Start-up knowledge brought to large organisations: Innovation management software based on blockchain technology

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ABSTRACT

Innovation speed slows down as an organisation grows, increasing the chance their existing business model will be disrupted by startups. Various tools and methods exist to support organisations in innovation management. Blockchain is a new technology that could be used in these tools. However, an insufficient amount of material is available on how blockchain features like cryptocurrencies and smart contracts can be used in innovation management systems (IMS).

The Lean Startup Methodology (LSM) is a method for innovation management that is getting increasing attention from organisations and researchers. Blockchain features could be used to implement the LSM in IMS. The increased attention from research and organisations on LSM was the reason for this paper's focus on LSM.

The main problem this paper will address is, how blockchain technology can be used in IMS? This research will expand the current knowledge base about IMS. Requirements from the literature on LSM are translated into a framework called the "token value discovery canvas", which makes it possible to assess the added value of blockchain in the LSM for IMS.

The design science methodology will be used to adapt the framework to the needs of the interviewed organisations. This research aims to seek what organisations actually need and help in the development of Nomoni, the first blockchain based IMS.

Keywords

Innovation management, innovation management software, blockchain technology, lean startup methodology, large organisations.

1. INTRODUCTION

Innovation speed slows down as an organisation grows [1]. This increases the chance their existing business model will be disrupted by startups. Especially, since an increasing number of startups are looking into applying new technologies to their existing business models [2]. The increase in startups can be explained by the low costs of starting a company. Startups can be built in attics and don't have high startup costs. By only paying rent or a coffee in a café, startups greatly reduce their startup costs. These low costs are the driver for the increasing amount of startups entering new markets. They are mainly being driven by technological advancements that democratize technology. Democratization is the process where the price reduction of products makes them available to more people. These people will try to use these technologies to their advantage and apply them in all different kind products and services. Most of these don't succeed, however, the ones that do can disrupt established organisations. The literature on innovation management in incubators and larger organisations provides us with best practices [3], but there is a knowledge gap in how these requirements should be translated into software requirements for blockchain based IMS. For example, Airbnb, who disrupted the hotel industry. Or another well-known example: Über disrupting the taxi industry.

To survive businesses should either fully focus on doing things better or fully focus on doing things differently. Doing things better is called a red ocean strategy whereas doing things differently is called blue ocean strategy [4]. Anything in-between has a higher chance of going out of business [5]. To address the increase in market entrant's methods have been developed to innovate faster or differentiate more. This research focusses on the blue ocean strategy of doing things differently.

Internal start-ups are one method of achieving differentiation. Companies can make use of tools that help develop these internal start-ups. One of the latest methods is Lean Startup Methodology (LSM) that uses continuous innovation to create radically successful businesses [6].

Many applications have been developed to assist businesses in achieving successful internal start-ups. These applications can be called innovation management software (IMS). Within these applications, ideas can be rated and decisions on what ideas to pursue can be simplified [7]. Different kind of ideas can cross these applications. Ranging from simple ideas for improving business processes to risky business strategy changing ideas. Everything can be assessed. This software, however, is evolving. The next generation could take advantage of new technologies like blockchain technology.

The power of blockchain technology is already being acknowledged by larger corporations like IBM and Barclays [8]. Blockchain technology makes it possible to replace intermediaries. The technology works in a decentralized fashion without the need for a central authority. This is why it is called a trustless network because parties can do transactions without the need to know the other party in order to trust them. Furthermore, blockchain technology has the ability to use self-executing contracts, so-called smart contracts. These contracts can only be executed if all preconditions are met [9].

For example, a smart contract to handle claims [10]. Currently, insurance companies need to handle claims through large processes. The insured person calls the insurance company to report a claim. However, information can get lost and policies

can be misinterpreted because of the number of intermediaries involved in the process. Due to the immutability of data on the blockchain, everybody has access to the same data. All parties involved could send a transaction to a smart contract which in turn automatically pays the claim to the insured person. Immutability of data also gives insurers a sound administration, which also prevents risk and fraud. By combining capabilities like a distributed ledgers or smart contracts in blockchain technology with current IMS, future IMS could potentially be strengthened.

The main problem is that we don't know how blockchain can be used for IMS. there is an insufficient amount of material available that covers the topic of blockchain based IMS. This research will expand the current knowledge base about IMS. This research focusses on large organisations that want to use the LSM because Startup Gnome has shown with big data research that the main concepts of the LSM improve start-up success rate [11]. However, start-ups function differently from large organisations. IMS would provide a way to incorporate these success factors into large organisations. The literature on innovation management of incubators and start-ups provides us with best practices [3], but there is a knowledge gap in how these requirements should be translated into large organisations.

This paper proposes a framework in which it is possible for the reader to identify where blockchain technology provides added value to IMS. First, we will highlight the limitations of existing IMS. Second, the characteristics of blockchain technology will be listed. Third, the characteristics of blockchain technology will be combined with the enablers and inhibitor of the LSM in large organisations. The combination creates a framework in which it's possible to asses where blockchain technology provides added value to IMS. Fourth, we show how this framework can be applied to the interviewed companies. Fifth, we show what the interviewed companies see as added value for the IMS based on blockchain technology. After reading this article the reader will be able to identify the potential of IMS based on blockchain technology. These could be used for future development of next-generation IMS applications.

The framework is developed using an adapted design science method. The method has one cycle that is used to check the framework against the needs of large organisations. First, the initial framework was created using a literature review. Second, the framework was applied to the results of the qualitative interviews with large organisations. Third the results of the applied framework were checked against the real needs of the same companies using a phone interview.

The paper is structured as follows. In chapter 2 we will address background and related work. It will discuss the basic principles of the LSM, IMS and blockchain technology. Then we discuss the limitations of current IMS and the characteristics of blockchain technology. In chapter 3 we will explain the proposed framework. In chapter 4 we apply the proposed framework to large organisations and finally, chapter 5 covers the verification of these requirements with the interviewees. Then a conclusion will summarize our findings and give an answer to how blockchain technology can be used in IMS for large organisations. Finally, we discuss what the implications of this new technology could be for existing companies and future research.

2. BACKGROUND & RELATED WORK

This chapter covers Lean Startup Methodology, innovation management software and blockchain technology. Each sub-chapter is structured as follows: first a brief explanation of the topic. Second, one or two examples of the subject. Third, the latest developments. Fourth, in case of the LSM, the enablers. In case of IMS the limitations. In case of blockchain technology, the main characteristics. Finally, we close off with a conclusion on how innovation management software and blockchain technology relate to each other.

2.1 LSM

The LSM was first coined by Ries in the book the Lean Startup. It explains how entrepreneurs use continuous innovation to create radically new businesses. Within the method, basic principles from lean manufacturing and agile development are applied to the process of innovation. In a time where business models have a decreased lifespan, companies should not only focus on a traditional incremental advancement [12]. The LSM was first developed for software companies but has extended its reach to other fields of knowledge too. A survey from "Innovation Leader" shows that 82% of large corporations are using a lean startup approach [13].

The lean startup methodology is based on the following principles:

1. Entrepreneurs are everywhere: "You don't have to work in a garage to be an entrepreneur";
2. Entrepreneurship is management: "A startup is an institution, so it requires management geared to its context";
3. Validated learning: "Startups exist to learn how to make sustainable businesses. This learning can be validated scientifically by running experiments that test a start-up's vision";
4. Innovation accounting: "To improve outcomes, hold entrepreneurs accountable. Measuring progress for startups is different than normal projects";
5. Build measure learn: "The fundamental activity of startups is turning ideas into products. Measure customers response and learn whether to pivot or persevere".

Another method to stimulate innovation is Design thinking. Just as lean startup it is also focused on users or customers. Although it does not use the lean startup principles, the main idea is the same. Identify users in order to create solutions that people actually need and buy. While lean startup is more focused towards quantitative metrics to measure success, design thinking focusses more on qualitative data in order to validate user needs. According to The Design Management Institute, design-led companies outperform their peers by more than 200% [14]. However, adoption is not as widespread as lean startup. One of the reasons being that with design thinking it is harder to make good management decisions due to a lack of key metrics [15]. This is because design thinking focusses more on qualitative data than quantitative data. Key metrics is something that is more present in the LSM.

Although some companies take the book by Ries for granted they should not be taken as ground truth. Ries explains in his book that the LSM, just like startups should evolve. The research community has answered this request and has made tools to better apply the method or improve parts of it. One of these tools is the Business Model Canvas [16]. Reuver et al. tell us that it is a way for businesses to model how an organisation creates delivers and sustains its business. Later Maurya suggested adjusting the Business Model Canvas into the Lean Model Canvas to better capture the things that are most uncertain about a business model [17]. Maurya put the focus on solving the main pain or problem, taking out, for example, the key partners and key activities. Also, the LSM has been under improvement. Bohemia et al. combined the LSM with design thinking to

improve the customer focus [18]. The LSM could also profit from the ideation techniques to faster iterate ideas before building a prototype. Finally, qualitative user interviews could be implemented into the pivoting steps. Ideas, however, have not been followed up on by empirical studies yet to prove these improvements.

Right environments are needed in order for Lean Startup to work in large organisations. Edison et al. proposed key enablers and inhibitors for large software organisations exposed by several case studies. These enablers and inhibitors have been used to structure the semi-structured interviews. The interviews give insight into what inhibitors and enablers are in place in large organisations. Not every organisation was familiar with the term internal start-ups, therefore in the interviews, the term internal startup was replaced with innovation initiatives. Results from the interviews have been used to apply the framework.

2.2 Innovation management

The term innovation management was first coined by Schumpeter in the 1930's. He first identified that innovation is a significant factor in economic growth [19]. Innovation is a process that can be managed. On one hand, creativity and ideas enter and on the other side impact comes out. However, innovation is not as simple as it seems. Many authors have found that there are many contextual aspects that are critical success factors for innovation [20]. To support companies many SAAS platforms have been developed. From communication software to file sharing cloud services. Then to further support companies in their innovation efforts, innovation management software (IMS) was created. IMS is a consortium of different tools that on one hand create a social network and on the other provide support for informed decision making. The current innovation management software market is estimated at 421.6 million USD in 2017, with an annual growth of 29,2 per cent [21]. This is not without reason, a study from Accenture has shown that companies that use innovation management software were twice as likely to introduce a new business process or model [22].

2.2.1 Innovation management software

The in 2005 founded Spigit is currently the market leader in the innovation management software market, growing with 42% annually [23]. Its platform uses crowdsourcing to generate ideas. These then drive breakthrough innovations, cost reductions and employee innovation engagement [24]. Algorithms and machine learning helps managers engage on the right ideas at the right time. It makes it possible to make better-informed decisions on what ideas to pursue and double down on.

2.2.2 Limitations

Gartner did research on the stance of innovation management software and did a survey among different large organisations to access their view on IMS [7]. They found the following limitations to current innovation management software:

Limitations

- Online and physical worlds are disconnected: physical follow-ups on innovation initiatives is often missing;
- They don't create enough incentive for employees to generate ideas and contribute;
- Low attractiveness and maturity of their mobile offerings;
- Inability to generate accurate ROI calculations for management innovation initiatives;
- Insights from IMS are very country specific due to the vendor's geographic locations;
- Maintainability of an innovation momentum;
- Not resolving intellectual property issues;
- Availability of meaningful advisory or consulting support;
- The idea selection process is still highly subjective.

Limitations leave room for opportunity. A new framework is needed to show if these opportunities can be exploited using blockchain technology. Chapter 3 will elaborate more on this.

2.3 Blockchain technology

A blockchain is a distributed ledger. It can be thought of like a bank statement. However, instead of the bank tracking all the transactions, this is done by all the people in the network. Every time the ledger gets updated it is synced across all the computers in the network [25]. Computers in the network can also be called nodes. Any inaccuracies in the network can then be fixed by comparing nodes to the rest of the network. All transactions per time unit are bundled together in a block. Each block then gets connected to the previous block by a hash creating a chain of blocks, a so-called blockchain [26].

The blockchain isn't a universal technology like the internet. Currently, it's a template that is being used by many different types of blockchains. Tokens like Bitcoin, Ethereum or Litecoin blockchain are all based on different blockchains [27, 28]. The biggest difference is often the way they provide an incentive to the people that maintain the network. These people can also be called miners. The differences in blockchains can be compared to the start of the internet when there were a lot of different communication protocols. Then it got standardized and came universally available under the currently known TCP standard [29].

While this technology is a kind of ledger, it does not only translate to financial applications. Transactions of currencies aren't the only useful application [26]. When the internet was first released email was thought of as its most important application [30]. While email has indeed become an important tool, it is by far the only application the internet provides. Because blockchain is a record of value exchanges in the form of a token, anything could be seen as a token. Even things like thumbs up on Facebook could be a transaction of a token. Because anything can be valued, blockchain requires a new line of thinking [31].

The most notable and one of the first applications of blockchain technology is the Bitcoin. The whitepaper on bitcoin was released after the big crash on wall street in 2008 by someone going by the name of Satoshi Nakamoto [25]. In the paper, Nakamoto proposed a decentralized online currency, independent from any financial institutions. In 2009 the first network was created by an open source community. It allowed bitcoins to be exchanged directly between owner and receiver without a third party. All the nodes in the network are anonymous due to encryption. This is also why bitcoin tokens are called a cryptocurrency. Transactions are broadcasted through the network informing all the nodes. Miners than collect the transactions into blocks, making the bitcoin blockchain. Miners that compute these blocks get rewards for their effort in the form of bitcoins [32].

2.3.1 Pros

While blockchain might not be the holy grail for all applications, there are a few situations in which it has a lot of added value. According to Zheng, There are four main concepts which define the situations of potential added benefits of blockchain technology [33].

Decentralization. A centralized database has a single point of failure, which creates a bottleneck. This results in increased costs

and decreased performance. Decentralizing this would create less overhead for the system.

Persistency. Transactions on the blockchain are almost impossible to delete or rollback. Blocks that contain invalid transaction can almost immediately be discovered.

Anonymity. Every user on the blockchain can have his own address without revealing their true identity. However true privacy cannot fully be guaranteed due to the public nature of the blockchain. Transactions and amounts are visible for everyone to see in the blockchain. This could potentially trace back to a user.

Auditability. The ability to keep an accurate record of all transactions. The transaction trail of a user on the blockchain is traceable, therefore verifiable and thus auditable. This is especially important to highly dynamic data with a clear audit trail. Blockchain technology enables multiple parties to write new entries to the shared ledger.

2.3.2 Exploiting the pros

To analyse if blockchain can be sustainable and characteristics add value to use cases, a couple of frameworks have been developed [34-36]. One of the more recent ones is that of Klein et al. [35]. This framework gives a good impression on what characteristics are important to identify potential blockchain use cases. All these models are young and have not been thoroughly tested. Empirical evidence on their usefulness is not yet available. Moreover, the technology is constantly changing. It's likely that what currently has been developed will be outdated next year. Some limitations proposed by Zheng et al. for example are already outdated due to developments in the field of blockchain technology [33, 37].

2.3.3 Cons

The bitcoin reward system is currently being questioned because mining can only be done lucratively by specialized hardware. This hardware is in the hands of a few large mining pools and they are currently overwhelming the bitcoin enthusiasts [38]. This centralizes the decision power. Something bitcoin in the first instance was made to prevent [25]. Furthermore, the value of bitcoins has skyrocketed since its first release. It brings in more new parties increasing the transactions in the network [39]. The increase in transactions has led to a major increase in power consumption by mining operations, which in Venezuela even led to power shortages [40].

When a group or person gets control over 51% of the system tampering is possible. In Bitcoin, for example, this means getting in control of 51% of the computing power and in some situations even less than that [38]. This means they could block transactions from happening, therefore, blocking the network. It's also possible to reverse a transaction, which can make it possible to double spend bitcoins. However, when a block is mined it cannot be reversed, even with a 51% attack [32].

2.3.4 Future of blockchain

The scalability issues that current blockchains are struggling with are being answered by a new technology called Tangle. Tangle is a storage system where items are linked to each other. When regular blockchain scales, the network slows while a Tangle network actually becomes faster when more people use it. Instead of certifying transactions in a block, with tangle in order for a transaction to succeed, the sender needs to certify the two transactions that came before it. So, for every transaction that gets added to the network two get verified, increasing the speed of the network. The technique behind Tangle is called a Directed Acyclic Graph (DAG). Directed means that the link always has a direction. Acyclic means that you can't create loops inside this structure. A graph is what it creates when all transactions get connected. A good example of a cryptocurrency that uses this technology is IoTA. While there is a lot of confidence in the technology, weaknesses still need to be solved [41].

2.3.5 Decentralized innovation with blockchain

Crowdsourcing like IMS applications is not the only way to innovate. Looking from a start-up's perspective, blockchain technology now enables the creation of decentralized organisations. An example of this is Aragon. A blockchain company which aims to disintermediate the creation and maintenance of organisational structures [42]. It provides the tools for anyone to start a business. Different from IMS is the fact that this can be done in a decentralized fashion where employees could be spread out over the world without the need for an office space. Working together in different parts of the world is not a problem due to the decentralized court system. It is not bound to artificial barriers or borders. This is interesting because it lowers the cost of market entry, which in theory should drive innovation and shorten the average company lifecycle even more.

Latest developments have been trying to combine the strengths of Spigit with those of Aragon. The Gasfabriek in Deventer, Netherlands, is a business innovation centre where Coinversable is building Nomoni, the next IMS based on blockchain technology. The main goal is to create a tool that better stimulates entrepreneurship. We try to use our knowledge of building start-ups to larger organisations. While current IMS focusses on idea generation and management, we focus on empowering entrepreneurs inside of large organisations.

2.4 Background & related work conclusion

IMS software for large corporations and the decentralized start-ups that use Aragon have something in common. They both want to create innovation and make sustainable businesses. Limitations from current IMS applications have a connection with the opportunities of blockchain technology. By analysing these with the proposed framework, new use cases for blockchain technology in IMS applications can be found.

3. BUILDING THE FRAMEWORK

From the background and other research, a framework to discover new possibilities for IMS based on blockchain technology has been built. The name of this framework is the "blockchain token value discovery canvas". Anything that has value can be captured in a cryptocurrency token. That is why it the term "token" is used. The term, however, is not new and has also been used for example to name the transfer of health records, which are also a form of value transfer [43]. This framework can be used by any company that wants to find the added value of blockchain technology in their innovation management practices/software.

3.1 Dimensions

The Y-axis of the framework composes the categories of the LSM. These categories are part of the taxology of LSM enablers and inhibitors proposed by Edison et al.[44]. On the right of the categories, assets are listed that can be tokenized. Examples of these can be found in the framework.

A semi-structured interview can be used to find which assets could be used as tokens. The interview can be found in de appendices under A. It contains the categories under which each question falls. Questions have been made using Edison et al. findings. It will help the user determine under which category an asset would fit.

The X-axis of the framework composes of adapted questions used in the framework proposed by Klein et al. The questions

from Klein et al. have been split up or combined so answering is easier. For example, instead of asking about multiple properties of the data in one question, the author has split this question into a question about immutability, permanent saving and transparency. Furthermore, three colours have been chosen to capture core elements of a useful blockchain application. Red is those regarding intermediaries the system would replace. Yellow is about data. Blue is about the automation of processes around the token. When filling in the framework, questions that have been answered with no can be made grey and questions answered with maybe can have a lighter colour tone. This creates overview because, only if a row contains three times "yes" on each colour field, then will blockchain have added value. If a row contains only two "yes" or less, blockchain becomes less likely as an option.

4. DEMONSTRATION OF FRAMEWORK

By answering questions about the potential tokens, a good impression can be created on the added value of blockchain technology for each LSM innovation category. The following canvas is the perfect example of how it should be used. It has been composed using one of the interviews with a large organisation. As an example, we take a feasible token and one that is not.

The asset "policies and guidelines" was based on the following statement by the interviewee: "*Why how what. The transfer of these core values is important."…"We want to stay away from strict policies.*". From left to right the author has answered the questions.

Would it be able to replace someone or something to save time/money? Yes, because it would disable a middle manager who will oversee that innovation is done according to these guidelines.

Is trust between stakeholders missing? No, because everybody in the company is entrusted that he or she will follow the core values proposed by the company.

Provides a save stable basis for transactions for flexible and temporary workers? Maybe, not if the innovation values are only used internally, however, if external parties get involved things might look different. A token would provide a fair ground for external parties. They could use the token to share the same core values. It would, for example, remove the need for an outsourcing company as an intermediary partner.

Should data be immutable? No, some policies or guideline need to be rolled back or adapted from time to time.

Should data be saved permanently? No, for the same reason as mentioned earlier. Sometimes policies get changed.

Should data be stored transparently? Maybe, in the case of an internal innovation, core values should only be visible to the internal stakeholders, however, if something is being crowdsourced or developed opensource, everybody should be able to collaborate on the same set of values.

Should the process around this asset be performed autonomously? Yes, this will make sure that collaborating on multiple levels will be easier.

Can the process around these assets be programmed into smart contracts? Yes, however, this will be hard because it will be almost impossible to check if someone is doing something according to these values or not.

From the framework it can be concluded that a token for transferring core values is a viable option to be used on the blockchain, however, an implementation might prove impossible due to the measurability of the use of these core values, but there are more categories to watch.

The culture category, on the other hand, might prove worthier. From analysis one can conclude that "a stake in the outcome" token has more "yes" answers. Therefore, it has more opportunity than the "core values of innovation" token. By filling in all the different aspects of the framework. Best blockchain token opportunities for an organisation can be found.

5. EVALUATION OF FRAMEWORK

For evaluation, this research used a phone interview to check if the applied framework was aligned with the interviewee. This is the first cycle of the design science methodology. The phone interview was used to check if the framework has any added value. All the answers in the framework where checked against the interviewee. After each answer, the interviewee was asked if he agreed, had remarks or thought differently about the answer. After each set of questions, a conclusive answer was being asked to check if the framework matched with the opinion of the interviewee.

The most important remarks on the tokens from the applied framework are listed below:

Policies and guidelines:

Would it be able to replace someone or something to save time/money? "If your policy is strict, I agree, however, there are a lot of edge cases that need to be assessed manually by the management team".

Should data be immutable? "I don't agree, policies could also just be updated. This way you know under which policy an innovation was done. It could have a timestamp of the beginning and end date".

Support for internal innovation initiatives with coaching, mentoring and training.

*Would it be able to replace someone or something to save time/money or to? "*But the question is; are there enough people to keep this blockchain alive if it would be running*"*

Can the process around this asset be programmed into smart contracts? "The problem is that it is hard to measure if someone actually delivered the service promised"

General:

"Internally the problems around rewards are manageable, however, if we go cross organisational cooperation it becomes harder."

"In any token, if the person wants to be forgotten that could be a problem in the blockchain."

5.1 Model improvements

It can be concluded that the opinion from the interviewee matches for a large part of the applied framework. However, what can be seen is that the interviewee is more critical about the questions and thus more critical on potential tokenization of assets. Furthermore, the answers show that some of the questions too much in common, therefore suggesting these do not provide added value. The final version of the model didn't include the following questions:

- *Does it provide a save/stable basis for transactions for flexible and temporary stakeholders?*
- *Should data be saved permanently?*

Blockchain token value discovery canvas		**Intermediary**		**Data**		**Process**		**Potential**
Innovation management Categories	What asset could be tokenized?	Would it be able to replace someone or something to save time/money or to?	Is trust between stakeholders missing?	Should data be immutable?	Should data be saved transparently	**Should** the process around this asset be performed autonomously?	**Can** the process around these assets be programmed into smart contracts?	
Organisational Structure	*Core values of innovation*	*Yes, an innovation manager, and save time by automatic execution of guideline and policies on these core values*	*No*	*No, some policies and guidelines might be rolled back.*	*Maybe, however only internally. Not public*	*Maybe, but only if the rules can be enforced*	*Maybe, but very hard*	
Knowledge and Technology	*Support for internal innovation initiatives with coaching, mentoring and training.*	*Yes, supporting companies like Deloitte or PWC*	*Yes, stakeholders (supporting companies and initiative) only have an invoice relationship*	*Yes, rewards should not be able to be rolled back.*	*Maybe, if only visible to the coaches, mentors, trainers and initiative stakeholders.*	*Yes*	*No, some rewards might be standardized but will probably be custom*	
Culture	*A stake in the outcome of initiatives*	*Yes, middle managers deciding how much stake someone should get*	*No*	*Yes, stakes should not be able to be tampered with*	*Yes, however only visible to stakeholders*	*Maybe, but it will be hard to figure take out the human factor. Someone's effort is something that is hard to measure.*	*Yes*	
Human Resources	*Rewards for employees who create cross-functional teams*	*No*	*Yes, starting up cross-functional teams is hard*	*Yes, rewards should not be able to be rolled back.*	*Yes, however only internally. Not public*	*Maybe, only if cross-functional teams are not yet in place*	*Yes, there should be rules in place on what makes a cross-functional team.*	
Business Characteristics	*Goals of innovation initiatives*	No, but if goals are not correctly aligned they might. This is the case for open innovation.	*No, but if goals are not correctly aligned they might. This is the case for open innovation.*	*Yes, No one should be able to delete a initiatives goal*	*No*	*Maybe, only if goals provide the ends for the means*	*No*	

	Has potential
	Has hurdles to overcome
	No potential

6. CONCLUSION

This research has proposed a framework in which it is possible to assess the added value of blockchain technology for innovation management software (IMS). The demonstration has shown that interviews with companies can be used inside the framework. Evaluation has shown that the interviewed company sees the added value blockchain technology can provide.

This paper questioned how blockchain technology could be used for IMS. The demonstration of the framework has shown a few use cases that could potentially increase the innovativeness of the interviewee if they would implement these benefits. Furthermore, this research will be used to improve Nomoni, the first IMS application based on blockchain technology.

The framework gives rise to new fields of study previously left unnoticed by researchers. It combines the field of IMS with the research on LSM. Both fields that are under development by the practice and research community [21, 45].

It should be noted that this is the first release of the framework. Future research in innovation management software based on blockchain technology could take this framework as a base and pivot or persevere to create a better model, that even better represents reality. This framework focusses on lean start-up. Innovation management best practices might change over time replacing the lean start-up methodology. Big data in start-ups, however, already shows that Ries has it at the right end [2]. Furthermore, this framework has only been tested on one use case, for more reliable results it should be tested in more use cases. The results from the framework are assumptions for organisations to find new opportunities, however, it is unknown how valuable these assumptions are.

Future research could focus on companies that are building IMS applications. They could see if the assumptions uncovered in this framework actually provide use cases with added value. This would provide valuable data to further improve the framework.

Disruption and innovation are accelerating, and companies want to be leaders not followers. However, in order to do so they will need to look more at radical innovation. For them the author says: this framework could be a starting point to find your innovative edge.

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