LINA.NETWORK

(LINA)

Blockchain Based Application for Innovation

LINA Network

Jan 10, 2019
Version 2.0

Abstract

Blockchain is an emerging technology that can radically improve banking, supply chain, and other transaction networks and can create new opportunities for innovation. Businesses contain many examples of networks of individuals and organizations that collaborate to create value and wealth. These networks work together in markets that exchange assets in the form of goods and services between the participants. Blockchain technology provides the basis for a dynamically shared ledger that can be applied to save time when recording transactions between parties, remove costs associated with intermediaries and reduce risks of fraud and tampering.

Based on this essential of Blockchain Technology, We, Smart Link Swiss decided to open the LINA platform on blockchain in the necessitous field such as review industry, supply chain management, healthcare, and education services which general call LINA NETWORK.

Review means the evaluation and description of the user's experience upon the use of a product or service. Although reviews and reviewers play a very important role in stimulating demand for products and services and building image for service providers, in practice the review results are often manipulated by Corporations, large companies through marketing techniques, or even a direct cooperation with the review system providers, making it difficult for users to trust the results of product reviews. The solution to this problem is to build LINA.review - the platform for reviewing on Blockchain, utilizing blockchain's immutability to produce the best possible transparency and create conditions for reviewers to benefit from providing quality reviews, as well as easily and directly interact with users and providers of products or services that are currently trustless. During the development of LINA.review platform, LINA network has noticed the importance of the review or audit activities of the processes or the standards in Traceability system so that we have decided to utilize LINA platform in Supply Chain Management which mainly focused area on Traceability.

LINA tokens shall be the native token of the system, with the purpose of tokenizing the review industry as well as the Supply Chain Management.

The information provided in this document is intended for informational purposes and is subject to change with more research.

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1 LINA Platform

1.1 Overview

The LINA Platform aims to create a network platform which use for social review application, the supply chain management application and identity…. This platform is able to expend for more application if any.

The LINA Core is the most critical element of the LINA Platform. It leverages smart contracts on blockchain to build a trusted network of users and address issues related to transparency, the immutability of review scores.

The LINA Token (LINA) is the native token of the LINA Platform. It will be based on Ethereum, a blockchain-based decentralized platform for applications that run as programmed without any chance of fraud, censorship or third-party interference to facilitate online contractual agreements in a cryptographically secure manner.

The LINA Applications are the products which are created on LINA platform belong to essential areas of life such as Food, Agriculture, Assessment, Pharmacy, Finance, Healthcare, Education and Government Management. Currently, LINA platform includes LINA REVIEW, LINA Supply chain, LINA Identity, Healthcare and Education.

1.2 Design of the LINA Platform

The main public Ethereum decentralized network, which uses the concept of smart contract, was chosen to serve as the decentralized settlement layer of the LINA Platform with LINA Token and provide transparency of payment transactions, reviews and bids.

LINA Platform introduces a **hybrid architecture** approach, bridging between public Ethereum chain (mainnet) and the high performance, scalable private side-blockchain transaction services for scalable interactions with the LINA token. The key reasons for not using a purely public chain architecture are scalability and transaction fees. The current Ethereum network's capabilities do not allow us to launch and scale the service globally due to several issues, including:

- The Ethereum network currently is theoretically capable of handling about 10 transactions per second [1], which is definitely not enough for the scale of millions of users (or even hundreds of thousands of users).
- Ethereum's transaction confirmation times are significantly delayed - which affect the user experience.
- Every transaction on Ethereum blockchain is required to pay transaction fee in ETH which most likely will be costly and creating an adoption barrier for the average user.

This hybrid approach will help avoid network fees in transactions between users, avoid stress on the public network due to the large volume of transactions and improve the user experience in terms of responsiveness and latency.

This design is applicable or both LINA review and LINA Supply Chain where the auditor plays the same role as the helper in LINA review and mainly responsible for auditing, checking the compliance of the processes and standards of Supply Chain system.
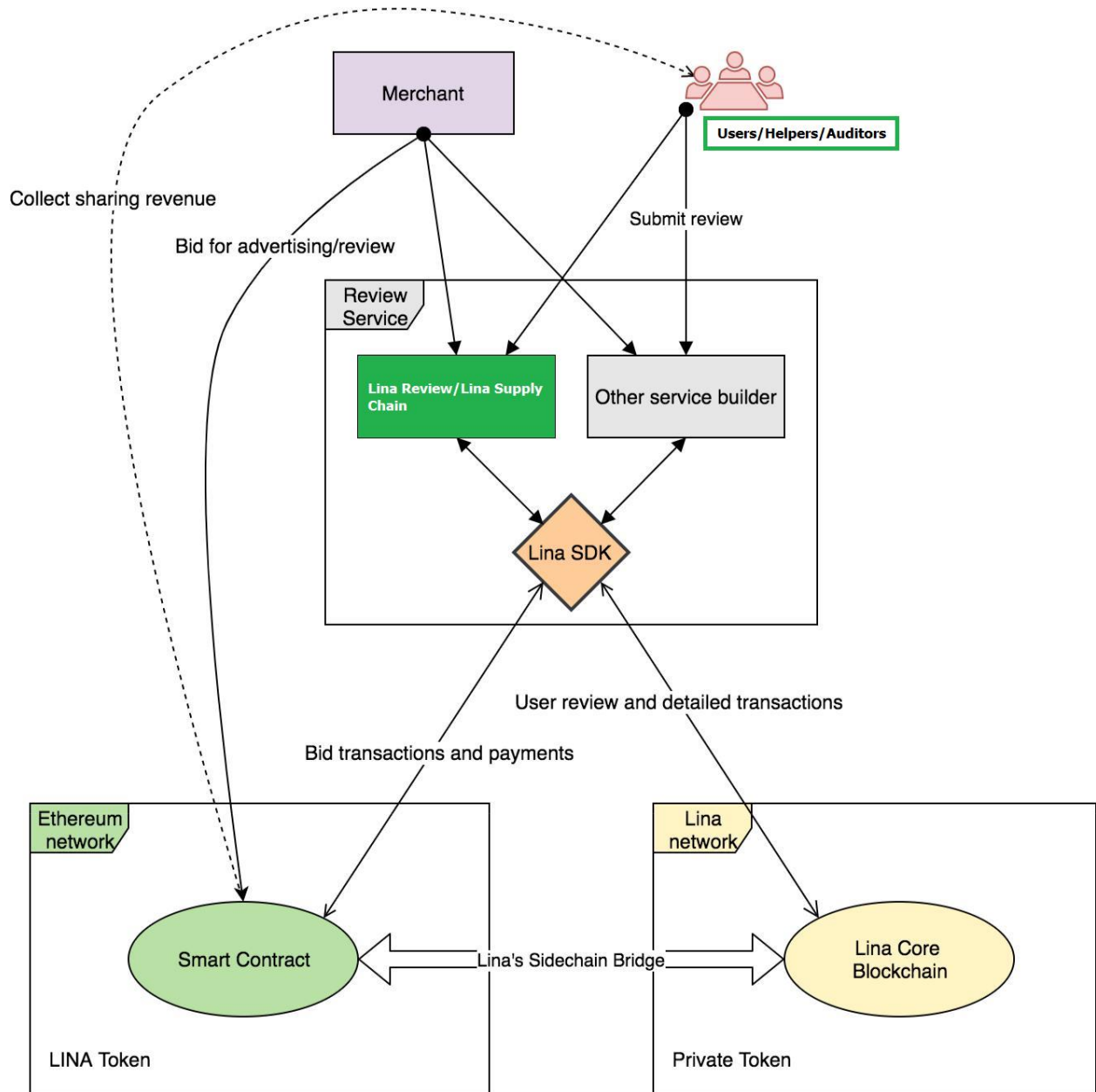
Figure 1: LINA Platform Overview

1.3   The LINA Core

The LINA Core is a high performance, scalable private blockchain transaction services for recording detailed transactions to help avoid Ethereum's network fees in transactions, stress on the public network due to the large volume of transactions and to improve the user experience in terms of latency.

Transactions and actions of merchant and users on LINA Applications and other systems are stored in LINA Core blockchain to ensure the transparency of reviews and prevent fraud. As the information is stored on the blockchain, it cannot be manipulated, so the transparency will be ensured.

1.4 The LINA Token

The LINA Token (LINA) is the native token of the LINA Platform. It will be ERC-20 token based on Ethereum, a blockchain-based decentralized platform for applications that run as programmed without any chance of fraud, censorship or third-party interference to facilitate online contractual agreements in a cryptographically secure manner.

The total number of LINA token created will be 900,000,000. 33.33% of all LINA tokens (300,000,000) will be available for sale to the public in the LINA Token Generation Event. 66.67% of all LINA tokens (600,000,000) will be locked in Smart Contract to be released annually over 10 years (60,000,000 Token per year).

In detail, the LINA locking and releasing mechanism will be as follow:

> 600,000,000 LINA tokens will be locked in Smart Contract.
> - Start from Q3/2019; 5,000,000 LINA tokens will be released each month (precisely every 30 days + 12 hours, that mean approximately 60,000,000 Token per year), and these tokens will be used for networking, strategic partner or for the development of LINA Ecosystem. At the end of the month, left over LINA token will be replaced again into the locked Smart Contract.
> - Based on the above mechanism, at max, there will be 5,000,000 LINA tokens enter circulation every month, and because leftover LINA token will be replaced back into the locked Smart Contract, the actual amount of LINA token released into circulation will be less than that.

1.5 The LINA Bridge

The LINA Bridge is a sidechain bridge service for the LINA Core blockchain network to synchronize bids, payment transactions and to interact with the LINA Token smart contract on the public Ethereum network.

Tokens between the private chain platform and the Ethereum blockchain could be dynamically interchangeable. As such, the balance of the ETH smart contract (LINA Token) could be equal to the liquidity of the tokens inside the private chain. Locking mechanisms in smart contracts should be implemented to ensure the consistency of the balance in user wallets between public and private platforms.

2 LINA Review

2.1 Value of online product review

With the explosion of the Internet, product reviews have become an important factor in building brand image and business reputation. A negative review can seriously affect the reputation of the business. This has even created an industry known as "reputation management" with the primary functions of helping companies "concealing" bad reviews [2]. However, from the users' perspective, this is not a good thing because it hinders them in accessing transparent and trustful reviews.

In Martin Lindstrom's marketing book "Buyology", he wrote about "mirror neurons"[3] - neuronal reflections: neurons that fire when an action is being performed and when that same action is being observed. He stated that this is related to the fact that the user when deciding to buy a product is often influenced by the interaction and review of other users of the product.

According to the statistics from Pew Research Center, more than 50% of US adults under 50 years of age regularly consult online product reviews before deciding on spending. In another survey conducted by the Center, 82% of adults in the United States said they "sometimes" read online reviews before making a purchase decision, and 40% of interviewees said they always or almost always read online reviews [4]
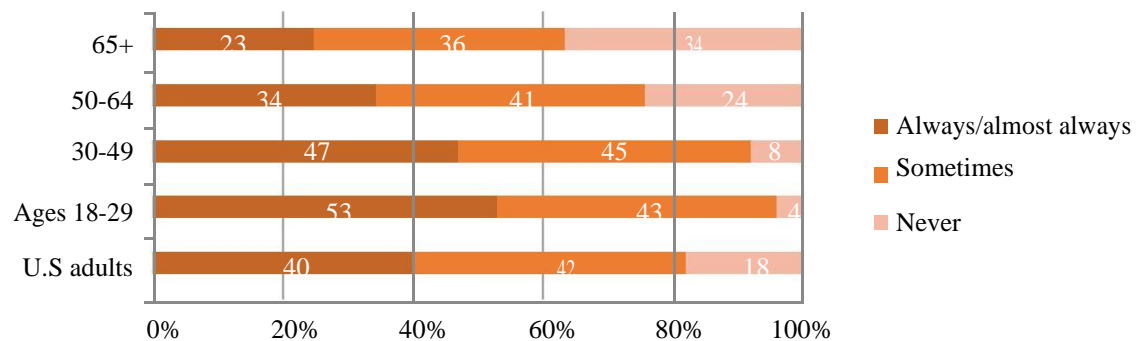
Figure 2: 50% of US adults less than 50-year of age regularly see online review

More importantly, the frequency with which users read online reviews is often proportional to the frequency with which they shop online. About two-thirds (67%) of weekly online shoppers said they usually read online reviews before making the decision. That figure for monthly online shoppers is 54%.

In fact, in the games and movies industries, there are cases where companies release awards not only on sales but also on the basis of expert and community reviews on Metacritic, the leading movies and games review site in the US [5].

"You get bonuses based on sales, and you get bonuses based on Metacritic scores. An executive producer might get a bonus of around $100K, and a regular programmer might get something like $15K, enough for a car."

-rollingstone.com

So, it is clear that the review industry is extremely important in building the brand image as well as the credibility of business reputation.

In the review industry, reviews of the experts play a decisive role. Expert reviews are usually written by reputable experts who have tried and tested products and services to find the best value for money. However, it is usually difficult for ordinary users to access these experts, while that should really be the main communication channel in the review industry.

2.2 Aspects of current review industry

2.2.1 Reliability of reviews and scores

While the importance of the review industry is undeniable, the most important part - the credibility of the score - is in question.

In May 2016, Yelp, US's leading restaurant and service review website, issued 59 notice warnings to consumers about businesses paying for better reviews [5].

Similar to Yelp, reviews on creative-related products such as movies or games on leading rating websites like Metacritic or Rotten Tomatoes are also considered as "Fundamentally Flawed" [6].

This happens because, in theory, the reviewers should be responsible for making the objective, unbiased and the most accurate reviews possible, but in reality, there is currently no evaluation mechanism for the reviewers themselves, so there is no clear connection between the benefits and the quality of the reviews of experts. When the experts do not have the motivation and responsibility to do their job, it is predictable that the quality of expert review would be reduced or influenced by other factors.

Besides, the lack of a transparent communication mechanism between the websites' offering review system and end users also creates a loophole that allows product or service providers to easily deal with the current rating system manager and thereby change review scores in their favor.

In 2010, Obsidian Entertainment, Inc. did not receive the bonus because their game Fallout: New Vegas only scored 84 points on Metacritic, while conditions for receiving the bonus is 85 points [7]. The publisher had been accused of consorting with Metacritic to change the score with the purposing of not having to pay the bonus. Although the truthfulness of this story will never be verified, it shows that the shortcoming of current rating systems is the ability to intervene in the review score of corporations and large companies.

This shortcoming leads to the reduction of users' trust in review results and systems. According to a survey from Pew Research, nearly half of the United States' surveyed population said they could hardly believe the results of online reviews.

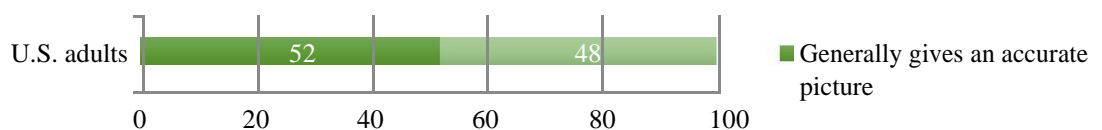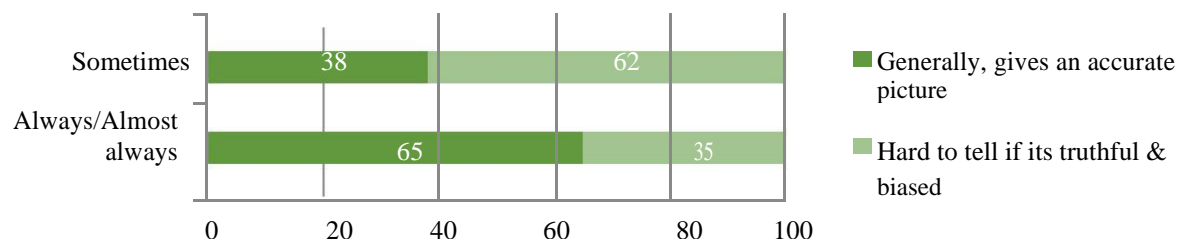**Figure 3: 48% of adults in the US suppose hardly to believe in the online reviews**

Figure 4: The ratio of the review readers trusts in the review results

Consequentially, end users lose their trust in review results, while review experts do not have the motivation to work. Therefore, manufacturers could not receive honest feedback to improve their products. It is a lose-lose-lose situation.

2.2.2 Difficulties in finding and comparing evaluation results

At present, there are many rating systems in different industries. These systems are quite dispersed resulting in difficulty for users to search reviews.

For example, there are many rating websites for technological equipment such as phones or laptops. Each of them has its own advantages/disadvantages, making it difficult to find reviews and almost impossible to gain experience from the previous reviewers.

2.2.3 Lack of standard criteria for each subject

One product is usually rated as "Good" or "Not Good", at the option of users. This is expressed quite clearly on websites providing scale-based rating with a large number of users. Take IMDB (the leading movie database website) as an example, the rating of 10 points or 0 point of movies, which have many viewers, are a lot, especially for controversial films. Or Rotten Tomatoes - the most appreciated review website, also gives users the choice of either "Rotten" or "Fresh".

Netflix - the largest movie streaming service - has also deprecated its star-rating system (from 0 star - 5 stars) and replaced it with "thumb up / thumb down [8]. One of the reasons for this change, at the option of Netflix, is that scale-based rating is decided by feelings and does not help customer feedback analysis.

In fact, the satisfaction or dissatisfaction of customers with products or services comes from many different factors and details of those products or services. However, most users do not realize where their satisfaction or dissatisfaction came from when reviewing. And yet, when being asked specifically about a criterion, they will immediately recognize that it is the cause of their positive or negative review. For example, for movies, many people acknowledged that the appearance of an actor/actress in the movie has a big impact on whether they like the film.

Therefore, it is necessary to build standard criteria for each subject in order to help business get the most accurate feedback from the customer. Thanks to the assistance of a network of experts in many industries, LINA.review has introduced a set of criteria applied to more than 20 fields ranging from technological products, medical services or hotels, to movies and books. In addition to being able to get the most accurate feedback from users about the selected criteria, LINA.review has introduced the LINA rating app (available on Google Play) so that users can "vote" for the criteria to be reviewed, currently for 6 subjects:

➢ Medical Service, Hospital
➢ Hotels
➢ Movie
➢ Restaurant
➢ Crypto Currency
➢ Smart Phone

The obtained results are fairly interesting, for example, for restaurants, the number of people voting for "Cleanliness" is greater than the number of people voted for "Food Quality", and the number of people voting for "Ambience" and "Food safety" is nearly equal to "Food Quality". This partly indicates that existing restaurant review criteria need to be updated.

2.3 Introducing LINA.review – community - driven review platform powered by Blockchain Technology

2.3.1 Solutions

By being implemented on Blockchain technology, LINA.review will address issues related to transparency and immutability of the score, as well as develop mechanisms to help users and experts earn profits based on system development and the quality of their reviews (via smart contract).

2.3.2 Procedures

Below are preliminary procedures of the system. Please refer to Section 4 for further technical details and illustrations.

For Merchants

Merchants are the parties providing the products or services who wish them to be reviewed. To join the system, a merchant is required to register with LINA.review about their fields of business and may have to pay for registration or product listing fee(s) (if applicable; depending on configuration). In case where a fee is required, the fee(s) will be distributed just like the advertising fee (Section 3.4).

For Advertisers

Advertisers are businesses or individuals who want to advertise on LINA.review or other review systems running on the LINA blockchain platform. Naturally, a merchant could be an advertiser - and standalone advertisers are treated as a special merchant on LINA.review. Hereinafter, Advertisers could be also referred to as Merchant.

The revenue from advertising will be distributed to the system participants according to the configuration of each system on LINA Platform. The 10% charge for administration and operation of LINA.review is required.

For Helpers

Experts (hereinafter referred to as Helper) mean those users who are qualified and will review products and services on the system.

When viewing products or services, Helpers' reviews shall be displayed separately. There are 2 options to become a Helper:

- ✓ Sign up with LINA.review by attaching CV, proof of domain knowledge, personal value, etc. The applicant is only considered as a Helper after being approved by the Helper Board. Please note that in the later stages of the system, when LINA.review has grown, the approval for being a Helper will be very strict due to the user-oriented assessment of the system.
- ✓ Publish lots of quality reviews, which are widely accepted (like/agree). After reaching the specific level, the reviewer will be promoted to Helper. Note that depending on the size of the system that this threshold will also increase accordingly.

The Helper will be entitled to receive a substantial portion of the advertising revenue or registration fee (up to 50%) depending on their fields. The parameter as mentioned earlier is only applied to LINA.review, and that of other LINA blockchain based review systems could configure their own incentive and revenue sharing policies.

It is the responsibility of the Helper to monthly submit a certain number of reviews with an acceptable quality (based on factors such as the number of like/agree from users). In case where the Helper fails to

satisfy these conditions in two consecutive months (configurable), they will be demoted down to the common user.

For Common Users

Common users mean those who are using the LINA.review system to search the information on products and its reviews as well as write their own review and assessment. Common users can become Helpers through the above-mentioned options.

Common users may be distributed system revenue for their review and assessment work, depending on configuration.

Specifically, for the system LINA.review, the common users will not receive system revenue for their review and assessment.

With other review systems running on the LINA blockchain platform, the revenue sharing for the user shall depend on each configuration.

For System Builders on the LINA Platform

Individuals or companies wishing to build a review system on the LINA blockchain Platform could easily do this. Participation is free but the LINA Platform will charge based on the activities on the system, namely the participation of merchants, advertising as well as rating activities themselves.

When these private systems come into operation, 10% of system revenues (from advertising or merchant participation fees) will be used to administer and operate the LINA Platform.

2.3.3 Example Use-cases

Use-case #1: Building the global review system (LINA.review is this use-case)

The review system is capable of developing communities and building/expanding networks of its Helpers. The logic of subject, criteria and experts are shown in Section 3.2 and 4.

Use-case #2: Building a specific review system for a specific subject

Subject: People who have the available community and wish to build their own review system with one or more predetermined review subjects.

Example: Building a travel review system for hotels, such as TripAdvisor.

Procedures:

> ➢ Build review application for tourism and hotel on LINA Platform using LINA SDK and sample applications.
> ➢ Configure criteria that are needed to be reviewed. For example, the criteria can be simple, not too detailed if the system mainly targets community.
> ➢ Configure specific parameters for each reviewer and Helper: Because of the large size of the global community, common users will not be able to get LINA Token when reviewing. A greater number of likes is required to become a Helper because the user community of tourism and hotel is already very large.
> ➢ Configure ad revenue distribution ratio.

Use-case #3: Building individual review systems

Subject: Qualified people who want to build their own personal review systems

For example, movies review blog

Procedures:

> Build the review application for the film on LINA Platform using LINA SDK and sample applications.
> Configure criteria that are needed to be reviewed. Since this is an in-depth review system, the criteria can be very detailed.
> Configure specific parameters for each reviewer and Helper: Since this is a personal system, there is no mechanism for common users to become Helpers.

Use-case #4: Business owners to build a review system for business services

Subject: Business owners who want to build their own review system for their services (with their own conditions).

For example, an automobile manufacturer who wants to build a system to get customer feedback on their cars.

Procedures:

> Build the review application for the automobile on LINA Platform using LINA SDK and sample applications.

> Configure criteria subject to feedback. For example, a luxury car firm, which does not care about the price criteria, could focus on the criteria of interior aspects such as sound and image system, seats, etc.
> Configure specific parameters for each reviewer and Helper: For example, because the firm owner needs customer feedback, each reviewer can receive a small number of LINA Token, and that of each Helper will be higher. The requirements to become Helper will also be more rigorous, requiring the business owner to confirm instead of being able to be promoted on the basis of the number of likes in his/her review.

2.3.4 Advertising on LINA.review

Advertisers will utilize LINA tokens to advertise on the system. Advertising revenue will be shared to participants in the following rates: (Note: figures can be changed/configured)

- Operating and administration expenses: 10%
- Helper: 50% depending on industries. For example, if advertising revenue comes mostly from car manufacturers, Helper in the field of the automobile will be distributed more. This does not mean that Helpers in the field that have no advertising revenue will not be shared, it is just that they are given fewer tokens.
- Large Token Holder: 40% - Holders of large numbers of tokens (> 1 million tokens) will be shared 40% of the advertising revenue in accordance with percentage of tokens. The division of revenue will be held every 6 months.

- When advertising on LINA.review, the businesses will approach to the right targeted subjects because when the users are interested in reading reviews in any fields, the advertising of these fields will be displayed.

- For LINA.review and LINA token systems, revenue from advertising is very important, as it generates three values:

- Create demand for LINA tokens, especially from businesses with high financial capacity.
- Create benefits for those who directly create the value of the system (Helpers), thereby increasing the quality of reviews resulting in increase of the system's value and higher advertising revenue.
- Create a Network Effect to attract users and helpers to evaluate in the system, thereby increasing the value of the system and leading to higher advertising revenue.

2.3.5 Business Landscape

Competitors

Metacritic: A website that reviews movies and games which is known as the largest rating system of its kind in the world. Many publishers are using Metacritic scores to evaluate product quality as well as give bonuses to producers. However, it is accused of being influenced by large corporations, especially in the games industry.

1. IMDB: The world's largest database system of movies. It has the function of reviewing movies, but this is not the main function.

2. Rotten Tomatoes: the highest rated review website for movies with a large number of qualified movie experts. However, the experts themselves are rarely replaced, which makes it difficult to maintain consistent quality.

3. Yelp: Review system for restaurants. Services and many other fields. Focus primarily on the US market.

4. TripAdvisor: A system for review of hotels and travel services around the world. In addition, users are also able to book rooms online.

5. TechRadar: A system for reviewing technology products such as phones and laptops etc.

The strengths of LINA compared to the current system

Current system	LINA.review
The result of the evaluation is not transparent, and it is easy to lose trust from users.	The results are completely transparent to the users
Easily influenced by outside factors due to centralized review.	The assessment is decentralized so it cannot be faked.
Users do not have the ability to monetize on the system.	Users and Helpers can earn LINA token basing on their contribution.
No specific review criteria for each subject	Build specific review criteria for each subject with the assistance of available team of Helpers.
Often only focus on certain products or services	Unlimited types of products or services.
Lack of motivation for reviewers (Common Users and Helpers) to improve their review quality.	Users can become Helpers if they have many high-quality reviews. Helper may lose their position if there are many poor-quality reviews.
Revenue is not transparent.	Revenue is completely recorded on the blockchain and visible to the public.

2.4 Technical Details of Review Application on LINA Platform

2.4.1 The LINA User Profile

LINA users mean those who are using review services on the LINA Platform to search the information on products and their reviews as well as write their own reviews and assessments. Each user will have their own profile where they can input their interests and preferences.

User levels (Common or Expert) can be determined by the owner of the review service.

In order to receive token rewards, users will need to register valid addresses to receive LINA token.

2.4.2 The Review System

The review system, such as LINA.review, is a review service built on top of the LINA Platform. It is designed to be easy for individuals or companies to build their own review systems on the LINA Platform using the LINA SDK and sample applications.

Building review services on LINA Platform is free but a maintenance fee will be charged based on the activities on the service, such as advertising and rating activities.

10% of service revenues (from advertising, merchant review bids) will be charged to cover the costs of development, operation and maintenance of the LINA Platform.
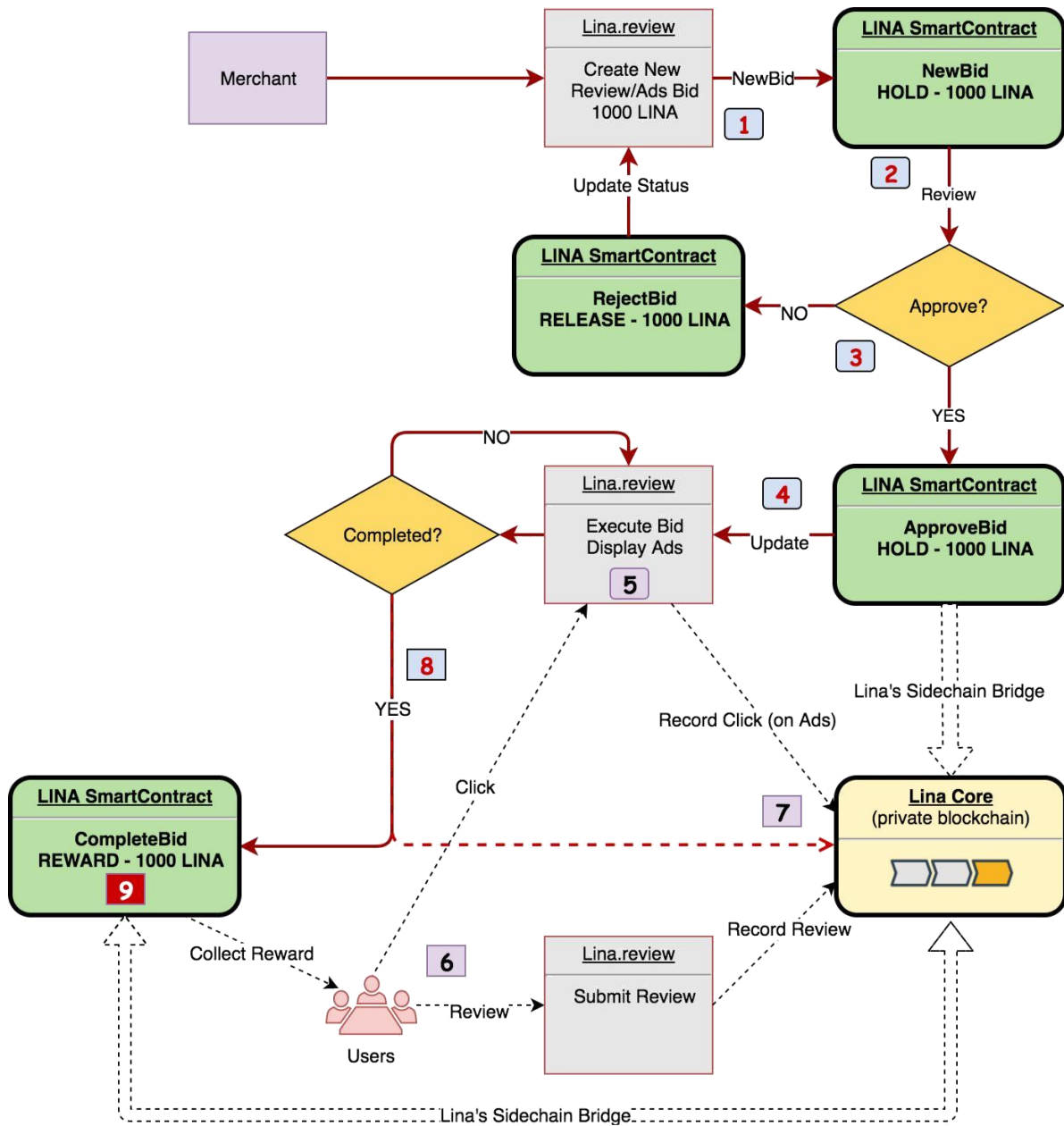
Figure 5: Bid and Reward Sharing Flow

This is an example walk-through of a bid for advertising request from a Merchant and the reward sharing flows:

1. The Merchant places a new product review request, or a new advertising campaign bid on the LINA.review website by providing campaign details (links, conversion goals, …), for example, 1000 clicks at the price of 1000 LINA (1 LINA per click).

2. The Merchant deposits 1000 LINA to smart contract to place the bid. 1000 LINA then will be locked, and the bid is waiting for approval.

3. LINA.review staff reviews and approves the bid. In case the bid is rejected, the deposit amount will be refundable to the merchant.

4. Once the bid gets approved, LINA.review service will be notified to execute the bid.

5. The bid gets executed on LINA.review website based on campaign parameters.

6. Whenever a user clicks on the ads link, the click will be recorded on the LINA Core private blockchain.

7. Whenever a user clicks to submit a review, the review details will be recorded on the LINA Core private blockchain. Note that the review could be subject to being approved by LINA.review staff or by votes from Helpers.

8. The LINA.review service will periodically check transactions on the LINA Core private blockchain and bid configurations to determine if the campaign is fully executed or expired.

9. Once a bid is fully executed or expired, the LINA smart contract will be called with statistical information to calculate fee(s) and revenue sharing distribution to users and LINA token holders. In case the bid is partly executed, the remaining amount (if any) will be refundable to the merchant.

   Bid status on the public chain will be synchronized to the LINA Core private blockchain by the LINA Bridge.

3. LINA Supply Chain

3.1. Importance of Traceability in Supply Chain

Beside Review application, the advantages of blockchain can also be replicated in the food supply chain management through traceability, especially considering that reviewing/auditing process by qualified third party is essential to the traceability and quality control aspect of the supply chain. Traceability is a bold move considering the fact that it is likely to empower firms or organizations. This would be achieved considering how they are better placed to harness strengths associated with security while also better placed to ensure that there is a high-quality watch over any issue that may come up within the supply chain. The challenge in current traceability techniques is the inconsistency evident in the use of the tracking and tracing. Safety and quality have also deteriorated in the food supply chain. From our review solution LINA.review – we are creating LINA.network – The traceability system that utilizing blockchain's immutability and transparency to present the whole supply chain process in the most accurate way, as well as allow third party to verify the accuracy and legality of the chain. Similar to LINA Review, LINA tokens will be the native token of the system, with the purpose of tokenized the relationship between producer, manufacturer, and auditor.

Based on the definition given by the International Organization for Standardization, it is always essential to have a way of tracing the history, the location or even the application of whatever is under consideration. As much as the definition may be quite broad, there is no standard measurement of all that should be considered. This is a situation that has begged a series of significant improvements which have to be made. The main goal is all about utilizing traceability frameworks on the basis of three major destinations. The three principles that should be the case at this point are enhancing supply administration, separation, and marketing of food products that have imperceptible quality traits and finally to encourage tracebacks for both quality and sustenance.

These are some of the major importance that comes with the process of incorporating frameworks that call for low-cost conveyance accompanies by lessened review costs. Other advantages include the presence of extended offers associated with those credits which may be difficult to recognize. This is a clear show that for most of the situations, the advantages and importance of traceability can be the source of positive change and more significant net incomes which would be recorded by firms (Tian, 2016). The major goal has always been to ensure that there is work improvement across any production network.
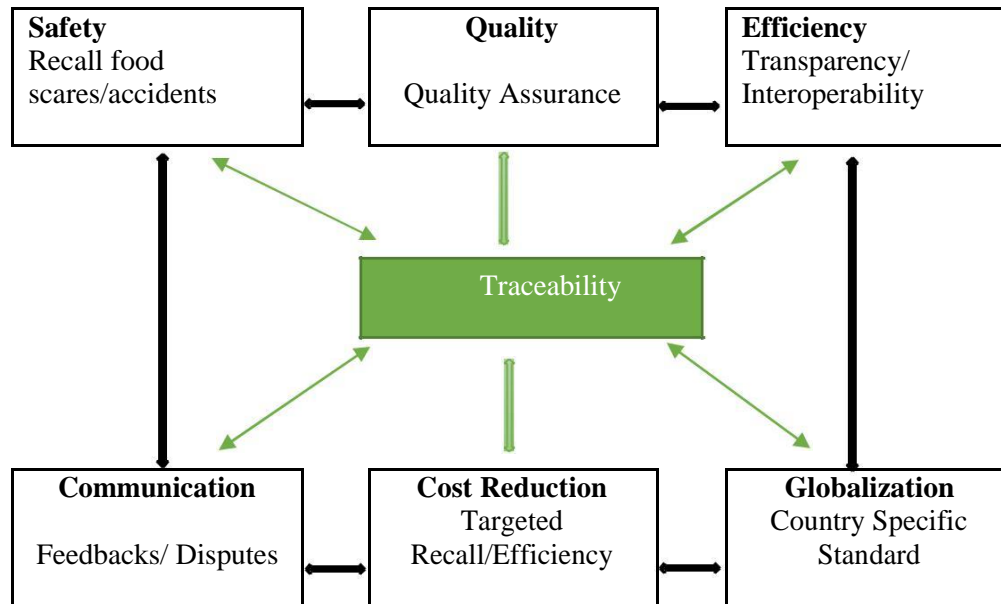

Safety Recall food scares/accidents	Quality Quality Assurance	Efficiency Transparency/ Interoperability
	Traceability	
Communication Feedbacks/ Disputes	Cost Reduction Targeted Recall/Efficiency	Globalization Country Specific Standard

Figure 6: The important of Traceability in Supply Chain

One of the noticeable importance and benefit that may accrue from enhanced traceability is the fact that there will be an enhanced supply distribution. This is a fact which leading industry investigators assessed in the year 2000, where they were looking at the supply-related exercises. One major finding that came up was the fact that American Organizations burned approximately 1.6 trillion dollars. This is a figure that was inclusive of stockpiling maintenance and controlling of all the things that were present in the shop network. The fact that it is possible to lower some of the costs incurred in various aspects is a clear implication that there is a significant contrast that exists between the fizzled firms and the profitable firms.

When it comes to those that have ventured into the foodstuff domain, which is characterized by thin edges and distribution management, bringing in traceability can be the best thing and can serve as a vital province that may lead to rivalry. Putting in place a traceability scheme is the best thing an organization can have and should be accompanied by a series of proficient approaches which touch on stockroom, producing items, launching and even gathering. Other concepts which have completely enhanced the traceability concept include the presence of electronic coding schemes. This is one of the most standardized recognition schemes that has fronted the idea of innovation. It is not in any way different to the utilization of radio-recurrence ID structures which have managed to streamline most of the operations in the United States when it comes to the process of making deliveries.

Looking at some of the biggest retailers in the United States like Wal-Mart, they have made steps to ensure that they put in place a restrictive inventory network data framework. This is a functionality that there ensure that all their providers receive [9]. Another additional confirmation is the Stock-to-deals proportions where most of the organizations spread across the United States are looking to grasp various calculated and precise frameworks so that they advance the process of keeping watch over the

stock stream. There is a significant downward sequence of the inventories which is a clear implication of the benefits that have come from efficiencies achieved by organizations in the sustenance industry backed by traceability frameworks.

Traceability is a bold move considering the fact that it is likely to empower firms or organizations. This would be achieved considering how they are better placed to harness strengths associated with security while also better placed to ensure that there is a high-quality watch over any issue that may come up. The ripple effect is the reduced time and appropriation of all that may be unstable or displeasing. Generally, it would be about getting rid of all that is associated with higher risks and those that may undermine the reputation and reviews. It also takes into account the advantages that come with an enhanced or improved time framework being followed. It is a move which automatically translates to speedier building and discrimination and resolution of all security issues being isolated from the good quality issues.

Once a drain processor is well designed with remarkable codes, there are higher chances of discriminating the times of formation, the places of formulation and even the generation lines. Having such respective information processors are well equipped to follow any item which may be flawed to the instance with which it was formed [10]. Once that is determined, different items can be chosen on the basis of the same group and eventually subjected to additional blemishing. The advantages and importance are immense and as a result, various purchasers are completely altering the approach.

Hotels and restaurants are not also being left out accompanied by a few other shopping centers which are now going ahead to give strict instructions to all their providers. They are all being challenged to come up with traceability frameworks so that they can always make sure that at any instance external players can be brought to the picture for the purposes of confirming whether the frameworks are working. The concept of bringing in outsider benchmarks who can affirm to the offices and ensure that the whole nourishing food industry has in place proclaimed traceability frameworks.

3.2 Current Challenges of Traceability and How Blockchain Can Solve It

3.2.1 Tracking and Tracing

The first biggest challenge that seems to be prevalent with respect to traceability is the fact that there is no consistency evident in the use of the words and tracking and tracing. Some of these terms have continued to be used interchangeably bringing about significant confusion between the two concepts. Most definitions that have been made before are trying to address its ability to follow up on any product movement throughout the entire supply chain. Traceability requirements for example in the EU has been defined as the ability to trace a product's movement a single step forward and also a single step backward. Traceability should be capable of supporting the two sensitive concepts; tracing and tracking [11].

Both tracking and tracing are two entities which should make up any fundamental traceability system. They are all part of the factors that have to be considered and factored into any product entity. Any product entity is normally made up of both the amount and type while the activity entity covers both time and type. However, looking at the existing systems there is no comprehensive approach that has been used to apply some of these crucial aspects that come in hand to tracks and to trace any product. Furthermore, there are no provisions which have been made to address both the external and internal traceability needs which pose a challenge to the entire supply food chain.

Internal traceability is about tracking and tracing any components, products or units that are unique and in line with the specific organization and also used within the organization. When it comes to the external traceability, it dwells on the ability to both traces and tracks the unique facets of information that are linked to the physical movement of the products between companies. The challenge comes in due to the absence of precise and fast tracing which addresses the two major areas. Any traceability

mechanism should be in a position to address both the external traceability aspect and the internal traceability aspect. The other additional part is ensuring that they should also be connected to the product. These are the desired components that should make up a traceability system but have not been addressed accordingly.

To further on the concept of external traceability and why it should remain a priority but is not at the moment, is the fact that there seems to be no connection that exists between information systems charged with the responsibility of linking the partners that make up a supply chain so that they maintain the desired connectivity to the interconnected information systems. The external traceability is a benefit that accrued from the success of internal traceability since each of the actors in the supply chain were tasked with initiating communications and collecting relevant information regarding their respective processes and products. The fact that the internal aspect was improved to bring out the external traceability implies the need for a more robust system that would address all the logistic processes that make up a supply chain and enhanced information sharing between companies.

3.2.2 Drivers of Traceability

There are various factors that have served as the most precise motivation to address the need for traceability in a supply food chain. The drivers have been all about ensuring that the traceability concept is brought to boo. Each of the factors has unique challenges and voids that need to be filled by the traceability concept in the food supply chain [12]. When combining the factors dwell on why, what, who and when questions which should also be in line with the globally recognized standards. All of them can be used to give a precise description of all the traceability processes, the related business needs, and even the legislative aspect. The factors that have proven to have unique needs and challenges are safety and quality, social factors and economic factors.

Safety and Quality

Safety and quality have always been the biggest challenge in the food supply chain. There has been a dire need to ensure that there are initiatives in place that can be used to enhance and improve the initiatives that makeup food traceability. Food traceability has a sole connection to the safety aspect and also the quality expectations. The focus has not just been about the need for an improved logistic process but instead the need to include the safety and quality aspect to the process. For the past few years, food traceability has continued to trigger immense conversations more so due to the increasing cases reported about vices such as food counterfeiting. There have been also concerns about the increasing cases of animal diseases and other sustainability issues. These are some of the setbacks and challenges that have motivated the need for a new or a more robust traceability system that may address some of the issues which have been on the rise.

As a stepping stone to address some of these emerging challenges that have attracted public attention is the move to pass new legislation. The legislation has laid a firm foundation which may at the end of the day reduce the concerns and the challenges which have come from the absence of a traceability system to curb such cases [13]. For cases where food is discovered to be contaminated, the first priority is to establish the source of the food so that the contamination can be stopped as quickly as possible. However, the challenge comes in when the traceability system doesn't come in handy and fails to pinpoint the source.

A robust traceability system should always have a record of data concerning the types of food, the ingredients and all the processes the food is subjected to at any stage of the of the supply chain. The resources used at any given system should also be well outlined. With this, it can be very easy to trace the origin of the food, or even its ingredients. Once such information is established, it can be easy to isolate the product form its specific source and even the specific ingredients in question. However, with the absence of a precise traceability system it may be a challenge identifying the source faster, and then going ahead to solve it. This is a hypothetical scenario which outlines the importance of a

comprehensive system to address this challenge. The presence of a highly reliable system eases the process of initiating a recall protocol and eventually enhances the security needs while also significantly reducing the costs to be incurred.

It is also important to note that quality has been a great concern to the public. If anything, a traceability system should not just focus on the safety requirements but also dwell on the need for a tool that can enhance both the quality and safety concerns. Designing a comprehensive traceability system is capable of addressing the quality concerns since workers would always be aware of the increased need to capture every detail as per the stipulated documentation process. At the moment, some of these loopholes have not been addressed. Such gaps are the smoking guns for the crisis which is likely to affect the economic frameworks, the marketing relations among the stakeholders in a supply chain both from national and international fronts.

Based on investigations and studies that have been conducted in the past, food contamination crisis has led to a significant number of people getting hurt. Furthermore, in such events, a massive amount of resources has been used with no actual resolution to the same problem in case it strikes again. The implications are not just felt by the supply chain actors but also the government agencies and those in the medical sector. To make matters worse is how these unfortunate events normally affect the consumers with whom their confidence will be hit most regarding the systems in place to protect them from such events.

Social Demand

Consumers keep on getting smart day by day and to date, they have shown a greater concern regarding the safety and properties that make up the food they eat on daily basis. There are very many cases that have emerged where consumers have protested to be assured of the safety of the products that they get from the stores and the fact that they consume such the rest of their lifetime point to how it is a challenge for them to be convinced of the safety of the food they take. There has been no effort among the producers and the rest of those in the supply chain to ensure that the information required by consumers at the end of the supply chain are informed and well aware of.

The best part is how consumers are no longer convinced of the labels that producers attach to the containers of their products. There is an increasing thirst for more information that does not only touch on the source of the product but also the details regarding the supply food chain. The challenge here is in the public domain where each individual is convinced that the supply chain is not as watertight as it seems. They are instead of the view that more information should be disseminated to them. Once they are equipped with the right information, they can be better placed to make the right decision. Unfortunately, the information they are demanding for is unavailable. Much as this may be attributed to the specific stakeholders in the supply chain, it could be a systemic issue which lags and fails to capture the desired amount of information [14].

Having a well-developed and precise information system is likely to alter the perception in the public domain. There is always a need to ensure that those at the end of the supply chain are entitled to a comprehensive information background of the product. It is high time that companies revisit the supply chain traceability system to ensure that the consumers remain the main focus and also ensure that at the end of the day they will be fed with the right information. The benefits cannot just be felt from the consumers' end but if they have the confidence to consume a product, then food products will shoot in terms of sales due to the desired consumer satisfaction.

Economic Conditions

The global way of doing business has been undergoing a major evolution and to date, the techniques being used to penetrate the market a decade ago have completely changed. This is an era marked by a series of innovations and extensive use of technology. While we may say the modes of operations have changed, so are the problems that combat the success of the supply chain. The economic conditions mutate with new sets of problems and challenges. The way operations are also executed are being changed at all levels of the supply chain. This is an economic trend that completely changes the operational landscape of the supply chain environment.

All these variables such as product pricing, potential funding, market access among others play a significant role in the entire supply chain [13]. The factors that emerge from the utilization of a supply chain need to be visualized in a productive manner so that there is a significant improvement in the use of the traceability information. However, this is an advantage which would only come in if the right tools are in place to ensure that some of this information can be captured comprehensively then addressed from an individual level for the benefit of the rest of the factors that make up the supply chain.

Efficiency has also been the main concern just as it is in any other business domain. To achieve the desired levels of efficiency, there is a need for the right logistics tools that put together then needs at all levels of the supply chain. Efficiency can be achieved if the logistical costs are lowered. This will happen in the presence of the right information and the cooperation of all the enabling players which can work hand in hand to put in place the right traceability system to aid in achieving the desired levels of efficiency.

3.3 How Block Chain Can Solve Traceability

Blockchain technology has proven to be among the most advanced platforms with the ability to revolutionize close to all domains across the globe. Its capabilities have been realized in other crucial disciplines for example in the finance sector where cryptocurrencies have emerged and gained a great deal of momentum. The fact that it has laid its roots in the financial sector is a clear implication the technology has a great deal of sophistication with the ability to address numerous and complicated challenges if applied accordingly. With regard to the supply chain management, the characteristics are clearly fit to tackle the setbacks that are present in the conventional traceability system.

Blockchain can also be used to solve traceability considering its capability to tackle complex processes. It is also capable of employing various decision parameters. All the parties would have to come together devise the right parameters which can then be integrated to the product level. Bringing such information and parameters to the product level may elevate the traceability need to the desired levels. The best part about blockchain is how it can be utilized to suit specific needs. The alterations would also be made so that they are in line with the needs of the various parties at different levels of the blockchain.

The blockchain is heavily reliant on structures well set up so that decisions can be executed accordingly. Blockchain has the frameworks to make up a robust system that takes into account all the building blocks and structure of the supply chain. It is a sophisticated piece of technology that is capable of delivering on both quality and capacity. The other advantage that comes with blockchain is the fact that it is capable of tracing all the history of specific entities that make up the rest of the food chain. Blockchain in solving traceability can bring together the four pillars; data to trace, traceability tools, product routing, and product identification, to make up a robust traceability system based on the blockchain.

Figure 7: The Important of Transparency to Supply Chain Traceability
(Farm-to-Fork Transparency: Food Supply Chain Traceability by Johannes Ahlmann)

Using Blockchain Technology, LINA Supply Chain can resolve the current problem with the increasing lack of trust from customer toward food quality:

- **Transparency**: Data stored on the Blockchain will be securely available to all parties in Supply Chain, like a customer, manufacturer, transporter, regulator. That means the information on food and supply chain data provided for the user can be trusted.

- **Reduce Fraud**: Because all data stored on the Blockchain is transparency to all nodes and in order to add new data to the blockchain, each node will require specific permission, as well as the consensus of the whole network, it's much harder (or impossible) for unauthorized party to manipulate the information on the Supply Chain. That will reduce or even eliminate food chain frauds.

- **Digitalize** paper-based process.

- **Reduce Human Error**: Based on Smart Contract, there are specific rules applied to each supply chain system, and those rules could run automatically without any human interference. So, the user cannot input "wrong" information on the Supply Chain. That will also maintain the integrity of data (reduce/remove human error and data tampering)

3.4 Introducing LINA.network – Traceability Ecosystem powered by Blockchain Technology

3.4.1 Solutions

Utilizing our already-being-build LINA.review system, we can set up a Traceability ecosystem that allows important third parties such as auditor company/individual, quality control department (independent or government based) can join and work together with the Supply Chain data in a trustless and transparency way while being rewarded in the process.

The main goal is to ensure that there is a link that exists between the physical setup and the digital world. This is to ensure that all the physical products that go through the supply chain process have digital identifications. For the identification process to work well and have a careful tracking of tracking of the physical products, the blockchain will integrate the use of NFC tags and QR codes which can uniquely identify the goods and also serves as a way of linking it to the traceability platform. There are also tags which can come in handy and include the use of other tags such as RFID [11]. Each of the goods will be identified both from the production and the manufacturing stage which is where the supply chain begins.

The other aspect which is also crucial for the blockchain is to ensure that each transaction that takes place in the supply chain is accounted for. Having this feature eases the audit process and as a result, the use of readily available devices present at all levels would come in handy. The display information available to customers can be decrypted with the aid of a smartphone QR code reader. The information to be relayed by the QR code reader will always remain unique and free from interference so that every time a consumer picks a product, they can use it confidently.

There will be Web Application and Mobile Application build on top of LINA Supply Chain to provide a UI for customers and regulators to watch the detail information on the supply chain. With the Mobile Application, the customer can just scan the QR code on the product label to get the information of the whole chain, and that information can be trusted since it will be verified by regulator and auditor parties.

Our LINA.review will provide a review system to LINA Supply Chain so that the customer can rate all objects in LINA Supply Chain, such as Farm, Factory, Brand… and even Auditor.

3.4.2 Actors

The supply chain is made up of various actors and all have to be part of the blockchain. All actors put together a blockchain and being from the producers, then to the manufacturers, registrars, standard organizations, certifiers and auditors and finally the final consumers of the product [10]. All the key player in the supply chain have to be added to the system so that they can interact with the blockchain. To meet the prerequisites each will need to have a real-world entity so that they get registered to the blockchain. This is a process that will touch on all entities that fall to the different categories of the supply chain.
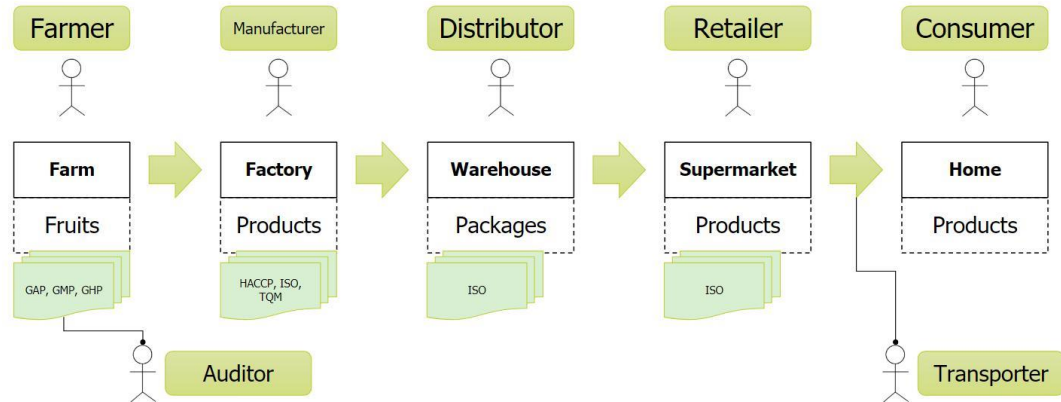
Figure 8: Actors in LINA Supply Chain system

Producer

Producer is the parties having the products that want to be reviewed/audited (Farmer, Manufacturer). To join the system, the Producer is requested to register with LINA.network about their business and **will** have to pay a fee (depending on the detail of their Supply Chain process, like the number of products, or steps in the Supply Chain).

Auditor

Auditor (Function similar to Helper in LINA.review) mean third parties who are qualified and will audit/review the process of the Supply Chain (Excluding process that they don't have permission to access).

The auditor can be independent parties/individual that have the necessary skill and knowledge to audit/review Supply Chain process, or they can be Government parties that responsible for the quality control of products.

The Auditor will be entitled to receive a substantial portion of the token (up to 90%) from the Producer fee.

Receiver

Receiver is actors in the Supply Chain that mostly work as in-out data nodes (Distributor, Retailer, Consumer). They will have different permission to access different steps in the Supply Chain. For example, the Distributor can only access products that are marked "ready to transport", and Consumer can only access data of the Supply Chain that Producer marked "visible to Customer".

LINA Supply Chain intended for LINA token to be used as a reward from Producer to Distributor or Retailer, but it will only be upgraded in a later version.

3.4.3 Permission

LINA Supply Chain is based on a **Permissioned Blockchain**, that means:

- All nodes in the LINA Supply Chain system will have a complete copy of the whole blockchain, that will ensure the transparency of LINA Supply Chain System.
- However, that does not mean all nodes will have identical data access. Each node still needs specific permission (set by the Supply Chain's administrator) to access specific data. For example, Regulator nodes will have greater data access than customer nodes.

As LINA Supply Chain aims to handle complex modern supply chain process, the design of each object is flexible, that means there is no "fixed" object but each object can be configured based on the design of the whole network with the following attributes:

- **Ownership**: The owner of each object, for example when the product comes to the transport department from the factory department, the ownership of that product change from Manufacturer to Transporter.
- **Location**: The current location of each product, will be used on the tracking and permission system (for example, only nodes that are located at the factory can add new data about Manufacturing process)
- **Data**: The detailed information of each object (like Degree.
- **Permission**: Each object will have different permission toward the different object. For example, Regulator nodes will have permission to access Factory nodes' data but Transporter nodes will not, or Auditor nodes can access detail data of Farmer but Retailer cannot.
- **Custom Attributes**.

3.4.4 Basic Use-cases:

Basic Supply Chain process with Auditors

As Figure 1, all data in the LINA Supply Chain can be maintained on the same ledger in real time, with total transparency.

At the start, the farmer will produce a raw product (like fruit), which is audited by an Auditor party to confirm that this product is good enough. The Auditor can produce a certificate (like a QR code label) to allow the farm to certify the individual stacks of their products. After that, the product will be transferred to Factory. Both Farmer and Manufacturer node will update the change of ownership in real time on the Blockchain, and that change of ownership will be broadcast to everyone on the system to check on the provenance of the product. At the factory, only authorized manufacturer nodes can add new data (like degree, the status of the manufactured product, etc..) and all the additional new data action will also be broadcasted to the whole network.

If there are any issues during above sample supply chain process, it's easy to track back to see where the exact problems are, since all actions are stored on the Blockchain with exact actor and timestamp.

In each process, if Producer actors (Farmer, Manufacturer) require, they can put up a campaign that requests their process to be audited/reviewed. Each campaign will require a specific fee in LINA token to be paid. The Auditors can apply to the process and be chosen by the Producer.

In case of Government Control, they are also an auditor actor but they can require the permission to access from the Producer.

3.4.5 Advertising on the Supply Chain Mobile Application and Web Application

Similar to LINA.review, Advertisers will utilize LINA token to advertise on the system. Advertising revenue will be shared to participants in the following rates: (Note: figures can be changed)

- Operating and administration expenses: 30%
- Nodes Operator: 20% depending on the size/complexity of their Supply Chain. Each big Producer will be required to work as a Nodes Operator and will be distributed advertising revenue according to their contribution to operating the Network.

- Big Token Holder: 40% - Holders of multiple tokens (> 1 million of tokens) will be shared 40% of the advertising revenue in accordance with their percentage of tokens. The division of revenue will be held every 6 months.

3.4.6 Business Landscape

Competitors

  ➢ **Blockchain-based Supply Chain**: IBM Supply Chain solution, VeChain, OriginTrail, TE-FOOD etc.

  ➢ **Centralized Supply Chain**: JDA, System powered by SAP/Oracle.

The advantages of LINA Supply Chain

Advantages	Description
Transparency	The Supply Chain data are completely transparent to the users
Permissioned Third Party	Allow third parties (especially auditors) tojoin the system in a permissioned way.
Monetize	Utilizing LINA token, allow the monetizing of the Supply Chain system to reward auditor or distributor.
Government Control	Allow Government to act as a controlled party in the whole chain.
Ecosystem	All parties in the LINA Ecosystem can work with each other, as well as with LINA token (if needed) seamlessly in a transparent manner.

3.5 Technical Details of Supply Chain Application on LINA Platform

3.5.1 Overview

Looking at our technical details (*Please refer to 1.2 for the architecture of LINA Platform)* it would encompass the use of various technologies. The best thing is to ensure that each of the technologies is based on a secure framework. Furthermore, the technologies should have dwelt into applications that have a deep history in computer science and other commercial applications. Some of the technologies to be integrated are addressed the integrity needs which is a core principle of any other platform. In line with the authentication mechanisms required, private or public key cryptography would be the first priority accompanied by hash functions. Other components which would also have to be part of the picture include distributed database technologies, decentralized processing, and consensus algorithms.

These components are in line with the projected standards which have to tackle the integrity issues and a robust distributed database.

As for the technical choices, the first consideration is the **permission** design which addresses the need for **permission** in order to address the platform. The second part which was also highlighted as part of the technologies is the choice of consensus which would dwell on how any new block can be introduced to the platform Another crucial aspect is that of smart contracts which will be used to establish whether virtual machines to represent any business process can be run. The last part is whether the recent bubble of cryptocurrencies can be brought to the picture (Tian, 2016). This is the part which may come in handy when in the execution of smart contracts. The technical aspect is the core of the platform since it would determine the best mode of governance that all the participants of the supply chain can use.

3.5.2 The LINA Actor Profile

Different to LINA.review, in LINA Supply Chain each user/actor will have different permission, that will allow the different party in the system (Producer – Auditor – Receiver) to work and share data securely and privately.

That permissioned design will also reduce the chance of fraud and human error, as each specific node cannot have access to specific data without specific permission.

All actions of each node in LINA Supply Chain will be recorded with detailed information about actor profile and timestamp.

3.5.3 The Supply Chain System

Different from LINA.review, there will be only one main Supply Chain system built on top of LINA Platform. At the moment it will not be possible for third-party developers to use LINA Platform to build their own Supply Chain publicity.

All producer, auditor, distributor that want to join LINA Supply Chain will have to pay a specific fee depend on the size/complexity of their Supply Chain.

The ability to build independent Supply Chain system on top of LINA Supply Chain (Other Services Builder in Figure 2) will be reserved for private usage, for example, if Producer wants to have their own private Supply Chain system, they will have to pay in LINA token to access LINA Supply Chain SDK. Users will work with LINA Supply Chain via Web Application and Mobile Application.

4. Token Generation Event (TGE)

4.1 Token Allocation

LINA TOKEN ALLOCATION

Public Contributor 33%
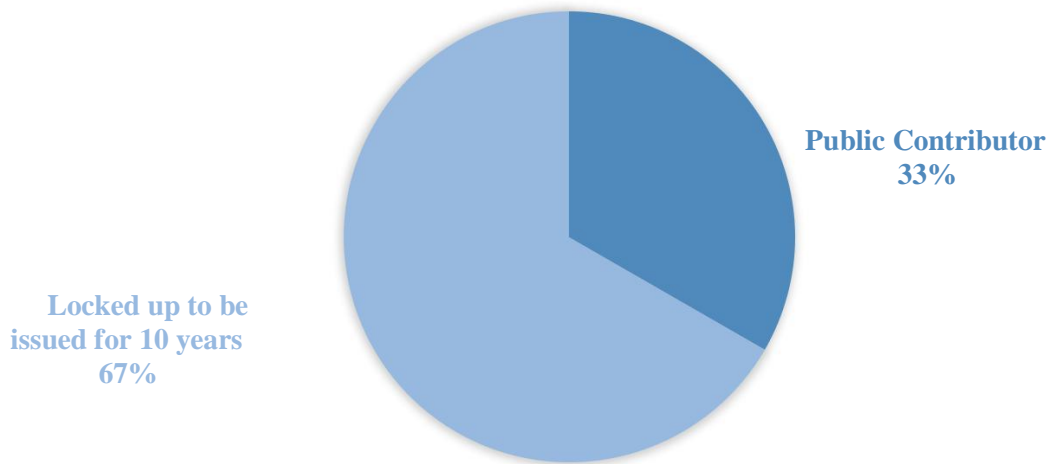
Locked up to be issued for 10 years 67%

Figure 9: LINA Initial Token Allocation

33.33% of LINA created during the Token Generation Event (300,000,000 Token) will be allocated to the Public Contributors who contribute BTC/ETH to the project.

66.67% of LINA created during the Token Generation Event (600,000,000 Token) will be locked in Smart Contract to be released annually over 10 years (60,000,000 Token per year). The released Token will be distributed as follow:

➢ 15% to the LINA Foundation to keep the LINA Platform running.
➢ 15% will be reserved for future stakeholders.
➢ 35% to the Helpers.
➢ 35% to Large Token Holders (those in possession of > 1 million tokens).
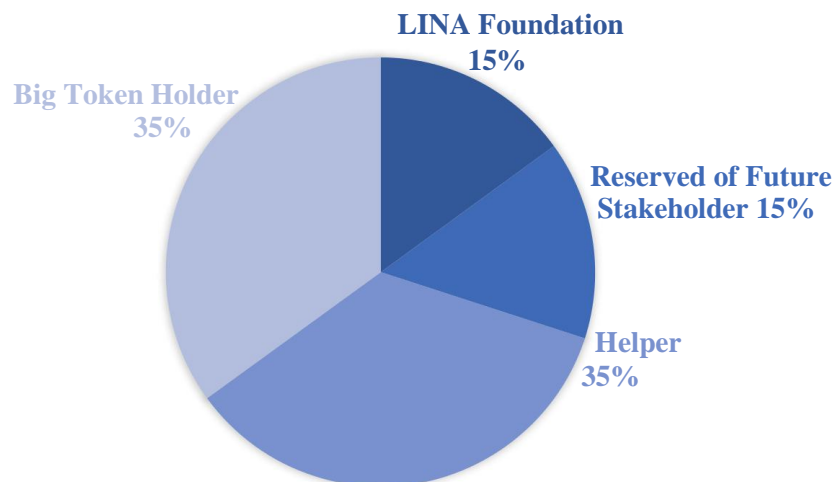

LINA Foundation 15%

Big Token Holder 35%

Reserved of Future Stakeholder 15%

Helper 35%

Figure 10: LINA Token Release Distribution
(Released time: January 15th each year, start from 2019 to 2029)

4.2 Budget Allocation

BUDGET ALLOCATION

5%
10%
10%
10%
48%
17%

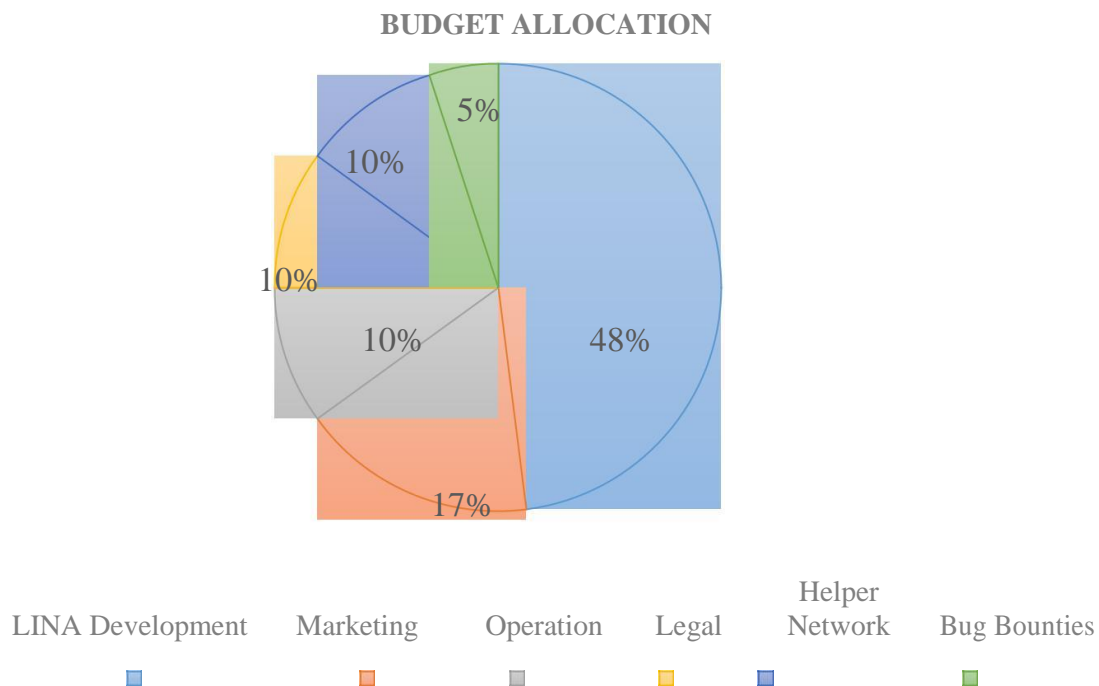LINA Development Marketing Operation Legal Helper Network Bug Bounties

Figure 11: Budget Allocation

5. Future of LINA.network Blockchain project

Distributed Ledger Technology is at the center of supply chain management. The coming years seem to be promising considering the fact that one of the most powerful tools is now readily available and can be tweaked to suit various needs. The pharmaceutical sector is on top of the list of those that are likely to benefit most. One of the main reasons is due to the fact that the pharmaceutical field is made up of very sensitive information ranging from individual patients' health to the need to ensure that they remain in an incorruptible manner. They should also remain permanent but without necessarily lowering the ability of the systems in place [15].

Looking at most of the projects in the pharmaceutical industry, they uniquely form part of the largest distribution networks. This is a field that entails the supply of medical products just as it is the case in the food supply chain. Medical products go through various jurisdictions and multiple countries. The case of medicine and medical products is not any different from the case dealing with the food supply. They have somewhat similar considerations which include security, data protection, safety which have to be paid the right way when in every step of the supply chain.

The use of digital ledgers of blockchain technology is a concept which is being developed and is likely to come in handy considering the need to track each stage the product goes through. The procedures cover all aspects of the medical drugs regardless of whether they have been put together for individual use or even a wide range of products. It is a technique which is likely to come in handy for most players in the supply chain considering the common menace in the industry, counterfeit drugs. There are also other various fraudulent activities which can be curbed with the utilization of blockchain just as it can be done in the food supply chain.

The use of blockchain in the pharmaceutical domain can be said to be the best leap forward which may help solve a series of the problem which is being recorded in various developing countries. As it is right now, most of the developing countries go through a series of problems ranging from getting access to medical drugs to accessing finances to purchase crucial drugs. Some of these concerns can be

attributed to the absence of streamlined traceability systems to keep track of all the dynamics in the pharmaceutical domain. A significant population across the globe is feeling the pinch and this can be viewed as a call for stringent measures to try and evaluate the pharmaceutical domain can be subjected to reforms with the aid of blockchain.

5.1 Healthcare Services

We are in a digital era manned by robust information systems that have tried to solve most of the wanting problems we didn't have solutions a decade ago. However, despite the immense effort that has been put in place by those in the health sector, there are still significant challenges that are lowering the intended goals of health care facilities. Most are still employing the use of outdated mechanisms and inconvenient mechanisms in managing medical data. Health records cover a wide variety of data starting from those that come from an individual's perspective to others that are obtained when one undergoes medical procedures. It is obvious that improper handling of data can lead to a very undesirable situation and is even likely to worsen if the situation is not addressed as soon as possible.

Blockchain technology is one of the most admired innovations and may come in handy in changing the data management landscape in medical institutions [16]. Management of medical data can be managed in a secure and efficient manner while also achieving the desired levels of transparency. As we have seen the potential of traceability in the food supply chain, the same can be replicated in the medical sector so that all the digital medical data can be relayed using the appropriate channels be it from the medical facilities to the caregivers and even the insurance providers.

Similar to the progress from LINA Review to LINA Supply Chain, after the launching of LINA Supply Chain System (estimate Q2 2019) LINA will progress further into Healthcare space, focus on 2 main missions:

- **Electronic Medical Record** using Blockchain Technology – Utilizing the permissioned design aspect of LINA Core.

- **Medicine Supply Chain** – Government Controlled Supply Chain for Medical Products.

5.2 E-Government System

A Memorandum of Understanding (MoU) was signed on Lao Blockchain Forum 2018 Vientiane between LINA Network and the Ministry of Science and Technology of Laos for the deployment of digital identity using Blockchain.

Under the MoU, LINA will provide solutions to develop Digital Identity and E-Government system for the Lao government based on Blockchain Technology.

According to Mr. BoviengkhamVongdara, minister of science and technology, the application of blockchain, specifically digital identity, will help enhance the transparency and efficiency of State management.

LINA e-governance systems are "citizen-centric," where people only need a single sign-on a single window. They can interact and use the services of the government all the time. That process will help increase transparency, reduce costs and promote socio-economic growth.

On phase one of the project, LINA will help to provide a solution for the secure digitalization of public data in Laos. There are similar designs between LINA e-Government and LINA Supply Chain in term of flexible object design (No "fixed" object) and specific permission data access – that will allow the different party in the system (Regulator – Citizen – Company) to share data securely and privately,

without any third party. Similar to Supply Chain System, all action in the LINA e-Government will be recorded with detailed information about actor and timestamp.
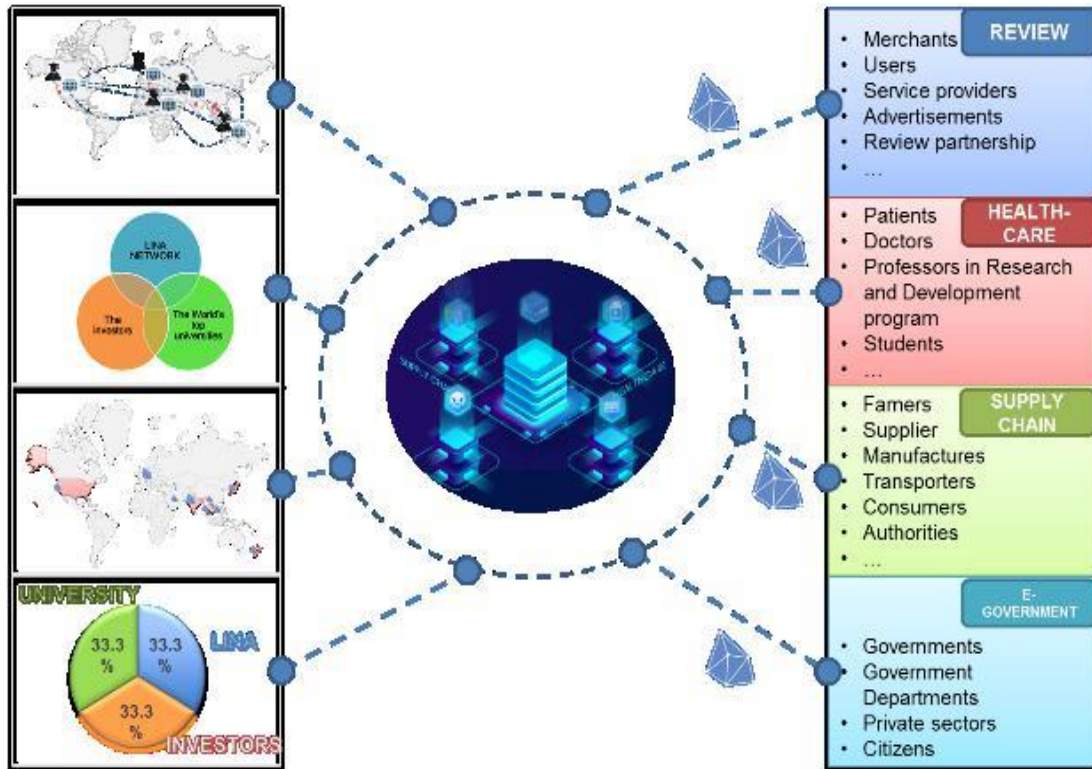
Figure 12: Future of LINA network project

6. Roadmap

2017- Q4		
Research and Project Development		Release of LINA Whitepaper

2018- January		
Development of LINA smart contract and the Launch of LINA token	First prototype of LINA review will be released in the early of Jan 2018	33,33% of LINA token will be available for sale to the public in the **Token Generation Event**

2018- Q2		
Focus on development of LINA core and LINA review	LINA review alpha version for Private Testing	Start working on LINA supply chain

2018-Q3		
Focus on development of LINA core and LINA review	LINA review first public Beta version release	Directly working with AIM THAI Fruit for data gathering system designing purpose

2018-October-Novemeber		
Infrastructure development		LINA Supply Chain MVP

2018- December
Supply Chain workshop in Thailand with Supply Chain experts and GS1 Thailand for more detailed requirement/challenges for LINA Supply Chain v1.0

2019-Q1
Development of LINA Supply Chain system

2019-Q2	
Release LINA Supply Chain Core Beta	Release LINA Supply Chain Wen Application

2019-Q3
Release LINA Supply Chain Mobile Application

References

[1]   Vitalik Buterin, Ethereum founder. url: https://twitter.com/VitalikButerin/status/940749096339542016

[2]   Hide Bad Review online. url: http://hidebadreviews.net/hide-bad-reviews-online/

[3]   Buyology: Truth and Lies About Why We Buy – Martin Lindstrom. url: https://www.amazon.com/Buyology-Truth-Lies-About-Why/dp/0385523890

[4]   Pew Research Center. "2. Online Review". url: http://www.pewinternet.org/2016/12/19/online-reviews/

[5]   Rolling Stone "'Metacritic' Still Matters, But for how long?". url: http://www.rollingstone.com/glixel/news/metacritic-still-matters-but-for-how-long-w466884

[6]   The New York Times. "Online Reviews? Researchers Give Them a Low Review. url: https://www.nytimes.com/2016/06/09/technology/online-reviews-researchers-give-them-a-low-review.html

[7]   Arstechnica. "Why linking developer bonuses to Metacritic scores should come to an end". url: https://arstechnica.com/gaming/2012/03/why-linking-developer-bonuses-to-metacritic-scores-should-come-to-an-end/

[8]   Business Insider "The exec who replaced Netflix's 5-star review system with 'thumbs up, thumbs down' explains why". url: http://www.businessinsider.com/why-netflix-replaced-its-5-star-review-system-2017-4

[9]   Meuwissen, M. P., Velthuis, A. G., Hogeveen, H., & Huirne, R. B. (2003). Traceability and certification in meat supply chains. Journal of Agribusiness, 21(2), 167- 182. Biswas, K., Muthukkumarasamy, V., & Tan, W. L. (2017, November). Blockchain Based Wine Supply Chain Traceability System. In Future Technologies Conference.

[10]   Pilkington, M. (2016). 11 Blockchain technology: principles and applications. Research handbook on digital transformations, 225

[11]   Swan, M. (2015). Blockchain: Blueprint for a new economy. " O'Reilly Media, Inc.".

[12]   Martínez-Sala, A. S., Egea-López, E., García-Sánchez, F., & García-Haro, J. (2009). Tracking of returnable packaging and transport units with active RFID in the grocery supply chain. Computers in Industry, 60(3), 161-171.

[13]   Sander, F., Semeijn, J., & Mahr, D. (2018). The acceptance of blockchain technology in meat traceability and transparency. British Food Journal, 120(9), 2066-2079.

[14]   Biswas, K., Muthukkumarasamy, V., & Tan, W. L. (2017, November). Blockchain Based Wine Supply Chain Traceability System. In Future Technologies Conference.

[15]   Barchetti, U., Bucciero, A., De Blasi, M., Mainetti, L., & Patrono, L. (2010, June). RFID, EPC and B2B convergence towards item-level traceability in the pharmaceutical supply chain. In RFID-Technology and Applications (RFID-TA), 2010 IEEE International Conference on (pp. 194-199). IEEE.

[16]   Glover, D. G., & Hermans, J. (2017). Improving the Traceability of the Clinical Trial Supply Chain. Applied Clinical Trials, 26(11/12), 36-38.