UNTANGLING BLOCKCHAIN CONSULTING

HOW TO EMBED STRATEGIC VALUE IN BLOCKCHAIN DEVELOPMENT

Master thesis
STRATEGIC PRODUCT DESIGN
FACULTY OF INDUSTRIAL DESIGN ENGINEERING
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GoBlock

UNTANGLING BLOCKCHAIN CONSULTING

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MASTER THESIS

GRADUATION COMMITTEE

PREFACE

Hereby I present to you my graduation report for the master program Strategic Product Design at the Delft University of Technology. In this report I shall guide you through a 6-month graduation project conducted in collaboration with the wonderful people of GoBlock.

During the past 6 months, I have come into contact with many interesting and inspiring people from all over the world. The blockchain industry truly is a global collective. I would like to take this opportunity to thank all of the people I have met during my graduation project. The openness and collaborative attitude of people in the blockchain industry was inspiring.
This extends on the principle that blokchain is still a young technology and that there are no 'real' experts on the topic. People recognize they need to interact and discuss with each other to reach insights.

In particular I would like to thank John Palfreyman for the multiple occasions we spoke. Your patience and ability to clearly explain the ins and outs of the blockchain consulting industry directly influenced the quality of work and my own personal motivation during this project. A true industry leader.

Moreover, I would like to thank my supervisory team from the university.

Viki, thank you for mentoring me during the first half of my project, even with your contract having ended earlier and with your son close to being born. Your coaching on focusing on crucially important information has helped me scope the project greatly.

Giulia, thank you for coaching me on the importance of the overarching story that needs to be brought across. It allowed me to reassess conducted steps and iterate based on new insights. Also, I would like to thank you for stimulating me to think more out-of-the-box. After all, design is about diverging before converging.

Pinar, thank you for joining my supervisory team and taking Viki's place. First of all thank you for being able to familiarise yourself with my project on such short notice. Also, thank you for your guidance on not making things too complicated for myself, something I tend to do sometimes.

I would also like to thank my supervisor from GoBlock in particular.
Hugo, thank you for embracing me in the company as you did. The responsibility and freedom within GoBlock worked motivatingly. Also, your work ethic and drive I find inspiring.

I would also like to thank all other employees from both GoBlock and Gapstars that I'd gotten the honour to meet and talk with. Thanks for your willingness to help and for your critical thinking!

Additionally, I would like to thank my fellow students, my friends, who have helped me countless times during my graduation project. This, by either attending a collaborative session or by brainstorming and bouncing ideas of each other. And of course for the (occasional) moments of relaxation, not unimportant during a graduation project.

I also would like to thank my roommates, Bart and Thijs. Thank you for accepting the perpetual study chaos on our dinner table and motivating (and sometimes distracting) me.

Lastly, I would like to thank my mother for always listening to and thinking with me.

All that remains for me to say is that I truly hope you enjoy my report and I hope you discover something you did not know yesterday.

Cheers,

Cyril

EXECUTIVE SUMMARY

This thesis explores the topic of 'embedding strategic value in blockchain development' within the context of blockchain consultancy startup GoBlock. The result of this research was a process framework together with a workshop for validating a blockchain use case's strength and potential.

In recent years, blockchain technology has gained tremendous popularity. The Bitcoin craze of 2017 has led many people and companies to explore the core technology behind it: blockchain. This has resulted in a large influx of capital into the industry, as many companies are now looking to reap the widely speculated advantages this technology might offer.
However, with the rise of its popularity there were also challenges that arose for companies experimenting with blockchain. First, the technology itself is still rather immature. There are no product archetypes which are considered to be industry standard. For some, Bitcoin is still the 'perfect use case' of blockchain, but many disagree. This has led to many projects trying to reinvent the wheel. To do this, significant expertise and manpower is required. This has led to a strong rise in demand for blockchain knowledge, in particular blockchain developers.

GoBlock, a blockchain consultancy startup based in Amsterdam, recognizes this need and views it as opportunity. With a strong development department, they are looking to cater to the need of blockchain expertise. After all, a lot of money has been poured into the industry, and with milestones not being hit and succesful product launches being extremely rare, the pressure is on for these companies.

This thesis hence aims to provide GoBlock with a way to structure their blockchain consulting process. The goal was to do this in a way that would result in the creation of succesful products (i.e. products providing value), as this is lacking in the industry.

Initial findings showed that the blockchain industry, and with that blockchain projects, are largely dominated by engineers and developers. This results in a technology-centered approach to blockchain development. Research showed that a multidisciplinary and design-driven approach can benefit blockchain development, both on a product level and on an innovation level.

An analysis of current consulting practices was conducted. It was found that the industry leader (IBM) utilizes Design Thinking methods in parts of their consulting process. However, it

was concluded that the majority of competitors apply the technology-centered approach. Hence, herein lies an opportunity for GoBlock to distinguish themselves from the competition, while better addressing market needs.

Additionally, a company analysis was conducted. First, a case study was done to study goBlock's previous processes. This showed that there was a fundamental lack of structure in GoBlock's process. Moreover, the case study brought forward three main challenges that hinder the success of a blockchain product. These are:
1. Blockchain technology is used for cases in which the technology does not need to be used.
2. The strategic impact of a blockchain use case is not evident for the customer's business. It is not always clear how business value will be created, if at all.
3. Stakeholder needs (i.e. user values) are left out of the equation. By not taking into account user needs and values, products are created that might never be adopted.

Therefore, this thesis proposes the addition of a validation step in GoBlock's process. GoBlock can play a key role in assessing the validity of blockchain use cases before engaging in a development project with their customer. This can not only benefit the technology's reputation, but applying user-centered approach to blockchain use case development allows GoBlock to distinguish themselves from competition.

To achieve this, a process framework is designed based on literature research and findings from expert interviews. This process framework contains two overall phases: validation and creation. In the first phase, GoBlock sits with the customer to assess the validity and potential of the customer's use case. In this phase the use case can be reshaped and finetuned. This, in order to make sure that when the project reaches the development phase, an actual valuable product is developed, rather than just a pilot.
The goal of the workshop is to spark awareness about blockchain's actual strategic impact, and that people in the blockchain industry should look beyond the technological realm to determine whether a use case is good or not. If mass adoption is to be reached, a user-centered approach is needed. This is where Design Thinking can be of value.

The framework and workshop were validated with students and the company, leading to recommendations for further development.

READING GUIDE

Below you can find a concise overview of the report that you can use as a guide.
A short description per chapter is given highlighting the main activities and content.

Each chapter begins with an introduction where the topic and content is shortly described. At the end of the analysis chapters the key insights and conclusions are noted. This can be recognized by the blue background. Where applicable these are also formulated to design requirements for the final solution.
In case you are short for time, reading the key insights and conclusions will provide you with sufficient information to understand the project's content.

PROJECT BACKGROUND & ASSIGNMENT

The background of this research project is described and relevant topics introduced.

BLOCKCHAIN, WHAT'S THE HYPE ABOUT?

Explores blockchain from both a wide innovation perspective as a narrow technology perspective.

DESIGN FOR INNOVATION

Different innovation approaches are discussed in order to determine the most suitable approach for blockchain as an innovation.

BLOCKCHAIN CONSULTING

Blockchain consulting in practice is researched. This is done to gain understanding of the necessary steps in a blockchain consulting project.

COMPANY ANALYSIS

The company context is researched to determine relevant capabilities. This is done through a case study of previous projects and several analysis methods.

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DESIGN BRIEF

Synthesises all insights and findings gathered in analyses to define a design goal and complementary design requirements.

DESIGN

Ideation process and outcomes are described, after which created designs are presented.

DESIGN VALIDATION

Designs are tested and validated to determine points of improvement and establish further recommendations.

RECOMMENDATIONS

Suggestions for further improvement of designs are given, as well as recommendations for implementation of proposed solution.

CONCLUSION AND DISCUSSION

Thesis is concluded and its limitations are discussed. Suggestions for future research are given and the practical implications of this thesis are elucidated.

PERSONAL REFLECTION

Author reflects on graduation project as a whole and on personal ambitions set prior to project kick-off.

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PROJECT BACKGROUND & ASSIGNMENT

1. Project background

1.1 Blockchain

Ever since Satoshi Nakamoto's paper Bitcoin: 'A Peer-to-Peer Electronic Cash System' was published in 2008, blockchain technology has shaped to be a potentially disruptive technological innovation (Nakamoto, 2008; Tapscott & Tapscott, 2016; Beck & Müller-Bloch, 2017). Its most well known characteristic is the potential to redefine financial systems or even whole economies. However, the further the technology develops, the broader its actual potential seems to become. The seemingly endless list of possibilities for this new technology are actively being explored, from supply chain applications to land ownership records. The amount of blockchain startups trying to create feasible solutions has grown tremendously in recent years (Diemers, Arslanian & Kong, 2018).

As the amount of blockchain businesses grew rapidly, so did the demand for blockchain expertise. The blockchain industry (and in particular the cryptocurrency market) is characterized by its volatility. Seemingly small developments can have a tremendous impact on overall business performance or business value. Moreover, a lot of capital has been invested into the blockchain industry in recent years. This puts blockchain based companies under immense pressure to perform.

Given the immaturity of the technology, there are no standard processes in place yet for its development. As many blockchain based companies reach the product development phase, challenges rise during product development which need to be solved ad hoc. To be able to do so, these companies are in need of resources that can accomplish this. In short, they need knowledge and manpower to assist them during the development process (Lee, 2018).

Besides the technological challenges these companies face during product development, there is also a design related challenge. As blockchain is a technology-driven innovation, the industry is dominated by blockchain developers, engineers and technology specialists. This means the focus lies mostly on further advancing the technology itself, while the business side is not addressed as much as it should be. This means that blockchain is often being proposed as the answer to a question that has yet to be asked. The result is that many blockchain projects are discontinued before or shortly after reaching the development phase as the business value cannot be distilled.

In order for an innovation to be successful, the needs of the user must also be addressed during development. Especially since with blockchain projects there are usually multiple parties (read: users) involved. Therefore, the need of these companies is two-fold. On the one hand they require technology-specific knowledge in order to build their product, while on the other hand they require a more user-centered approach.

1.2 GoBlock

This graduation project has been conducted in collaboration with GoBlock. GoBlock is a blockchain consultancy startup with its headquarters located in Amsterdam. GoBlock was originally set up as an extension of Gapstars, an off-shore company aimed at providing fast-growing tech companies with digital development teams to help them scale.

GoBlock was founded in 2017 by stepbrothers Hugo Hemmen and Michael Eerhart. Amidst the blockchain and cryptocurrency hype of 2017 (Bovaird, 2017), Michael was approached by Hugo to do "something" with blockchain technology. This idea did not spawn out of nowhere. Michael had already been involved with cryptocurrency for years on a personal level. He had built up a comfortable living through mining cryptocurrency, trading these

currencies and investing in future projects (initial coin offerings). Therefore, Michael was rather experienced with blockchain technology and cryptocurrency. At the time, Hugo was director of Gapstars, a company he had started in 2015. Gapstars is an offshore company with its headquarters located in Amsterdam, but with the vast majority of its employees located in Colombo, Sri Lanka (Gapstars, 2018). Gapstars specializes in providing fast-growing tech companies with agile offshore development teams. Hence, given the blockchain craze, Michael and Hugo thought GoBlock would be an excellent way to use Gapstars' development resources and experience to serve the blockchain market.

Initially, GoBlock facilitated blockchain investments for customers by buying and selling crypto assets. Their idea was to lower the barrier for people to participate in cryptocurrencies (and ICOs) and thus increase the adoption of blockchain technology.

"The facilitating of investments in crypto and ICOs was nice as a starting direction, but we knew it was not something we wanted to do for a long time. Especially given the regulatory grey area in which we operated. We did not like it not having legal certainty about our operations."
- Michael Eerhart

However, after being in operation for a while, GoBlock increasingly got requests from companies for boardroom sessions and masterclasses to learn about cryptocurrency and blockchain technology. Michael and Hugo listened to the market and pivoted GoBlock's focus towards the consulting business. They started facilitating sessions at companies explaining the basics of blockchain technology and cryptocurrencies.

"Some customers came back to us after having conducted the sessions that they were interested in a follow up of the initial sessions. They wanted us to assist them with ideating or even prototyping blockchain solutions."
- Michael Eerhart

With Hugo being director of Gapstars, GoBlock

had the resources available to facilitate this and so GoBlock expanded their proposition. The idea was to conduct the first phase of the process as consultants and then have Gapstars' offshore scrum teams help with building the proposed solution.

Lastly Hugo and Michael bought out the other shareholders of Gapstars, resulting in ownership of both GoBlock and Gapstars. Therefore, Gapstars' development teams are considered to be GoBlock's resources during this graduation project (figure 1).
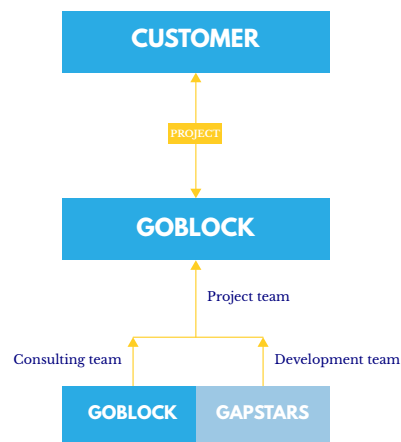
Figure 1. Relation between Gapstars and GoBlock with regard to resources.

GoBlock strives to position itself as the go-to company for all blockchain-related new product development projects. For GoBlock this means taking the consulting process a step further. This new proposition is to be called GoBlock LABS. However, as GoBlock experienced in earlier customer projects, the overall consulting process often stagnated in the concept phase and did not progress into actual development. In order to become a blockchain solutions provider, GoBlock needs to stay involved in the actual product development phase as well. This thesis aims to provide GoBlock with a way to ensure consulting projects transition into the development phase.

2. Assignment

2.1 Problem definition
Currently, a lot of blockchain based companies fail to reach their set goals and deliver on their initial promise. With the vast amounts of capital raised for blockchain based companies (Catalini & Gans, 2018; Diemers, Arslanian & Kong,

2018), a lot of eyes are aimed at these projects to see what they will lead to. Given blockchain technology's young stage of maturity, many blockchain startups do not have the required capacity or knowledge to realize the initially set goals, deliver on their promises or to even build a working product at all (van der Voort & Spenkelink, 2018). Thus, there is a need for blockchain expertise and manpower among many blockchain based startups to enable them to realize their goals.

Besides the technological challenge, the industry is dominated by technology specialists, leading to blockchain being offered as a solution for problems to which it not always is a valuable solution. This results in blockchain projects being canceled or failing to deliver and giving the technology itself a bad reputation.

Where GoBlock currently has experience in the partial consulting projects (either early stage consulting or as development partner) they have not yet been able to bridge the gap from consulting to development in a project. This is needed in order to become the go-to partner for new blockchain product development as they ambition. The problem definition is visualised in figure 2.

2.2 Assignment
The graduation assignment was therefore formulated as follows:

Create a new process for GoBlock's new GoBlock LABS proposition to allow their consulting projects to transition into the development phase in order to become a blockchain solutions provider.

The aim of this assignment is to provide blockchain consultancy startup GoBlock with a well-grounded and structured approach on how to expand their current service portfolio in order to become an end-to-end solutions provider for blockchain projects. To do so, the success factors of new blockchain product development processes need to be determined, GoBlock's current consulting process needs to be examined and the requirements for an end-to-end process need to be established.

Figure 2. Schematic representation of problem definition.

DISCOVER	DEFINE	DEVELOP	DELIVER
Literature research	Expert interviews	Ideation	Final design
Internal analysis	Case study	Design validation	Implementation
External analysis	Synthesis		

Figure 3. Double-diamond model used as design approach for this project.

3. Approach

The approach for this master's thesis was derived from the traditional Double Diamond process and consisted out of four main phases: Discover, Define, Develop and Deliver. They are shown in figure 3 above.
Below, a short description of key activities during each phase is given.

3.1 Discover
This phase was focused on gathering insights about the organization and the context of the design project. To get a deep understanding of all relevant factors th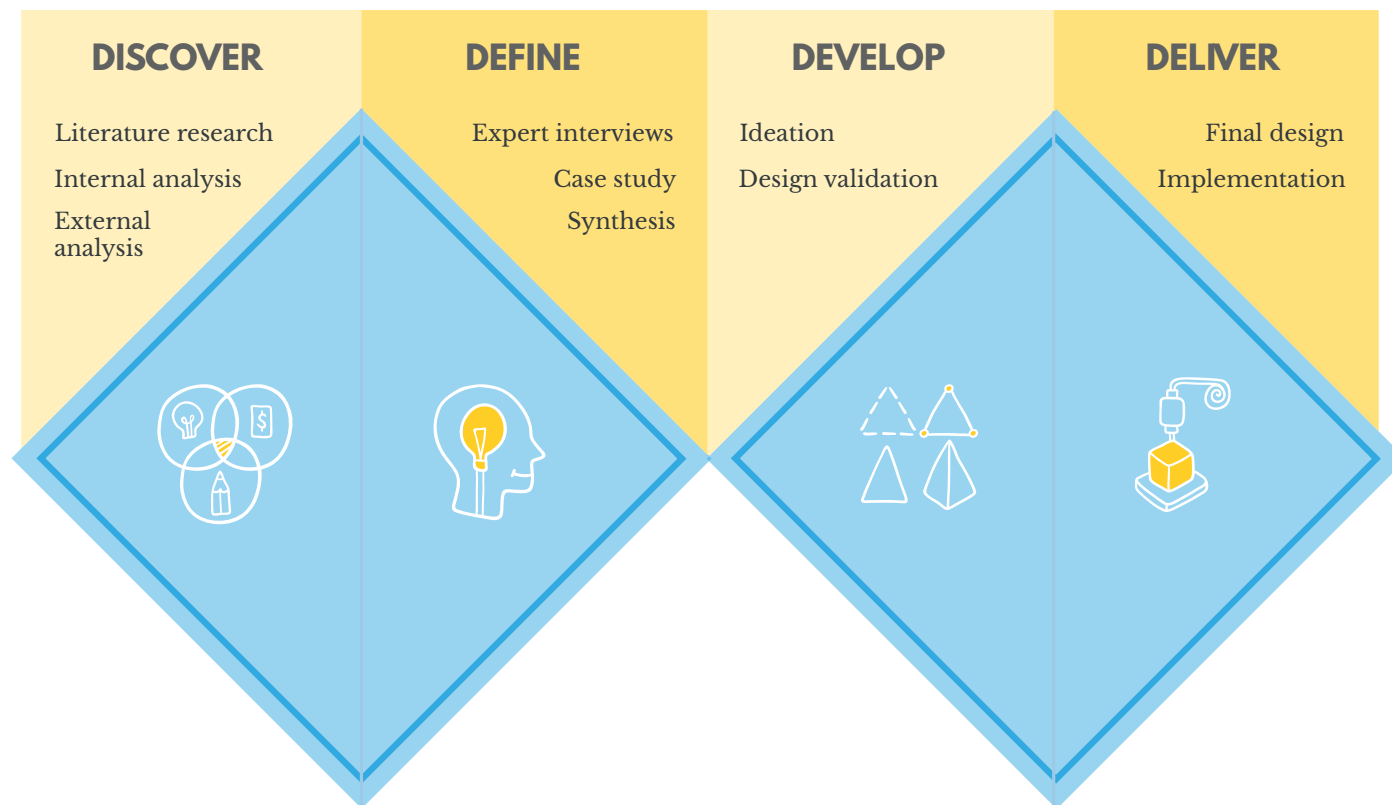at play part in this project, different ways of analysis were conducted. A literature analysis was done on relevant blockchain technology literature and software development literature. Next to that, an external and internal analysis of the company was conducted. Lastly, interviews with experts and stakeholders were conducted.

3.2 Define
In this second phase, additional research and analyses were conducted to further specify and validate the design direction. The company itself was studied further and previous projects were examined. This was done using expert and stakeholder interviews and a case study.
The result of this phase was a design brief containing the established design direction, target group and main design requirements.

3.3 Develop
In this phase, iterative ideation took place to create the solution for the earlier established design problem. A preliminary design was created which was validated through sessions with company stakeholders. The design was then evaluated through a final session to gather feedback with regards to future recommendations.

3.4 Deliver
In this phase, the proposed solution was finalized. This included future recommendations based on the feedback from the previous phase and an implementation plan for GoBlock on how to implement and scale up the proposed solution.

CHAPTER 2
BLOCKCHAIN, WHAT'S THE HYPE ABOUT?

In this chapter, blockchain technology is explored. This is done, as it is important to have a good understanding of a technology and its relevant facets, before being able to advise on it. Blockchain is decomposed on both the general innovation level and the technological level. This is done to get an idea of the impact blockchain can have on both individuals, business and society. Lastly, blockchain development challenges are formulated.

In this chapter:

1. Blockchain in general
2. What exactly is blockchain?
3. Blockchain types
4. Blockchain's practical value
5. Business finance
6. Blockchain development challenges
7. Key insights, conclusions and requirements

BLOCKCHAIN, WHAT'S THE HYPE ABOUT?

1. Blockchain in general

In recent years, blockchain technology has increased vastly in popularity, and is often being acclaimed as a revolutionary technology that will change the world (Marlin, 2017). Moreover, it is being referred to as the fifth disruptive computing paradigm (Swan, 2015). According to Swan (2015), the first four paradigms were the mainframe, personal computing (PC), the Internet and mobile and social networking. The fifth paradigm that is currently emerging, the one of blockchain, is referred to by Swan as the "connected world of computing" (Swan, 2015).

It is evident that the world is eager to see what this promising technology will bring to our future lives. Currently, companies are actively exploring the use cases for blockchain technology. The amount of blockchain based companies has significantly grown in recent years. The vast amount of cryptocurrencies validates this statement. (PwC, 2018).

When looking at Gartner's Hype Cycle (figure 4),

one can see that blockchain technology currently surpassed the 'Peak of Inflated Expectations' and is crossing over into the 'Trough of Disillusionment' phase. This means that "interest wanes as experiments and implementations fail to deliver" (Gartner, 2017).

Gartner estimates it will take 5 to 10 years before blockchain technology reaches the 'Plateau of Productivity' phase, where mainstream adoption takes place.

Gartner says that companies will be involved in dynamic ecosystems, as the technology develops further. However, in order to reach mainstream adoption for blockchain technology, new business strategies and platform-based business models are required. Mike Walker, Gartner's research vice president stated: "The shift from compartmentalized technical infrastructure to ecosystem-enabling platforms is laying the foundation for entirely new business models that are forming the bridge between humans and technology" (Morris, 2018).
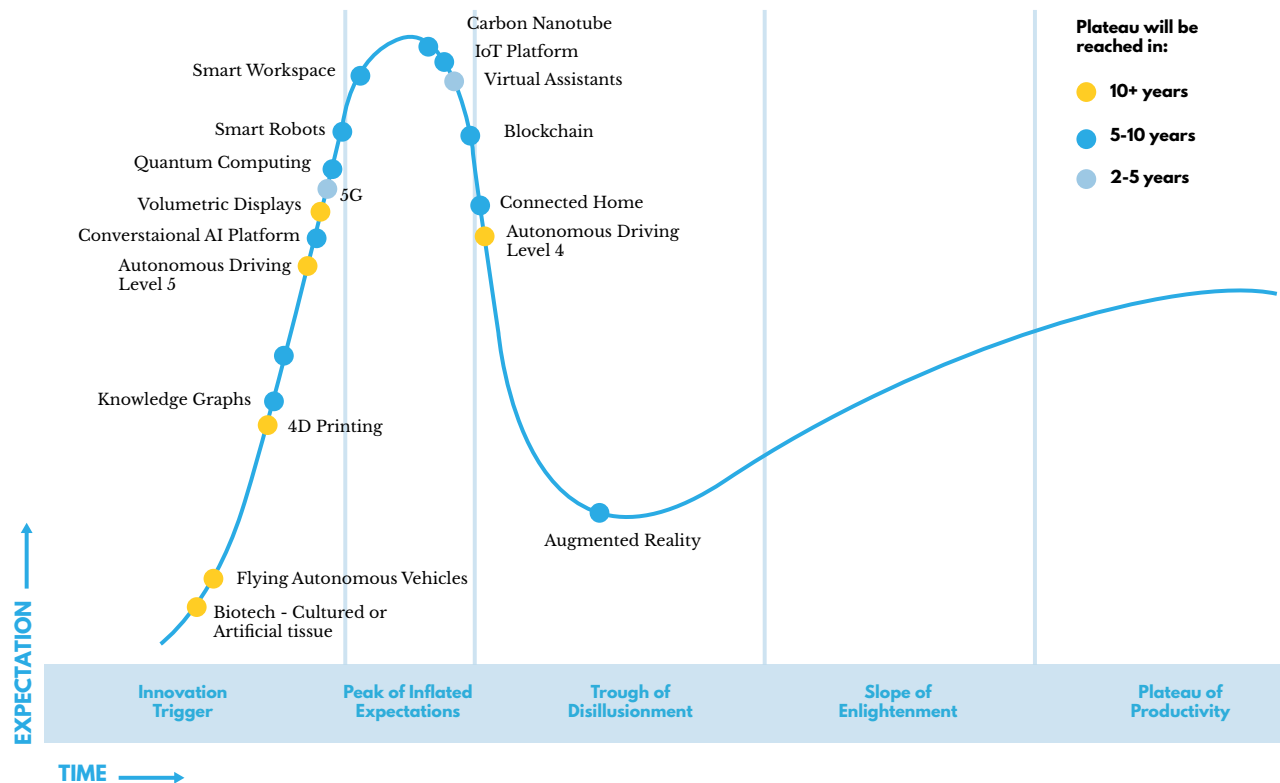
2. What exactly is blockchain?

Before explaining what blockchain technology exactly entails, it is important to know what the actual problem is that this technology solves. Only then it has use to know what the precise solution is.

In short, blockchain technology solves the need for having to trust a third party when one demands to transact a digital asset (either money, information, documents etc.) from one person to another.

Up until now, if we wanted to transfer money to another person, we were dependent on a bank acting as the middleman in the transaction (figure 5). The bank made sure that the person sending the money actually has sufficient funds in their account, did not spend that money elsewhere and ensures the exact same amount of money that is deducted from the sender's account will be added to the receiver's account. Lastly, the central authority, the bank, was also responsible for keeping a track record of all transactions (the ledger).
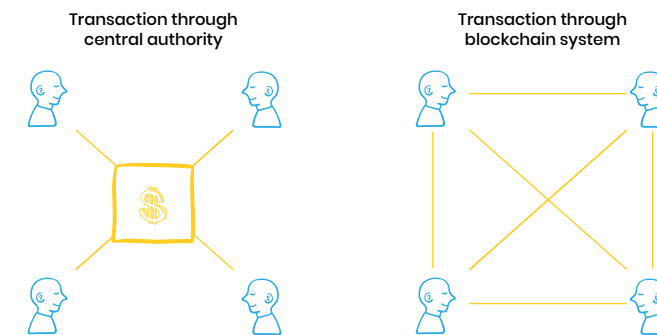
Figure 5. Difference between a transaction using an intermediary (centralised system) and a peer to peer transaction (a decentralized system).

As this central authority needs to be trusted by both parties participating in the transaction, there is a cost involved, as these authorities get paid in order to ensure the exchanges take place correctly. In recent history, it has not been uncommon for the trusted intermediary to misuse its position, fail to deliver or damage the overall trust in such central parties. A prime example of this is the 2008 financial crisis (Baghla, 2018).

In the digital space of the internet, files can be copied easily from one location to another. For example, when person A wants to send a digital

file to person B, a copy of that file will be sent, rather than the original itself. This copy can then also very easily be copied and shared with other people, therefore reducing its value due to copious availability. Naturally, this is unwanted for digital files like ownership records or money, so a way had to be found to ensure that digital files could not be duplicated. This is known as the 'double spend problem'. Satoshi Nakamoto's paper on Bitcoin was the first protocol to solve this problem by making use of cryptographic functions (Swan, 2015). Therefore, the main strength of blockchain lies in the fact that third parties are no longer needed for the transaction of digital information (money, land ownership records, music rights etc.) between two entities. All this sounds quite as revolutionary as blockchain technology is made to be in the media, but what exactly is a blockchain?

"The blockchain is an incorruptible digital ledger of economic transactions that can be programmed to record not just financial transactions but virtually everything of value" (Tapscott & Tapscott, 2016).

Translating this jargon into more digestible language: the main purpose of blockchain technology is the storing of transaction details in a secure and immutable way so that these details can be considered true. The transactions in a blockchain are validated and basically locked, meaning they cannot be altered. This ensures an immutable record of all occured transactions over time. This means blockchain technology allows two peers to transfer (money, information, documents etc.) directly with each other, without interference of a middleman, while all transaction details are validated and secure, therefore guaranteeing the legitimacy of the transactions.

To allow for a trustless exchange, blockchain technology makes use of three different core technologies: a distributed ledger, immutable storage and a consensus algorithm (Elsden, Manohar, Briggs, Harding, Speed & Vines, 2018). A distributed ledger is in essence a shared database between entities to which all entities have access and permission to read and write. The immutable storage aspects refers to all changes made to the ledger (i.e. new transactions)

Figure 4. Gartner Hype Cycle for emerging technologies 2018, adapted from Gartner (2018).

Plateau will be reached in:
- 10+ years
- 5-10 years
- 2-5 years

Carbon Nanotube
IoT Platform
Virtual Assistants
Smart Workspace
Smart Robots
Quantum Computing
Volumetric Displays
Conversataional AI Platform
Autonomous Driving Level 5
Blockchain
5G
Connected Home
Autonomous Driving Level 4
Knowledge Graphs
4D Printing
Augmented Reality
Flying Autonomous Vehicles
Biotech - Cultured or Artificial tissue

EXPECTATION
TIME

Innovation Trigger | Peak of Inflated Expectations | Trough of Disillusionment | Slope of Enlightenment | Plateau of Productivity

being stored in a block which links to an immutable chain of previous transactions. The consensus algorithms ensure that the proposed transactions are verified by all entities involved and a consensus is reached on the state of the database.

Additional information on the exact workings of blockchain can be found in Appendix B.

3. Blockchain types

As companies are actively exploring the technology's implications and uses, different types of blockchains exist. The most common distinction between blockchains is a permissioned (or private) blockchain and a permissionless (public) blockchain. Below, the main characteristics of both types are shown in figure 6 (Buterin, 2015; Kadiyala, 2018).
For companies it is important to know the differences between these types of blockchains, as they have each been developed for their own philosophy. Permissionless blockchains, for example, are better suited for business models that include cryptoeconomics. For businesses focussed on providing a trusted source of truth, permissioned blockchains are better suited. However, it is expected that in the future businesses will use multiple types of blockchains in parallel (Kadiyala, 2018).

Figure 6. Characteristics of permissionless and permissioned blockchains.

4. Blockchain's practical value

As Bitcoin presented us with the first official use case for blockchain technology, it acted as a source of inspiration for others to think about additional use cases for blockchain technology. According to Swan (2015), there are three main stages in which blockchain technology will disrupt the world as we know it. These three stages are respectively blockchain 1.0 (currency), blockchain 2.0 (smart contracts) and blockchain 3.0 (decentralized applications). With each stage, the need for trust is eliminated more and more. Rather than having to trust each other or a third party intermediary, users of a blockchain system put their trust in the open-source cryptographic algorithms that make up the blockchain system (Tapscott & Tapscott, 2016). As most companies' blockchain algorithms are open-source, everyone who desires to do so can review the source code of blockchain systems. Most public blockchain systems' source codes can be viewed on software development platform GitHub (www.GitHub.com).
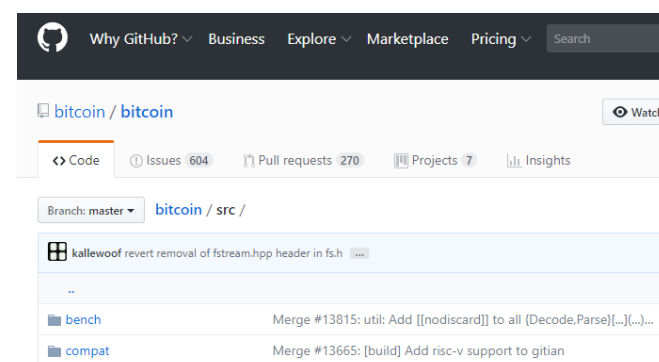
Figure 7. Part of Bitcoin's repository on Github, taken from Github.com/bitcoin/bitcoin.

4.1 Blockchain 1.0
Blockchain technology as it was presented in Satoshi Nakamoto's paper, Bitcoin: a peer-to-peer electronic cash system (2008), is considered to be blockchain 1.0. It is merely designed as the backbone for a digital currency. The total supply of digital tokens, the transaction mechanics and validity of transactions are all governed by the system's algorithms. Two peers can transact directly using the system, rather than having to involve and thus trust a third party.

4.2 Blockchain 2.0
The second stage of blockchain's disruption are smart contracts. Ethereum was the first example of a smart contract use case for blockchain technology and to this day is the largest smart contract platform. It was proposed in 2014 by Vitalik Buterin as an improvement on Bitcoin (Buterin, 2014). The term smart contracts, however, is not exactly new. Well known computer scientist Nick Szabo invented the term in 1994 when proposing a way to fulfill his desire of removing the middleman (Szabo, 1997).

With a traditional contract, two or more parties agree to do (or do not) perform a task in exchange for something. Each of the parties involved in the agreement must trust the other parties in the agreement to fulfill their promise. A third party (e.g. a notary) is usually involved as the enforcer of the contract.
Smart contracts remove both the need to trust the other parties involved in the agreement, as the need to trust a third party as contract enforcer. This, because smart contracts consist of code in which the conditions of the agreement are predefined. As soon as the conditions of the agreement have been met, the contract is enforced automatically without interference of an intermediary (Tapscott & Tapscott, 2016).
According to Swan (2015) smart contracts have three main attributes:
1. Autonomy: once the smart contract is running, no further interaction is needed between the initiator(s) of the contract and the contract itself.
2. Self-sufficiency: no human interaction is needed in order to execute the contract. The contract is self-enforcing.
3. Decentralization: they are distributed among network participants and not stored on a central server.

Below, a schematic explanation of a smart contract is shown (Blockgeeks, 2016).
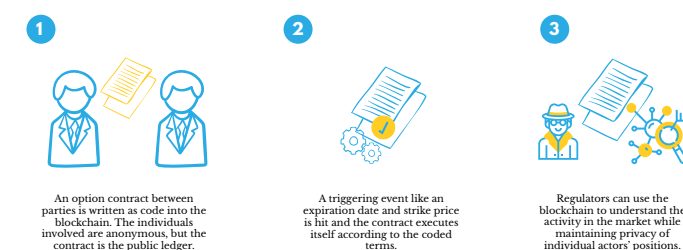
Figure 8. Main principle of a smart contract (adapted from Blockgeeks, 2016).

The most tangible metaphor of a smart contract is the one of a vending machine. As Melanie Swan illustrates in the following example:
"When you deposit money and make a selection, the item is released. There is no possibility of the machine not feeling like complying with the contract today, or only partially complying (as long as it is not broken). A smart contract similarly cannot help but execute the prespecified code." (Swan, 2015)

Smart contracts' main value lies in the increase of efficiency in processes for value exchange, as they are automated and require no human interaction. This, combined with the fact that a third party intermediary is no longer required to enforce the contract result in overall cost reduction for the exchange of value assets (e.g. home ownership records).

4.3 Blockchain 3.0
The third stage of blockchain's disruption are decentralized applications, or 'DApps' for short. DApps make use of decentralized storage. So rather than traditional apps that run their backend code on centralized servers, DApps run their backend code on a decentralized peer-to-peer system, a blockchain. DApps are generally a combination of smart contracts, data input and frontend code (interface).

4.4 Blockchain 4.0
As the first three stages have already occurred and are in continuous development, experts foresee a fourth disruptive wave: blockchain 4.0 (Unibright.io, 2017). Blockchain 4.0 is about creating solutions and approaches that enable blockchain technology to be usable for business needs. More specifically, adhering to the demands of Industry 4.0. Industry 4.0, also called smart industry, is a collective term for (primarily) IT-driven changes and developments to manufacturing systems. It is mainly about automation, the integration of systems and decision-making without human involvement (Lasi, Fettke, Kemper, Feld & Hoffmann, 2014). Blockchain 4.0, therefore, is primarily about making blockchain 3.0 usable in real-life scenarios. In theory, blockchain has the potential to meet industry 4.0 demands.

5. Business financing

The birth of blockchain technology also saw a new way of business financing: initial coin offerings (ICOs). An ICO is in essence a hybrid between an initial public offerings (IPO) and a crowdfunding campaign (Rhue, 2018). In short, an initial coin offering entails the issuance of a digital token (crypto coin), similar to Bitcoin, to the public to raise funds (Rhue, 2018; Diemers, Arslanian & Kong, 2018).

Blockchain startups that are funded through ICOs face different challenges than traditionally funded startups. This is due to the fact that ICOs are mostly built upon future promises. Since blockchain technology is still in such an early stage of development, it is not uncommon for the owner of the ICO to not yet have a Proof of Concept (PoC) or a tangible product to show its potential investors (Diemers, Arslanian & Kong, 2018). Moreover, due to ICOs' public nature, investors are not as experienced as traditional business finance investors.

In recent history, vast amounts of capital have been raised through ICOs, with ICO funding outperforming traditional venture capital (VC) funding in 2017 (Catalini & Gans, 2018). 2017 saw a massive growth in the number of ICOs held and the capital that was raised. From 2013 to 2016 a total of 69 ICOs were held raising an accumulated total of just under 300 million USD, while in 2017 alone 552 ICOs were held in 2017 raising over 7 billion USD. This trend continued with 537 ICOs taking place in the first five months of 2018 raising over 13.7 billion USD (Diemers, Arslanian & Kong, 2018).

Below, figure 9 provides a visual representation of the amount of capital raised in ICOs from January 2014 until August 2018.

It is important for companies funded through ICOs to keep their investors satisfied and deliver upon what they promised, as unsatisfied ICO participants (i.e. token holders) can decide to sell their share of tokens. If many tokens are sold at the same time (e.g. during a panic sale), the price of the token can be driven down due to basic supply and demand dynamics of an open market (Kaal & Dell'Erba, 2017). Naturally, this is bad for business and is something that should be prevented.
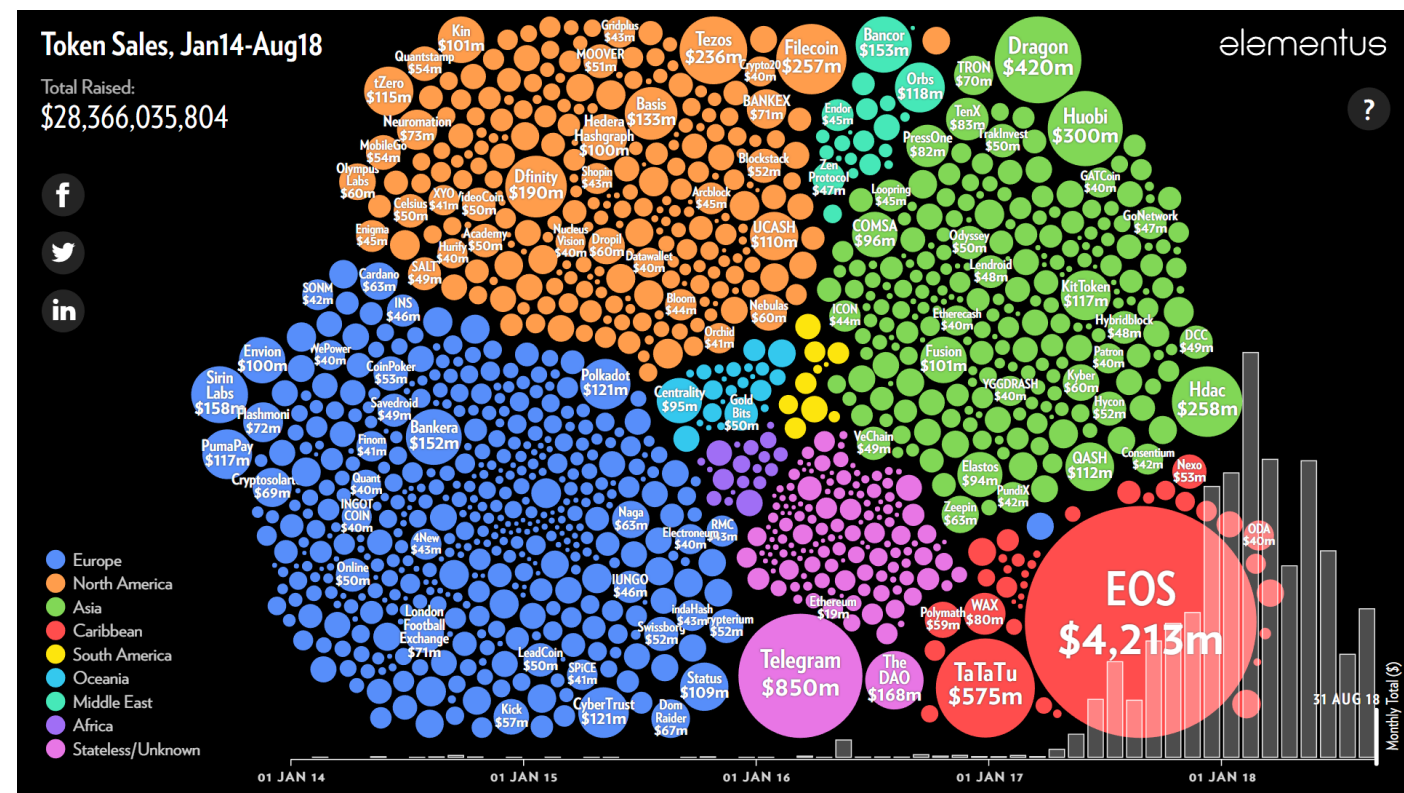

Figure 9. Overview of business financing through ICOs from January 2014 to August 2018 (taken from Elementus.io).

The more participants in the network, the more valuable the overall network will become. This is known as the network effect (Uzzi, 1996). As blockchain based companies further develop their product, the utility and thus the value of the network increases. This increases the value of the underlying tokens as well.

6. Blockchain development challenges

6.1 Multidisciplinary knowledge

As said earlier, many different blockchain initiatives are in existence. Startups, established companies and researchers are pouring significant effort and resources into discovering blockchain, but still have difficulty grasping its true potential (Beck et al., 2016). Blockchain and its technical protocols, distributed technology, decentralized consensus mechanisms, smart contracts and decentralized applications are rather complex. Therefore, the engineering and commercialization of blockchain applications is a non-trivial challenge which requires multidisciplinary knowledge (Notheisen, Hawlitschek & Weinhardt, 2017). As companies do not yet understand the technology and its potential well enough, it is mostly up to the engineers and developers to dive into the technology and propose solutions. However, as Notheisen et al. (2017) note, it takes multidisciplinary knowledge to properly grasp the technology's true potential.

6.2 Auditing

Another major challenge in blockchain development is auditing. As companies spend large amounts of time and effort in establishing a business case, testing their approaches and create proof of concepts, they tend to get stopped by audits (Smith, 2018).

Smith (2018) identifies four main issues that hinder the internal audits of blockchain projects:

1. **Newness of blockchain technology**: the first blockchain application Bitcoin is merely a decade old (October 2008). Most blockchain applications are very immature. Whereas management systems that are being used have been around for decades. It takes audit teams some time to get used to the new technology.

2. **Different controls**: a new technology requires a new way of thinking. As auditing approaches have never considered a technology like blockchain, they will need ways to answer questions like 'Who has control over the blockchain?' 'Who gets access to the system?' Does the technology actually do what it should do?

3. **Lack of technical knowledge**: according to PwC's 2017 Global Digital IQ Survey, 86% of financial service executives stated their organizations have not yet acquired the necessary blockchain skills (Curran, Garrett & Puthiyamadam, 2017).

4. **Blockchain's reputation**: as blockchain is mainly known for its connection to Bitcoin, there are many misconceptions about and biases towards the technology.

Thus, although the blockchain industry is buzzing, there is need for improvement in order to capitalize on its true potential. Startups and enterprises are in need of multidisciplinary teams with the required knowledge about blockchain and all of its relevant facets to develop successful blockchain use cases.

6.3 Supply vs. demand

However, by far the biggest challenge with the development of blockchain products and/or services are the developers themselves.

The demand for blockchain trained engineers and developers has absolutely skyrocketed in recent years, with some sources reporting an increase in demand of around 6000% (Upwork, 2018), see figure 10.
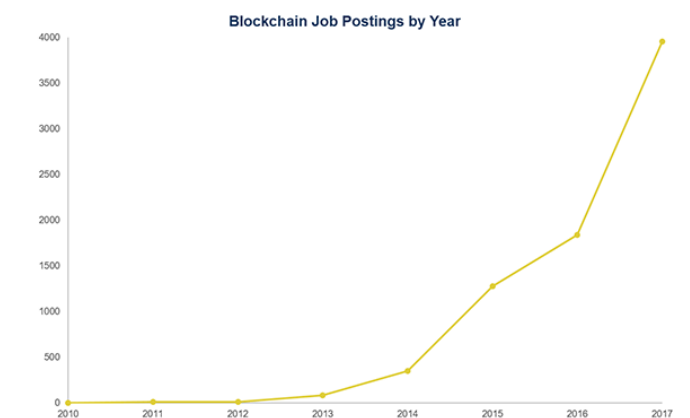

Figure 10. Blockchain job postings by year since 2010.

With the demand for blockchain trained people at such a high, suppliers are doing whatever they can to meet the demand. However, the demand continues to rise far above the supply (Zhao, 2018; Terzo, 2018).

Hence, one of the main barriers for the realisation of blockchain products is the gathering of a workforce that is able to develop the product. There is a widespread shortage of dedicated blockchain engineers and developers. It is therefore not uncommon for blockchain companies to try and lure away blockchain experts from one project to their own (Terzo, 2018).

Founder of Ethereum Vitalik Buterin, for example, reportedly got a rather attractive financial offer from Google (Zuckerman, 2018).

Following basic economics, if the demand surpasses the supply, prices rise. This means that it is relatively expensive to hire the people needed for the development of blockchain products. Companies wishing to develop a blockchain product from scratch will most likely have to invest rather heavily. In figure 11, the average salaries of people working in blockchain are shown. Both for the technical and non-technical jobs, people working in blockchain earn about 10 to 20% more compared to similar functions at non-blockchain companies (AngelList Data, 2018).
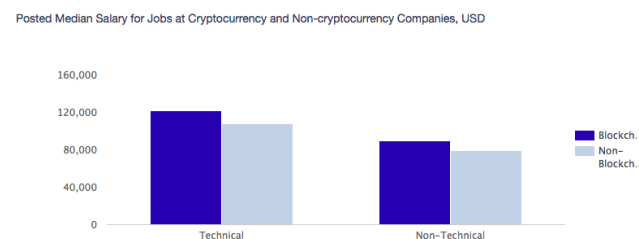
Posted Median Salary for Jobs at Cryptocurrency and Non-cryptocurrency Companies, USD

Figure 11. Median salaries of blockchain and non-blockchain functions (taken from AngelList Data).

Concluding, for companies aspiring to create a blockchain product, there are some difficult challenges to overcome. The main barrier to cross is gathering the required blockchain expertise, both on the business and technical side. This is not only quite hard but also rather expensive to accomplish.

Increase blockchain companies
The amount of blockchain based companies has significantly grown in recent years, indicating the growth of the industry as a whole. This validates the relevance of GoBlock's proposition and the necessity of a structured approach. The approach should allow for upscaling, as the industry is growing fast.

Blockchain's hype status
Blockchain has passed the Peak of Inflated Expectations' and is crossing over into the 'Trough of Disillusionment' phase on the Gartner's Hype Cycle. The hype starts to fade now that people have to wait for the solutions to be built and for companies to deliver on their promises (if at all). The solution should therefore allow GoBlock to help their customers deliver on these promises by being able to build the products.

Multidisciplinary knowledge required
As companies do not yet understand the technology and its potential well enough, it is mostly up to the engineers and developers to dive into the technology and propose solutions. However, as was found through literature research, the technology can benefit from multidisciplinary knowledge. Hence, the solution should incorporate knowledge from different areas of expertise for the creation of blockchain products.

Manpower is the largest obstacle
The biggest challenge with the development of blockchain products and/or services are the developers themselves. Global demand for blockchain trained developers has exploded in recent years. Demand has risen far above supply. GoBlock needs to make sure they are able to address this need, as that is a key determinant for the realisation of blockchain use cases.

Blockchain is being pushed as answer to questions that have yet to be asked
Not enough business aspects are taken into account when setting up blockchain projects. The vision is to innovate but the actual business value is often overlooked. This also leads to blockchain getting a bad reputation.

The solution should therefore include a way of determining whether or blockchain is a suitable technology, in general or in its current state of development.

CHAPTER 3
DESIGN FOR INNOVATION

1. Innovation types

As innovation takes place, it does not always take place in the same fashion. There are different types of innovation that can be distinguished. According to Norman & Verganti (2014), there are four main types of innovation: technology-push innovation, meaning-driven innovation, technology epiphanies and market-pull innovation. These are divided over two axles: meaning and technology. The four innovation types are shown in figure 12.
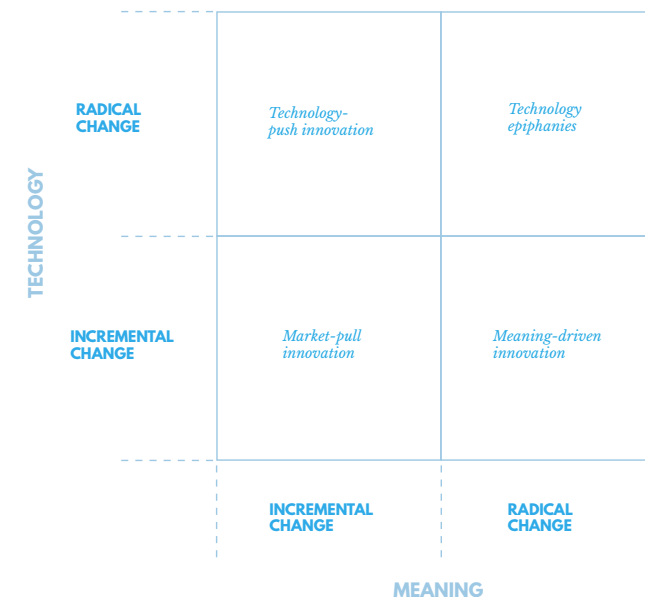
Figure 12. Four types of innovation, adapted from Norman & Verganti (2014).

To further distinguish the innovation types, a distinction is made between incremental change and radical change. Incremental change is defined as "improvements within a given frame of solutions", whereas radical change is defined as "a change of frame" (Norman & Verganti, 2014). In short, incremental change usually entails the improvement of existing products, whereas radical change involves introduction of totally new products or markets.

1.1 Technology-push innovation
As the blockchain industry is currently dominated by engineers and developers, it is without a doubt a technology-push innovation. Technology-push innovations are innovations that result from radical changes in technology without any input from user research. This is currently the case for blockchain technology. Where the focus within most blockchain related projects lies on the technical aspects (additional features, new protocols etc.), little user research is being conducted. Although the blockchain industry is currently highly dependent on technological development in order to gain first-mover advantage, it could benefit from a more human-centered design approach in the future. As Norman & Verganti (2014) note in their paper, after the radical innovation has been developed, human-centered design methodology is invaluable for product enhancement after the first market introduction. They raise the example of Google, Facebook and Twitter that have all modified their propositions after their initial introductions in order to enhance their product or its appeal.

1.2 Market-pull innovation
Whereas with a technology-push innovation there is little to no user research, with a market-pull innovation user research is the base of the innovation. Users are the starting point in identifying the innovation's direction. A market-pull innovation is a product developed to satisfy user needs that have been identified through user research. This user research can consist of user observations, interviews and user tests. From this research the needs are derived directly from the users. As the users are the only inspiration for the innovation, the innovation is bound to the frame of reference from the users. This is why market-pull innovation leads to incremental innovation and not radical innovation, as for radical innovation a new frame is required.

1.3 Meaning-driven innovation
Meaning-driven innovations are changes that have an impact on socio-cultural level. It results

in radical new meanings of a product, without the introduction of (radical) new technology. In their article, Norman & Verganti (2014) exemplify the introduction of the mini-skirt as a meaning-driven innovation. There was no novel technology, but the innovation symbolized a radical change in society regarding women's freedom.

1.4 Technology epiphanies

Technology epiphanies are either a radical change in the meaning of a product as a result from a (radical) new technology, or by using already existing technology in a new context, giving it a new meaning (Norman & Verganti, 2014). One of the most well-known examples of a technology epiphany is the one of Apple's iPod. Whereas the MP3 technology used by Apple for the iPod had been around for a couple of years, it was Apple that found the most valuable and meaningful way to use the technology (Verganti, 2009).
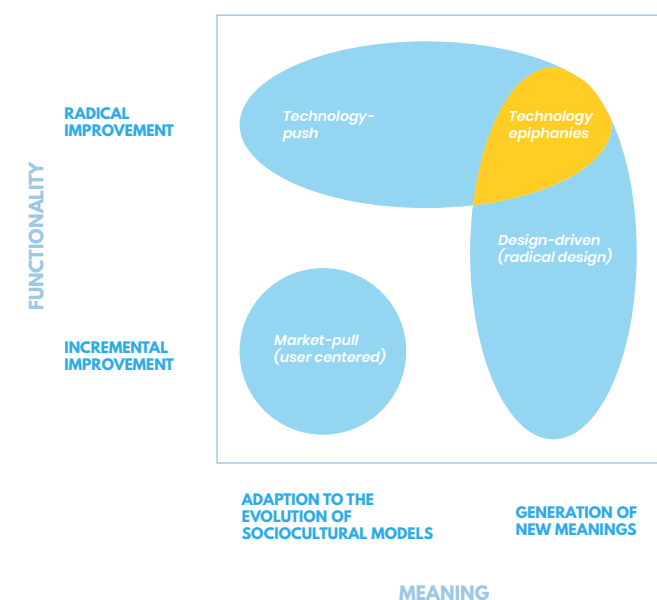
Figure 13. Innovation strategies, adapted from Verganti (2009).

1.5 Design-driven

Rather than having technology push, or a market pull an innovation through, Verganti (2009) argues that innovations can also be pushed by design, see figure 13. Design-driven innovation is about the creation of new markets by proposing radically new meanings. As Verganti notes in his book Design-Driven Innovation: people do not buy products, they buy meanings (Verganti, 2009). Looking at both figure 12 and figure 13, we can see that meaning-driven innovation and

technology epiphanies both fall under design-driven innovation (Verganti, 2009; Norman & Verganti, 2014). In order to create radical new meanings, visions must be proposed (i.e. create new markets), rather than focussing on existing user needs (Verganti, 2009;). Within these new markets, user needs can then be identified and the innovation can be designed accordingly. As Baldasarre, Calabretta, Bocken & Jaskiewicz (2017) exemplify in their study by using user-driven innovation to create a sustainable value proposition design.

As blockchain is an emerging new technology with the undisputed potential to "reshape our economy" (Lee, 2018), new markets need to be created. In order to do so, visions need to be proposed. Therefore, applying a design-driven approach is critical for the success of blockchain technology as a radical innovation.

2. Design Thinking

Design Thinking in essence is the solving of problems by addressing the user needs and coming up with solutions that are both feasible and viable (so regarding the technological and the business aspect). By doing so, companies utilizing Design Thinking can create high-impact solutions that find their origin in the consumers' actual needs. Therefore, Design Thinking is the bridge between human, technology and business, see figure 14.
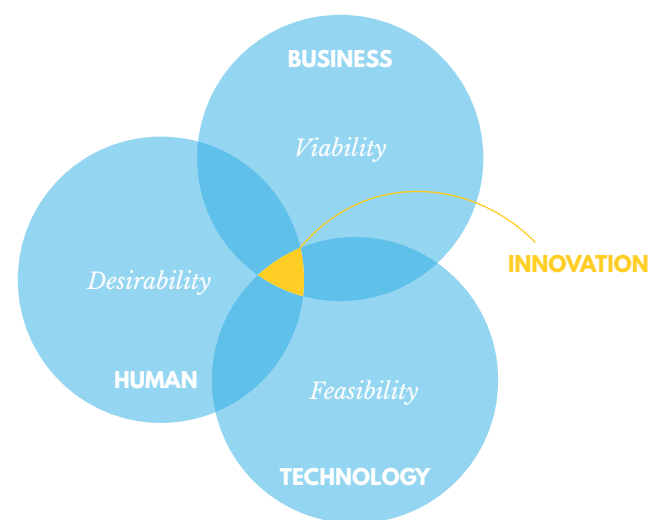
Figure 14. Design thinking is the bridge between human, business and technology.

In contrast to traditional problem solving, which is rather linear and structured, Design Thinking consists of three main spaces: inspiration, ideation and implementation through which people loop (Brown & Wyatt, 2010). Contrary to traditional processes, these steps do not have to be followed sequentially.

In figure 15, the process of Design Thinking is visualised. This is the Design Thinking approach used by internationally renowned design company IDEO.

With Design Thinking being hailed as an "exciting new paradigm for dealing with problems in many professions, most notable in Information Technology (IT)" (Dorst, 2011), it can be deducted that blockchain related product development can benefit from a Design Thinking approach.

In Chapter 4, the link between Design Thinking and blockchain consulting is further discussed.

Figure 15. IDEO's design process, adapted from IDEO.

CHAPTER 4
BLOCKCHAIN CONSULTING

In Chapter 2 and 3, blockchain was elaborated from both a technological perspective and from a wider innovation perspective. However, in order to be able to provide GoBlock with a solution to assist them with improving their consulting proposition towards a solution provider proposition, it is of importance to also understand the blockchain consulting process in general.

In this chapter, first additional literature research was conducted. Blockchain consulting was examined in order to understand the different phases of a blockchain consulting project, the stakeholders involved and the challenges.
Based on the conducted literature study, research questions were formulated. This Chapter's goal was to verify the findings from literature research and to answer these research questions. The data in this chapter was gathered through literature research and in-depth interviews with industry experts.

1. Consulting process

1.1 Best practice example: IBM
IBM can be considered as one of the blockchain technology leaders in the world (Juniper Research, 2017). Hence, a look was taken at IBM's blockchain consulting process in order to get a thorough understanding of a blockchain consulting project.

Naturally there are many differences between a large multinational like IBM and a startup like GoBlock. Therefore, blindly copying such a process to GoBlock's context would not provide any value to GoBlock. What does provide value, though, is looking at what IBM does differently and to determine why IBM is as successful as they are.

As can be seen in figure 16, IBM's blockchain consulting process consists out of four phases.
The first two phases are aimed at providing the customer with the relevant knowledge about blockchain and to analyse the customer's organisation so that a business problem can be identified and potential use cases can be brainstormed.
Some customers, however, already have a use case in mind. In that case, the process would start at the third phase 'First Project' where Design Thinking and agile methods are applied to concretise the use case.

LET'S TALK	BLOCKCHAIN HANDS-ON	FIRST PROJECT	SCALE
1. Discuss blockchain technology 2. Explore customer business model Show blockchain application demo	1. Understand blockchain concepts & elements 2. Hands on with blockchain on Bluemix 3. Standard demo customization	1. Design Thinking workshop to define business challenge 2. Agile iterations incrementally build project functionality 3. Enterprise integration	1. Scale up pilot or scale out to new projects 2. Business process re-engineering 3. Systems integration

Figure 16. IBM's blockchain consulting process lay-out, adapted from IBM.

1.2 9-step approach
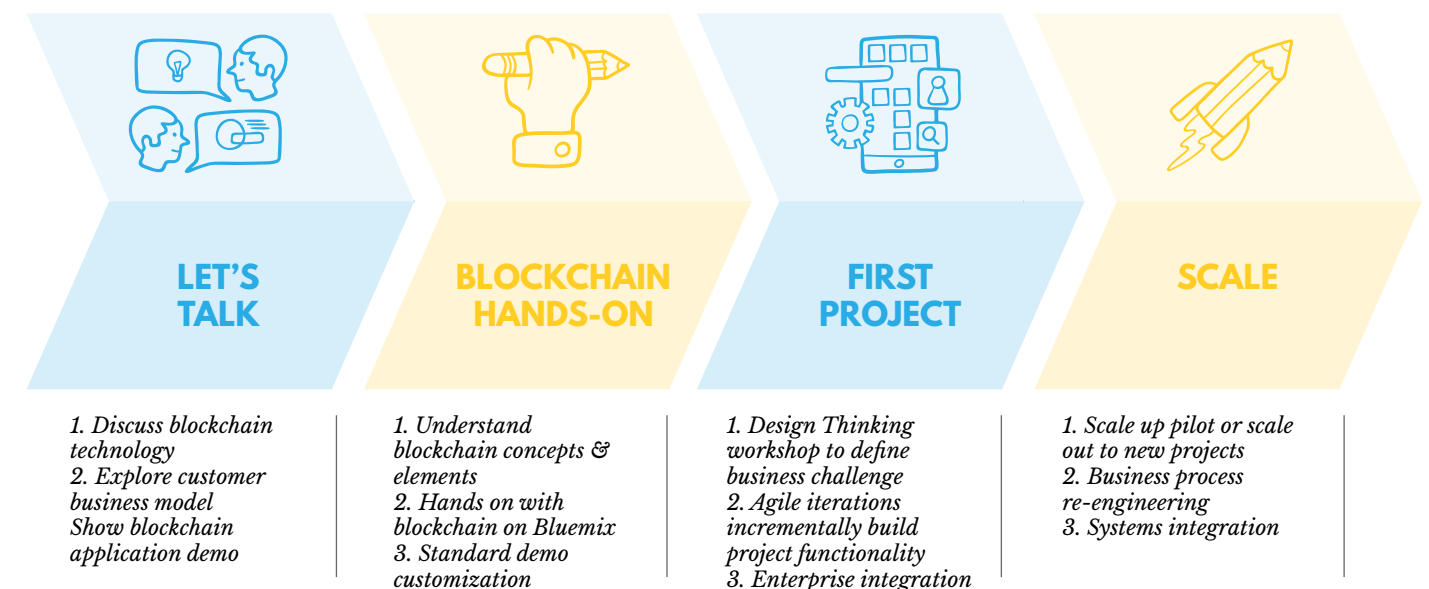
In his book 'Business Blockchain: Unlocking Transformational Potential', Palfreyman (2018) describes a 9-step approach (figure 17) for getting first blockchain projects off to the most effective start.

The 9-step approach, similarly to IBM's process, makes use of Design Thinking and agile methodologies.

As can be seen, the 9-step approach is strongly focused on establishing a strong use case and its contextual factors, before starting to develop the envisioned product. The development of blockchain products is similar to other software development processes. This is explained in the next section.

1. Know - ensure appropriate levels of awareness of business blockchain

2. Brainstorm - possible use cases based on the knowledge from step 1

3. Select - the use case that will best leverage blockchain characteristics, add business value and can be built with current levels of knowledge and technology maturity

4. Unpack - the selected use case to ensure details are understood and shared

5. Network - understand the business network, its layers and how it will work together

6. User - focus on a few users from the core business network, understand how they do their job today and how it could be improved

7. Hills - form concise statements of business need for key users, then prioritise

8. Needs - understand non-functional and project needs to sufficient detail to start agile development

9. Agile - render first project with a number of short duration agile iterations

Figure 17. Palfreyman's 9-step approach for first blockchain projects (Palfreyman, 2018).

2. Software development

2.1 Agile

Many software companies nowadays follow an agile approach in their development.

Agile entails a value-driven approach based on continuous stakeholder and user feedback, allowing for flexibility and thereby enabling companies to decrease the time-to-market for new ideas. This is done by creating a minimum viable product (MVP), which are the minimum set of product features that provide value to the user (PwC, 2017).

Agile as we know it was first presented in the Manifesto for Agile Software Development (Beck et al., 2001). It builds on four main values:
1. Individuals and interactions over processes and tools
2. Working software over comprehensive documentation
3. Customer collaboration over contract negotiation
4. Responding to change over following a plan

In figure 18, an overview of a general agile process is shown.
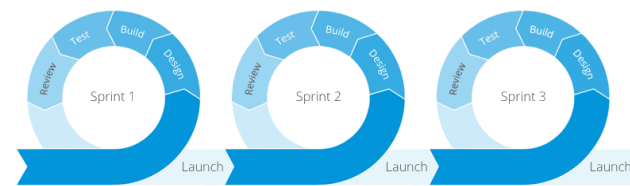
Figure 18. Typical agile development process structure.

In figure 19, the traditional development process and an agile development process are shown. As can be seen, Agile employs multiple production cycles (iterations) delivering multiple products, whereas the traditional process only delivers one product. Agile uses iterations of one to four weeks in which features of the final product are developed and tested. As said earlier, the continuous feedback that is characteristic to the agile process leads to product improvements with every cycle and results in a shorter time-to-market (PwC, 2017).
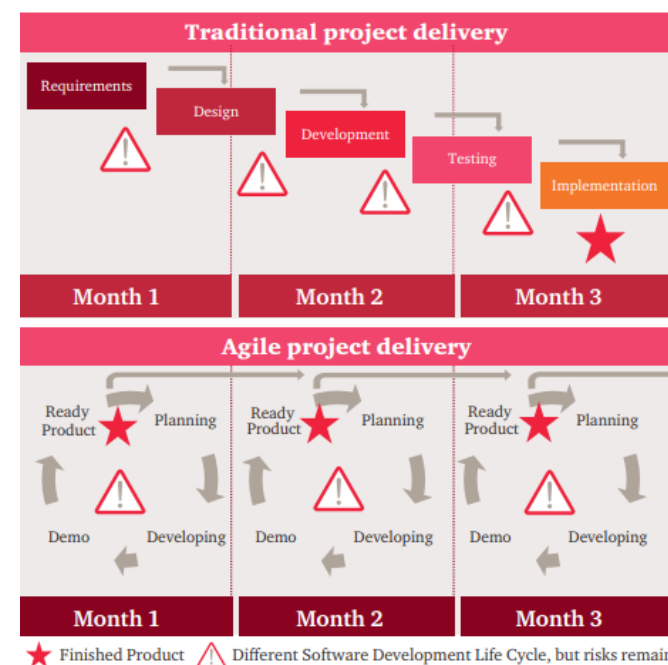
Figure 19. Traditional vs. Agile project delivery (PwC, 2017).

3.1 GoBlock's software development

Gapstars, GoBlock's technical backbone, also follows an agile delivery process, similar to figure 18. Internal Gapstars documents were studied in which the application of Agile to Gapstars' practices is explained. Gapstars' agile process consists of the following steps:

1. Product vision
Create a product vision together with stakeholders.

2. Product roadmapping
After defining a product vision that all stakeholders are happy with, a product roadmap is created. A product roadmap contains all key milestones that are to be achieved in order to realise the product vision.

3. Release planning
Prioritize key milestones and group them in a time scale, allowing the team to look at the sprint deliverables in a holistic way.

4. Backlog preparation and grooming
A product backlog is created by capturing all features and the required technical work into a prioritized list for the team to follow.

5. Sprint planning
During sprint planning, the parameters of the agile sprints are discussed in relation to the overall project. The goals and outcomes are also determined and agreed upon.

6. Sprint execution
The sprints are executed. Gapstars' sprints have a standard duration of two weeks. During the sprints there are daily scrums in which progress is discussed.

7. Sprint review
Inspect and adapt items that were built in the sprint so far to validate if the product meets the earlier set goal(s).

8. Sprint retrospective
The team discusses how the sprint went. Emphasis is on the process itself, rather than on the product that was built. That was already discussed in step 7.

3.2 Scaling agile

As organisations are exploring blockchain technology, and the technology has a lot of room to grow (Seth, 2018), it is important to look at the scaling of software development. If a company decides to develop a concept and proceed to the production phase, upscaling is needed. An early stage Proof of Concept can be created with a relatively small team, however in order to develop a fully functioning product, full scale production is needed.

3. Hypotheses

Based on the literature research of Chapter 2, 3 and 4, hypotheses were formulated. These hypotheses were defined to verify the main findings gathered through literature research and to gather inspiration for the eventual solution. These would then be answered through conducting interviews with industry experts.

Three main hypotheses were defined:

1. Multidisciplinary knowledge is needed to define a strong blockchain use case.

2. Before starting the realisation of a blockchain use case, an assessment of the strength of a use case is needed.

3. Design Thinking can help blockchain consultants apply a more user-centered approach to new blockchain development projects.

4. Interviews

The interviews are used to collect insights and perspectives on what blockchain consulting should take into account.

The interviews were conducted in a semi-structured way. This means the interview is based on an interview guide in which themes are set, but allow for the interviewer to ask additional questions and probe (Patton, 2002).

First, the interviewees are presented, after that the interviews' main themes and insights will be discussed.

The interviews were conducted with different industry experts with a background in either blockchain consulting or blockchain development. Below, the interviewees are shown.

John Palfreyman
- Former Blockchain Director IBM UK
- CEO Palfreyman Ventures
- Design Thinking & blockchain consulting expert

Jelle van der Ploeg
- Former Blockchain Competence Leader IBM
- CTO & Co-founder Unchain.io
- Blockchain consulting & development expert

Julia Liubevych
- Chief Business Development Officer Unicsoft
- Blockchain development expert

Figure 19. Interviewed experts for this chapter.

5. Results

The interviews brought forward interesting insights. Most of which verified the earlier literature findings. However, also new insights came to light. Moreover, the interviews helped shed a light on how the solution could address the challenges in blockchain consulting and solution provision.

5.1 Hypothesis 1: *Multidisciplinary knowledge is needed to define a strong blockchain use case.*

As was found in the literature research in Chapter 2, blockchain development can benefit from multidisciplinary knowledge. Hence, this hypothesis was formulated.

Multidisciplinary knowledge, and with that understanding among different customer stakeholders, is critical for the development of a good use case:

"The goal in the beginning is for the business guys in the customer's team to have a sensible conversation about blockchain use cases: what are good and what are bad use cases?"
- John Palfreyman

"It was a challenge to overcome the technical discussions. It was quite common for the technical department from companies to act as 'tire-kickers' and start endlessly discussing all kinds of technical aspects of blockchain. By getting them together with the business people, you create the momentum to move past the technical discussion."
- John Palfreyman

This hypothesis was thus confirmed.

5.2 Hypothesis 2: *Before starting the realisation of a blockchain use case, an assessment of the strength of a use case is needed*.

Based on existing processes from industry leaders and from literature research in Chapter 2, this hypothesis was defined.

Establishing that a blockchain use case is in fact one that provides strategic value is the most important part of the whole process. The better this phase is executed, the more smoothly the process will eventually transition into the development phase.
As blockchain is still rather immature and needs additional understanding, it is important to focus strongly on establishing a strong use case around it.

It is critical to know the painpoints that will be addressed with the new solution and whether or not blockchain is actually the right solution for the given problem. The hypothesis that blockchain is the right answer to the given problem needs to be constantly tested and evaluated:

"I would say that a good consultancy firm needs to understand blockchain so that they can recommend when it's the right solution for their customers' business problem. And also when they can recommend that it's the wrong solution for the business problem."
- John Palfreyman

"Consultants are all about objectivity and about thoroughly understanding the problem before recommending a solution. I think of blockchain as one potential solution. You need to avoid the syndrome where blockchain is the answer, but what's the question? I think that sort of results in blockchain getting a bad name."
- John Palfreyman

Apart from whether or not the technology fits the given technological challenge, it is also important that the future benefits of the use case are determined and understood:

"You actually go through a process of brainstorming the potential use cases in a business area with the customer and then selecting the one that drives most blockchain advantage but also drives strategic value for the customer."
- John Palfreyman

"If things are not going right just stop and go back and start again. It's better to do that than not start and also better to do that than go ahead when you really think things might no be going where you wanted them to go with from the start."
- John Palfreyman

"Whenever a customer approaches us that already has a blockchain use case in mind. We always first sit with them to critically assess the use case, before we actually start building it. Of course we want to start development as fast as possible, but the business case needs to be legit."
- Jelle van der Ploeg

"The main challenge with creating a blockchain product is recommending your customer to make the correct decisions early in the project. The actual future value of a use case is of high importance, otherwise the product won't make sense."
- Julia Liubevych

Following the interviews' insights, this hypothesis was also confirmed.

5.3 Hypothesis 3: *Design Thinking can help blockchain consultants apply a more user-centered approach to new blockchain development projects.*

Industry leader IBM specialises in blockchain consulting for large enterprises. To do so, IBM uses a blockchain consulting process that is based on Design Thinking in the early stages of the process (Palfreyman, 2017). As Palfreyman also states in one of his articles for IBM's blog: *"In one recent workshop, the consortium brought along a requirement and had mapped out user journeys. I was reluctant to go back to the start, analyse the business network and do persona based analysis. But I'm pleased I did. Design Thinking added clarity which helped the development team deliver early value and the consortium members explain the benefit of their solution to stakeholders and potential new business network members"* (Palfreyman, 2017).

These insights led to the definition of the third hypothesis.

Design Thinking is well suited as a methodology framework in the early stages of the consulting process. This, because it allows for a user-centered approach and to allow for the creation of new meanings by determining future value for its users:

"The best way is through experimentation. The design-driven approach very much lends itself to experimentation. Start the experimentation early and with an open mind and, of course, with a good use case. Things would then naturally drop out as you go through the process."
- John Palfreyman

"I tend to think that Design Thinking starts when you have selected the personas and the business network and you are really going to analyze things from that persona viewpoint.
- John Palfreyman

"At both IBM and now at Unchain, if a customer already has a use case figured out, we still take them through a Design Thinking workshop. This is done to assess the use case and to determine what we build first. Design Thinking lends itself to fit neatly to agile development."
- Jelle van der Ploeg

By applying a user-centered approach to the use case, the main value drivers of a use case can be determined. In other words, user benefits can be formulated which help customer stakeholders understand the envisioned use case more clearly. These main value drivers provide the input for the agile development.

"When you have chosen the use case you spend some time understanding the business network that is involved in rendering that use case, and then some time understanding the different personas in that business network who work together to render the use case."
- John Palfreyman

"Approaching the use case from a user-centered perspevtive allows us to pinpoint what will give the user the most value in the end. That is what we want to build first."
- Jelle van der Ploeg

A lot of customers want their product to be built as quickly as possible, and might not always be willing to put in the required preparation effort. The benefit of the process and methodology (e.g. Design Thinking) for the customer should be explained clearly to convince the customer of the importance of the early stages of the process:

"What we basically said is that it is absolutely vitally important to get the project team and the customer team, all the different members of the customer team, on the same page. And that same page needs to be Design Thinking, design led. The main way we convinced them was talking that through with them

and saying 'because you did all that work, we should be able to go through this really quickly. We will go through it as quickly as will be safe.'*"
- John Palfreyman

Moreover, it is important that the customer feels in charge in a blockchain consulting process:

"We also said, at any stage, bear with us for a bit, but if you don't see value quickly we'll stop and talk about it and think again. They were remarkably open to it. They actually saw it as a good second validation step."
- John Palfreyman

The third hypothesis was thus also confirmed.

6. Conclusion

Concluding from the interviews, all three hypotheses were confirmed.

First, whereas blockchain development is currently mostly dominated by the technical teams, a multidisciplinary approach is needed. This way, blockchain use cases can be tuned to the context in which they take place. A blockchain use case should be viewed as a wholistic thing. It is more than just a technological back-end solution. It should make sense for the whole (eco)system that blockchain is used.
A way to accomplish this is to engage in a sensible discussion, without immediately getting too hung up on technical details. Additionally, a multidisciplinary team allows for a broader look on the business context of the use case, resulting in a more wholistic approach.

Second, it is essential to assess the actual strength of a blockchain use case, before deciding to proceed with building an MVP or piloting it. Naturally this is needed with other technologies as well, but with blockchain even more so. Given the fact that there are many bad use cases in the world today, this is not being done sufficiently. This is mostly due to the technology being a misfit for the given problem, or just a lack of elaboration of the use case itself. The latter meaning that only part of the use case is thought out (e.g. Can we build it? Can we integrate it with our systems?), while important parts are left

uncovered (e.g. Will this result in something that will actually provide benefit?).
If this is not done accordingly, a project can grind to a halt, or a suboptimal product can get developed. Neither of which are desirable for supplier, buyer or even the reputation of the industry.

Third, the potential of a blockchain use case ultimately comes down to one aspect: value. If the future value is not clear or cannot be created, the use case is invalid. The benefit of the use case must be clear to the end user of the solution, as they will eventually be the ones that need to adopt it. Hence, a more user-centered approach is required. Design Thinking allows consultants to embed end-user needs into the new blockchain product development process.

Key insights, conclusions and requirements

Use case validation
Establishing a use case and validating it is by far the most important part of the process. If this is not done correctly, the project is pretty much doomed to fail as no real strategic value will be created. The use case should provide value to all stakeholders involved and blockchain should actually be the right solution to the problem. Best practice approaches therefore focus strongly on use case establishment before engaging in software development.

Industry examples showcase the importance of establishing a strong blockchain business case. There needs to be a constant critical assessment whether the blockchain use case is a sensible one that will provide value.

The solution should therefore allow GoBlock to determine the validity of a blockchain use case. Next to that, it should also allow for the elaboration on a blockchain use case, if it is deemed invalid.
GoBlock should be able to advise their customers whether or not blockchain is the technology to use for the given use case and advise on how value can be created. The solution should enable GoBlock to do so.

Design Thinking
Design Thinking is very well suited for blockchain use case development as it helps stakeholders to remain user-oriented. As the product eventually needs to be adopted, Design Thinking allows for the incorporation of end-user perspectives.

Concluding from industry examples and interviews, Design Thinking is applied after a use case is agreed upon. Design Thinking is then used to elaborate on and validate the selected use case.
Additionally, Design Thinking allows for prioritization of user values, which can then be used as input for the agile development.

The solution should incorporate Design Thinking principles to allow GoBlock and their customer to elaborate on the user perspectives of the use case to distill the main value drivers.

Agile development
Software development processes mostly follow agile methodology. So does blockchain software development.
Agile methodology very well suited for blockchain development as it is a value-driven approach. As mentioned before, it is a good follow-up of Design Thinking as that is where key value drivers are determined.
The process should therefore make use of an agile delivery process, similar to one that GoBlock uses currently to minimize organisational change and risk.

CHAPTER 5
COMPANY ANALYSIS

After conducting external analyses about the facets surrounding the design challenge, it was time to scope inwards and examine the company GoBlock and its relevant touchpoints. Hence, this chapter will describe the performed company analysis.
In this analysis, multiple different aspects of the company were studied. GoBlock's competitive position and customer portfolio were examined and a SWOT analysis was drawn highlighting the strengths, weaknesses, opportunities and threats for GoBlock. Lastly, a target group for GoBlock is defined, based on gahtered insights.

In this chapter:

1. **Competitor analysis**
2. **SWOT analysis**
3. **Customer analysis**
4. **Target group**
5. **Key insights, conclusion and requirements**

1. GoBlock's consulting process

Besides researching established companies' blockchain consulting processes and practices, GoBlock's previous consulting projects were also examined. This was done in order to determine potential problem areas which could be in need of improvement. In this section, one customer project was used as a deep dive.
Additionally, other GoBlock customer projects were studied on a more general level to gain additional insights.
This was done by studying the project deliverables and conducting interviews with project stakeholders from GoBlock. Interviews were conducted with founders Hugo Hemmen and Michael Eerhart.

1.1 Case study
1.1.1 Project
One of the previous consulting projects that GoBlock participated in was one with a digital product customer. This project was originally supposed to be an end-to-end project, but it stagnated after the concept proposal. By studying GoBlock's deliverables and proposals and interviewing employees of GoBlock, the project was used to identify factors that influenced the premature ending of the project. In figure 20, an overview of the different phases of the project is shown.

Michael Eerhart
• **Founder GoBlock**
• **Role during project: Blockchain Consultant**

Hugo Hemmen
• **Founder GoBlock**
• **CEO Gapstars**
• **Role during project: Account Manager**

The first phase of the project was a so-called Blockchain Discovery Phase. In this phase, GoBlock and the customer explored the potential of blockchain technology. This was done by evaluating the possible fit of blockchain technology and cryptocurrencies in the current and future business plans of the customer. The outcome of this phase was a summary of the customer's goals and business ambitions. Based on this outcome, a project plan was drafted.

"The project plan that was created was not the result of a predefined or structured approach. It was pretty much improvised. The customer was happy at the time, but from our side it was not very professional."
- Hugo Hemmen
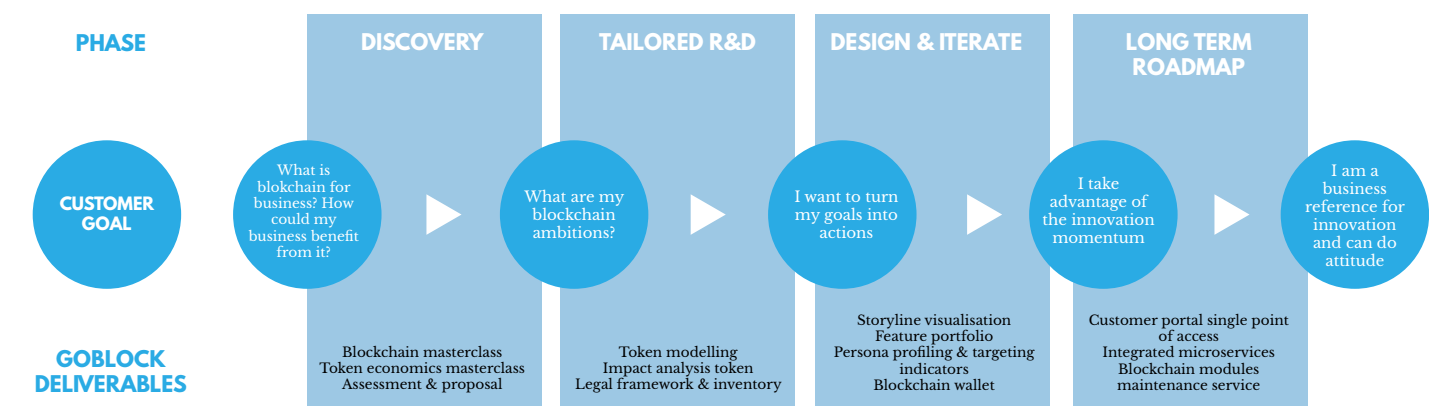
Figure 20. Representation of process of case study project.

Although GoBlock had plenty of required blockchain knowledge, they were less experienced in organizing the project. Also, the exploration of blockchain implications for the customer was done from a technology perspective, meaning that blockchain was pretty much offered as a solution upfront, without having a clear idea of which problem to solve.

After the Blockchain Discovery phase, they project moved into the Tailored R&D phase. In this phase, specific business goals were formulated based on the business plan resulting from the previous stage. During this phase, GoBlock advised the customer about different aspects of creating a blockchain product. It was imperative that both customer and GoBlock had a certain level of knowledge about relevant topics before creating a concept proposal. Hence, the economics of digital tokens were explored and the different aspects and dynamics of ICOs were discussed during sessions. Additionally, GoBlock conducted analyses relating to the realisation of the blockchain use case in order to assess the necessary requirements and potential risks of the project.

A total of 3 workshops were to be held between GoBlock and the customer. These sessions were meant to accommodate the exploration and ideation of blockchain use cases and to be informative for the customer's technical team. In the third session a preliminary concept proposal was to be discussed along with the requirements for the rest of the project.

Thus, GoBlock got to work on a first concept proposal. A concept cryptocurrency ecosystem was designed, based on the previously defined goals and criteria. The proposal consisted of a description of the ecosystem, an economic model of the concept token, a risk analysis, product-company fit analysis, product success factors and a technical product architecture outline in which the product elements were explained. However, due to unclarity between both parties about the sessions' results and following steps in the process, only 2 of the 3 workshops were eventually held. This led to the eventual stagnation of the project.

The sessions were rather improvised by nature, as GoBlock did not have a structured outline for the project:

"After two workshops we invited their technical team to a third party workshop aimed at explaining blockchain system's architecture, not knowing that essentially would render our third workshop obsolete."
- Hugo Hemmen

"After the session with NEM (the third party workshop), their technical team thought that they could do everything they needed themselves, meaning they no longer needed us"
- Michael Eerhart

Moreover, as GoBlock did not clearly specify what the workshops would include and entail for the customer, the customer eventually was of the opinion that there was still a third session to come, while GoBlock already agreed with other stakeholders from the customer on a substitute for the third session. This lack of clear communication was also a direct result from the lack of structure. The intended outcome of the workshops was not clear for all stakeholders.

The lack of structure was not only showing in the workshops. By not having a good overview of their own capabilities and the absence of an overall project strategy, GoBlock was not able to accurately allocate their resources to the project. This resulted in a product development proposal that was not deemed sufficient by GoBlock themselves. The project ground to a temporary halt as GoBlock and the customer agreed to suspend the project until further notice.
Additionally, with GoBlock's technology-centric perspective, the product proposal was created in a way that was very difficult for the customer to understand.

"The thing was, we didn't really know what we could actually do for them with regards to developing the final product at the time. We had multiple projects going on and we didn't know how to shape the project from that point onwards. Add to that the situation that occured with the architecture workshop. It was just not viable to proceed at the time"
- Hugo Hemmen

1.1.2 Conclusion

Three main conclusions can be drawn from case study.

First, the lack of a structured project outline resulted in an unorganized chain of events which actually cost GoBlock the project. GoBlock was not able to predict what the exact added value was they would bring to the customer. Moreover, the lack of structure resulted in them not having a clear idea of what the workshops with the customer should entail. The content of the workshops was not very well grounded. There was no clear strategy or methodology being applied. GoBlock is in need of a structured process clearly outlining the steps to go through, which methods to use and which outcomes to generate.

Second, communication to the customer needs to improve. Specifically communicating the value GoBlock brings to their customer. What is it exactly that the customer gets out of a collaboration with GoBlock? As mentioned, the technical team of the customer felt that they no longer needed GoBlock with the technical development of the project after the technical workshops, while in reality the development was rather complex and the final product was never built. GoBlock must therefore clearly know what their added value to the project is (i.e. not rendering them obsolete) and communicate this to the customer from early on.

Last, when a use case is being established, it should not be done by assuming blockchain is the solution before actually establishing the business problem that needs to be tackled. This may have also played a part in the final proposal not being deemed worthy and valuable, as the strategic value of blockchain was not evident.

1.2 Partial consulting projects

As mentioned earlier, the other projects that GoBlock conducted were all partial consulting projects, most of which focussed on the earlier stages. The reason that these projects did not proceed into the development or implementation stages and turn into full end-to-end projects is as follows:
Blockchain trained developers are relatively expensive. As was found during the literature review, the rise for blockchain trained developers has exploded in recent years and is continuing to climb, resulting in blockchain development being rather expensive. Therefore, as GoBlock's consulting projects progressed into the concept proposal phase, many companies were hesitant to invest in the actual development of the proposed solution. Moreover, Gapstars is specialized in helping fast-growing companies in scaling their development. Many of the projects for small startup customers simply did not proceed into development as the customer was not able to invest the required amounts in eventually scaling the project into production. As a result, they either chose to develop it in-house, to look for alternative solutions or to discard the whole project. These last two options are instantly fatal for a valuable outcome of the project.
However, projects of companies that chose to develop the proposed solution in-house often also ran into difficulties. As the technology is so immature, unforeseen challenges and obstacles during product development are a given. With most companies' technical departments lacking relevant knowledge with regards to blockchain development, these problems are not always solved in the correct way (if at all). As a result, many projects are discarded eventually.

Needless to say this is something to be avoided for both GoBlock and their customers. From GoBlock's point of view, a loss of project is a loss of revenue, a customer and potential branding opportunities, while for their customer discarding a project means innovation will not take place and time and money have been wasted.

Summarising, it is mutually beneficial for both GoBlock and their customers that the transition from concept to product goes well. It is imperative for GoBlock to clearly communicate the added value of their service to their customers and making sure that the investment is actually worth it. This way, GoBlock can increase its revenue and the customer is provided with a properly developed product proposal.

1.3 Conclusion

Concluding from analysing GoBlock's previous projects, two main challenges can be identified.

First, GoBlock's projects' success has been mainly limited by a lack of overall process structure and, resulting from that, suboptimal communication to their customers. Not exactly knowing what each phase should contain and how it should be structured has led to missing out on additional phases in customer projects which result in missing out on potential revenue. Also, conducting projects for customers which were never planning on or capable of developing the product did not help. As GoBlock is a business like any other, in the end it is about generating revenue in order to stay operational and expand. Therefore, a structured process tool needs to be designed to help them transition into development stage of the process, as that is where the main bottleneck of the process lies. Figure X shows the case study process with the bottleneck of the process highlighted.

Second, elaborating on the bottleneck, passing the threshold of actually engaging in the development process: As the development of the product is by far the most expensive part of the process, it is understandable that this is where most companies start critically asking whether or not they want to proceed. The challenge then lies in proving to the customer that the process that was conducted up to this point has resulted in a use case and a solution design that will actually provide strategic value, both to the overall business as to the individual stakeholders of the business problem.

2. Competitor analysis

In order to get an idea of the developments in the market for blockchain consulting, and to ensure GoBlock can maintain a strong position within this market, a look was taken at the competition and GoBlock's relative position to its competitors.

The data that was collected for the competitor analysis was gathered by searching for literature and through informal interviews with GoBlock stakeholders and competitors.

A list of competitors was compiled. As GoBlock's headquarters are located in The Netherlands and the majority of their business takes place in The Netherlands, the competitor analysis is focused on the Dutch market. An overview of the identified competitors, both direct and indirect, is shown in Appendix D.

The competitors are divided into direct and indirect competitors. The direct competitors are specialised blockchain consultancies providing end-to-end solutions.

The indirect competitor category consists out of multiple groups. First, there are the large well-known consultancies that are not specialised in blockchain, but offer consulting services in multiple emerging technologies. Second, there are companies that are not specialised in blockchain technology and that do not provide end-to-end solutions, but only part of the process (e.g. only software development). Last, there are companies that provide blockchain training programs. These are not direct competitors to GoBlock, but they do offer the client an alternative by providing the client with relevant blockchain knowledge.

2.1 Porter's Five Forces

In order to determine GoBlock's relative competitive position, Porter's Five Forces method was used. The results of which can be found on the next page.

THREAT OF NEW ENTRY
Attractive market for potential entrants

Difficult to acquire required resources

Threat of new entry is neutral

SUPPLIER POWER
Resources already largely present

No uniquity with suppliers

Supplier power is low

COMPETITIVE RIVALRY
High demand for blockchain expertise

Companies covet each other's specialists

Competitive rivalry is neutral

BUYER POWER
Demand for expertise is very high

Buyers can't dictate prices

Buyer power is low

THREAT OF SUBSTITUTION
Competitors offer similar services

Switching costs for buyers are low

Threat of substitution is high

Figure 21. Porter's 5 forces model applied to GoBlock.

2.1.1 Supplier Power

With GoBlock being a consultancy, they do not really have suppliers in the classical sense. The resources required for GoBlock to offer their service are mostly already present at GoBlock. However, as the demand for certain resources (i.e. blockchain experts, blockchain engineers and developers) has risen significantly industry-wide, it might become a challenge to acquire these and accommodate future growth. As blockchain trained engineers and developers are the highest required resources in the industry, GoBlock has close relationships with educational institutes in Sri Lanka that teach software engineering. The uniqueness of the resources supplied by suppliers is relatively low. Moreover, there are similar suppliers resulting in low switching costs. Therefore, supplier bargaining power is low.

2.1.2 Buyer Power

Buyer power is very low as the demand in the market is very high (Zhao, 2018; Terzo 2018). With such a high demand and relatively low supply, buyers have little power. If they are not willing to pay set amounts, they can be replaced relatively easily. The switching costs are not high as GoBlock is a service provider and there are hardly any sunk costs like you would have with a physical product (i.e. production line, molds

etc.). For GoBlock, switching mid-project would only cost them spent time and potential future revenue, which are relatively light consequences.

2.1.3 Competitive Rivalry

The market is not dominated by a small group of incumbents. There are competitors active in the market, but as the industry is growing and blockchain markets are being shaped and created, the attractiveness of the blockchain industry is high. This attractiveness can be derived from the rise in blockchain projects and with that the demand for blockchain talent (Zhao, 2018; Terzo, 2018).

However, this rise in demand also has a negative side. As mentioned earlier in the analysis, it is not uncommon for companies to try and 'steal' blockchain talent from each other by offering large financial benefits as a way of persuading potential employees. This can also have a reverse effect on the attractiveness for some players in the market, as it is hard to acquire the required talent and could pose high costs for new entrants. Nonetheless, the overall market attractiveness of the blockchain industry is high, due to the undisputed potential of the technology and the growing market. Competitive rivalry is neutral, as there is plenty of demand for the different consultancies to supply, but acquiring the resources needed to be able to fulfill the role of blockchain consultancy is relatively difficult.

2.1.4 Threat of Substitution

As mentioned above, the competitors in the blockchain consultancy space are largely similar. They mainly offer their technical expertise to help clients understand the technology in order to brainstorm about potential blockchain use cases and offer their expertise to help develop these ideas into prototypes or actual products, depending on the consultancy. Hence, the threat of substitution is relatively high. There are no significant differences in the services offered by competitors. Switching costs for buyers are relatively low, as clients are able to pick up where they left off with a competitor. The only thing that needs to be determined is the level of blockchain knowledge at the client, before being able to proceed. Hence, the main thing the client loses is time. Needless to say time is valuable in a fast-moving industry like

the blockchain industry, but given that clients suffer no additional costs when switching (e.g. IP, production molds, distribution rights), switching costs are considered low.

The exception here is IBM. IBM has one trait that sets them apart from the rest in the market: Hyperledger. Hyperledger was a so-called umbrella project hosted by The Linux Foundation. The Linux Foundation is an organisation geared towards the creation of sustainable open-source ecosystems. In short, Hyperledger is a permissioned blockchain platform created by many different organizations, of which IBM was one of the early members and main founders. The Hyperledger is intended to be an industry standard. It forms the fundament of the IBM Blockchain Platform, meaning that IBM is the only (blockchain) consultancy in The Netherlands that can build solutions on their own platform, whereas other consultancies rely on established third-party platforms (e.g. Ethereum or NEM) or the creation of new blockchain platforms when developing new solutions. Having an established blockchain platform with the dozens of well-known contributors from different fields (finance, technology, academic etc.) that Hyperledger has can be a decisive factor for some clients to choose IBM over the other blockchain consultancies. However, the clients of IBM are mostly established incumbents that require large scale blockchain consulting, meaning smaller consultancies were never really an option.

Moreover, as mentioned under 'Competitive Rivalry', the majority of competitors focus solely on the technology perspective. By positioning themselves slightly differently, GoBlock could reinforce their competitive position in the market.

2.1.5 Threat of New Entry

With the amount of blockchain initiatives present today and the resulting demand for blockchain expertise, the market is very profitable. Hence, it might be an attractive option for potential entrants to explore the role of blockchain consultancy.

Although it might be attractive to join the market due to its current profits, establishing a

position in the market can be relatively difficult. If a new blockchain consultancy were to be formed, it would need relevant expertise in order to provide its services. With the supply of blockchain specialists being smaller than the demand (Terzo, 2018), this can bring significant costs for new entrants. New entrants would need either deep pockets or a very well established network in the industry in order to acquire the needed resources to gain a position in the market. Therefore, the threat of new entrants is neutral.

2.2 Concluding from competitor analysis

There are other blockchain consultancies active in the Dutch market, both large (e.g. IBM) and small (e.g. Kryha). These consultancies do not necessarily have a specific target group, but the majority of their business is for enterprises and governmental organisations. Moreover, the majority of competitors focus on getting their clients to understand the technology and focus on a meticulous execution on the technical development part. Herein lies an opportunity for GoBlock to distinguish themselves from their competitors.

It can be assumed that the technical expertise of the competitors is comparable and that there are no significant differences between them. Although understanding a technology is essential in order to create a product/service with it, it might not always be the right choice to approach innovation solely from the technological perspective. As mentioned earlier under Design for Innovation, the success of blockchain as a radical innovation (i.e. its adoption) could be increased by applying a design-driven approach. The competitor analysis supports this.

Although IBM applies Design Thinking to their blockchain consulting practices (see Chapter 4), it is still largely approached as a technology-push innovation. The Design Thinking principles are applied to the structure of the consulting process itself, rather than the content of the process. The emphasis still largely lies on the technical feasibility of the project. As none of the competitors seem to emphasize the potential value and importance of design (as a way of thinking) when creating new blockchain

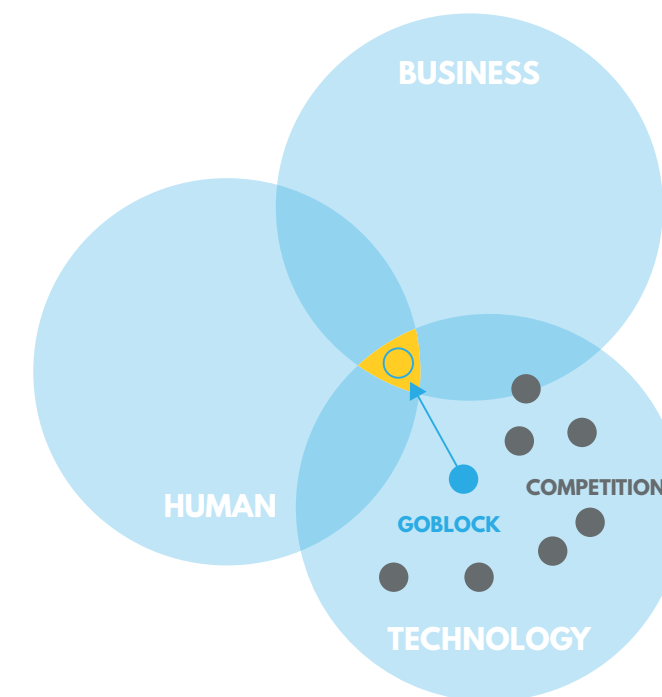products, this presents an opportunity for GoBlock.

Figure 22. Relative position of competitors GoBlock and opportunity for GoBlock to distinguish from competition.

3. SWOT analysis

3.1 SWOT overview

From the aforementioned analyses, conclusions were drawn. These conclusions were then synthesized and structured in a SWOT analysis, which can be found below. The full explanation of the SWOT analysis can be found in Appendix E.

STRENGTHS	WEAKNESSES
Strong established network: strong customer relations	Technology is immature. No product archetypes yet
Experience and capabilities required for different project phases	Location: development team is located off-shore. On-site development would mean extra complexities and costs
Well established development resources with new talent being acquired and trained cheaply and efficiently offshore	No process structure. Projects plans are shaped on case by case basis, often improvised
Gapstars (GoBlock's sister company) is specialized in facilitating upscaling	Company size: GoBlock is a relatively small company so it cannot serve entire market

OPPORTUNITIES	THREATS
Fast growing market. Major demand for blockchain expertise	Regulatory environment: lot of ambiguity regarding regulation of blockchain and cryptocurrency projects
Publicity: signature projects could be good PR given the media's attention to blockchain	Funding: exact benefits of blockchain are not always clear, so future value is difficult to estimate. Leads to difficulty in project funding
Design Thinking: Direct competitors approach the innovation from technology perspective. GoBlock can distinguish itself in the market by applying a user-centered approach to blockchain development	Bad reputation: there have been some major scams and failures in the blockchain industry. Participating in such a project can be fatal

Figure 23. SWOT analysis of GoBlock.

3.2 Conclusion SWOT: from analysis to action plan

Having conducted a SWOT analysis, the Strengths, Weaknesses, Opportunities and Threats of GoBlock have been defined. However, having these four elements defined does not solve anything just yet. The eventual goal is to ensure that GoBlock maintains a competitive position in the blockchain consulting industry. Therefore, an action plan was formulated by leveraging one of GoBlock's strengths to tap into an identified opportunity.

One of GoBlock's main strengths is having well established development resources. They acquire new development resources relatively quickly and easily compared to their local Dutch competitors. Therefore, they can very well accommodate the increasing demand for blockchain trained developers. It is therefore imperative that the new client projects they acquire will include the development phase, as that is where their main strength lies. Moreover, as Gapstars (the development resource provider) is specialized in facilitating the scaling of fast-growing technology companies, they can not only supply current demand but also anticipate future demand for the development of blockchain products.

4. Target group

As GoBlock is a small consultancy, aspiring to serve the entire blockchain market with its many different types of initiatives and their respective needs would be a slightly arrogant and unwise decision. Defining a target group was done, since it is not only important for a proposition to fit the needs of the target group, but it must also be ensured that the company can actually fulfill those needs from an organizational perspective. For example, a large organizational restructuring is not preferred, as that would bring additional risk.

The target group was defined based on an examination of GoBlock's previous and current customers and by interviewing industry experts. After examining GoBlock's current and previous customers, two main types of competitors were distinguished. Those that had no idea of what blockchain could do for their organisation and those that already had a slight idea of a business problem or use case for the technology.

4.1 Customers without use case

The first group are customers that approach GoBlock that have no idea how blockchain could fit their organisation and business. These companies mostly want a basic training on the main characteristics of blockchain technology and have no intention of actually developing a blockchain solution with GoBlock. It was discovered that this was mainly due to two reasons. Firstly, very large customers only work with preferred suppliers, as founder Michael Eerhart noted:

"The thing is, corporates like ABN Amro usually work with preferred suppliers. Those preferred suppliers are mostly the large consultancies like Deloitte or IBM. A full blockchain project would therefore go to a large competitor like IBM, rather than to a small consultancy as us, which is logical."
- Michael Eerhart

Secondly, other customers never planned on creating a blockchain product or service in the first place. They were interested in blockchain as a buzzword, not in capitalizing on the potential of this new technology.

"We found that some companies were not even that interested in the technology, but mostly wanted to be able to say to their shareholders that they were doing 'something' with blockchain. They just wanted to board the hype train. It was not really our position then to convince them to pursue an end-to-end project with us."
- Michael Eerhart

Lastly, within this first category there are of course companies that have no idea how blockchain can help their organisation just yet, but are willing to innovate. These customers, however, are in need of blockchain training and education in order to understand the technology well enough so that a meaningful discussion can emerge among customer stakeholders. Also the organisation needs to be analysed in order to identify areas that might benefit from blockchain as a technology. All this is a rather time intensive process. GoBlock does not have the resources to be able to invest heavily into a lengthy process upfront without any reassurance that the project will transition into development. As that is where their main strength lies and their main revenue is to be made, these companies are not ideal as a target group in the short term and GoBlock should not try to serve them.

4.2 Customers with use case

The second type of customers that was distinguished are customers that already have an idea on how blockchain might be used to help their organisation, or have a pressing business problem in mind that needs solving. In these cases, GoBlock would be approached in order to help elaborate on the use case or to develop a concept or prototype for the customer's use case.

These companies suit GoBlock better, as they tap into GoBlock's strength of being more resourceful at the development side. They are not a company that should focus on trainings etc. That is not where their strength lies.

4.3 Competitor target groups

Target groups from competitors are relatively diverse. Whereas IBM focuses merely on large enterprises, Xurux, a smaller consulting company, mostly focuses on government blockchain initiatives. In order to see if this

was an interesting direction for GoBlock, two experts on blockchain and governments were interviewed.

Interviews were conducted with Christian Schouten, Blockchain Expert at the Dutch Ministry of Finance and with Koen Lukas Hartog, Project Manager Blockchain Projects for Governmental Organizations.

Koen Lukas Hartog
- **Project Manager Blockchain Projects for Governmental Organisations**

Christian Schouten
- **Blockchain Expert at Dutch Ministry of Finance**

From these interviews, it was concluded that governmental initiatives are not well suited for GoBlock. Before a blockchain consulting project involving governmental organisatiwons takes off, all involved organisations must be aligned. Given that these ecosystems usually involve many different organisations (some involve more than 13 governmental organisations), this is a very lengthy process and requires relevant knowledge of governmental organisations. This was validated by both interviewees:

"What development agencies often underestimate is if they want to work with a consortium like that, especially governments, there is a lot of behind the scenes stuff that needs to take place before a project can reach development. For example, legal entities need to be formed, product ownership needs to be discussed etc. That can take a long time during which the development company is basically on hold."
- Koen Lukas Hartog

"You are basically a mediator between all these different organisations. You have to be able to answer the question 'what's in it for me?' for all individual stakeholders and organisations. I do this by diving into and familiarising myself with the organisations' processes. As you can imagine this can take some time."
- Christian Schouten

GoBlock does not have the resources to invest that heavily into a project and survive for months or even years the project will get off the ground.

4.4 Conclusion

With the customers, a certain willingness to innovate must be present. It is important that they are actually interested in creating something that will provide strategic value to their organisation, rather than just boarding the hype train. Additionally GoBlock's should use its strengths to build their business, rather than focussing on a group which would require organisational change.

Concluding, the recommendation for GoBlock is made to focus on companies that already have a blockchain use case in mind.

In the future GoBlock might be able to help companies that are in the super early exploration phase, but given its current capabilities and the risk associated with the required organisational change and investments to accommodate that make it something not worth recommending on the short term.

The only challenge that GoBlock is faced with here, is the one that they need assurance that the customer's use case is actually one that will be of value. This will be further elucidated in the Design Brief.

GoBlock already uses agile process
GoBlock's technical teams (Gapstars) already work using agile methods. which suits the industry trend. The solution should therefore incorporate agile development into its process.

GoBlock's lack of organisation
The lack of methods and structure in GoBlock's consulting process led to suboptimal product proposals or stagnation of projects. These projects ended as a result from either a lack of structure, a lack of clear strategic value for all customer stakeholders or overall missing technology fit.
Hence, the solution should enable GoBlock to structure their consulting process by providing a main process outline.

Answer: blockchain. Question: unknown
A big determining factor for project failure is that blockchain is often offered as a solution upfront, without having an idea of which problem to solve.
Firstly, blockchain should not be offered as the solution before the actual problem has been determined and explored.
Secondly, the solution needs to be defined in such a way that it will bring strategic value to the customer's business and its stakeholders. This value should be clear and evident. Only then is it possible to have a meaningful discussion with the customer on how to develop the proposed solution. This is needed in order to convinve the customer to proceed into the development stage

Process bottleneck: engaging with the development phase
The main challenge for GoBlock in a blockchain consulting project is the transition into the development phase.
The solution should therefore include a way for GoBlock to convince their customers it makes sense to proceed with the development of the use case.

Perspective
As most competitors focus on just the technology side of blockchain innovation and do not emphasise the importance of the user's perspective, GoBlock can use a design-driven approach to distinguish themselves from its competitors. The solution should incorporate this.

GoBlock's competences
GoBlock is strong on the development side and has the experience, knowledge and capability to facilitate upscaling. The solution should act as a way for GoBlock to capitalise on these strengths.

Acquisition of development manpower
GoBlock can neatly tap into the large demand for blockchain developers, as they acquire new development resources relatively quickly and easily compared to their local Dutch competitors.

Target group (no end-to-end process)
Given that GoBlock cannot serve the entire market, the recommendation was made to focus on customers that already have an idea for a use case. This was done, because it fits more closely to GoBlock's strengths and requires less of an organisational change and investment. Exploratory blockchain projects often require significant investment (of time and knowledge) before reaching the development phase.
Thus, the solution should be geared towards customers that already have a blockchain use case in mind. The solution should not focus on the exploration of blockchain use cases in general, as that phase has already been executed by this target group.
Therefore, the choice was made to advise GoBlock to not pursue an end-to-end proposition, as it does not fit their capabilities on the short term. As the solution needs to be implemented on a short term basis, this is something that can be looked into in the future.

CHAPTER 6
DESIGN BRIEF

1. Synthesis

Below, key insights from the conducted analyses are synthesised and discussed. These are the insights that have the most significant impact on formulating the design challenge for this project.

1.1 Process Structure
As mentioned in Chapter 1 and later examined in Chapter 5, GoBlock's consulting projects suffered from a fundamental lack of structure. This led to GoBlock not being able to communicate with their customers about the necessary steps to take in order to realise the idea or to allocate their own resources. This led to a decrease of customer engagement in the projects.

Moreover, as was shown in Chapter 2, the blockchain industry has been growing rapidly over the past years. In order to serve this market, GoBlock is in need of a scalable solution to help them structure their process and allow for expansion.

1.2 Multidisciplinary knowledge
Chapter 2 and 3 indicated that blockchain development can benefit from a multidisciplinary approach, as it allows for a wholistic approach for use case realisation and enables stakeholders to move past a solely technical discussion. It is therefore important that the business and technical department understand each other.

1.3 Use case
Chapter 2 and 4 indicated the importance of a critical assessment of a blockchain use case in order to determine its potential and value. It was shown that the market is in need of guidance about the applicability of blockchain technology for different use cases. There is a need for expertise to help determine the validity of a blockchain use case and to help elaborate said use case in order to develop something that brings value.

1.4 Design Thinking
Chapter 3 and 4 concluded that Design Thinking can allow for a more user-centered aproach in blockchain development. This is something lacking fundamentally in the industry, as the majority of competitors approach blockchain development and blockchain consulting from a technology-centric perspective. As did GoBlock. Design Thinking can help with applying a more user-centered approach to blockchain development to align all relevant customer stakeholders and help the customer understand the product's value. Whereas Design Thinking is often used in the fuzzy front end (i.e. when coming up with use case ideas), Chapter 4 showed that it can also be used to elaborate on an already existing idea by identifying the key users and approach it from their point of view.

1.5 Agile development
As was shown in Chapter 4, GoBlock, similar to the industry trend, uses an agile delivery process for their software development process. Chapter 4 also showed that agile is well suited for user-centered blockchain development, as agile is a value-driven method. Hence, Design Thinking and agile fit each other well in the context of blockchain consulting.

1.6 Process bottleneck: starting development
As was noted in Chapter 4 and 5, the main challenge for blockchain consulting projects (and in this case specifically GoBlock) is the actual green light for the development of the proposed solution.

GoBlock was often not able to convince customers to proceed into the development of the proposed product, while that is where their main strength lies as a company and their main revenue is to be made.

To lower this barrier, customers need to understand the development process better,

i.e. what is required and what they will get out of it. The case study showed that the unclarity regarding project requirements and outcome resulted in cancellation of the project.

However, most importantly, as the development stage is overall the most costly stage of the process, customers felt unsure and hesitant to proceed. Customers therefore need assurance that engaging in the development will be worthy of its investment.

1.7 Three main challenges

When looking at the challenge of acquiring green light to start the building the proposed solution, three main factors can be identified from the analysis.

1.7.1 Technology misfit (feasibility)

Blockchain is offered as the an answer to a question that yet has to be asked. Often, the technology does not suit the use case well. There is a lack of critical assessment from both GoBlock and the customer whether or not blockchain is the right tool for the job. Later in the project this then leads to issues that could have been prevented if tackled earlier in the project.

This is in synergy with the Feasibility aspect of Design Thinking. The solution should thus include a way to test for the feasibility of a customer's blockchain use case. Tradtitionally, Feasibility asks the question "can we build it?". In this context, however, it should be interpreted as: "does the tool fit the job?" I.e. a hammer can be used to drive in a screw, it's just not the best tool to do so.

1.7.2 Blockchain's strategic business value (viability)

Validating the strategic value for the customer's business one of the most important parts of the process. If the value for the overall business
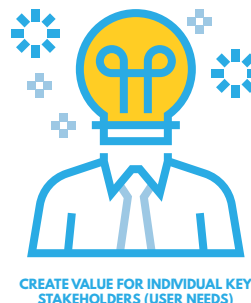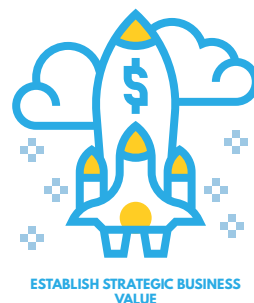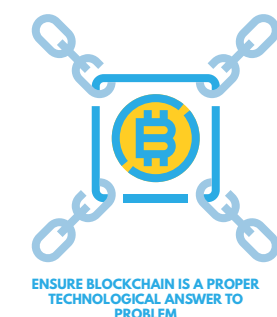
is not clear to all stakeholders, the project is doomed to fail. Chapter 4 showed that in previous projects, the strategic value was either not always created, or not clearly understood by customer stakeholders. This is the Viability aspect of Design Thinking.

1.7.3 Individual stakeholder value (desirability)

Apart from overall business value, a blockchain use case should provide value to all its users individually. This was often not the case with prevkous projects, and is something that is often overlooked in the industry in general. In order for blockchain applications to be adopted, all stkaeholders must experience personal benefits, otherwise they are not willing to switch. This is the desirability pillar of Design Thinking.

2. Design goal

Taking into account the main findings, the design goal is formulated as follows:

Offer GoBlock a solution to help them structure their blockchain consulting process, which can be used to validate a customer's blockchain use case and to allow for a smooth transition into its development.

In essence, the design goal is twofold. The first goal is to provide GoBlock with a process structure that they can apply to their blockchain consulting projects so they take place in a structured and organised way. The second goal is to zoom in on the main challenge within this process which is validating the use case's business value before proceeding with the development stage. The goal is to provide GoBlock with a solution to lower the barrier of transitioning into development.

Figure 24. Schematic representation of three main challenges in order to reach the development stage of a new blockchain development project.

3. Constraints

As with any design challenge, there are constraints that need to be taken into account when designing the solution. Below, the most important constraints of this projects are mentioned.

3.1 Time constraint

As this graduation project is bound to a maximum duration, limited iterations are possible for improving the solution. Therefore, final recommendations will be made at the end of this report based on concept testing.

3.2 Testability concept

The time constraint also presents limited testability. As a full on consulting project can take weeks or months to conduct, it will not be possible to test the entire process up until completion of the final product.

3.3 Immaturity of technology

As the technology is immature and there are no archetypes yet, assumptions have been with respect to GoBlock's expertise. It can be assumed that GoBlock possesses the required expertise to develop any customer use case they come across (that is deemed valuable).

4. Requirements

In order to make sure the solution addresses the key findings from the analysis, design requirements have been defined. The goal of design requirements is to provide concrete parameters for the design of the solution.

4.1 Target group: customers with a blockchain use case in mind

Chapter 5 showed that GoBlock was serving all types of customers, by not knowing exactly where their strength lay. This led them to projects which did not fit their organization quite well.

Given that GoBlock cannot serve the entire market, the recommendation was made to focus on customers that already have a use case in mind. This was done, because it fits more closely to GoBlock's strengths and

requires less of an organisational change and investment. Concluding the solution should focus on blockchain development projects in which a blockchain use case has already been selected.

4.2 Technology fit assessment (Feasibility)

As was mentioned in the synthesis, one of the three main reasons projects did not proceed into development was a technology misfit.

GoBlock is in need of a way that provides structure with regards to assessing the technology fit of a blockchain use case. This is also something that the client needs to understand.

Hence, the solution should include a tool to assess the technology fit of a customers use case.

4.3 Business value assessment (Viability)

The second main success factor for initiating the development stage was the impact of blockchain on the overall business. The solution should therefore include a way for GoBlock and the customer to determine the strategic business value of a blockchain use case. To do so, the solution must include a way to encourage customer stakeholders to think of how the blockchain use case can benefit their business.

4.4 User value assessment (Desirability)

The third determinant of the project's progression into development was individual user (stakeholder) value. The solution should include a way to allow for the creation of value for different individual stakeholders.

This is where Design Thinking can come into play. As concluded from the analysis, Design Thinking allows for a user-centered approach in order to determine user value drivers. The solution should therefore use Design Thinking tools to analyse the blockchain use case from key users' perspectives.

4.5 Create customer understanding

The customer should understand their use case into sufficient detail that a meaningful discussion can be held between the customer stakeholders (e.g. business team and technical team) discussing the use case details. The strategic value of the to be designed blockchain

solution should be clear to all.

Moreover, the solution should provide a way for GoBlock to communicate to their customers about the process. This way, the customer knows what to expect and has an overview of what steps need to be taken and how the different steps are structured. This enables for a smoother collaboration between GoBlock and their customers, as there are no uncertainties about the content of the process.

4.6 Structured process outline

The solution should enable GoBlock to create structure in their process internally. It is important for the consultants of GoBlock to know exactly what it is they offer to customers and where the value lies. Also, it is important that they can use the structure as a basic approach to all blockchain consulting projects.

Moreover, the solution should provide GoBlock with a structured way to ensure the projects they participate in make it to the development phase and actual value is created.

4.7 Realise customer's blockchain ambition

The solution should allow customers to realise their blockchain ambitions in a structured and grounded way by siding with GoBlock. The customer must have the assurance that they will not just start building, but that they know in what way value will be created through validation and prioritization.

The solution should therefore act as a way of assuring value for the customer.

4.8 Produce actionable outcomes

The solution should produce actionable outcomes in order to enable a smooth transition into the development phase. As the initiation of development is the main bottleneck in the process, the outcomes need to be concrete so consecutive steps can be taken accordingly.

Therefore, the solution should produce clearly defined and prioritised value drivers which provide the starting point of the agile development.

4.9 Implementable in short term

The industry is fast-moving as was concluded in the analysis and there are a lot of new competitors entering the market. In order to remain competitive, it is important for GoBlock to quickly be able to adapt and implement the solution.

Therefore, the solution should be implementable within 6 months.

4.10 Customers must be willing to adopt

As the target group consists of companies that already have a blockchain use case in mind, they might not always see the importance of (re) evaluating the use case they came up with. It is therefore important that the use case assessment does not require significant customer investment (of either time or money).

CHAPTER 7
DESIGN

In ths chapter, the design process is described. First, a dive is taken into the ideation process itself, what it looked like and how it was conducted. Following, the ideation findings are discussed. First, the general process is synthesised, after which the general process framework design is presented. Lastly, the validation workshop design is presented.

In this chapter:

1. Ideation process
2. Synthesis: process outline
3. First iteration: process frameworkCustomer analysis
4. Second iteration: validation phase
5. Use case validation workshop
6. Workshop parameters

DESIGN

1. Ideation process

The choice was made to divide the ideation into two main parts. First, the overall consulting process structure for GoBlock would be determined. Second, the new and crucial part of the process would be addressed by concretising this phase.

The ideation phase consisted of several iterations, both individual and collaborative. These will be further elucidated in this chapter. The applied methods and decisions will be discussed and argued in their respective sections.
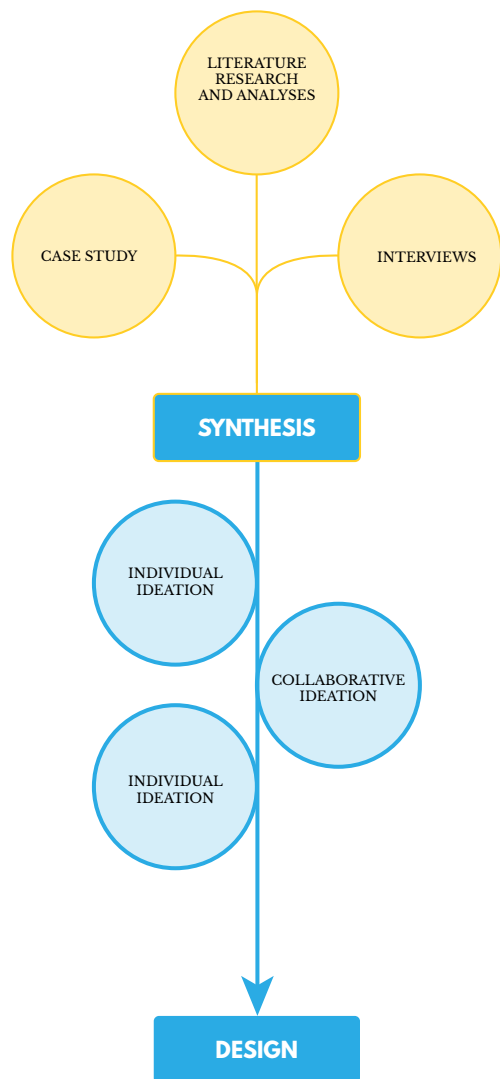
Figure 25. Visual representation of ideation process.

2. Synthesis: Process outline

2.1 Validation vs. creation

In order to create the process framework for GoBlock's overall consulting process, a distinction of the different needs and tasks in the process was first created. This was done based on insights from the literature insights and expert interviews (Chapter 4) and GoBlock's capabilities (Chapter 5). Two main process phases were identified: Validation and Creation, shown in figure 26.

As was concluded in the Design Brief, GoBlock is in need of a use case validation step in their process before starting to build the desired product. This way, they can convince their customer that a valuable outcome can be created if they build the product, as the potential value has been validated with them.

Figure 26. Two main overarching phases of GoBlock's future consulting process.

3. First iteration: Process framework

3.1 Process structure

After establishing the main two phases of GoBlock's process, an iteration was conducted to zoom in on the main outline and to determine how to structure the process framework.

In order to determine what phases should make up the process framework, insights from literature research, expert interviews, industry examples and GoBlock's capabilities were used as inspiration.

An individual ideation session was conducted to create a concrete framework to structure the Validation and Creation phase. The choice was made for an individual ideation session as a collaborative ideation session is better suited for exploring creative ideas. This was not a direct
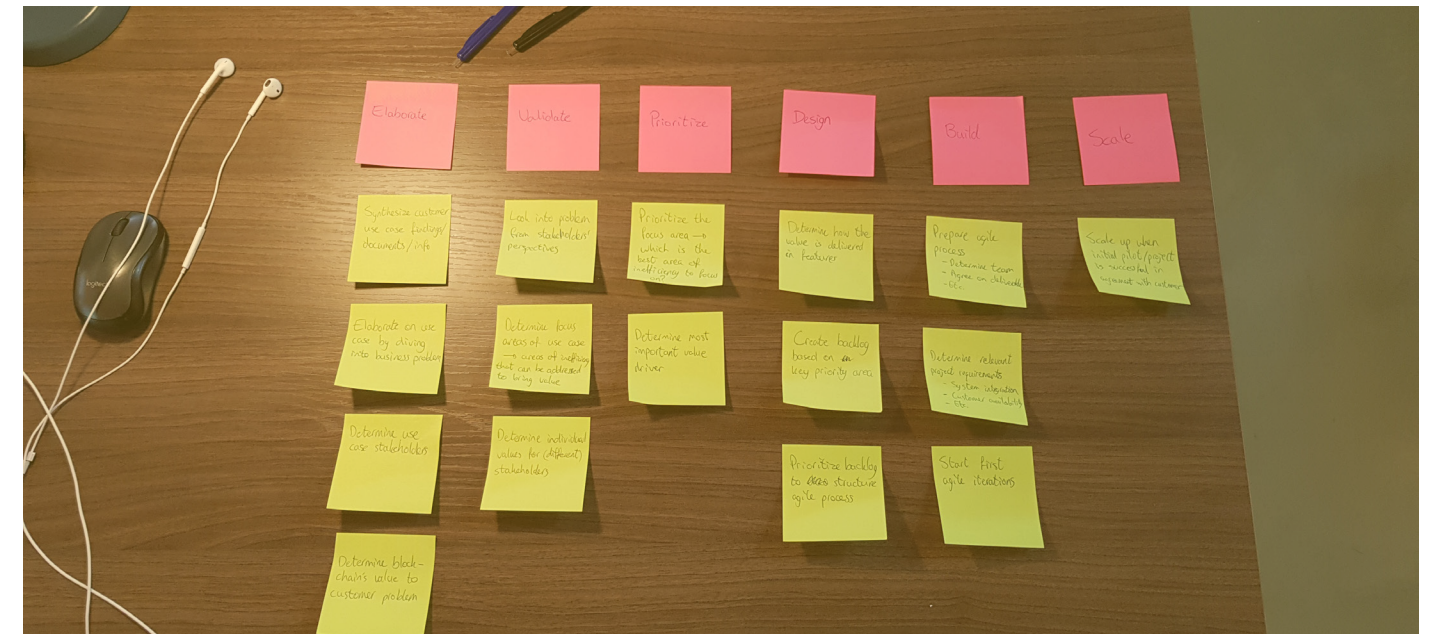
Figure X. Example of individual ideative session.

need in this iteration, as the process structure mainly came forward through research findings. In the third iteration, however, a creative session was organised to explore creative directions. The results of which will be discussed under 'Third Iteration'.

The process structure created in this iteration was then discussed with company stakeholders. This was done to see if there were points of improvement and to make sure that the company stakeholders understood and agreed with the process. In the end, they are the ones that will have to bring this proposition to life so it is important that they understand the overall process and that it resonates with the overall business. In figure 27, the process structure is shown. Six phases can be identified: Elaborate, Valuate, Prioritize, Design, Build and Scale.

3.2 Process framework

Based on the process structure created in the second iteration, a process framework was designed. This framework shows the 6 main steps of GoBlock's new process while breaking down each step into subparts, in essence acting as a guideline for GoBlock's consultants.

On the next page, the full framework is shown. In the following sections, the framework is explained step by step and design choices are justified.

Figure 27. Process structure shown with its two overarching phases.

1

ELABORATE

Rethink use case

Recommend other technology to solve business challenge

Shared understanding of use case

No fit

Technology fit assessment (Feasibility)

Fit

Rethink use case

Strategic business value (Viability)

2

No / unclear business value

VALUATE

Clear and understood business value

Stakeholder value (Desirability)

Identify areas of inefficiency

Create solution statements

3

Determine key value driver

PRIORITISE

VALIDATION
IN THIS PHASE, THE BLOCKCHAIN USE CASE IS SHAPED BY USING A DESIGN THINKING APPOACH

4

DESIGN

Determine product features (concept proposal)

Create product backlog

5

BUILD

Prepare agile process

Start agile iterations

No need to scale

Wrap up project

Evaluate

Need to scale

6

SCALE

CREATION
IN THIS PHASE, THE BLOCKCHAIN USE CASE IS REALISED THROUGH AN AGILE DEVELOPMENT PROCESS

Figure 28. Process framework.

As mentioned earlier, the process framework consists out of two main phases: Validation and Creation. These two main phases are then divided into six different steps. The first three steps of the process make up the 'Validation' phase, and the last three steps make up the 'Creation' phase.

The Validation phase will be conducted in a two-part workshop. The section starting on page 56 will elaborate on this.

First, the process framework is explained below.

3.2.2 Step 1. Elaborate

The first step of the Validation phase is to elaborate on the customer's use case. This is important, as it will allow GoBlock and the customer to gain a deep understanding of the underlying business challenge that the customer is trying to solve. It will align both GoBlock and the customer about the use case and its goal. This is done by reachin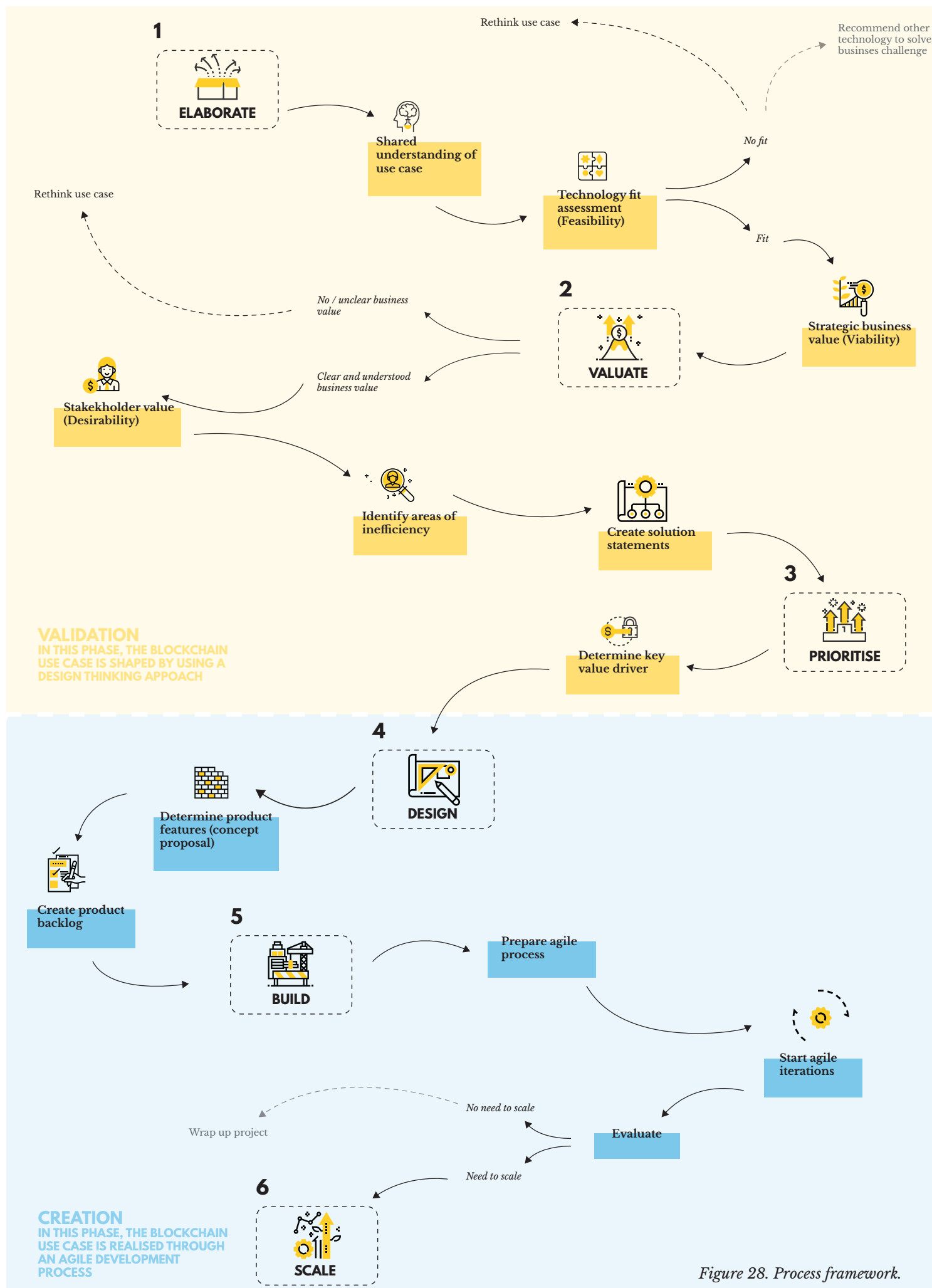g a shared understanding with the customer about their blockchain ambitions. Elaborating on the use case then allows GoBlock and the customer to assess whether the blockchain use case is a strong one. To do this, two things will be assessed:

1. Technology fit: is blockchain as a technology the right one to use in this case? As was found in Chapter 2, there are many blockchain use cases in which the technology is being used for something that it will not actually benefit. Chapter 5 showed that this is something that GoBlock did not do structurally in the past. With GoBlock being the expert at the matter, they should advise their customers whether or not the use case makes sense from a technological point of view. This is done in the first phase of the process, as that will allow for easy iteration if the technology fit is deemed insufficient. It is then easy for GoBlock and the customer to take a step back and rethink the use case so the technology fit does make sense.

2. Business value: does the blockchain use case benefit the customer's business strategically? As was shown in Chapter 4, some of GoBlock's previous projects stagnated due to lack of strategic business value for the customer's business. This was either because

this was overlooked, or the value was not well understood by the customer. Hence, an assessment of business value is needed. In Chapter 2, three main ways were identified how blockchain technology can strategically benefit different industries. It is important that both GoBlock and the customer are aligned on the way the use case is expected to benefit the customer's business.

After the use case has been concretised to pass the technology fit and the strategic business value is established, the next step in the process can commence: Valuate.

3.2.3 Step 2. Valuate

The second step in the Validation phase is to determine the strategic value of blockchain for the individual (key) stakeholders involved. A solution will need to bring strategic value to all stakeholders in order to be adopted (SOURCE). Why would one invest time and/or money in something that will not bring them any additional value?

In this phase, GoBlock and the customer dive into the key stakeholder perspectives in order to determine the main value drivers for each key stakeholder. This is needed to ensure the solution will bring value to its key users and therefore stimulates adoption.

3.2.4 Step 3. Prioritize

As was stated in the design brief, the solution must allow for a smooth transition into the development phase, as that was found to be the main obstacle in the whole process (Chapter 4).

As was also seen in Chapter 4, before starting the development process, the product backlog needs to be created. The product backlog is a prioritized list of features in build order. In order to lower the barrier to the development stage, it is recommended that the prioritization is done as soon as possible.

To make sure this is done correctly and the importance of this step is emphasized, the choice was made to include this as a seperate phase in the process. The goal is not just to create understanding, the goal is for concrete outcomes to be created.

This is the last step of the Validation phase. After

this, the solution can be designed (i.e. product proposal can be created), using the prioritized value drivers as main input for the design and subsequently the first agile iterations.

3.2.5 Step 4. Design
Building on the prioritized value drivers created in the previous step, a product proposal is created by GoBlock for an MVP. The MVP addresses the priority value driver as identified in the previous step.

By focussing on the main priority and creating the product features to address that priority, it is possible to build the product incrementally and create value in every step. This is in line with the agile ideology as a value-driven methodology.

It is very important in this phase that GoBlock clearly communicates to the customer what an agile development process is and why it is used. This is needed in order for the customer to better understand the incremental nature of an agile delivery process and to lower the barrier of engagement into the development phase.
This is communicated to the customer through the proposal.

3.2.6 Step 5. Build
After creating the MVP proposal, a meeting is set between the customer and GoBlock. Here, the agile planning for the MVP production is discussed and decided upon.
The customer and GoBlock discuss the project parameters and requirements for the development phase. In this step it is discussed what is required from the customer with regards to availability, frequency of communication during the development, the nature of the deliverable etc.
Also it is determined which product backlog features will be built during the first sprint (i.e. what is feasible to build in 1 sprint duration).
After this the development team is built and the agile sprints will take place. The development process follows the agile development process as it is already being applied by Gapstars (as described in Chapter 4).

During this phase, the MVP is built and incrementally improved and built out as sprints progress.

3.2.7 Step 6. Scale
Depending on the initial agreement between GoBlock and the customer, a meeting is set up either during or after completion of the pilot project. In this meeting, GoBlock and the customer will discuss future steps and potentially upscaling the production. The development can then be scaled up when necessary to accommodate future plans.

4. Second iteration: Validation phase

After creating the main process framework, the decision was made to zoom in on the Validation phase, as that is the key success factor of GoBlock's new process. This is what the third iteration focused on.
This was done through multiple ideation sessions, both collaborative and individual. In this section, the sessions and their respective insights and results will be explained.

4.1 Collaborative ideation session
In order to gather external perspectives and to explore the three main challenges identified in the Design Brief, a creative session was organised with four fellow IDE students.
The session was held at the IDE Faculty at the TU Delft, in a reserved meeting room. This, in order to prevent any unnecessary surrounding distractions. For the creative session to take place in a structured manner, a session handout was prepared for participants with background information. This handout stated the key insights from the analysis, the design goal and a visual explaining the context of the problem. The handout can be found in Appendix F.

4.1.1 Session goal
The goal of this session was to explore the three challenges that were identified in the Design Brief. These were: technology misfit, blockchain's business value and individual stakeholder value.
To explore these topics, How-To questions were formulated prior to the session. Four How-To questions were formulated, one for every challenge and one for the overall progression of a project into development.

The How-To questions are shown below.

1. Feasibility: How to determine a technology fit?

2. Viability: How to communicate knowledge and findings to different stakeholders?

3. Desirability: How to make stakeholders experience different perspectives?

4. How to convince a customer to engage with product development?

4.1.2 Session structure
The session was structured as follows. First, the overall goal of the session was explained. Then, as an ice breaker a starting exercise was conducted. This had as goal to get the participants into their creative mindset.

After the ice breaker the goal of the graduation project was shortly explained to the participants. In this phase the problem definition and design goal were discussed, along with the main insights and conclusions thus far. The process framework was also explained and shown to the participants.
After a quick question round about the context and content of the session, the How-To questions were explained.

Each participant was handed one How-To question for which they had 3 minutes to brainstorm solutions. After the three minutes the questions were transfered to another participant. After 4 rounds, all participants had brainstormed all How-Tos.

Following the brainstorm session, the generated ideas were explained and discussed. This was an important and rather valuable step in the session as discussing the ideas led to generation of new ideas and the linking of solutions between different How-Tos.
Concluding the discussion, the most promising ideas were selected. These would form the input for the later individual ideation.
After this, the session was wrapped up.

4.2 Individual ideation
The ideas generated in the collaborative session formed the input for the individual ideation that followed. The individual ideation had as goal to concretise the brainstormed solutions into a concept. Besides the individual ideation, informal discussions with fellow IDE students helped shape the design.

4.3 Design directions
The ideations brought forward multiple options that could offer a solution to the given design problem. These are explained below.

4.3.1 Workshop vs. Digital Validation Platform
First and foremost, the choice was made to integrate the Validation phase into a workshop between GoBlock and clients. Alternatives were explored, but a workshop was deemed most appropriate.
For example, GoBlock could choose to assess the validity of a use case themselves, by acquiring the necessary information form the customer, and then advising the customer on the potential and next steps. This could be done through a Digital Validation Platform, for example (figure X, on the following page).
However, as the Design Brief states one of the criteria is for the solution to create customer understanding. A workshop better allows for shared understanding between GoBlock and customer stakeholders than a unilateral advise from GoBlock to customer. Also, it would not allow GoBlock to help the customer revisit the use case, if deemed invalid. As GoBlock is expert on the matter, they should be able to explain to their customer why a certain use case (aspect) is invalid and how it can be reshaped, rather than just providing a yes/no answer. Hence, this alternative was not chosen.

4.3.2 Workshop elements
After the decision was made to create a workshop to validate blockchain use cases, the insights from the collaborative session were used to shape the different elements of the workshop. In the following section, the workshop steps are explained. Generated ideas are discussed and design choices are justified per step.
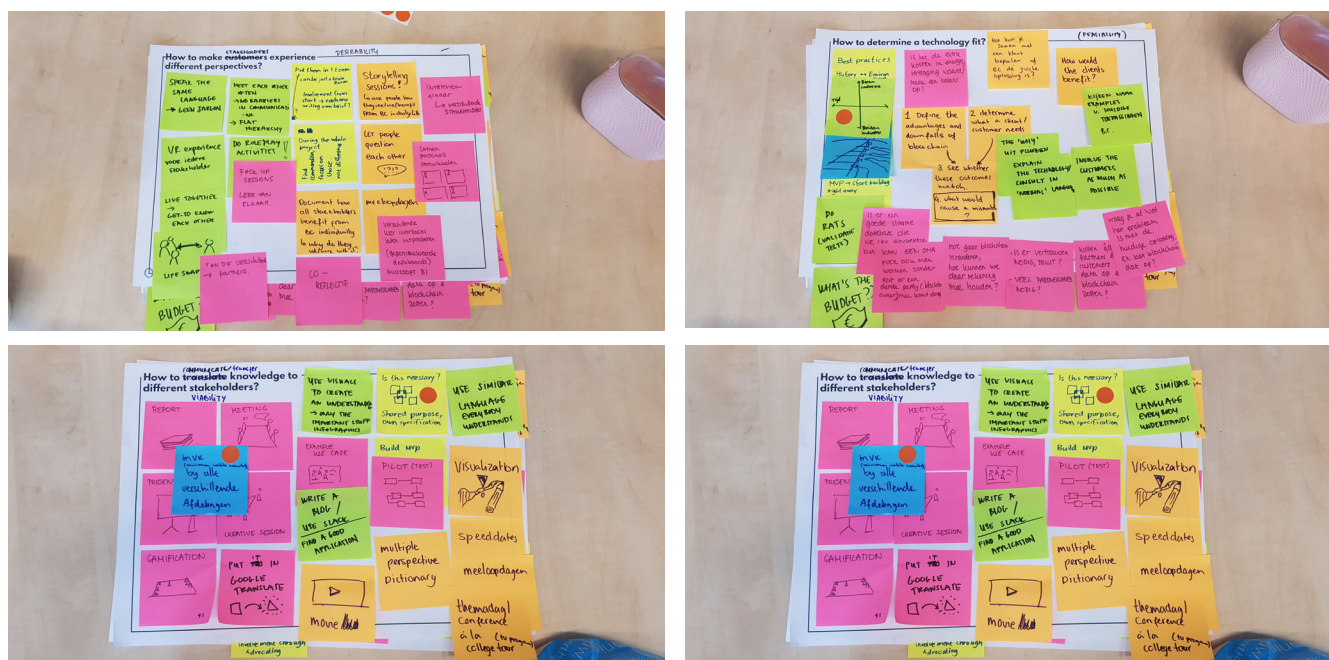
Figure 29. Collaborative ideation session (top) with some of the session outputs (bottom).

Figure 30a. Visual of workshop workbook

Figure 30b. Visual of workshop workbook (MVK)

5. Use case validation workshop

Insights from earlier research and the creative sessions were synthesized. This led to the creation of an 8-step workshop between GoBlock and their customer. The workshop is divided into two sessions held on separate occasions. This will be further explained under 'Workshop Parameters'.

First, the workshop's steps are explained in detail, design choices are argued and methods are described. After that, the workshop's parameters, attributes and requirements will be discussed.

Session 1: first part of the workshop

In this session (+- 4 hours), GoBlock sits with the customer to elaborate on the customer's use case and to approach the use case from the technology and business perspective. The second session will focus on the user perspective and the prioritization of user values.

1. Minimum Viable Knowledge (MVK)
Goal

As was seen in process framework, the first step in the Validation phase is to elaborate on the customer's use case. This is done through guided discussions to assure both customer stakeholders and GoBlock have a shared understanding of the business challenge to be tackled. As Palfreyman (2018) notes, it is important that stakeholders can hold a meaningful discussion between them, without getting sucked in the technicality of things.

Methods

First, workshop participants are asked to answer 6 questions that will require them to discuss

the blockchain use case. These questions are adapted from Palfreyman's 10 questions for unpacking a use case (Palfreyman, 2018). These questions were reformulated and simplified to better fit GoBlock's context.

Following the insights from the ideaton sessions, alternatives were explored. One of the alternatives that was explored in this step was gamification. However this was not chosen as suitable, as gamification is best used for motivating users to influence their behaviour or to amplify intrinsic value of the a subject (Deterding, 2012). That is not the case here. The goal of this step is for information to be gathered and elaborated so a shared level of understanding is established. This step will not benefit from overcomplicating the procedure. Hence, the choice was made to have the participants discuss use case related questions among each other to evoke a discussion.

The 6 questions in this first step are:

1. Describe the specific business challenge you are wanting to tackle in less than 30 words.
2. How is this challenge currently solved?
3. Describe the transactions in the business network. What are the assets, information and conditions?
4. Describe the main steps of the current workflow of the asset moving through the business network.
5. What are the expected benefits?
6. What are the needs for integration with existing systems?

The next exercise in the first step is to map out all stakeholder organisations and users for the use case. Then, the participants are asked to identify the key users of the blockchain use case.

These key users will be later the subjects of the user-centered approach (Step 4 and onwards).

Duration
This step takes 60 - 90 minutes, as it will allow for the participants to have a proper discussion and get aligned. Also, it allows for potential reshaping of the use case.

2. Technology perspective (Feasibility)
Goal
The first assessment in the validation phase is to test the customer's blockchain use case against the Feasibility pillar of Design Thinking. This goal of this step is to ascertain whether blockchain technology is in fact the right technology to use for the customer's business problem and to prevent a technology misfit.

If the use case in its current form is not a suitable one for blockchain as a technology, rethinking of the use case is required. As this is an essential aspect, this step is placed early in the process so a potential iteration on the use case will not render spent effort useless.

A blockchain expert will be present to help participants with potential questions they might have and to assist them with potentially rethinking the use case.

Methods
This step includes an interactive exercise in which the teams have to trace a route on which they are faced with 6 binary questions. The questions are derived from the US Government Department of Homeland Security's Science & Technology Directorate Flowchart (Yaga, Mell, Roby & Scarfone, 2018).

If they reach the end of the route, the grounded conclusion can be drawn that blockchain technology fits the customer use case.

Multiple alternatives for this step were explored. The most important of which were showing industry best practices and gamification.
Similar to the previous step, gamification was again not deemed suitable, as the goal in this step is not to influence behaviour of participants (Deterding, 2012). As stated in the Design Brief, one of the goals of the solution is to create customer understanding.
In order to stimulate this understanding,

participants need to be actively involved (IDEO, 2017). Hence, the showing of industry best practices was also not explored further, as it is a rather passive form of communication.
The choice was made for a group exercise with a visual element, as it stimulates active participation. Moreover, visualising helps to think about the subject at hand (Arnheim, 1969). Additionally, McLoughlin & Krakowski (2001) showed that visual thinking helps build understanding, which relates strongly to the specified design requirements.

Duration
This step takes 30 - 60 mins, depending on the use case. It is important that there is enough time for a discussion to take place and for all stakeholders to understand why blockchain is or is not suitable for the use case. It also allows for reshaping of the use case. 30 - 60 mins should be enough with a blockchain expert present to help answer questions and steer the discussion along with the facilitator.

3. Business perspective (Viability)
Goal
As the customer already has a use case in mind when approaching GoBlock, it can be assumed that there are customer stakeholders that are already familiar with blockchain's strategic value for their business. This step has as goal to ensure that all stakeholders understand the value it can have on their business and to think about ways it can add value. In this step, the use case is tested against the Viability pillar.
If the business value is not clear enough yet, this step allows GoBlock and the customer to think of ways that business value is accomplished.

Methods
This step is two-fold. First, GoBlock shows the participants an infographic displaying blockchain's strategic impact for a variety of industries. This infographic (VisualCapitalist, 2018), is based upon a McKinsey study researching the strategic business value of blockchain technology (McKinsey, 2018).
The infographic is used as it is visual and can help gain a better understanding of the matter at hand (Arnheim, 1969; McLoughlin & Krakowski, 2001). McKinsey (2018) identifies three main

ways blockchain can provide strategic value for business. These are:

1. New business models/revenue creation
2. Cost reduction
3. Meeting previously unmet consumer needs

After that, a deep dive will be taken into the customer's business industry showcasing some best practice examples. This is done to help participants understand the type of impact blockchain can have on businesses similar to theirs as a source of inspiration.

After understanding the infographic and blockchain's value for business, the participants are asked to think about how exactly the blockchain use case will provide value for their business.
The participants are asked to discuss and answer the following three questions:
1. Can you think of a new business model for your business or a new way to generate revenue by realising this blockchain use case?
2. Can you think of ways how this use case can help you reduce costs?
3. Can you think of ways how you can meet previously unmet consumer needs?

This way, the customer will both understand the strategic impact blockchain can have on businesses, and what it can do in the context of their own business.

The choice was made to leave these questions open-ended to eliminate boundaries of thinking. An alternative that resulted from the ideation session was to use predefined benefits/business values. However, given the maturity stage of blockchain as a technology and the general lack of understanding of its future value (see Chapter 2), this was deemed inappropriate.

Duration
This step takes 60 - 90 mins, depending on the use case. In this step it is important that the participants understand blockchain's strategic business impact well enough to discuss it. It can be assumed that there is some base knowledge available, as they have already thought of a use case. Hence, 60 - 90 mins should be enough to discuss the business case in detail.

Session 2: second part of the workshop
The second part of the workshop (+- 6 hours) is conducted on a separate occasion and covers step 4 - 8. As discussed earlier, the workshop is split up in two separate sessions so real user insights can be gathered for the second session. As will be discussed under 'Workshop Parameters', this allows the customer to either interview key users or bring them to the second part of the workshop to maximise the user perspective approach.

4. User perspective (Desirability): Persona
Goal
The third and final pillar of Design Thinking is Desirability, or the user perspective. In order to provide value to all users of the blockchain use case, it is important to consider the Desirability aspect. To do so, different stakeholder perspectives must be considered. That is the goal of this step. This is the first of three Desirability steps to dive into a user's perspective in order to determine their key value driver.

Methods
As mentioned above, this is the first step in the Desirability element of the workshop. The participants are asked to create personas for one of the key users identified in the first session. This will eventually be done for all key users for the use case. The personas are created using real user input.
Personas are the chosen method, as they allow for a good first step into getting to know the user. Moreover, as figure X shows, personas are well suited for solution-driven communication (Alves & Nunes, 2013).
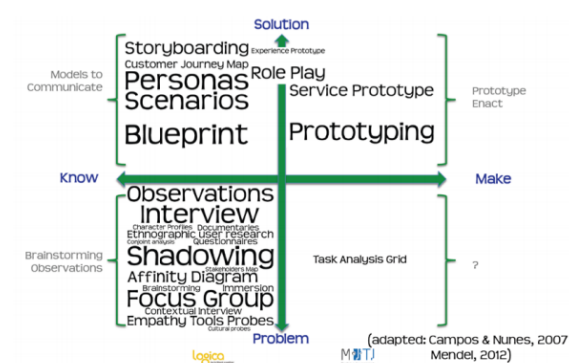

Fig. 3. Why: the motivations

Figure 31. Overview of different Design Thinking tools plotted in a quadrant showing motivations for using them, taken from Alves & Nunes (2013).

This step takes 20 - 60 mins, depending on the amount of users. It is recommended to focus on no more than three key users.Palfreyman (2018) recommends 15 minutes per persona. Including introduction of exercise and explanation of methods it should not take longer than 1 hour.

5. User perspective (Desirability): Empathy Map
Goal
In order to get a better understanding of each stakeholder's perspective, it is important to note characteristics that are both easily observable and not easily observable.
In this step, participants are asked to elaborate on the persona they created in the previous step to really get a thorough understanding of the key user they are addressing.

Methods
After establishing a basic understanding of their user, the teams will create an Empathy Map. This is an excellent tool to gain a deeper understanding of your user's perspective, as it differentiates between what a user says, does, thinks and feels (IBM, 2016). This way, teams can properly empathise with their user to help them understand where potential areas of value might be (Palfreyman, 2018).

Duration
In his book 'Business Blockchain: Unlocking Transformational Potential', Palfreyman (2018) advises to take about 20 minutes per empathy map. Including explanation of method this step should therefore take no longer than 30 - 90 mins, depending on the amount of users.

6. User perspective (Desirability): Scenario
Goal
The last of the three Desirability steps is identifying potential areas of improvement. After getting a thorough understanding of the user by mapping out their thoughts and feelings, these thoughts and feelings need to be placed into context. This is done to identify areas of inefficiency that can be improved by focussing the solution on that specific area.

Methods
The insights gathered in the previous step when creating the Empathy Map are then transfered to a Scenario Map. This is an overview of the different phases the user goes through while fulfilling their task. This is based on the workflow description provided in the first step of the workshop, in the first session. The scope of this task is within the business problem.
For each key user, the participants will then transfer their Empathy Map insights to the designated area to map out what the user does, thinks and feels during each of the phases.
When the insights are plotted, the participants go ahead and try to identify areas of improvement in the user's workflow that could benefit from blockchain technology.

As can be seen in figure X, another great tool for solution-driven communication is a scenario (Alves & Nunes, 2013). Palfreyman (2018) recommends to use a scenario to plot the findings from the empathy map along the current user workflow to identify areas of inefficiency.

Duration
The participants will reuse the insights gathered when creating the empathy map, so no new insights need to be created. Hence, 15 minutes per scenario should be sufficient. This means this step should not take longer than 60 minutes in total, including explanation of methods.

Break
After these steps, it is recommended that a (lunch) break is held. The previous steps might be tiring for participants that are unfamiliar with Design Thinking tools. Hence, in order to refresh the minds before thinking of solutions, a break of about 1 hour is advised.

7. 3-W Statements (Who, What, Why?)
Goal
After the customer stakeholders have gained a deep understanding of their users and have mapped out potential areas of improvement, it is time to concretise this into actionable statements.
The goal of this step is to provide the teams with a clear list of actionable outcomes that concisely define the value that can be achieved.

Methods
Inspired by IBM's Hills method (Palfreyman, 2018), the team then proceeds to formulate concrete statements stating a solution to the area of improvement they identified in the previous step. The team discusses how to improve these areas and to deliver value to that user. They then capture this in the 3-W statements.
This states explicitly who the user is, what they will get and why it will benefit them.
The team ends up with multiple statements highlighting different ways to deliver value to their user.

Finally, the participants choose one statement per user that delivers the best value.

Duration
This step will take approximately 20 - 60 minutes, depending on the amount of users. As the scope of the use case is already quite narrow, and blockchain is already determined to deliver the solution, 20 minutes per user should be enough to formulate the statements and prioritize.

8. Storyboarding
Goal
After choosing the priority value driver for the user, it is time to communicate this value.
As the goal of the validation phase is to provide the input for the development phase, actionable outcomes are required.

Methods
The last exercise of the validation workshop is to visualise the statements created in the previous step. The team creates a storyboard showcasing the experience of their user with the proposed solution, using the priority statement as input.

This step is included in the workshop, as a storyboard helps with visualising the ideas generated. As Alves & Nunes (2013) show, it is another excellent way of solution-driven communication. As GoBlock will turn the workshop outcome into an MVP proposal, good communication of value is key.

Duration
This step will take approximately 20 - 60 minutes, depending on the amount of users. The priority statement is already chosen, so the participants only need time to visualise it. Hence, 20 minutes per statement is chosen.

6. Workshop parameters

In this section, the workshop's requirements and parameters are discussed and justified.

6.1 Pre-workshop
Before the workshop will take place, GoBlock will send out a pre-workshop document to the customer in which a couple of things are stated:
• Small introduction GoBlock
• Goal of the session, why session and what is the expected outcome?
• Session logistics (structure, planning & location)
• Requirements

6.2 Workshop structure and duration
The workshop consists of two separate sessions, both of which last a half day (+- 4 hours).
The first 3 steps are conducted in the first session and focus on aligning GoBlock and the customer stakeholders by establishing a shared understanding of the use case. Also, the first session includes the identification of key users and the feasibility and viability assessments.,
The remaining 5 steps will be conducted in the second session. This second session will focus on applying a user-centered perspective (desirability) on the use case and prioritising the identified value drivers. Later in this section, the steps will be further explained in detail.

The choice was made to split up the workshop into two parts, as it will allow for the integration of real user insights. As the first steps sees the identification of stakeholders and key users, these key users can be approached to gather insights that can be used in the second session. This will allow for an accurate representation of the user perspective for a more concrete outcome to be realised.

6.3 Participants customer
The workshop will be performed in a team setting consisting of different customer

stakeholders. This is in line with the need for multidiscplinary knowledge concluded in Chapter 3. The workshop will be conducted with 3 participants. These three participants should have the following roles within the customer's organisation:

1. Product Owner
2. Business Lead
3. Tech Lead

These participants are chosen, because as stated in the Design Brief, Design Thinking's principles needs to be applied. Design Thinking is about applying a technology perspective (feasibility), a business perspective (viability) and a user's perspective (desirability). To ensure a business and technology perspective, the Business Lead and Tech Lead are present. The Product Owner is present as they are in charge of the project.

For the second part of the workshop (see: Duration), additional participants can be added if they have the role of key user. This, in order to embed a user-perspective into the workshop. If this is not possible, user insights will be gathered that can be used in the second part of the workshop.

6.4 Participants GoBlock
From GoBlock, two people will be joining the workshop. A Design Thinking facilitator and a blockchain expert.
The facilitator will facilitate the session and guide the participants through the workshop. The facilitator's tasks are further explained under 'Facilitator'.
The blockchain expert will be present to assist the workshop participants when necessary. E.g. to answer blockchain related questions or to help think of a way how blockchain can solve the given problem.

6.5 Facilitator
The facilitator is the most important role for the workshop. As noted in 'Design Kit: The Facilitators Guide' (IDEO, 2017), there are a couple of key responsibilities a facilitator should uphold to when facilitating a workshop that uses Design Thinking tools.

The most important of which are:

1. Explain what Design Thinking is and why it is used.
2. Foster engagement among participants
3. Guide the discussion so it stays on topic
4. Ensure the participants can conduct the workshop without unnecessary barriers (i.e. make sure all materials are present and information is clear etc.).

To guide the facilitator through the workshop and provide notes and tips, a facilitator guide has been created. This can be found in Appendix J. This facilitator guide was created based on the 'Design Kit: The Facilitators Guide' (IDEO, 2017) and interviews with company employees.

6.6 Participant workbook
A workbook was created that will be used by the workshop participants. The goal of this workbook is to guide them through the workshop in a structured manner and to provide them with a way of documenting their thoughts and progress.
The workbook can be found in Appendix I.

6.7 Outcome
The goal of the workshop is to provide clear input for the development of a concept proposal by GoBlock. Therefore, the outcome of the workshop are concrete and visualised statements of intent on how to bring value to each user. GoBlock will then synthesize these priority value statements (one per user) and use them to create the proposal.

6.8 Post-workshop
After the workshop, a post-workshop document is drafted by the facilitator which will be sent to all participants. This document contains the main results from the workshops and thanks all participants for their input. Additionally, it will describe the follow-up steps that GoBlock and the customer will take.

DESIGN VALIDATION

In this chapter, the solution is tested and validated. First, the structure of the validation process is described. Second, the design test will be discussed, after which the company validation is covered. This chapter focuses on the insights gathered from the validation sessions, which provide the input for the design recommendations described in the next chapter.

In this chapter:

1. Validation set-up
2. Test with IDE students
3. Validation with GoBlock

DESIGN VALIDATION

1. Validation set-up

Two main validations were conducted. Part of the validation workshop was tested with students and both the process framework and full validation workshop were validated with GoBlock. In their respective sections, the set-up and structure of the validation sessions are explained.

This chapter will describe the design validation and discuss the main insights from these two sessions.

2. Test with IDE students

A student test session was organised to test the workshop design. Unfortunately it was not possible to conduct the validation with an actual customer of GoBlock. Hence, a test with students was chosen as alternative. This will be further explained in the next section. Based on initial company validation by means of informal discussions, the choice was made to focus the student test on the second part of the session: the user perspective and prioritziation of user values (step 4 to 8 of the workshop).
This, to test the outcome of the workshop. As was stated in the Design Brief, it is important that actionable outcomes are produced in the workshop to allow for a transition into the development phase.

The goal of this test session was to see if the flow of the workshop steps is logical and if outcomes created are sufficient material to work with.

2.1 Set-up
The test was conducted with fellow students from IDE. For the session a separate meeting room was reserved in order to prevent distractions. A company representative of GoBlock was also present to observe the test and assist with gathering insights.

The participants were tasked with applying the workshop exercises to a fictional blockchain use case. After the session, the participants were asked to fill in a survey about the session. This survey can be found in Appendix L. Following the survey, a discussion was held between facilitator and participants to discuss and elaborate on the feedback that was provided.

2.2 Case
The fictional case was inspired by an ongoing project of GoBlock. Names and details were anonymized to conserve confidentiality. The use case that the participants were working on was the one of a university looking to increase the efficiency of the certification of student information and documents when applying for a student exchange at another university. The full case description can be found in Appendix K.
The participants (IDE students) focused on student perspective of the use case to eliminate variables of lack of user insights. The students participating had experience with going on an exchange so was familiar.
Information about the vlockchain use case was provided through a presentation at the beginning, along with some user insights (taken from case) to give an idea to patricipants.

2.3 Structure
The test session was structured as follows. First, the graduation project was broadly explained, followed by the session goal and the session's use case. The exercises were explained to the participants as the session progressed. Time inbetween exercises was reserved for questions and feedback discussions. After the session, a more elaborate discussion was held to gain feedback on the overall design and workshop. The session's duration was two hours.

2.4 Findings
The test provided a range of insights about the workshop as a whole and on specific details. In this section, the most important insights are discussed. Chapter 9: Recommendations will focus on formulating advise on how to improve the design.

2.4.1 Goal workshop
The overall goal of the workshop needs to be communicated more clearly. This was done insufficiently with the test session leading to participants needing additional guidance. Naturally, it is expected for a facilitator to guide the discussions, but the overall goal of the workshop needs to be clear to all participants.

2.4.2 Further explanation exercises
The workshop's exercises could benefit from a proper explanation. The partcipants were familair with the tools to use, as they were design students, but in the context of the case the goal of each exercise was not always evident.

2.4.3 Scenario phases
Participants were having trouble with determining the scope and broadth of the phases in the Scenario Map. They needed guidance to help them think how zoomed in the scope has to be. Here, additional tuning is needed.

2.4.4 Problem to solution is a big step
The participants experienced some difficulty when moving from the Scenario Map to formulating the 3W statements. This is where extra guiadnce was needed. It is important to explain what Design Thinking is and why it is important in this context. Also, exercises should be clear to the participants in order to get good results and to evoke a meaningful discussion.

2.4.5 Off-topic discussion
The discussion tended to get off-topic a couple of times. It is important that the discussion is actively managed and guided to maximise outcome and effect.

2.4.6 Storyboarding
When asked to create the storyboards, there was some condusion among the participants about what they had to draw, a concrete solution proposal or the interaction of the user with the solution. Additional clarification is needed in order to provide consistent and congruent outcomes.

Figure 32. Student test session.

3. Validation with GoBlock

Next to a student test, the design was also validated with stakeholders from GoBlock. The goal of this validation session was to assess the feasibility, viability and desirability of the solution.

In this section, the design validation session at the company will be discussed. First, the session will be explained, after that the main insights of both the process framework and the validation workshop will be discussed.

As mentioned before, Chapter 9 will focus on formulating recommendations based on the insights gained in validation.

3.1 Set-up
The session took place at the office of GoBlock. Both co-founders (Michael Eerhart & Hugo Hemmen) and a company consultant (Max Rietmeijer) attended the session.

The sesion was structured as a step by step walkthrough of both the process framework and the validation workshop. The solution was presented to the attendees and every step was explained and assessed. A discussion was held at every step to gather concrete feedback.
The session was recorded for post-session analysis.

3.2 Process framework
The validation brought forward a couple of interesting insights about the created process framework. The most important of which are discussed below.

3.2.1 Touchpoints
The framework did not contain all of the touchpoints between GoBlock and the customer. Another point of feedback was to show the entire process that gets conducted prior to the GoBlock process as well (i.e. client meetings to land project and initial discussions etc.).

"I think it might be cool if we could also see all of the touchpoints with the clients on here, including the meetings that took place before we actually do the Validation workshop."
- Michael Eerhart

3.2.2 Context process
One of the feedback points was to include the context of the process into the solution, as it does not start with the validation workshop. That is a phase in the overall end-to-end process. The brainstorming of use cases and selecting a use case has already been conducted, however the framework does not show this.

"... we shouldn't forget that this is basically just part of the end-to-end process. I think we should acknowledge that we are aware that the exploring of use cases and selecting one is a step in the overall process, even if we don't offer it right now. ... I think that will add to our credibility."
- Max Rietmeijer

3.2.3 Visual aspect helps
The visual style of the framework was experienced as pleasant, allowing for better communication.

"... I like the designs, it helps make things exciting and you can quickly see what each phase is about. It doesn't take ages to understand everything."
-Michael Eerhart

3.2.4 Scalable solution
The process framework was considered to be a tool that is relatively easy to implement and scale.

"With some finetuning we could really use this to onboard new consultants if we want to scale. We just hand them this and they should be practically ready to go."
- Hugo Hemmen

3.3 Validation workshop
The step by step walkthrough approach proved fruitful when conducting the validation session, as many insights were gathered. The most important are discussed below.

3.3.1 Identifying key users
The step of identifying the key users from the stakeholder map is a very important one as they will be the subject of the second part of the workshop. However, there are no guidelines or criteria on what qualifies as a key user.

"I think we need to help participants and tell them what can be considered as key user. Now it's just the stkaeholder map, but then who to choose as key users?"
- Max Rietmeijer

3.3.2 Technology fit questions are too strict
Although providing a good starting point, the technology fit assessment was too strict. In other words, it can conclude a use case is invalid while in reality it can be. Additional finetuning of the questions is required.

"... Sometimes the answer can be no, but it's a soft no. There are exceptions with some of these questions. However I think the idea itself is very good , we just have to redefine some questions."
- Michael Eerhart

3.3.3 Goal workshop
It is important that the goal of the workshop is communicated to the participants both before prior to the workshop as well as at the actual beginning of the workshop, in order to maximize participant understanding and alignment.

"I think this could work well, but the goal of the workshop would have to be very clear, as it otherwise might get confusing what exactly needs to be done."
- Max Rietmeijer

3.3.4 Storyboarding needs further explanation
As also came forward in the student test, the storyboarding step could benefit from additional clarification. Although being experienced as helpful with understanding, it should be made more clear about what exactly should be storyboarded.

"If I were to see this now, I wouldn't know what to draw. I like the idea of storyboards a lot, but we need to be consistent on what should be drawn."
- Michael Eerhart

3.3.5 Workbook format works well
The workbook was received positively. It allows for more customer engagement and buy-in in the session. Also, all findings are documented so people tend to take them more seriously.

"I like it beacuse then you get buy-in from the participants. It's a nice guide through the workshop and documenting the findings is nice for later."
- Hugo Hemmen

3.3.6 Concrete and practical solution
The workshop with ith corresponding workbook was perceived as concrete and practical.

"I like this workshop with the booklet,it's a very concrete thing that makes us look professional. I like it if we can clearly communicate to our customer this is what we will do and these are the methods we use. Shows we put thought into our process."
- Michael Eerhart

Figure 33. Company validation session.

CHAPTER 9
RECOMMENDATIONS

Based on the Design Validation, recommendations were formulated for GoBlock on how to improve the proposed solution. This chapter will cover recommendations for both the process framework as the validation workshop. Recommendations have been formulated for both improving the design and on implementation requirements of the proposed solution.

1. Design improvements

1.1 Process framework

1.1.1 Context process
For external communication, it is recommended that GoBlock shows the context of their proposition. As proposed in this thesis, the proposition starts with the Validation Workshop. However, this is of course not the beginning of a blockchain use case. As GoBlock is advised to target companies that already have a use case in mind, initial exploration, brainstorming and selection of use cases is already done. Therefore, it is recommended GoBlock shows their customers that they are aware of the earlier phases in a nmew blockchain product development process, even if that is not part of their proposition. It shows that GoBlock is knowledgeable on the topic and transparent. That is an image they should try to achieve, as it is an opportunity to distinguishing themselves in the blockchain industry, as shown in Chapter 2 and 5.

1.1.2 Journey GoBlock - customer
For internal communication, it is recommended that GoBlock updates the process framework by adding all customer touchpoints, from initial customer contact to project wrap-up or system maintenance. This way, the process framework can be used as a complete guide for (new) company consultants, as it includes the entire journey from end-to-end between GoBlock and their customer.

1.2 Validation workshop
1.2.1 Communicate goal of workshop more clearly
As was found in both the student test and the validation with company stakeholders, the goal of the workshop needs to be communicated more clearly. Therefore, it is recommended that the goal is clearly stated and explained both prior to the workshop, in the pre-workshop document, and at the beginning of the workshop itself. It is very important that the goal is clear to all customer stakeholders, otherwise the necessary depth of the workshop will not be reached.
This is especially important for the Design Thinking tools, as it can be assumed that many customer stakeholders are not experienced with the Design Thinking mindset.

1.2.2 Exemplify workshop exercises/tools
As the validation showed, additional guidance was needed with some exercises, to get the participants started. Taking into account that they were students with a design background, hence had experience with the tools, this need is only greater with customers. Therefore, it is recommended that GoBlock tunes the facilitator deck to include more examples and that the facilitator is aware of the importance of this. Enough time should be taken to properly explain and execute the exercises, even if this means that the total duration of the workshop is no longer doable in two half days. Thus, the recommendation is made to test the workshop with different durations when implementing it in the beginning. This way, the differences in quality can be noted to see how much time participants really need to properly understand the exercises and valuable results are created.
Besides explaining how the exercises should be conducted, participants should be made aware of their relevance to the overall workshop and project as a whole. This will increase customer understanding and also customer engagement.

1.2.3 Provide input for phases Scenario Map

In order to ensure consistency in this step, GoBlock should provide input by filling in (some of) the phases of the Scenario Map. These are based on the insights gained in step 1 during the first session, when participants are asked to describe the current workflow. If the phases are not correctly defined, they can be altered by discussing them, but it was found that creating them from scratch is timely and leads to discussion, if there are no guidelines. Therefore, the recommendation is made for GoBlock to already fill in the phases of the Scenario Map.

1.2.4 Smoothen transition problem to solution

The student test showed that the participants experienced difficulty when moving from the Scenario Map to formulating the 3-W statements. Whereas the Scenario Map is alrgely focsed at identifying potential problems, the 3-W statements step alreaddy focuses on solutions. This proved to be quite a big step. Hence, it is recommended that GoBlock includes a step inbetween these two exercises in which a clear problem definition is formulated. That will make it easier for participants to think of a solution than concluding it from a Scenario Map. The problem definition should clearly state which specific user problem will be solved to provide that user with value. Then, the 3-W statements exercise focus on how value will be delivered to that user.

1.2.5 Key user criteria

The identification of key users of a use case is crucial, as they will be the subject of the Design Thinking tools used in the second session. However, as came forward from the company validation, customers might struggle with identifying key users. Hence, the recommendation is made to introduce 3 key user archetypes that need to be filled in. Many blockchain projects show similarities with respect to stakeholder roles. In general, three main roles can be distinguished: data submitter, data receiver and data subject.

By creating persona templates for these three key users (i.e. criteria), the participants have guidance with selecting key users from the stakeholder map.

1.2.6 Redefine technology fit

The six binary questions that make up the technology fit assessment need to be refined to allow for more flexibility. This way, the questions do not rule out potentially valid use cases. It is recommended that the revisiting of the questions is done in a collaborative session with blockchain experts from GoBlock. Following the updated questions, the visual will also need to be adapted accordingly.

1.2.7 Outcomes: create PoC instead of proposal

This thesis aims to provide GoBlock with a way to lower the barrier for engaging in the development phase. Hence, but not only because, the validation phase was introduced to GoBlock's process. The goal of the Validation Workshop is to provide actionable outcomes that provide solid input for the development of the final solution.

From the validation it was concluded that it was not fully clear what happened after the storyboards were created. Participants felt that there was still a step missing, hence a look should be taken on how to conretise these outcomes further or to manage expectations in a better way.

Currently, GoBlock creates a proposal to develop an MVP based on the identified priority value driver. However, it is recommended to look into the possibility of providing a Proof of Concept (PoC) based on the workshop, rather than just a proposal, as that is dependent on approval. A PoC might prove to be a stronger 'foot in the door' into the development phase.

2. Implementation requirements

2.1 Importance of facilitator role

Naturally, the role of facilitator is crucial in workshops. Currently, GoBlock consultants do not have experience with Design Thinking facilitation, but they fully understand the importance and added value of it. As company stakeholders were clear about their positive intentions of implementing the proposed solution, it is recommended for the consultants to undergo Design Thinking training. This, in order to get them familiarised with the Design Thinking mindset and to gain knowledge on how to facilitate a session.

However, for the first few sessions it is advised that an experienced facilitator is acquired to conduct the sessions. GoBlock can draw inspiration and learn from this, without directly putting the success of the customer workshop at risk. It is recommended that first the workshops are done by one facilitator on case by case basis. This, to get familiar with the solution and to improve it where necessary. In a later stage this role can be built out to a full time role.

2.2 Launching customer

It is recommended that pilot sessions are conducted with a trusted customer. This, because the session will most likely need additional improvements and a trusted customer is generally more patient than a new one. It is advised GoBlock takes time to properly test what works well and what needs updating. Understanding the Design Thinking mindset and gaining experience with the tools is not an overnight process, hence it is advised to take enough time.

2.3 Expand proposition to full end-to-end

In the future, it could be interesting for GoBlock to look into expanding the proposition to cover the entire new blockchain development project end-to-end.

This means extending the consulting process to include the initial blockchain exploration phases. In these phases, blockchain is explained and explored, as is the customer's organisation. Then, use cases are brainstormed and a selection is made of (a) promising use case(s). The choice was made in this thesis to not include this yet, as the solution had to be implementable in the short term and it would require a significant organisational investment from GoBlock to accomplish. Moreover, GoBlock's main strengths lie in the final part of the process, hence the choice was amde to utilize these strengths to gain a competitive edge. However, in the future it is recommended GoBlock looks into the possibility of becoming a full end-to-end blockchain solutions provider, as that fits with current industry trends.

2.4 Customer convincing

It is recommended that GoBlock takes appropriate time to explain to their customers why the validation of their use case is important. Also, it is important that GoBlock explains why Design Thinking is used and how it connects to an agile development process. If this is not done correctly, customers might not be willing to go through the validation step as they do not see value.

2.5 Use validation workshop as marketing

It can be interesting for GoBlock to differentiate themselves from other competitors by using the validation workshop as a marketing tool. As Chapter 5 showed, many competitors still apply a mostly technology-centered perspective, whereas GoBlock will make use of Design Thinking to validate a use case. The fact that GoBlock conducts a validation step testifies of their expertise if communicated correctly to their customers.

CONCLUSION AND DISCUSSION

1. Conclusion

This thesis aimed to provide a starting point for blockchain consulting startup GoBlock to structure their blockchain consulting process. By applying Design Thinking, GoBlock can play a key role in establishing a strong use case with their customer. Research found that many blockchain use cases today are in fact not strong. This directly negatively influences blockchain's maturity, consumer adoption and overall reputation.

Insights were gathered through literature research, company analysis and expert interviews. From these analyses it was concluded that a use case validation step had to be added to GoBlock's process. This was done by proposing a Validation Workshop in which GoBlock sits with their customer in two separate sessions to discuss the use case. The use case is first elaborated upon, after which it is assessed based on Design Thinking's three main pillars: feasibility, viability and desirability.
The goal of the validation phase is to establish a solid blockchain use case while simultaneously providing concrete outcomes that enable for a smooth progression into the development phase.

By proposing a design-driven approach for GoBlock's consulting process, they can distinguish themselves from current competitors in the market. Analysis showed that both customers and competitors largely focus on merely the technological perspective.

The goal of the proposed solution is to inspire GoBlock's consultants to experiment with Design Thinking tools to establish succesful new blockchain development projects. This is done by incorporating the end-user early into the process to lower the barrier to development .

2. Limitations and future research

2.1 Existing literature is limited

Blockchain technology is actively being researched, but existing literature is limited. Hence, during this thesis several assumptions were made. Future research may however show different insights that can lead to different conclusions. Therefore this thesis should not be interpreted as holy grail, but merely as an attempt to provide some structure to the eventful and often chaotic blockchain industry.

2.2 Limitations of design and validation

Due to the time constraints of the graduation project, the entire process framework was not tested, as a customer project generally takes months. In practice, the framework might show some teething problems when being applied to an actual customer project.
Moreover, the workshop was tested partially due to time constraints and feasibility. Ideally the workshop would be fully tested multiple times to finetune it. However, this thesis attempted to shed a light on how a blockchain solutions provider can structure their process using initial insights.

2.3 Blockchain is immature

As blockchain is still a rather young and unknown technology, additional research and development is needed to properly understand how it can benefit us as a society. Chapter 2 showed that this needs to be more than just developers and software engineers experimenting with the technology. A multidisciplinary approach is recommended. This thesis tried to apply a multidisciplinary approach to blockchain use case development by integrating it into the consulting process of GoBlock. After all, new technology is supposed to increase ease of life, not make it more complicated.

2.4 Blockchain is a back-end solution

Blockchain is a back-end solution, so it can be challenging to determine user values, as users often do not understand blockchain technology. Blockchain use case development should therefore be approached from a wholistic point of view. Blockchain is often one of the technologies in a system (e.g. Bitcoin). However, this does make it very complicated in recognizing these user values and to get users to understand.

This thesis provided a validation workshop with Design Thinking tools to familiarize with the key users of a blockchain system, in order to determine those values and to ensure a valuable solution gets developed. It is recommended that additional research is conducted on the effect of a multidisciplinary approach on blockchain use case development. In particular its effect on the ability of determining user values.

2.5 Measure effectiveness workshop

It might be interesting for future research to create a way of measuring the outcomes of the workshop, to see if actionable outcomes are created and whether or not the values that are defined are accurate. Based on these measurement insights, the proposition can then be adapted where necessary to provide a better output.

3. Implications

3.1 Use case validity

This thesis contributes to the blockchain and blockchain consulting industry in a couple of ways. First, this thesis aims to provide blockchain development companies or blockchain consulting agencies with a way to assess a blockchain use case's strength. A Design Thinking approach is applied to incorporate not only the technological perspective, but also the businses and user perspective. This can help mature the technology as a whole and by focussing on the user values it can help increase blockchain adoption. Moreover, critically assessing blockchain use cases can strengthen blockchain's reputation. As Chapter 2 showed it is now mainly associated with volatility and uncertainty. In order to reach mass adoption, that image needs to be changed.

3.2 Design mindset

This thesis showed that an industry dominated by engineers can benefit from a more design-oriented mindset. Looking beyond the realm of the blockchain industry, it can be interesting for emerging tech companies in general to apply a more design-oriented approach. If employees have a designerly way of thinking, user values have a more prominent role from the start, rather than only during the development process, where agile methodologies are used.

CHAPTER 11
PERSONAL REFLECTION

In this chapter, a personal reflection is given on the graduation project. First, GoBlock will be reflected upon. Second, the project's main learnings will be evaluated and lastly, a reflection on personal ambitions is written.

In this chapter:

1. GoBlock
2. Project learnings
3. Personal ambitions

THINK OUTSIDE THE BOX

PERSONAL REFLECTION

Overall I look back on my graduation with satisfaction and a good feeling. Although there are, of course, plenty of ways the design could be improved or the project could have been conducted differently, I am happy with the result. As first stated during the kick-off meeting, my ambition was not to achieve a specific grade, but rather to deliver something that I myself am proud of. With GoBlock actively looking into implementing the solution proposed in this thesis, this has been accomplished. In this section, I will shortly describe the main things I experienced and learned during the graduation project I conducted for GoBlock.

1. GoBlock

First and foremost, I thoroughly enjoyed working at GoBlock and becoming a part of such a small but versatile team. I was taken seriously by GoBlock's employees from the start and experienced the internship as very pleasant. Working for a small start-up is something that I very much enjoyed for a multitude of reasons. The most important one is that decision-makers are practically always within reach. The lack of bureaucracy enables for quick deicion making and high level discussions. Moreover, the broad responsibility that comes with being part of such a small team is something that suits me.

A drawback of such a small company is the lack of diverse customers compared to a large consultancy. This was mostly noticable in the design validation phase, as there were no customers to test with. In the future I should be more proactive in such a situation so I can anticipate this.

With GoBlock being an offshore company with just a few people located at the HQ in Amsterdam, some interesting challenges occured. For example, the demographic difference made it difficult to reach all relevant employees. Also, this had to be done over video call, which is of course always a different experience than talking to someone face-to-face.

Lastly, I had no experience with software development or management of it. Hence, it took me quite some time to get familiar with the company and its operations. I had to get acquainted with software development in general and understand how these products get built. This took some time, but it is knowledge that I can take with me to future challenges.

2. Project learnings

This graduation provided me with a number of learnings. The most important takeaways are mentioned below.

In the beginning I experienced some unclarity about the project scope. Initially, the goal was to develop a end-to-end proposition for GoBlock. However, after initial analysis and numerous discussions with company stakeholders, this shifted towards a blockchain software development proposition. As there was very little existing literature, I experienced trouble in the first phase with determining my focus and staying on track. A lot of sidetracks were explored and eventually rejected as they did not relate closely to the project's focus. In the future it is important that I keep a closer eye on the project's focus as I progress. Naturally it is good to apply a broad scope to an analysis, but it needs to add value to the overall project.

Another thing I learned is that I should be more proactive. By coming into a company you experience quickly that all people around you have their own tasks and roles that they are focused on, so it is important you take ownership of all things related to your project. This is something I sometimes did not do consistently (e.g. awaiting replies or not following up appropriately). In the future I will ensure to take charge and ownership of more facets of my projects.

Something that I found challenging during this project was that I was the only one in the company with a design background. During university projects, you are subconsciously used to being able to spar with fellow designers and bounce ideas of each other. In the context of this graduation project, this was not the case. I found that after careful explaining people start seeing the value of a design mindset, but being the only one in a business environment with that mindset can be challenging. Hence I often went to the IDE faculty to sit with fellow students and discuss the project, in order to gain fresh perspectives.

One of the major things I learned is that in order to progress, you have to make choices. In the beginning I sometimes had the tendency of overanalyzing before making a decision. This got rather complicated sometimes as the blockchain industry is a rather under-researched area. Hence, I was forced to make decisions based on minimal findings. However, I found that it is better to do this and adapt accordingly along the way, rather than trying to make the eprfect decision from the start. This corresponds with the iterative approach of design in general.

Extending on the iterative approach, my personal experience with this is ambiguous. On the one side, I very much support the iterative approach as it allows for repeated improvement of a vision/product/service etc., but on the other hand it can be a rather frustrating process in practice. Having to 'take a step back' can feel as the opposite of progress, even though you might improve your design in the process. This also corresponds again with the keeping in mind of the project goal. If you are consistently aware of the ovrall goal, iterations might become less frustrating and mostly value-adding. Moreover, an iterative approach makes project planning quite challenging.

3. Personal ambitions

Lastly, I will shortly reflect on some of the personal ambitions I had stated in my Project Brief, at the beginning of the graduation project.

One of the ambitions I mentioned was the challenge of applying Design Thinking to a context that was not familiar with it. GoBlock, and software development in general, generally do not use Design Thinking. This led to interesting challenges, as it forced me to explain to company stakeholders why I would conduct certain steps or methods. This forced me to think critically about my process and mostly about the argumentation. I found that after a while, stakeholders started to understand the value of Design Thinking, and a design-oriented mindset in general. However, this is of course a gradual process and needs to be explained continuously to have significant effect. The main thing I found was that a design mindset can really provide a wholistic approach and overview on a business.

Additionally, I had mentioned that as a designer you are in essence a bridge within a company. You have to be able to communicate with both the tech people and the business people. This is something I was forced to do many times, in order to acquire the necessary insights. I found myself translating my progress and findings often into either business terms or technical terms, to ensure stakeholder understanding. This gives you a nice multi-perspective view on the case at hand. However as mentioned before it sometimes was a bit frustrating that I was the only one with a design background.

Finally, conducting my graduation thesis at a blockchain consultancy did allow me to further develop my knowledge of both the technology and the industry as a whole. Although I am not very much interested in the technology from a technological point of view, the wider innovation perspective does appeal to me. I find it rather interesting to see how blockchain develops as an innovation and what is needed to increase adoption.

Concluding, I will take all learnings gathered during this project to further develop myself. I will also apply my design mindset to problems to benefit future projects. As mentioned before, I once again found the true value of design lies in the wholistic approach it offers, by taking into account all stakeholders. Design is more than an activity, it really is a way of thinking.

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