advantage for technology companies offering EMR and other services. For example, one potential future partner can be the Anthelio Heathcare Solutions, recently acquired by Atos.

Anthelio's platform for comprehensive population heath management demonstrates the value of designing a unified data warehouse for each patient medical data and history. The platform dominantly consists of personal information about the patients, clinically performed tests possible

during patient's lifetime and hospital treatment history. Exploiting block chain technology would in addition empower patients to contribute continuous data from their smartphones and any wearable technology to their EMRs.



Technical feasibility

We use the principle of secure, public ledgers to support the creation of a medical social network that empowers patients. Using blockchain means that there is no centralized point of control that can gain access to personal membership information, or override chosen access levels. We will use a private, permissioned blockchain to have multiple, coexisting networks that utilize the same consensus method.

Using proof-of-stake consensus, rather than proof-of-work, means that transactions are validated and processed by those who are already recognized by the ledger. A major benefit is that costs to secure the network can be greatly reduced to network participants as the only computational work needed to be performed by is to validate transactions, rather than requiring hashing power to mark a block as valid. Proof-of-stake consensus is censorship resistant and counterparty risk, under similar

conditions to proof-of-work provided nodes are sufficiently distributed and not susceptible to outside influence and requires that tokens be distributed before the network can go live. We will offer a presale 'IPO' to business partners and use the proceeds of the cryptocurrency creation to fund future development efforts. The reward for maintaining consensus will be decoupled from the punishment for defecting. Nodes will be rewarded for the processing power they contribute and the opportunity cost of tying up resources, while the punishment for defecting can be a significant portion of their bonded stake.

We aim to store encrypted, anonymized digital assets using the Coloured coins protocol to store distributed encrypted torrents. Coloured Coins is an open source bitcoin 2.0 protocol that enables the creation of digital assets on top of bitcoin blockchain. The two separate layers are the underlying transactional network based on cryptographic technology, and an overlay network of issuance of distinct instruments encapsulated as coloured coins. Information in the coloured coins can include EMRs, image scans, test results and data streams from IoT devices. IoT devices will be authorised using transactions on the blockchain. Patients with configured smart devices will benefit from proactive notifications based on self-defined custom rules on continuous monitoring of the IoT data streams.

Using circles of trust patients can determine data access for other network members, including whether to provide anonymised data to other circles on the network. The private blockchain will authenticate and securely store fully anonymous, yet provably correct, identities. When the user logs in an authenticating private contract is executed validating the user. This links the real identity with a public pseudo identity used for the transaction to provide patient anonymity.