A TECHNO-ANTHROPOLOGICAL STUDY OF TECHNOLOGICAL START-UP ASSESSMENT

This master's thesis investigates the different criteria for developing successful technological start-ups.

AALBORG UNIVERSITY

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Abstract

The aim of this master thesis was to investigate the criteria for what a successful technological start-up were. We have used Social Construction of Technology (SCOT) as our main theoretical framework while using Constructive Technology Assessment (CTA) as a supplement. Throughout our data collection, we observed that our initial literature did not focus on elements such as relevant social groups or interpretive flexibility, but rather focused on the economical aspect. We then chose to gather perspectives from two innovative and technological start-up companies, Lithium Balance and Dixa. Hereby, we analyzed the two companies in order to obtain knowledge about how they became successful and if the criteria from our initial research correlated with what we observed when analyzing the two cases. The result of our analysis showed that flexibility both in the technology, but also in the organizational structure had a huge impact on whether or not the start-up would create opportunities which could later on lead to success despite none of our initial sources elaborating about flexibility.

Key terms: flexibility, interpretive flexibility, relevant social groups, closure, Lithium Balance, Dixa, technological start-ups, criteria, success

Acknowledgement

First and foremost, we would like to thank Lars Barkler, CEO at Lithium Balance, and Rob Krassowski, Director of Product Management at Dixa, for their willingness to participate in interviews in relation to their technological start-ups. Without their input, we would not have been able to obtain a deeper understanding of their company as well as their business considerations. Second, we would like to thank our supervisor, Tom Holmgaard Børsen, Professor at Aalborg University, for his guidance and knowledge in relation to our construction of this thesis.

Motivation

Our interest in start-ups, investors, technology and the way to success started as one of the authors of this report, Katrine de Souza, went into developing her own start-up company in the beginning of the Master Program of Techno-Anthropology. The start-up idea came from wanting to find hair solutions for people with hair loss, such as Alopecia. This idea got accepted into Aalborg University's incubator program where she was then lectured in various start-up approaches and business models.

The other author of this report, Anna L. M. Jacobsson, has a medical background but went into the finance sector part-time as an assistant specialist in AML during her studies. As both authors developed an understanding for the financial sector, with Anna coming from a more financial perspective and Katrine from an innovative start-up perspective, our conversations about developing new businesses started to revolve around how investors managed to analyze technological start-ups and the cutting edge and innovative technology that often breaks through in start-ups. There is a tendency for start-ups to be more willing to dig their hands into cutting edge technology, whereas more established companies' organizational structure can take years to implement and rethink new technology while often being more risk sensitive (1). In our perspective, start-ups are a vital part of introducing, rethinking, normalizing, and testing boundaries of new technology, but often time, carving new ways will requires economic resources. This is where investors play an essential role, as they are looking to benefit from the start-up. But how can investors analyze the relation between the social and technical elements from both inside the start-up and the given surroundings of the start-up and technology?

Introduction

The idea of creating a start-up mostly originates from a certain need that cannot be fulfilled or an optimization of a current product or service (2). When watching the Danish version of the Dragons' Den, almost every contestant is a part of a start-up that needs either knowledge or money to continue their growth with the purpose of expanding their company. The investors almost always asks the same questions like "is there a need for your product?, "do you have it patented?", "what about funding?", "what are the numbers?" meaning how does the economy look like within the start-up, "what are your skills and what about your team?", and "what are your goals?" (3). When searching online for literature that helps you to understand what a successful start-up looks like, the common denominator is explanations that answers these types of questions. However, we acknowledge that

the term “success” is a broad term which consists of several elements which can be interpreted differently depending on the circumstances.
As a Techno-Anthropologist, our questions would focus more on the social elements such as stakeholders and social interests. Additionally, the interaction between the technology and humans, but also the interpretation and flexibility of the technology based on the different stakeholders involved.

There are a lot of different advices the internet presents to people that want to go solo and become entrepreneurs. According to TechSavvy, which is an online newsletter for entrepreneurs, it is about monitoring your expenses and minimizing them, building a great network of other entrepreneurs, knowing your strengths and weaknesses, hire the right kind of people, creating a cash flow, and trying to generate economic growth (4). Another website mentions the “Lemonade principle” which is a reference to the expression “make lemonade” which is a common phrase among Americans when dealing with an unforeseen incident. In the world of start-ups, this means that entrepreneurship often is uncertain and instead of trying to prepare for alternative solutions to unknown challenges, it is wiser to engage in the challenges as they come to surface (5). What many entrepreneurs had not seen coming was the 2007 financial crisis.

Prior to 2007, the world had experienced a high economic growth with great optimism by politicians, different authorities, companies, and consumers. People were spending money they did not have, and loans and investments were being given out like free candy (figure 1) without having an understanding or the knowledge about possible risks. From 2003 until 2008, newly established companies were arising, and by 2009 it fell by almost 10.000 which correlates with the rate of investments in figure 2 further down below (6).

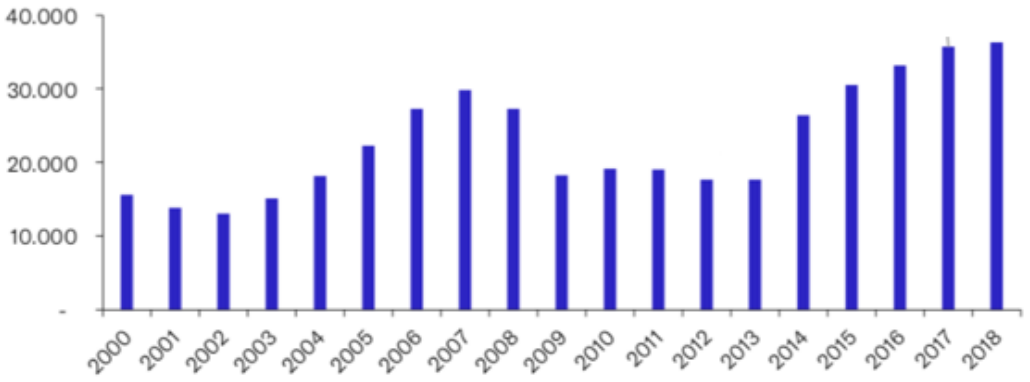


Figure 1. Illustration of the growth rate of newly established companies in Denmark. (6)

Specifically, in the investment world, supposed risks were not documented transparently enough and investments were being "blue stamped" which meant that people were promised a secure investment with minimal risks. By 2007, these loans and investments began to show great insecurity and by mid-2007 the financial world in the United States collapsed. As a result of this, lacking trust towards the financial institutions began to drop worldly, and by 2008 a global financial crisis had become a reality (7). In Denmark, between 2008 and 2010, small and medium size companies (SMV's) lost 13 pct. of their full-time employees and for larger companies it fell by 5 pct. Five years later, the SMV's had only gained back a 5 to 6 pct. in growth of full-time employees. During the financial crisis, the SMV's lost a huge amount of investments, and to this day, the level of investments are still very low and has been ever since 2009. It was only by 2014 and 2015 the first progress began to show with growth rates at 3 and 7 pct. which meant that investors were beginning to take chances again (ibid.). Figure 2 illustrates the rate of investments of small and medium size companies (SMV's) from 2005 to 2015 in Denmark. With the financial crisis, the investments of the SMV's fell drastically and have been laying low and relatively monotonous ever since 2009 which the figure shows. This could be a result of not having the same possibilities of lending money from the banks according to the Confederation of Danish Industry (8).

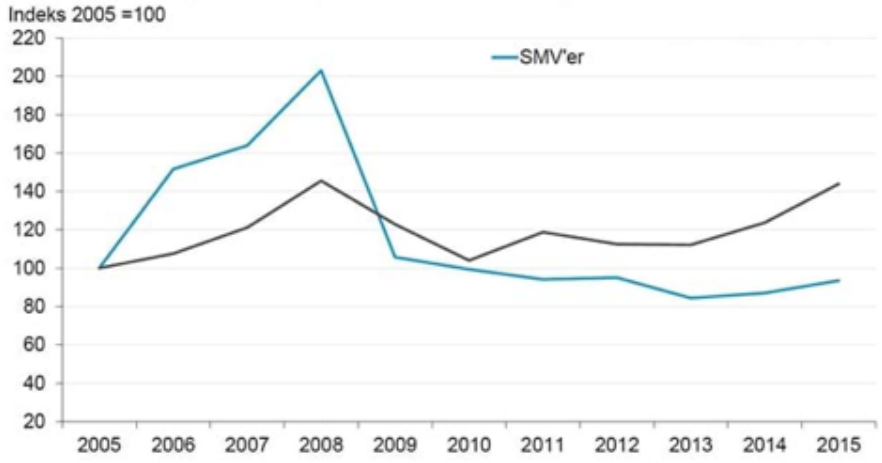


Figure 2. Illustration of investment rates of the small and medium size companies (SMV's) (8).

According to Statistics Denmark, the survival rate of newly established companies within their first year was an average of 72 pct. from 2010 to 2017 which meant that despite the financial crisis, SMV's did quite well at sustaining their economy (9). But how come 72 pct. of SMV's were able to survive? Was it because they had a different approach in building their start-up, and what is the "right" approach to become a successful start-up? Reality programs like the Dragon's Den has given the common public an insight to what it means to be a successful start-up, but also how to invest and what to look for when investing.

Watching the Dragon's Den made us wonder how come some start-ups do well and others do not, and why investors in the show sometimes invests in start-ups but not others. It made us wonder what a successful start-up is and what factors are involved in building a successful start-up. When searching online to answer the above questions, four things comes to surface; personality, education, training and experience, current and future network (5). This means that the team and their background is of importance, and that a start-up should fo8cus on their current situation, e.g., what skills they have and what their strengths and weaknesses are. To have a current and future plan for their start-up, and to engage and include interdisciplinarity in order to develop new business areas, finding resources, and to minimize expenses (ibid.). According to Saras D. Sarasvathy, Associate Professor at Darden Graduate School of Business at the University of Virginia, the above approach would be characterized as causal reasoning or rationality (10). Here, one has a pre-determined goal and a given set of means where one seeks to identify the most efficient, fastest, and cheapest alternative to achieve the given goal. She explains that casual thinkers are like great generals trying to conquer lands.

When watching the Dragon's Den different terms are often used, e.g., "ROI", meaning return of investment, "cash flow" meaning the ingoing and outgoing transactions of a start-up, and "B2B", which is an acronym for "business to business" that covers trades between companies (11). Then there are models like "DCF" which stands for "discounted cash flow". This model is a valuation method for estimating the value of an investment based on the expected future cash flows. The model tries to analyze the value of a current investment based on projections of how much money it will generate in the future (12). According to the investors in the Dragon's Den, it is important to have an estimation of when they will get their investment back in order to evaluate if the start-up is even worth investing in. All of the above are factors that contribute to a successful start-up and are correlating with casual reasoning. However, all the above also addresses the financial part of developing a start-up, but what about the human part of investing, and is economy the most important part when creating a successful start-up?

In the DEKOInspire podcast, Jesper Buch, founder of JustEat, elaborates about the team being the most important thing when investing and that he invests in people (13). In the podcast, he mentions how risks are minimized if the team is strong and have different people on board with different strengths and competencies. What also distinguishes a successful start-up from a failure is a thorough research prior to approaching possible investors. By this, he means examining the market, the competitions, budgets, and funding amongst others. He also addresses the fact that not only should

the team have strong and different competencies, but they should also be fun to be around (ibid.). But is the team then the most important factor for creating a successful start-up?

In a TED Talk video on YouTube with Bill T. Gross, founder of Idealab, he elaborates on trying to find out what the criteria were for successful and failed start-ups, and what factors matters the most (14). Initially he thought that the idea was the most important factor because the idea is your starting point. But then, just as Jesper Buch, he thought that the 'team' was the most important factor for developing a successful start-up and quoted Mike Tyson saying "*everybody has a plan, until they get punched in the face"* which he thought seemed similar to a start-up team; the execution and the ability to adapt to getting punched in the face by the costumer (ibid.). However, he then moved on to thinking that the 'business model' might be of the highest importance if the company had a very clear path of generating costumer revenue. Then leading to if 'funding' and the intense amount of funding companies receive was what mattered the most. Lastly, was it the 'timing' that had the biggest influence on whether or not a company became successful? What if the idea was too early and the world was not ready for it, or maybe you hit the market at the perfect time because you saw a need for your product? He compared the companies by 5 essential elements: ideas, team, business model, funding and timing as figure 3 illustrates.

Figure 3. Model for 5 essential elements that lead to success (14).

He compared 200+ companies, half of them being Idealab companies and the other half being non-Idealab companies. He then ranked the companies based on the 5 essential elements, and from his knowledge in investing in companies for the past 20+ years, from a range of 0 to 10 (figure 4 and 5).

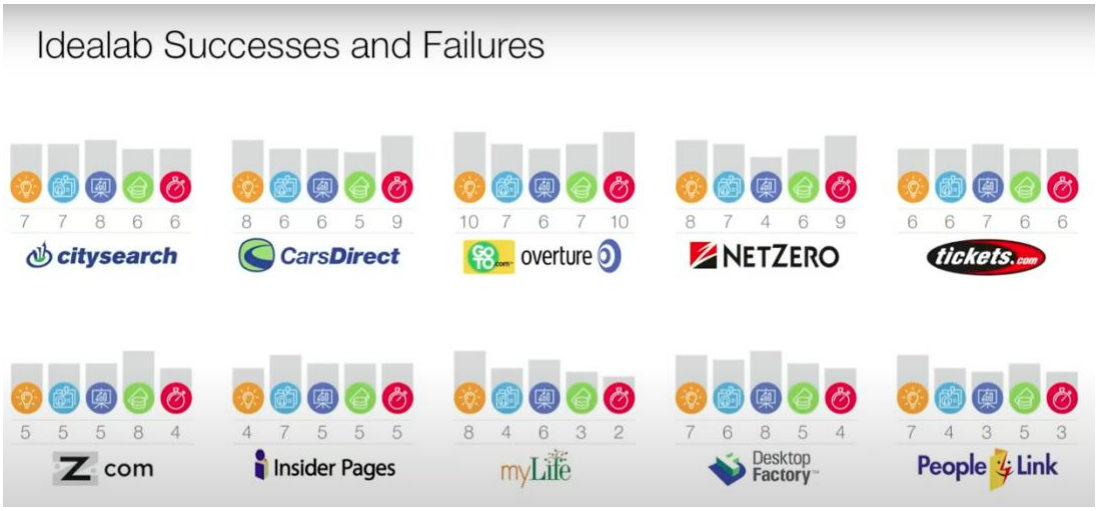


Figure 4. Some Idealab companies that have either succeeded or failed.
The upper row shows the successes and the bottom row shows the failures (14).

Figure 5. Some Non-Idealab companies that have either succeeded or failed.
The upper row shows the successes and the bottom row shows the failures (14).

After reviewing all of the 200+ companies, he realized that the common denominator of the succeeded companies all ranked high in the element of 'timing' (figure 6). Despite having a great team that really knows how to execute, timing was essential for a start-up to become successful. Needless to say that this investigation was not definitive, but more so an indicator (14).

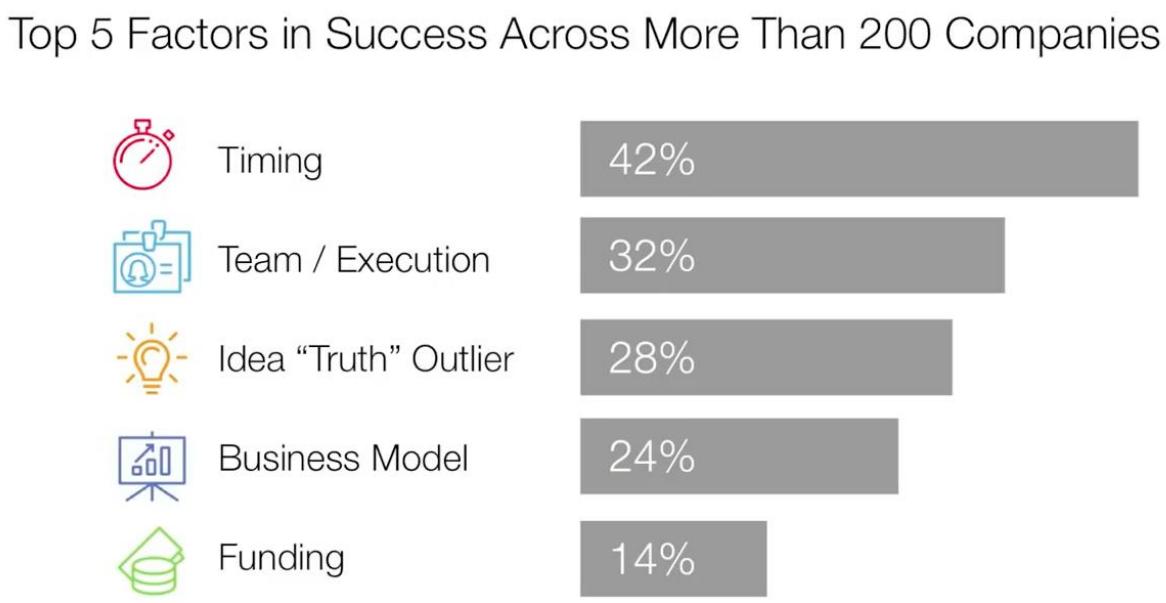


Figure 6. Top 5 factors in success across more than 200 companies (14).

He was surprised to experience that 'timing' accounted for 42 pct. of the difference between success and failures within the 200+ companies compared (14). What both Buch and Gross thought to be the most important factor came in second and accounted for 32 pct. Third, the 'idea' by 28 pct. which also was a surprise for Gross since the idea is the starting point for a start-up and what generates further development. What was not surprising to Gross was the percentage for the elements of business model and funding. According to Gross, one can always start a business without having an actual business model and then add one later if the customers are demanding what you are creating. The same goes for funding since a business most of the time is underfunded in the beginning and later gaining traction (ibid.).

When reviewing the given advices from different sources above without generalizing every literature about start-ups, it seems like the common denominator is more focused on the business itself and the financial elements. As Techno-Anthropologists, our aim is to understand what impact the social elements have when investigating why start-ups becomes successful and the criteria behind. Our goal is to provide the reader an insight to what Techno-Anthropology can contribute to the field of developing start-ups and investments.

Problem statement

What are the prerequisites for a start-up to become successful, and how can Techno-Anthropology facilitate this?

Research questions

1. What is an illustrative example of a successful technological start-up?

2. What does it mean for a startup to be successful?
3. Which relevant stakeholders are involved in technological start-ups?
4. Is the product's flexibility a required factor for success?

Outline of the thesis

To answer our problem statement, we have structured our thesis in different chapters as outlined in the following order:

In **Chapter 2**, we will describe the two cases we have chosen as examples of successful innovative start-ups. We will shed a light on what their technology concerns and the history of the start-up.

In **Chapter 3**, we will explain the theoretical approach as well as methods used for this thesis to investigate what the criteria are for developing a successful start-up based on literature and the chosen cases.

In **Chapter 4**, we will unfold the chosen cases by analyzing these from a SCOT and CTA perspective. This will include focusing on the start-ups' innovative technology and strategy by looking at different elements.

In **Chapter 5**, we will discuss the literature and cases, but also focus on what we as Techno-Anthropologists can contribute to this field.

In **Chapter 6**, we will conclude what our findings were based on the analysis and discussion.

In **Chapter 7**, our reflections upon our process will be elaborated.

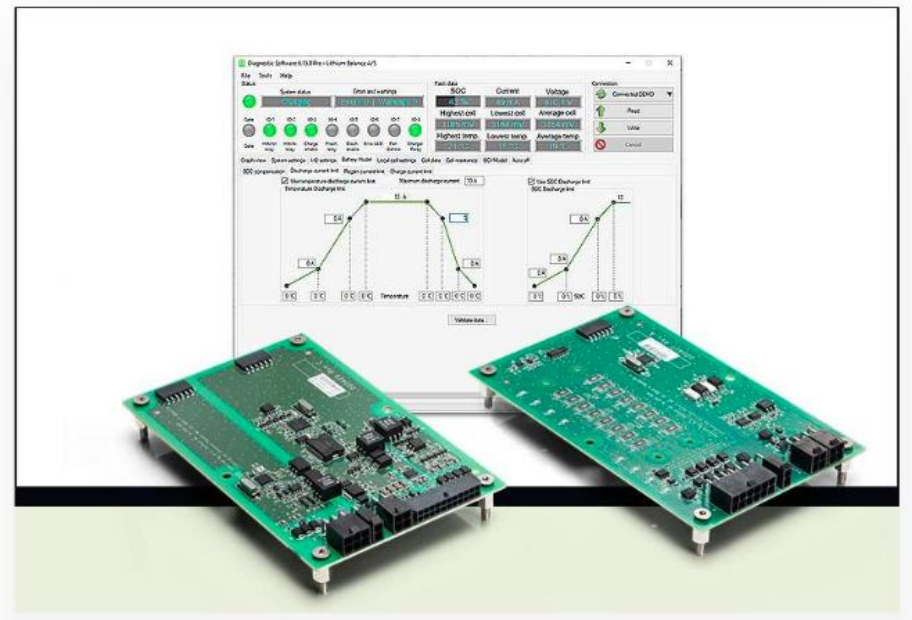
Chapter 2: Chosen cases

In this chapter we will present two technological start-up companies. We chose to search for start-ups that have innovative and sustainable products due to fact of how our world progresses within the field of technological innovation. Nevertheless, it was important to choose start-ups that had flexible products with a socio-technical understanding.

Lithium Balance

The company was founded in 2006 at the Danish Technological Institute with the ambition to develop, manufacture, and sell battery-based electrification technology by using lithium ion (Barkler interview, appendix). The reason for choosing lithium was because it is the lightest of all metals with the biggest electromechanical potential, and the purpose was for it to be a substitution for lead batteries. In relation to figure 10, the purpose was also to migrate away from fossil fuels and non-renewable energy sources since discovering that new and innovate measures such as lithium-ion technology had the

same potential of performance in transport, industry and residence (ibid.). However, when focusing on the technique behind the technology, inherently lithium ion is unstable when charging and therefor needs to be managed although certain precautions during charging and discharging provides lithium ion more advantages compared to other chemistries. Based on this knowledge, the company established a Battery Management System (BMS) as an essential enabling factor for lithium ion batteries (15). With different skills and creative inputs, the company created a system that ensures control over all the cells within these packages.



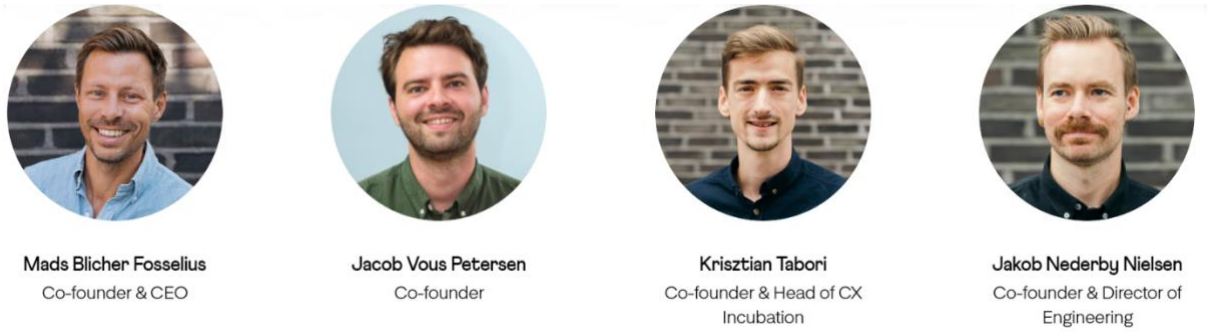
Picture 1. s-BMS (battery management system) and the components. (16).

Today Lithium Balance provides high-tech battery packages and components for electric cars and robots, development of management systems to electric cars, submarines etc., development of electronics and software for optimization of batteries with the aim of increasing charging, performance, and durability (17). In the podcast, Iværksætterhistorier, CEO Lars Barkler, elaborates on how difficult it was to suddenly pitch an oil-based industry that batteries were becoming a part of the future despite the release of a report from the oil company Shell elaborating on how battery-based electrification technology were replacing oil (ibid.). However, knowing that batteries were the future, the concerns were if Lithium Balance, being a start-up, would be chosen as a supplier for larger companies within this field. Their strategy became to target the segment that were already using electromechanical technology although their breakthrough spiraled when Tesla came on the market with their Models S which rocked the whole automotive industry completely. This meant that the car manufactures around the world had to change their strategy although there had been a huge denial of using lithium batteries instead of fossil fuels in cars (ibid.). In recent years, the company has had several big investors, but the latest investment came from the American industrial enterprise, Sensata

Technologies, which helped Lithium Balance into becoming a big supplier on the market in several industries, e.g., the automotive industry (18).

Dixa

In 2015 four friends from Copenhagen founded Dixa with a mission to end bad customer service by making it more personal, intelligent, and data driven. The founders, (Mads Fosselius, Jacob Vous Petersen, Jakob Nederby Nielsen and Krisztian Isrvan Tabori), created and built a cloud-based customer service software (SaaS, Software as a Service). While Fosselius had over 7 years of experience with customer service, both him and the rest of the founders had experience from previous customer service companies 3pas and Cirque, also founded by Fosselius (19). This experience fed their ideas and developed into a platform where users of the software could access its inbuild software applications when a device runs on shared computing resources (20).



Picture 2. Illustration of Dixa's founders. (20).

The Dixa software has many other inbuild qualities and capabilities, such as omnichannel platform, prioritization, and inbuild conversational and personalization tools to support their product's vison, which is "*to empower customers and brands to build stronger bonds – as if they were friends."* (20). Their vision with the company is *"to create a world in which all people are welcomed by their favorite brands with the warm familiarity of a friend."* (ibid.).

The omnichannel platform is meant as a step away from customer service teams working in "siloed, fragmented systems" (as Dixa puts it) that unifies, connects multiple platforms with cross-channel prioritization, which chooses which inquiries are more urgent than others (21). Dixa wants to deliver a flexible interaction with the modern-day customer, by incorporating some of the most used contact channels today, this being WhatsApp and Messenger, while the function of the live chat is to meet the customer while they are most engaged (ibid.).

The conversational and personalization capabilities will ensure that the customer is directed to the same customer service agent when possible, and that agents are equipped with all data about the customer when entering the conversation. This is built to support the feeling of familiarity and a sense of friendship relation between brand and customer (ibid.).

Dixa was commercially launched in 2018 and has since had an increase of 1800 pct. in monthly revenue while grown from 12 to 120 employees spread from its headquarters in Copenhagen to offices in London, Berlin, Kyiv and Lviv. They have gained recognition from attending start-up competitions like TechCrunch and partners with companies like Zapier and Hubs who is also within the customer service industry (20).

Chapter 3: Context and method

For this chapter, we wish to provide the reader with an overview on the current literature on what the criteria are for developing a successful start-up based on knowledge from both entrepreneurs and investors. We will also highlight the lacking focus, within the literature, on technological flexibility and interpretation when investigating how successful start-ups are built. Our wish is to contribute to this field based on techno-anthropological knowledge and skills. To frame this project, we have used the techno-anthropological theory being Social Construction of Technology (SCOT) along with Constructive Technology Assessment (CTA). By using the framework, we will be able to explore the reflections regarding relevant social groups involved in the creation of the technology, the technological flexibility and stabilization, and the socio-technical understanding of the technology.

Theory

This chapter will unpack the chosen theories, Social Construction of Technology (SCOT) and Constructive Technology Assessment (CTA). By using these, we want to carry out an investigation of our literary sources to understand the socio-technical aspect of creating a successful start-up and what the reflections and considerations are behind the innovative technology.

SCOT

The interest in analyzing technology as a social construction has been extensive since mid 1960's within the Science & Technology Studies (STS) (22). The social constructivist view in science studies gained popularity and grew into other academic areas. In the science-technology relation studies, the 'social shaping of technology' became the common designation as it grew as an academic field and as a critique pointed towards science and technology and technology studies within the dominating fields of history, philosophy and sociology. The science-technology studies went from a debate with a general focus and view of the relation of science and technology as "pure science indebted to developments in technology" which is now considered within the STS field to less desirable and to particularly to 'be cautious in drawing any firm conclusions from such work'. The field now views the science-technology relation as; *"science and technology are themselves socially produced in a variety of social circumstances."* (23).

Deriving from these discussions, Social Construction of Technology (SCOT) developed in the 1980´s through the meeting of the sociologist of science, Trevor Pinch, and Wiebe Bijker who had conducted studies on the innovation of technology. SCOT offers a socio-historical study, theory, and method of technology where the social and the technological cannot be separated while the technology's purpose and design is shaped by the work and negotiations of social groups (22). The relation between science and technology has long been discussed going from an 'older' view where "science discovers, and technology applies" is now seen as an overly simplistic and generalizing model that no longer suffice. Figure 7 shows such a linear innovation process model. This is where Pinch & Bijker criticize previous studies on the history of technology (ibid.).

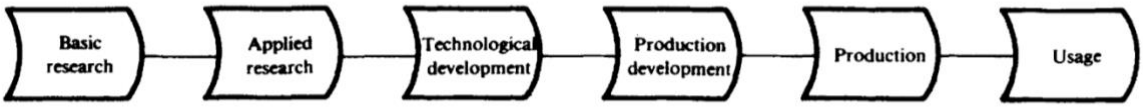


Figure 7. Six-Stage Linear Model of the Innovation Process (23).

The critique of the linear model is also a critique of the underlying technological determinism, where technology is viewed as separate from society and the social, and sees technology as having an 'impact' on society's development, once released into it. SCOT argues for a softer boundary between the technological and the social, and that the social to a certain extent also shapes the technological. As Pinch & Bijker cites Eugene Ferguson in their article "Social Construction of Facts and Artefacts" (23).

"*(…) the whole history of technological development had followed an orderly or rational path, as though today's world was the precise goal toward which all decisions, made since the beginning of history, were consciously directed.*" (24).

The linear model points to the view of the success of a technology as being an explanation of its following development and that there is no further studying of the given process needed (23). Instead SCOT suggests a multi-directional view of technological development, where different versions of technology compete while specific historical circumstances have shaped the outcome of whether one version 'wins' over another (22).

"In SCOT, the developmental process of a technological artefact is described as an alternation of variation and selection. This results in a 'multi-directional' model, in contrast with the linear models used explicitly in many innovation studies, and implicitly in much history and technology. Such a multi-directional view is essential to any social constructivist account of technology. Of course, with historical hindsight, it is possible to collapse the multi-directional model onto a simpler linear model; but this misses the thrust of our argument that the 'successful' stages in the development are not the only possible ones." (23).

In relation to the above quotation, an example of a multi-directional evolution is the history of the bicycle which is widely used within SCOT-literature (ibid). The example of the bicycle is shown as a

contrast to the linear model because the bicycle initially is seen as a one-fixed design (22). The success of this one-sided design is explained with technological superiority and efficiency but does not look at the social reason as to why one design was chosen over another. In SCOT, technology is only what it is through its relation to different social groups, also referred to with the term 'relevant social groups' (ibid.). The term is used to describe both institutions, organizations, organized and unorganized groups of individuals who all share the same set of opinions about the specific artefact. These groups construct the technology in different ways, and therefore the technology must be studied in relation to the different relevant groups (ibid.).

"In deciding which problems are relevant, a crucial role is played by the social groups concerned with the artefact, and by the meanings which those groups give to the artefact: a problem is only defined as such, when there is a social group for which is constitutes a 'problem'." (ibid.).

The relevant social groups refer to institutions, organizations as well as organized and unorganized groups. In the example with the evolution of the bicycle, the relevant social groups are identified as "young men of means a nerve" who had the physical ability to climb and operate the high-wheel-bicycle. For them, the design was an uncontroversial and well-functioning technology whereas women and older men were members of the relevant social group of non-users (ibid). While older men were physically limited in operating the high-wheel-bicycle, it was not socially accepted for women to operate it, especially because they were wearing dresses. The different ways of relating to the same technology depending on which group you were a part of, is also called to interpretation flexibility. The essential criteria for a specific relevant social group are that every member share the same meanings related to the technology (or artefact). Finding relevant groups, we must therefore look at whether the members of a social group have any set of meanings towards the technology (ibid.). An example could be users that fulfills the requirements by being in contact while other non-user groups can be harder to identify when finding meanings connected to the technology.

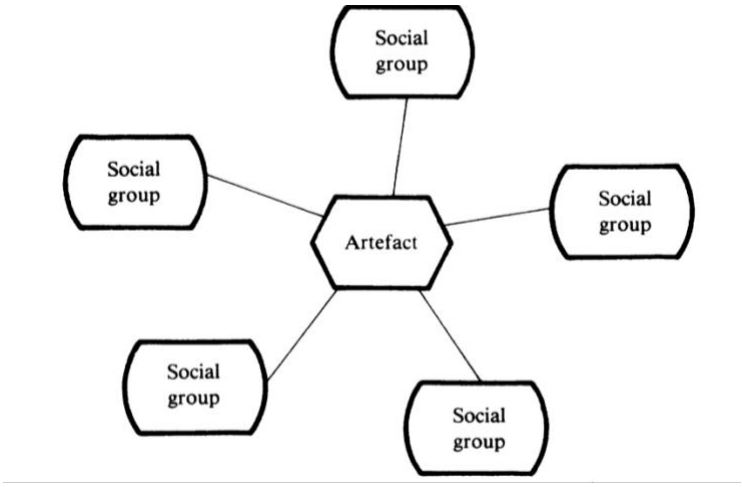


Figure 8. The Relationship between an Artefact and the Relevant Social Groups (25).

Technologies, that today is an integrated part of our lives, has once been a subject to controversies between different relevant social groups. These controversies have since decreased in conflict and the technology has found a relatively stable meaning and shape. The terms used when describing this process is 'stabilization' and 'closure'. The important point here is that in order for a technology to stabilize, is not for the controversy to actually *be* solved but for the relevant social groups to *consider* the problems within the controversy as solved. Therefore, there are also different levels of stabilization, as it can be related to many different groups (22).

"In principle, the degree of stabilization is different in different social groups. By using the concept of stabilization, the 'invention' of the Safety Bicycle is seen not as an isolated event (1884), but as a nineteen-year process (1879-98)." (22).

In order for a group to close a controversy, two strategies can be used. One is 'rhetorical closure' where one group tries to convince one or several groups, which have other opinions, that a technology is either problematic or unproblematic (22). An attempt to convince other groups can be done with e.g., commercials or rhetorical demonstrations. In relation to this, an example could be of the bicycle where one group tried, with commercials emphasizing how safe the bicycle was, to convince non-users that the high-wheel bicycle was safer (ibid.). The inventors of this specific design tried to convince potential users that the technology was unproblematic. Another strategy, labeled as 'closure by redefinition of problem' (or redefining closure), is when a group creates possible solutions to a problem which can redefine and/or solve other problems, and hereby gain closure. Case in point, the example of the bicycle and its air tires (ibid.). Originally, the design of the bicycle was intended to minimize vibrations when riding it which stabilized initial design. However, this design solution did not

solve the problem of the vibrations. Instead of going back to former designs, the problem was reframed as a matter of making the bicycle faster because the inventors realized that the bicycle could achieve much faster speed with air tires (ibid.). Another way to obtain this closure strategy was by altering the design of technology. Case in point, when the design of the bicycle was changed multiple times. A third example was when the inventors included women into their design which changed the placement of the supporting beam on the bicycle in order for women to use it without getting their dresses in the way as they would have if the bicycle had had the original supporting beam (ibid.). The stabilization of a technology happens through closure strategies and is always connected to one social group. The closure connected to a specific social group means that the technology will not stabilize in relation to other social groups (ibid.).

The methodological aspect of SCOT

SCOT as a method has a few guiding lines for how to conduct a study of a given technology. First step is to demonstrate the interpretive flexibility of the technology artefact, and that it is culturally constructed and interpreted. By this, it is intended to not just look at the flexibility in how people think or interpret artefacts, but also the flexibility in how it is designed. By demonstrating that a given technology, which has some level of stability today, was once more 'unstable', then enables the researcher to identify different relevant social groups to show how these social groups has constructed the technology differently (22). The second step to the SCOT approach, is to expound how the technology stabilizes or destabilizes by drawing out the mechanisms that closes the debate and stabilizes the technology. The stabilization processes can be unfolded by looking at the strategies that actors within social groups utilizes to close a controversy. The third and last step consists in relating the technological artefact's contents to a broader socio-political aspect, since the situation surrounding the technology shapes its norms and values which, again, shapes how the technological artefact is being perceived and interpreted. Even though this step is mentioned in its original formulation of the method, there has never been given a further explanation or guideline in how this step of the technical frame should be carried out. In order to expand our understanding of the field of technological start-ups, we will use Constructive Technology Assessment as a supplement because it will offer an methodical extension as well as theoretical (22).

CTA

Constructive Technology Assessment (CTA) was developed by Jens Müller in the late 1970's and 1980's at Aalborg university. The objective of CTA is to give a socio-technical understanding of a technology and to understand how technical matters are embedded in society and vice versa. This means how

society and stakeholders impact the technological development. It also gives methods to conduct responsible design and suggests responsible roles of engineers through ethnographic and participatory methods. The method has already been used within health, environment, and politics, nevertheless, Techno-Anthropology studies prepares you to handle complex/wicked problems (26).

> *"A T-A approach to CTA thus contributes to the technology assessment by combining different socio-technical modes of analysis (e.g., STS, innovation, organizational approaches) with technical understanding, quick and proper ethnographic methods, ethical and societal evaluation, and participatory and action research methods."* (ibid.)

The interdisciplinary approach to the development of technology gives and deepens the CTA methods by looking at multiple actors in the co-construction of technology, this being both engineers, users, and other stakeholders (27).

"From a techno-anthropological perspective, there are five main reasons for the relevance and importance of CTA today.
1. A socio-technical perspective gives depth to the understanding of technology.
2. By assessing technologies, the contextual elements of technology become clear.
3. CTA facilitates engagement in technological change with local people and thereby highlights the importance of understanding the local settings and further engaging in participatory processes with key actors (users, designers, producers, etc.).
4. CTA provides a framework for addressing technology-related complex or wicked problems.
5. CTA can be used to emphasize sustainability (social and environmental) perspectives in technology development, implementation, and transfer." (26).

In a CTA connection 'society' means 'the social field', meaning the sum of stakeholders and/or users influenced by a given technology. The technical design is in focus (and not systems like political decisions). While in CTA, technology is defined as *"one of the means by which mankind reproduces and expands its living conditions."* (28). Technology is not a thing, but a process that is made of 4 elements.

Figure 9. Elements in the conception of technology (28).

- **Product:** What is the purpose of the technology is. The product is the main element in which the following three elements beneath should be mirrored in that direction (28).

- **Organization:** Concerning the division of work labor and pattern of specialization. Through a structural organization analysis, a distinction between horizontal and vertical division of labor.

- **Technique:** Technological functionality. Hardware and software, commodities, energy and resources.

- **Knowledge:** Scientific as well as other forms of knowledge, such as learning, skills, hidden knowledge and creativity (ibid.).

According to CTA, these four elements are what a technology consists of. The analysis of the technology should therefore be based on these, by identifying each component in the social construction of a technology. Another layer of CTA is the context which is the surrounding elements illustrated beneath in figure 10.

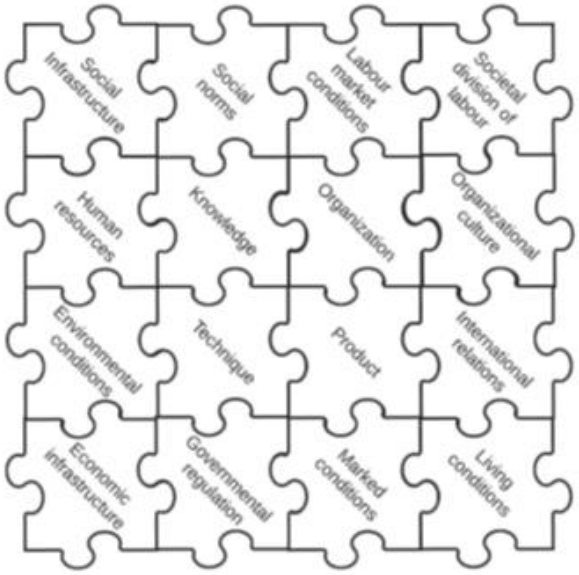


Figure 10. Technology in its complex context (28).

The surrounding elements in figure 10 is also called the 'complex context' or the 'complex local setting' (28). The flexibility of the technology and the relation to the setting in aspects like for example politics, infrastructure, economics and environment, is also called the 'complex local settings' and should always be seen as important elements, when analyzing technology (ibid.).

"What actual technological changes do occur is as much dependent on the external socio-political, economic and cultural setting, i.e., the 'local conditions' […] as on the internal variables of the technology in question." (28).

The 'complex local settings' or 'local conditions', that is shown in figure 10, is surrounding the technology (related to figure 9) and should be seen as a coevolving setting. This means firstly, that each piece is interconnected and not distinct entities.

Methodological aspect

The script of CTA and how one technology or a design of a technology replace another, looks at what the existing technology can do, and that the replacing technology also should be able to, and what the replacing technology can add (27). Firstly, each of the four constituting components of a technology should be identified. These can be seen in figure 9. Secondly, the surrounding elements are the complex local setting should then be identified as to which elements have had or currently are having an influence on each other (ibid.).

State of the art

As our project focusses on the topic of how to invest and the criteria for creating a successful start-up, we want to provide the reader with examples of literature on this topic and exemplify how our project might provide new insight into this field. We have searched for literature on the internet, the virtual library of Aalborg University, Google Scholar, and Microsoft Bing by using words and sentences like “criteria for successful startups”, “investment criteria”, “successful startup”, and “technological innovation investment”. Most of the literature either contains articles about how to become successful based on a few steps and mostly how to generate economic growth. Other literature in the shape of books are more guidance books, properly used in universities, to teach students on how to become successful and how to start their own businesses but does not go beyond the financial part of developing a start-up. In overall, most of the literature we have found deals with the desire to transform a small start-up to a multimillion-dollar company from an economic point of view although we are not capable of generalizing all kinds of literature in relation to development of start-ups as economically focused.

When looking at our findings from a SCOT perspective, most of them do not address the different relevant social groups involved and their role in a start-up or in the technological innovation. Neither does the literature go in-depth with knowledge on technological stabilization or flexibility, or the importance of knowing the impact of a technology which can be different to different stakeholders. It does not seem like the configuring of the user takes place particularly, nor does defining the potential users’ likely future actions. We believe that the literature has failed to elaborate about the knowledge and expertise about future users and relevant social groups (29). In addition to this, the literature does not emphasize the importance of the social and environmental aspects which, from a CTA perspective, is relevant when analyzing new and innovative technology amongst other factors illustrated in figure 10. We observe the literature writing into a topic where founders of big companies and professors attempt to describe and educate others in how to create a successful start-up even though there are many factors within this field. However, we do not believe that the notion of relevant social groups in start-ups and their role, and the stabilization and flexibility of technology nor the socio-technical understanding is emphasized properly or enough throughout the literature we have found online at least.

While searching for literature online, we stumbled upon a small article written by Jarie Bolander, an entrepreneur and author, on the website thedailymba.com (30). A website that gives out advice to other entrepreneurs with the aim and focus on improving entrepreneurship, innovation and technical

management. In this article the author writes about 4 criteria for selecting which start-up to invest in. He explains that only 4 criteria are necessary because it quickly eliminates a majority of companies that does not meet the basic standard for investors considerations (ibid.). The first criteria Bolander writes about is 'talent' and how important the team is to a start-up, not only what they are capable of businesswise, but also how they treat each other and how they handle failure and unknown challenges. The second one is about 'timing, more so market timing and the reflections about whether or not the idea and product is too early or too late of its time which figure 6, by Gross, also illustrates to be one of the essential factors for successful start-ups. The third is targeting the technology itself and the considerations about patents, inventions, and similarities on the market (ibid.). The last and fourth is about the technique behind the technology and the complexity of it. However, none of these criteria addresses relevant social groups, stabilization or flexibility of a technology or just the importance of understanding the socio-technical aspect within a start-up and their product. One might argue that the second criteria touches very lightly upon what goes into the word 'timing', meaning the world we live in, the interpretations, the people, but it does not go further in depth with what timing also could mean beside market timing. Elements such as human resources, besides the ones within a start-up or the impact of technological change to society, does not seem to be a consideration, at least not an important one.

Another article we came across was by Lars Tvede, CEO of Beluga and co-founder of the venture capital fund Nordic Eye, and Mads Faurholt, serial entrepreneur and co-author to the bestseller "Entrepreneur – building your business from start to success" with Lars Tvede (31). In their book they have written about 46 typical success criteria for start-ups which they have listed on their website. When reading through the list, only one sub-criteria and an explanation of pivots deals with users and other stakeholders. The other criteria are about the founders and their characteristics, the planning process of the start-up such as prototypes, strategic goals, funding, the business model, and how to enable scaling with decreasing or minimal costs etc. (ibid). Only when addressing the business momentum do they highlight the user but does not go into depth about the importance of the user and their interpretation. Neither do they write about engaging in participatory processes with other stakeholders nor do they elaborate upon the socio-technical factors. Based on SCOT and CTA, one might ask if the importance of relevant social groups is limited or if the focus is only on whether or not there is a demand, but not about who you are impacting. Nevertheless, there are a lot of different factors that goes into developing a start-up, however, we were still a bit surprised that it is presented as such a small portion of the development. In addition to the observations above, we were also interested in what investors looked for when investing in start-ups and if they had considerations

about relevant social groups, stabilization, and flexibility and other socio-technical understandings. In this case we found an article by business angel, Rolf Garde, on the website Keystones which is an online platform where start-ups can look for business angels to invest in their companies (32). The platform is functioning as a network of serial entrepreneurs which start-ups can pitch their ideas and business case to and hereby find an investor that matches their needs. In the article by Garde, he elaborates on what 9 criteria he focuses on when being introduced to a new start-up seeking for an investment. When reading the 9 criteria, all of them either focuses on the product, the team, the percentage of ownership, valuation, B2B, and geographic location (ibid.).

As observed previously, relevant social groups, their role, and stabilization and flexibility of the product, and in general socio-technical understanding is not prioritized or mentioned as much as economic growth possibilities, competencies and business models. This made us wonder whether or not these factors even were a consideration to any stakeholder involved or if in fact the market evaluation mainly focused on supply and demand without researching further into who their end users really were and how their product would impact different people in different industries. Although we kept in mind that these articles were more highlighting the main areas to focus on, we still saw a pattern of discharging the different relevant social groups which we thought to be an important part when developing new innovative technology to be used by others. However, we came across an educational book by Bill Aulet that presents 24 steps to create a successful start-up that actually elaborates on how important it is to look at an idea from different angles based on its end users (33). The author, commonly known as William K. Aulet, is a professor of the Practice, Technological Innovation, Entrepreneurship, and Strategic Management besides being a Managing Director for MIT Entrepreneurship at the MIT Sloan School of Management (34). It caught our attention, not only because of the author's credentials, but also because it breaks down necessary processes into a comprehensive and integrated framework based on 24 steps. In one section it deals with the different stakeholders that are involved in a start-up. In another section he elaborates about market segmentation and how important it is to see the world through the eyes of others based on what technological idea one might have (ibid.).

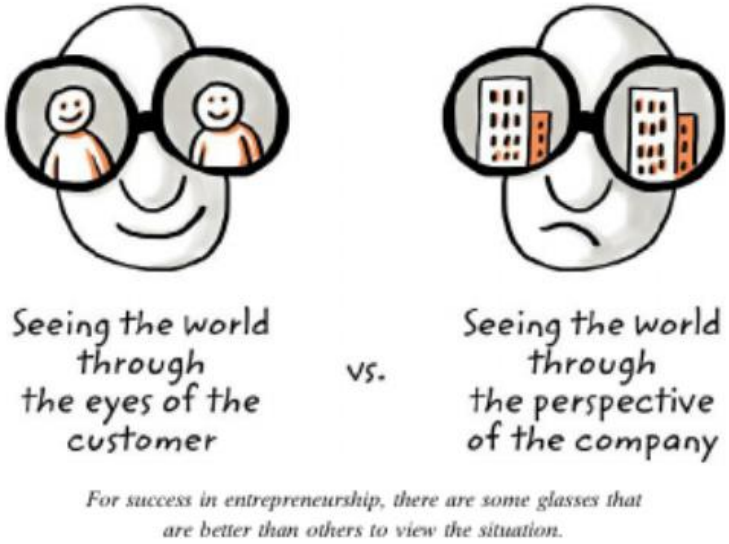


Figure 11. From the book "Disciplined Entrepreneurship: 24 Steps to a Successful Startup" (33).

Furthermore, he [Aulet] elaborates on how important it is to identify potential industries and hereby potential users for your product. He gives an example of improving education with technology, and how necessary it is to reflect upon what kind end user one might have (ibid.). It could be teachers, administrators, parents, and students which all could be potential end users with different approaches and interpretations of the technology. In addition to this, the book also addresses considerations in regard to the flexibility of a technology where one has to imagine, while investigating the different possibilities of the technology across industries, how relevant social groups might become affected by the technology and how they would choose to use it (33). Needless to say, this section of the book is not dominant but only a small portion of the entire book despite several chapters describing the importance of end users and how to specify an end user etc. From a SCOT perspective, this smaller section is targeting an interpretive flexibility, reflections, and broad-spectrum about different relevant social groups and other socio-technical factors which we have not observed while researching for literature online (29).

A strategic research methodology

The method to employ does sometimes depend upon the nature of the research problem. Sometimes researchers within social science becomes more interested in discovering insights and interpretations rather than testing their hypothesis. Although our project is not testing a specific hypothesis, we are still interested in understanding the world of successful start-ups and investments and gaining an insight into a field that seems not have many specific guidelines on building a successful start-up, but rather depends on subjective viewpoints and experience. This is why we believe it to be a strategic

methodology within the field of case studies. According to Robert Yin, a case study can be translated into an event or an entity of analysis where a phenomenon is being investigated within a real life context by using multiple sources (35). In this project we have used interviews, podcasts, articles, and online books as our research sources for investigating the phenomenon of successful start-ups and investments. We are interested in the contextual realities that goes into building a successful start-up and investing in one (ibid.). Flyvbjerg might argue that our project would be a paradigmatic case due to the fact that we are investigating a phenomenon with the purpose of establishing a domain within the world of successful start-ups and investments (36). When investigating a paradigmatic case, the focus is to find a common denominator within the field you are studying although this kind of case exceeds all forms of rule-based criteria. In addition to this, it is also arguable if the case study we are investigating is critical since we are trying to gather information that permits logical deductions of the cases we have chosen, and to determine general characteristics within successful start-ups (ibid.). However, a critical case is also difficult to answer and investigate since no universal methodology principles are available which means that experience is the key word for successfully labelling what a critical case is (ibid.). According to Flyvbjerg, it is possible for a case to be both paradigmatic and critical because it depends on how you interpret all the different data you obtain, and different perspectives and conclusions increases based on the information you are given (ibid.).

When reading about our chosen start-ups, we are interested with how and why they became successful. According to Robert Yin, case studies are not intended to be studied by looking at the entire organization, but rather focusing on a particular issue or unit of analysis (35). This allows us to create an area of interest and research for data with the purpose of going in-depth to understand what criteria and considerations that goes into building a successful start-up (ibid.). In the article "Case Study: A Strategic research Methodology", Robert Yin highlights different types of case studies such as the exploratory research which "(*…) can be useful for example study processes in companies."* (ibid.). We find our case study of the chosen start-ups to be exploratory since we are trying to understand the processes that goes into building a successful start-up and why investors want to invest in these. By defining our case study as both paradigmatic and critical, our aim is to define general characteristics and establishing a school of domain within the contextual realities of successful start-ups and investments. The phenomenon of interest becomes more directly when using participatory observation. Here, the researcher is related to a specific setting or environment in which the specific activities takes place. By using participatory observation, we generate an insight and understand on the phenomenon being studied (37).

Methodology

To gather information about what important and essential criteria there are for developing a successful start-up and investment, we applied quantitative methods such as searching online for literature or studies that would give us an understand into this field. We read articles, online books, heard podcasts and other informative literature we could find online. We also used qualitative methods in the shape of interviews to obtain a deeper understanding of an actual start-up development and what its strategy and process were towards a successful status. According to the different roles listed in the text by Broberg and Hermund, we viewed ourselves as being dialogue researchers since we performed some kind of observational work and gathered user experiences based on viewpoints from entrepreneurs (29). Our data was a result of listening to podcasts, reading articles and books while also doing interviews. The outcome of acting as dialogue researchers allows us to systematize and translate covered and uncovered areas or practices based on the knowledge we have gained through literature and interviews. We will be able to present an overview on what the literature and interviews states when investigating what a successful start-up and investment is, but more so find the unknown and unexplained elements that might give more value in product development and user understanding (ibid.). However, despite our aim to maintain objective on this matter and trying to describe what the literature and interviews said about successfulness, it is questionable whether or not it is possible to maintain objective. Then the reflections are if it is even imaginable to be objective when we obtain knowledge? Tommaso Venturini mentions, in this book "What is second-degree objectivity and how could it be represented?", the term 'second-degree objectivity' which came from Bruno Latour (38). Such term stems from finding diverse viewpoints that holds some kind of impartiality caused by exploring different partial biases (ibid.). According to Venturini, the best way to gather experiences is to deploy as many subjective perspectives as possible, and in continuation of Venturini, Becker claims that it is not possible for scholars to obtain and perform uncontaminated research although the question is not if we do take sides, but which side (39). As previously mentioned, our initial goal was to describe the criteria for success based on relevant literature, books, and interviews. But one might ask if we already saw flaws or holes within the world of investments and start-ups of evaluating innovative technologies based on the knowledge and skills we have obtained through our education. We began to wonder if we were biased because we allowed ourselves to give credence to the perspective of factors that did not go in-depth with what we thought was missing such as relevant social groups, the interpretive flexibility of the technology etc. Becker mentions that the 'minority', being the above factors that we felt was missing, should have just as much credence as the essential factors for success explained by investors and entrepreneurs which is what we did.

During our data collection, we applied ethnographic methods in the shape of participant observation. The dual purpose of participant observation is to engage in activities accordingly to a situation and to observe activities, people, and other aspects of a situation (37). By being a participant observer, the ethnographer is able to increase his or her awareness to widen observational focus which possibly could lead to important data, to raise their level of attention, and to tune in and out of situations (ibid.). In the text "Participant Observation" by Spradley, he elaborates on the type of nonparticipation. Since we have not experienced or participated in any activity, we view ourselves as nonpartisans because we avoided involvement (ibid.). One might say that we looked from the outside through a computer screen into the world of start-ups and investments by reading literature and listening to podcasts because there was not any specific activity or situation that we could observe (ibid.). However, despite not being able to participate more directly, other opportunities for observation were still available. By observing while reading or listening, different features or general characteristics became clearer to us which we will argue also is some kind of observation.

Interview guide

In the process of choosing our informants, it was important to incorporate an entrepreneur from a successful start-up that would be easy to get in contact with – which is why we chose two Danish start-ups. We considered the CEO of Lithium Balance to be an expert within this field based on his success with transforming the start-up into a company that develops and delivers lithium battery packages and components to different big companies such as Ford in China and ABB. However, in terms of getting access to specific data or information about the company, it turned out to be a bit difficult since the field of start-ups and investments are bound to a lot of confidentiality agreements. In our interview with the CEO, we had asked whether or not he would be able to provide us with specific documents or other relevant data in order for us to obtain a better insight to their company and processes. However, this was not something he was able to disclosure due to several confidentiality agreements with investors and other relevant actors involved which is why our access to data regarding the company has been limited to what we were able to find online.

Another way in which we have been limited is that our interview with Rob Krassowski, Director of Product Management at Dixa, came very late in the process of this thesis. We had several times, over the past few months, tried to get in contact with different people from Dixa such as Mads Fosselius, CEO of Dixa, and other, but without luck. However, despite getting in contact with Dixa a bit later, than what we would have wanted, an interview was performed which gave us a deeper insight to the company. Although it is necessary to point out that we still experienced the same limited access to

relevant documents due to confidentiality agreements. Nevertheless, our informant from Dixa has previously co-founded developments of technological and innovative start-up companies in areas such as MedTech. In 2020, Krassowski became a part of team where he helped other brands in building stronger bonds with their customers. Today Dixa enables agents to help customers faster and to give value to their conversations resulting in better overall customer experience which is performed across e-mail, phone, chat and messaging in real-time.

Empirical field

Our empirical data has been collected during the lockdown caused by the covid-19 pandemic. The data reflects online books such as the one by Aulet, articles by investors, webpages by business angels, YouTube videos of serial investors, and interviews based our chosen our start-up cases about innovative technological skills and performance. Due to the lockdown causing a difficulty of getting in contact with informants, we narrowed our empirical field to ensure specific and in-depth data. Since no specific methodology exists when developing a successful start-up, we took the liberty to search the internet for answers and guidelines. Our search online has given us an insight to both the entrepreneur's and the investor's point of view by reading on webpages such as Keystones.com, Tvede-Faurholt.com, and thedailymba.com which are all addressing the process of developing a successful start-up. On YouTube we found a serial investor, Bill T. Gross, co-founder of Idealab, which had conducted his own research about the criteria for successful start-ups. His research showed that there were 5 essential factors, one of them being 'timing', that had a huge impact on whether or not a start-up would survive. Despite the internet giving us a lot of data, we were still interested in doing interviews with Danish innovative and technological start-ups that had got to be successful. It would allow us to obtain an in-depth understanding and knowledge about how their company had got to be successful, and to see if we could find similarities to what we had found on the internet.

Semi-structured interview

As our problem statement implies, a qualitative research method was key to conduct relevant and in-depth data regarding successful start-ups and investments for our thesis. Based on the hermeneutic framework of understanding, semi-structured interviews was chosen as it would allow us to obtain more specific and in-depth details and answers with the opportunity to elaborate on topics relevant to the interview (40). By using a qualitative research method, we were able to strive for descriptions that would enable us to understand the processes to develop a successful start-up and the reflections behind the technology in terms of flexibility, stabilization, and closure. It was important to obtain an increased insight into our informants' knowledge in order to allow ourselves to grasp their point of view (41). When we prepared the interviews, we were inspired by ethnography, and by Spradley and

his structure for creating a semi-structured interview (42). By asking Grand-tour and Mini-tour questions it would allow us to ask descriptive questions in order to highlight the narratives of our informants. Our intent was to encourage the informants to speak on their cultural scene but still giving them the time to reflect upon their answers so they would be based on their lifeworld and the spoken language used (ibid.) By using Grand-tour questions such as *"can you describe the reason for using batteries instead of oil?"* would allow the informant to speak upon his/her experiences, but also giving the informant the possibility of elaborating more about the subject without interruption. By asking questions that were not intended for short answers, we would be invited into the knowledge and insight of our informant (ibid.). In addition to this, Mini-tour questions would allow the informant to explain a fraction of the experience that was based on the Grand-tour question such as *"what considerations do you have in terms of the products flexibility in relation to other industries?".* The semi-structured interviews were conducted virtually through Microsoft Teams guided by an interviewer while letting the interviewee elaborate freely during the interview. The purpose was to convey their experiences and point of view which had follow-up questions (ibid.). When conducting interviews like this, the interviewer becomes involved in the process which opens up for interpretation between the interviewer and interviewee (43).

Transcription

We chose to transcribe our interview because it was important to use the exact language that our informant was using. However, transcribing the correct terminology can affect how it is read, meaning the possibility of creating an artificial translation (41). Our informant is a CEO in a start-up company, and he used different terms that are common in the start-up and investment world which is why it was important to document these in writing. We wanted to ensure that his knowledge and points were clear to the reader. This would also allow us to obtain a better understanding of how he viewed the company and its journey through the past 16 years in a now very competitive industry where the focus is on substituting fossil fuels for lithium-ion batteries. However, Kvale & Brinkmann discusses whether or not a transcription might be disturbing the ongoing conversation, and that it will become frozen because the words assume a firmness that is not intended while interviewing someone (ibid.). Nevertheless, we chose to do it anyway since it was important to get our informant's correct terminology in order to meaning condensate his answers with the focus of doing a SCOT analysis.

Meaning condensation

To obtain an overview of our transcribed interview, we read the transcription several times. We wanted to divide our informant's answers into sections that related to our SCOT analysis. We were

interested in finding the elaborations that said something about the technology's interpretive flexibility, stability, and closure. We were also on the lookout for answers that explained the purpose, technique, and functionalities of lithium batteries which would allow us to get a deeper understanding of the technology itself. Nevertheless, the questions we had asked helped us in trying to find the answers we were looking for which allowed us to break down the interview into smaller pieces and hereby discuss under which section of the upcoming SCOT analysis it belonged to. We wrote bullet points under the headlines of the analysis we had structured with references to the interview and quotations (44).

Chapter 4: Analysis

In this section, we will use SCOT primarily, and CTA as s supplement, to analyze our empirical data which consists of interviews and other relevant literature gathered as data. The aim of this analysis is to describe the considerations behind innovative technology such as flexibility and stability of a technology, relevant social groups in the process of creating technology, and the socio-cultural situation within the technological frame. In this analysis we have chosen two cases, Lithium Balance and Dixa, as our primary focus.

We will begin by analyzing the interview of Lars Barkler, CEO of Lithium Balance, which will give the reader an understanding into the interpretive flexibility that lithium batteries have had based on different relevant social groups. In addition to this, we will highlight different sources in relation to Lithium Balance such as investors, clients etc. An explanation regarding the technology's stability and closure will come afterwards where the reader will get an understanding into the controversies among relevant social groups in relation to lithium batteries. Finally, an analysis regarding the technological frame and the socio-cultural situation will allow the reader to understand the cultural scene and considerations about lithium batteries when the company, Lithium Balance, began its journey as well as its evolvement through the years. Nevertheless, the evolution of acceptance of lithium batteries as substitutes to fossil fuels. We will then analyze the interview with Rob Krassowski, Director of Product Management at Dixa, while using existing podcasts and articles in which relates to interviews with both Mads Fosselius, CEO at Dixa, and their investor, Preben Damgaard. We will then identify the different stakeholders in order to discover what meanings lies behind the relevant social groups and what their interpretations are of the platform. Lastly, we will look at how these meanings are influenced and changed through different closure mechanisms.

Merge of relations between different elements

As mentioned above, we are interested in understanding the relevant social groups and other elements that contributes to the flexibility, stability, and closure of a technology (22). Nevertheless, are we interested in investigating the socio-cultural setting in relation to the usage of lithium batteries, and to understand the elements that influences the social field (27).

Figure 12 is a visualization of the socio-cultural setting based on the interview with the CEO from Lithium Balance. It illustrates the different elements involved in both the company and the lithium batteries itself. By looking at the mind map, the reader gets an opportunity to understand the different relevant social groups as well as other elements involved in the company's journey towards acknowledgement and success. However, the mind map also lets the reader get an insight to elements that has had consequences for Lithium Balance as a company, and also does the illustration visualize other relevant social groups that has been a part of controversies regarding the usage of lithium batteries instead of fossil fuels.

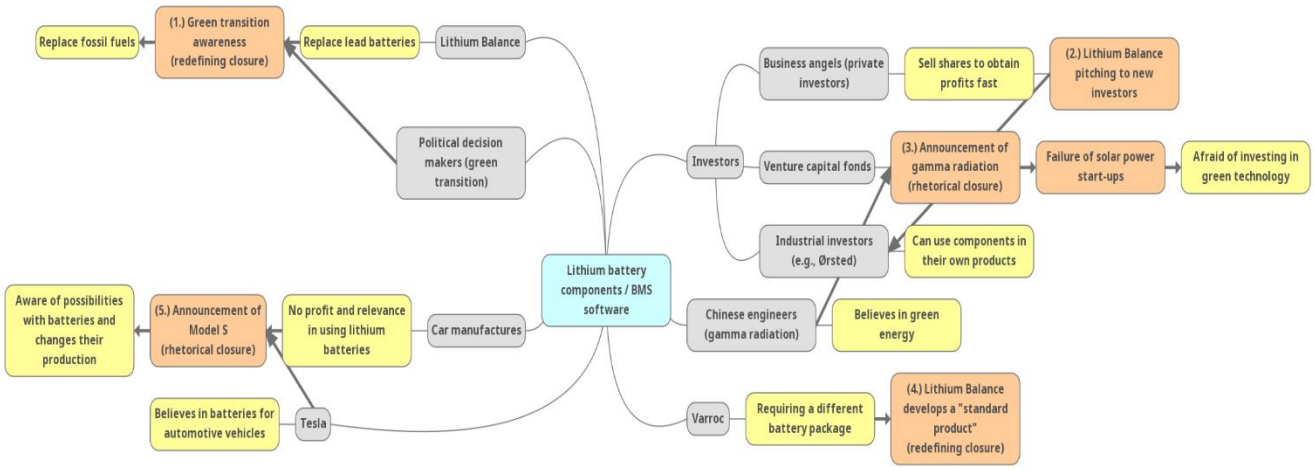


Figure 12. Visualization of the socio-cultural setting involved in Lithium Balance and lithium batteries (appendix).

As the visualization illustrates, several elements are involved in the usage of lithium batteries. When making the mind map, we split the company, Lithium Balance, and the batteries into two entities because different elements were related to the two. The elements within the socio-cultural setting have had different effects on the company, and through the interview with Barkler it became clear that all of the elements correlated with one another which was highlighted in the interview. In fact, solar power and the Chinese breakthrough with gamma radiation as well as Tesla's 'Model S' announcement would have a huge impact for the company in its early stages but also later on.

Lithium Balance

When investigating the flexibility of lithium batteries, one is not only looking at how the relevant social groups has been a part of constructing the technology based on different interpretations, but also looking at how the technology has taken shape. Needless to say, the importance of looking at how the stability and closure of a technology has changed based on the relevant social groups while trying to frame the technology in relation to the cultural scene. In addition to this, we will also look at the technology from a CTA perspective and the conception of a technology with the focus on the elements in figure 9.

The original idea with lithium batteries was actually not intended for moving towards green energy, but more so substitute lead batteries since lithium had a better performance and other factors that made this kind of battery more favorable than lead.

"When lithium batteries were introduced, it was to replace lead batteries (…)." (Barkler, interview)

"We were even not supposed to change whether or not people used batteries, but our company was only supposed to help the ones who were using lead batteries in getting a better solution such as using lithium batteries." (Barkler, interview)

In a podcast, Barkler explains why lithium batteries are so favorable than lead batteries due to several factors that enhances the performance of the product when using lithium batteries (17).

"The most important thing is that you have the same amount and volume, but with lithium batteries you will get 4 times the amount of energy". (Barkler, interview)

"There most important factor when using lithium batteries is performance, but there are also many other advantages; a larger memory effect – when using an old mobile phone, you would always have to recharge completely and then let it die or else you would lose capacity which the lithium battery does not do. It is also less sensitive to temperature, e.g., in forklifts in a cold environment. It is also more environmentally friendly. The main reason for people to focus on lithium is its flexible functions that other batteries does not have." (Barkler, interview)

When looking at these statements from a SCOT perspective, it is clear, when looking back, that the intention was not to use lithium batteries as we know it today, but more so to use them for other

purposes which indicates that the intention of the technology was completely different than it is today. We believe this to be the first redefining closure (figure 12, pt.1) happening when the concerns of replacing lead batteries with lithium batteries changed to be an awareness of green energy and CO_2. In other words, this creates a technological frame based on environmental conditions (figure 10) and we hereby analyze the interpretations of the technology as being once unstable and one-sided, meaning the intentions of the technology was only focused on one thing, when the focus was on lead batteries. However, one might say that the interpretation of lithium batteries stabilized a bit when the focus on green transition occurred. In relation to this, and from a CTA perspective, we also believe this to be technological frame where we get to understand the technological change and functionality based on local settings and environmental conditions (figure 10). This is related to the demand of improving performance in certain areas and industries that used batteries at the time, but nevertheless, we also see a focus on the worldly conditions in terms of pollution and damage to our nature which obviously has long-term effects on our living conditions.

In a podcast and in our interview, he further mentions different examples on why electromechanical products such as electric cars are more comfortable driving than the ones using fossil fuels, and why batteries also eliminate the possibilities of getting exposed to exhaust fumes when using forklifts inside buildings (17).

The electric car is actually more comfortable because it only drives when you hit the accelerator pedal. There is no engine running which means that it is easier and more comfortable when driving because you do not have to stop and start or press other pedals when driving." (Barkler, interview)

"Lithium Balance actually started focusing on the advantages of using batteries with the aim of reducing CO_2 before there was any focus (…) An example could be when using forklifts that drives around inside. If the forklifts are driving on gas or gasoline, you would become exposed to exhaust fumes which are toxic to people that are inside the building. This why these types of automotive technologies have always driven on batteries because they only drive short routes." (Barkler, interview)

From at CTA perspective, the technology also provides some kind of knowledge in relation to toxicity and why it is important to reduce exhaust fumes in closed areas where people are working because it can affect our health. However, one might say that the technology itself only became stable in a certain way since lithium batteries were a relative new technology. In addition to this, the batteries

were expensive which is why the market was small, and according to Barkler, only 5 companies in the world were making components to lithium battery packages at the time.

"We were only 5 companies in the world making this type of product which meant that we did not need to do any marketing because companies came to us if they needed anything. But there were not many customers since the market was not big. Lithium was still very expensive so typically we saw other start-ups having problems they needed to be fixed, but the big companies only came later on when they got interested in lithium batteries." (Barkler, interview)

With the upcoming focus on the disadvantages of fossil fuels worldwide, and the attention on CO_2, car manufactures were producing prototypes of electric cars and testing them to show the politicians that something had to change within this field. However, the intention was never to actually produce electric cars. In a podcast, Barkler elaborates on their concern about developing lithium battery packages or components for electric cars and trying to get investors and customers knowing that the cars would never go into production (17).

"There were a lot of tests to show the politicians that something had to be done in relation to CO_2, but the intention was never to produce cars. This meant that we could have used all of our time to convince customers or investors to buy into this industry knowing that the cars would never go into production, and we would never be able to sell our components." (Barkler, interview)

Another concern was that Lithium Balance was a relatively small company at the time, and larger companies were not trusting smaller companies to be their supplier to a product they might have worked on for several years.

"(…) big companies had a hard time buying supplies from smaller companies (…). They wanted to make sure that they could get components all the time, and that their supplier could resists a 'recall' which means that if there was an error on a component, the supplier would be able to repair or substitute the component quickly." (Barkler, interview)

According to Barkler, a 'recall' would destroy their company which is why they chose a strategy where they would target a specific type of investors, e.g., industrial investors that were already using batteries in their products. By seeking industrial investors, Lithium Balance would have an opportunity to scale in size as well as in seniority because they would get acknowledged investors onboard (17).

One might think that this strategy of choosing to seek industrial investors was a way of being flexible with the organization of Lithium Balance. Despite not being able to get certain investors onboard, the company had to have flexible reflections in terms of what their next move was in order for them to move forward, and to come closer to what their initial goal was. Nevertheless, he further explains in a podcast that the company had had investments from business angels, but they were only interested in getting profit within a couple of years and hereby sell their shares which meant that Barkler had to go pitch his ideas to more than 300 companies (figure 12, pt. 2) (17). However, in the interview he addresses the difficulties of getting investors since many of them did not believe or dared to invest in green energy due to previous controversies, hence the Chinese development of gamma radiation for solar power (figure 12, pt. 3).

"I made a conscious and very early decision to target a segment where our size and components matched which is why we chose to target the industry segment first." (Barkler, interview)

"These business angels have always had one goal which was to sell their stocks within a timespan of 2-3 years which means that most of my time have gone by pitching to different investors to see if some of them wanted to buy those stocks. But that is completely unrealistic due to the fact that we are a start-up (…) It resulted in us finding industrial investors that could see themselves using or selling our products in their own businesses." (Barkler, interview)

"Many of the investors had put a nail in the coffin on different technologies within the solar power industry because the Chinese suddenly came with gamma radiation. It reduced the prize completely which resulted in a lot companies going bankrupt all over Europe and the States (…) A lot of investors then pulled away from green energy." (Barkler, interview)

Another thing he faced when pitching to several investors was that they [investors] were only interested in the company if there was a market for their product, the efficiency of the technology, or competition advantages such as patents, the team behind etc. He also mentioned that a lot of investors were impatient with the long timeline of the company's economic growth which meant that they needed an investor that, nonetheless, believed in their product but also had the patience to wait for any economic gain. In a statement for Gronfond.dk, Barkler elaborates on the importance of getting Danmarks Grønne Investeringsfond onboard (45).

"[Danmarks Grønne Investeringsfond] has the will and competencies to understand the technology and our business model, and hereby evaluate our long-term potential. The development of our BMS technology is expensive, and there is no quick profit to gain which is why we needed a patient financial partner." (45).

However, despite getting investors, he further explains that his predictions from years ago about using batteries were just as valid today as back when he pitched them the first time despite none of the investors, at the time, believed in batteries enough to invest. One might think that being a pioneer is a good thing, but Barkler states *"You cannot say that being first is the same thing as being successful".*

Since Lithium Balance would not dare to start producing components for electric cars due to a possible insecure future for the company, and the fact that venture investor fonds was not focusing on batteries because of the controversy with solar power, one might say that this was the first rhetorical closure for the company based on how the different relevant social groups constructed their interpretation of the technology. Despite Lithium Balance believing that lithium batteries would perform well in cars, the interests from the automotive industry was not there which is why the company had to seek an alternative strategy in order to stabilize their product and survival.
An example of a technological stabilization strategy was to get certified in a specific standard protocol which created more awareness and acknowledgement.

"One of our most important things were to get certified in an ISO Standard 26262. It is called "Functional safety in road vehicles". It is a safety standard for vehicles which apply to all vehicles, not only cars. It is relatively new and difficult to fulfil." (Barkler, interview)

One might say that their strategic choice of getting certified was a part of stabilizing their product and outside appearance to both customers and investors. In addition to this, the company also shows a flexibility in terms of what path to take towards their goal despite not being able to use this certification right away. One might say that this kind of flexibility in terms of changing strategies while still keeping the goal of becoming a part of the automotive industry at eyesight, is a flexibility within the organizational structure. He then further elaborates on why they made this choice of getting certified in the ISO Standard 26262 and the considerations behind it.

"There is a danger when using batteries. They can start to burn which means that there is a risk of killing people so that is why we wanted to obtain this certification in order to avoid errors." (Barkler, interview)

"I should be able to sleep at night knowing that there is 1 million people driving around in vehicles controlled by my system which decides if a battery goes into flames or not." (Barkler, interview)

Nevertheless, the company saw the benefits it had brought by getting certified because more customers and big investors were turning to them for their products. According to Barkler, they experienced the doors open to a greater network of investors because of their strategic choices. This led to Sensata Technologies buying 75% of Lithium Balance in 2021 despite already owning 25% of the company. The company is a big American industrial enterprise which, among other things, delivers sensors and sensor-based solutions to a wide range of industries, e.g., car manufactures (7). In an interview with Energy Supply, Barkler talks about the importance of getting Sensata Technologies as an investor because this would allow them to obtain a certain status towards e.g., the automotive industry which was one of their future goals, *"We now become one of the big guys with Sensata as an owner which is essential if you want to move towards the big car manufactures"*. (18). Not only was the fusion with Sensata Technologies a win for Lithium Balance, but according to Nicholas Moelders, Vice President at Sensata Technologies, this was also a win for them (18).

"We are very excited about the team, the BMS technology as well as the pipeline of products and business that Lithium Balance takes along with them to Sensata. It will be a strong expansion of our team and business, and will help our growth within electrification, and accelerate our strategy for green energy." (18)

However, by making choices and choosing certain strategies follows the rejection of others. In our interview with Barkler, he elaborates on making choices in relation to the algorithms they use for their control systems.

"*We have always based our algorithms on the simpler methods (…) It is a de-selection of the more advanced methods because it would demand a bigger production process which costs a lot more and would result in our product becoming more expensive. We have often chosen a simpler way because it is cheaper and because we know how to make it work. It is also a segment where we see competition."* (Barkler, interview)

Despite having to reject using an advanced method for their algorithms, another example to stabilize the technology was when Lithium Balance came into business with Varroc. The company is Indian-based and produces components for cars and supply exterior lighting systems among other things. According to Arjun Jain, President of Electrical & Electronics at Varroc, their goal has been to elevate their status towards being a component supplier for electric cars which the collaboration with Lithium Balance made possible (46).

"Varroc's direction is to drive growth by leveraging sustainable automotive trends like the desire to be greener, safer, smarter and connected. Today at Varroc, we supply almost the entire electrical-electronic system for IC Engine. We aim to do the same for the electric vehicle. Our collaboration with Lithium Balance is another step in this direction" (46).

During the process of discussing which components to use and why, Varroc made specific demands to the components and battery packages that Lithium Balance were supposed to produce which changed the way the company develops their lithium battery packages.

"We had a battery system in which they had tested and liked because they could see how well it performed. However, they had some requirements to costs and other demands to the product which they wanted to be more flexible. They wanted a product where one could gather more battery packages together parallelly which we did not support. This meant that we had to develop something completely new." (Barkler, interview)

"(…) they also wanted to gather components that normally was not part of a constellation which was a new thing for us." (Barkler, interview)

In the interview, Barkler explains how this product designed specifically for Varroc created the possibility of creating a new battery package in which we would say is a redefining moment of closure for their product (figure 12, pt. 4). He explains that parallel to developing this specific design for Varroc, they invented a "standard product" which had more features than the previous one. This meant that their product would be more flexible in terms of customer needs. However, the company had some challenges with developing the product for Varroc because they suddenly needed more staff and time to create a system that had to meet the criteria within the ISO Standard 26262. The difficulty was then to use a different platform for the battery management system because it

contained more battery cells than Lithium Balance was used to, although the company had decided to pursue this platform for future development. Barkler and his team could see that this high voltage project was going to costs them more money and time which is why they chose another strategy.

"(…) we had a bit of a conflict because we had a timeline and a team that had built this high voltage battery management system and a new platform which we wanted to base our future development on. However, by using these we would be having problems in terms of costs and production time." (Barkler, interview)

A way to ensure making the deadline, Lithium Balance chose to create an alternative voltage project that was similar to the intended high voltage one although this was not what the customer had in mind going into business with them.

"Alternatively, we chose to do another voltage project that was similar to the one we had already developed and wanted to base our future on. We would not have made it in time if we have gone with the high voltage battery management system project, and the project itself would have costs a lot more than what our client had agreed to." (Barkler, interview)

Despite having customers and making a name for themselves in the world, the company still had an eye towards the automotive industry. Barkler had foreseen for many years that batteries could be a great substitution for fossil fuels, but the industry was not yet ready to take on that challenge. As mentioned previously, he had pitched to more than 300 investors about batteries being the savior of our planet but still they were not interested. In a podcast, he mentions going to the States to visit Tesla back when the company was working from a garage and Elon Musk was not even a part of it yet (17). The second rhetorical closure for Lithium Balance came when Tesla introduced the world to their 'Model S' (figure 12, pt. 5).

"Tesla has singlehandedly made electric cars acceptable. It happened when he [Elon Mush] introduced the Model S. The whole industry knew that it was coming, but the car manufactures did not really think that it would become successful. They [car manufactures] did not even want to use their time to produce something similar, but when he [Elon Musk] introduced the Model S it got 6 stars and took over 30% of all luxury car sales in Denmark in one month." (Barkler, interview)

In the Wall Street Journal, car enthusiast and journalist, Dan Neil, wrote about his experience and thoughts about the car in which he seemed to be just as surprised as the industry but also very satisfied with the new launch; *"And here we now are, looking at the Model S, which, if everything works as advertised (…) would rank among the world's best cars."* (47). In addition to this, Barkler further elaborates on how this announcement of Tesla's Model S chook the entire industry, and states that suddenly car manufactures had to change everything and turn their products into electric cars despite not acknowledging using batteries in their cars. He mentions VW in the interview, and that they admitted being far behind in their process in developing electric cars. However, VW had not issued a statement that they will only focus on creating electric cars in the future. According to Barkler, this acknowledgement would never had happened if it was not for Tesla. The reason we believe this to be the second rhetorical closure is because not only did the automotive industry get involved in lithium batteries, but the investors started to believe and dare again to invest in green energy. This meant that Lithium Balance could now upscale their company by getting more investors, and by having bigger investments behind them, the company would now be viewed upon as more likely to survive a 'recall'. In the interview, Barkler mentions how Tesla got the prize on lithium batteries to shrink by announcing in 2017 that they would build a giga factory in Nevada that would produce all of their batteries, *"That one factory doubled the worlds production of lithium-ion batteries.".*

At that time the prize for lithium batteries was at a $400-500 pr. kg. watt. The American energy authority had estimated that the lowest prize they could image within the next years would be around $250 pr. kg. watt, but Elon Musk did not agree. He suddenly came and said that he could do it for $150 pr. kg. watt which started the whole boom of producing lithium batteries for electric cars, and that new developments of giga factories where being announced almost every moth.

> *"Now we are headed towards $50 pr. kg. watt which opens the market in which people see more opportunities with batteries in different industries. At the moment we are talking about energy storing to all windmill, solar power systems, battery driven ferries etc."* (Barkler, interview)

A summation

Based on statements from Lars Barkler, it seems clear that different relevant social groups have been a part of constructing the interpretive flexibility, stability, and closure of lithium batteries. To sum up the analysis, we started by analyzing how the technology came about and the purpose. As mentioned previously, the whole purpose of the technology was to replace lead batteries because lithium had a better performance and survival time as well as being unsensitive to temperature (17). At this time,

we think of the technology as being unstable because it is limited in its interpretation and flexibility. We also learn about lithium batteries based on the technique and knowledge behind, hereby the functionality, the hardware and software as well as other resources in order to understand why lithium batteries are more favorable than others. We get an understanding of the battery management system (BMS) that ensures the function of the batteries which is just as important as the batteries themselves. We learn about car manufactures producing prototypes of electric cars despite no intention from the automotive industry of actually producing electric cars. This move is only intended as a wake-up call for politicians in terms of green energy awareness which we believe to be the first closure by redefinition for lithium batteries because the interpretation of the technology changes from not just being a replacement of lead batteries, but suddenly a resource for moving towards a green transition. In this case, the car manufactures are seen as a relevant social group because of how they interpreted the usage of batteries. They have a say in the actual construction of using batteries in cars, but they are also constructing how lithium batteries are being interpreted in their industry. The cars manufactures' meanings towards using lithium batteries are based on the disbelieve in profit and relevance. This creates a thought process for Lithium Balance in terms of whether or not they should begin to produce components for electric cars despite knowing the possibility of not being able to sell their products because no market is available at the time (17). Another concern the company had was how they would become respected as a component supplier despite their size. However, with an investment from Sensate Technologies an opportunity is created for Lithium Balance to become one of the big guys in the field which opens different possibilities of future collaborations. But keeping in mind that Sensata Technologies first enters the scene in 2020-2021.

In addition to the above, the company experienced a lot of difficulty in getting investors, who previously had invested in green energy start-ups, since a lot of them loss of a lot of money during the gamma radiation announcement from China. We believe this to be a socio-cultural situation that created a technological frame in how lithium batteries were going to be interpreted. We also believe the Chinese gamma radiation to be a certain relevant social group, within this technological frame, because they constructed the way investors interpreted green energy which unfortunately affected Lithium Balance in how they got investors in the future. One might say that the investors, who had jointed these green energy start-ups who failed due to the gamma radiation announcement, started out believing in green technology and then became non-users or doubtful because of the different failures within this field, and the chain reaction of failures it created when China came with a better and cheaper solution for solar power.

Another issue Lithium Balance had was that their business angels wanted to sell their shares after only a few years with the purpose of gaining some profit which meant that Barkler had to go and pitch to several investors in order to sell their [business angels] shares. This was the first rhetorical closure the company experienced because it was so difficult in finding the right kind of investors, and due to the fact that most of them did not dare to invest their money in another green energy company. In a podcast, Barkler elaborates on having to change strategy and move towards the industrial investors because they would be able to use the components in their own companies (17).

In order to create some sort of stability, the company wanted to get certified in an ISO Standard which allowed them to obtain a specific certification of safety in vehicles which would create opportunities for getting bigger investors onboard. Another technological stability was when they chose to use a simpler algorithm method than an advanced one which only happened because they saw an advantage and because they had the knowledge and skills to make it work just as well as if they had used an advanced one. The second closure of redefinition came when Lithium Balance made a deal with Varroc. The company wanted a specific design in how their battery package should look and what it should contain which was a completely new constellation for Lithium Balance. The redefining moment of closure came when Lithium Balance tried to solve a problem with the battery package requirements from Varroc which resulted in the creation of a new setup of components in how they produced their battery packages. In this case, Varroc was the relevant social group that interpreted the technology differently which made Lithium Balance redefine how they should produce battery packages in order to reach more customers. They [Lithium Balance] experienced by creating a 'standard product' with more features and components, they would be able to make their battery packages more flexible to different customers. However, they also experienced challenges in terms of not being able to develop the exact battery package the customer had ordered due to fact of not reaching deadline and further costs. Nevertheless, the second rhetorical closure for Lithium Balance came when Tesla announced their 'Model S'. This car rocked the entire automotive industry which meant that all the car manufactures that, up to this date, had rejected the thought of even producing electric cars suddenly stopped all of their productions in order to keep up with the new and innovative solution for cars. Not only did this affect the automotive industry, it also affected and changed the way other industries look at lithium batteries including big venture fund investors. Tesla had opened a magic door in which Lithium Balance now saw an opportunity. Here we think of Tesla as being a relevant social group because of how they influenced another relevant social group, being the investors, that had discarded batteries in cars and in general, but made them believe in the product because of the exposure and attention their Model S suddenly got.

Another technological start-up that thought outside the box was Dixa. Their innovative way of thinking about customer communication service created a whole new platform for future communication.

Dixa

As mentioned in chapter 3 of the theory and methods, a SCOT analysis must first identify the different relevant social groups that has meanings towards the technology (22). This is done in this section while the three following sections will unfold the closure strategies happening between the identified groups. We will also identify the following stabilization that can happen when closures happen. Lastly, we will identify the first four constituting components in figure 9 from CTA, in the two first sections appropriately, as we go through the different closure mechanisms found.

Dixa has been shaped by different relevant social groups, and by looking at these we find the multidirectional history of development. The groups that surround the technology and the interpretive flexibility and conflicts of the technology that each group possess. This will be unfolded in this section while digging deeper into some of the social mechanisms of the software build in Dixa.

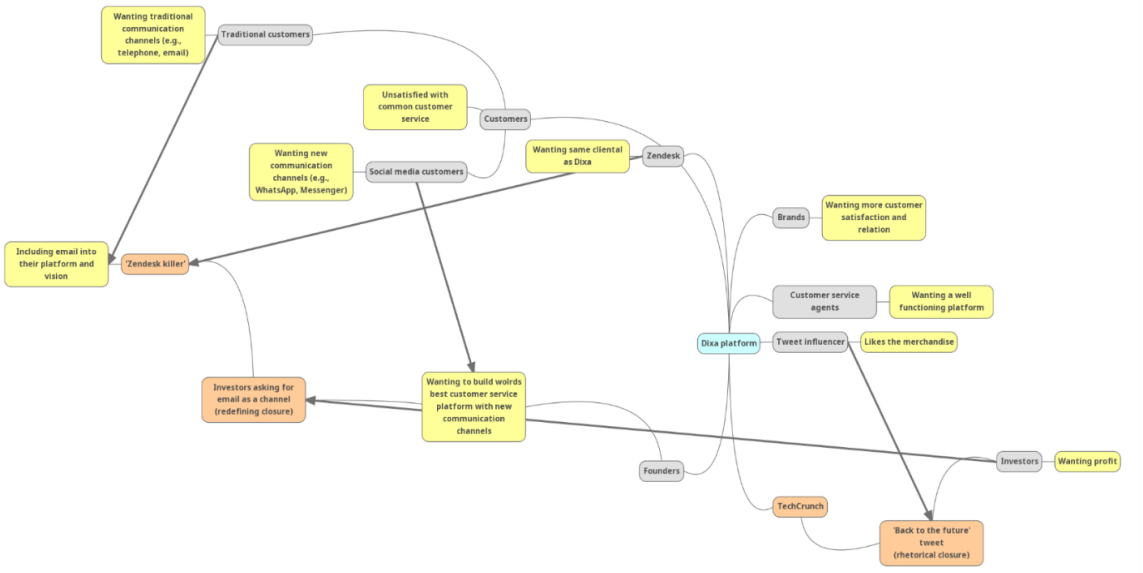


Figure 13. Visualization of the socio-cultural setting between Dixa and their customer service software (appendix).

Figure 13 shows a mapping of the social relevant groups, where we start by the customers being divided into two social groups. The traditional groups, often being people born before the social media era, and the social media customers group that is familiar with using social media. Both of these were found to have experienced dissatisfaction with other customer service software. The set of meanings that the two different customer groups possesses regarding Dixa's software, differ because the social media customers value easily accessible customer service on the platforms they already utilize, while

the traditional customers value the “traditional” design of using outlets like telephone and e-mail. What these two groups have in common is possessing dissatisfaction with customer service. However, these meanings towards customer service are not directed towards Dixa’s technology, but customer service as a whole which could be everything from dissatisfaction towards things that is out of Dixas’ technology range of influence. The dissatisfaction could be about brand responses or level of service within brand policy, but also things that is within Dixas’ technology influence range, like chosen outlets or level of insight in customer cases. What these tree groups [the traditional group, the social media group, and founders of Dixa] have in common with both brands and customer service agents, is that there is a shared dissatisfaction with current customer service platforms and customer-brand relation. This means that old and stable solutions like telephones are no longer satisfying for the customer, and therefore the old model becomes unstable as existing and new-forming social groups destabilizes it and expresses a need for something else. The founders see this destabilization as a gap in the marked and attempts to redesign a new solution by gathering both old and new communicating outlets into one platform, by drawing on their former experiences and knowledge from 3pas and Cirque.

The conflict within Dixa, in the beginning, is that they [founders] keep running out of money before they start getting investors. The investors therefore also play a role in how the technology is shaped as they might not have been a part of the initiating idea behind the technology but a necessity to construct and stabilize it. In relation to figure 9, the idea and purpose of Dixa is to make friendship-like relations between customer and brand through their platform. The product, in relation to figure 9, is the platform itself with its software and inbuild apps. The product’s mission, as we have just identified, should be mirrored in the three remaining categories. One of these categories is technique, which in Dixa is largely the software (for instance the coding behind the platform) that gives ability for the capabilities of the platform mentioned. In a sense, also the hardware that is used to create, maintain, and use the software, this being both customer service agents with headphones, computers, and customers contacting through hardware like phones or computers (ibid.). The knowledge and organization will be dug deeper into in the following section, as we will look at how the capability of the team at Dixa was an important criterion for one of their investors. We will also look at the years of experience in which the team at Dixa had obtained, which will illustrate the knowledge that is incorporated into the technology and start-up.

Building the right team

Dixa started off by its co-founder, Mads Fosselius, trying to sell his idea to Jacob Petersen, the current CTO, because he wanted to build a better platform for customer service and hereby increasing customer relations (19). But to understand the background of where the idea of Dixa started from and

was built upon, the founders' background plays a part in experience and the relevance of building a qualified team (ibid.). Fosselius had been working in the customer service sector as an IT manager since he was nineteen years old, and then ventured into the customer service startup world with the companies, 3pas and later Cirque. Together with Petersen and the Cirque team, they built and sold customer service systems while Petersen was the managing director of development in Cirque and an IT developer (ibid.). So, two of the founders had already had years of experience with IT, customer service, and building and selling businesses. We consider the team at Dixa to be a relevant social group which expanded from two founders to four, and then further grew as new employees was added to the team. In a podcast by "Iværksætterhistorier", Fosselius explains how the founders of the team came to be by him and Petersen taking many walks in the Kings Garden (Kongens have) in Copenhagen, while Fosselius stressing the need for a new way of doing customer service and wanting to build the world's best platform in relation to customer service. He argued that Zendesk thought they had nailed their platform, but he disagreed. He thought the platform did not have enough communication options for users and therefore wanted to combine multiple communication channels into one platform. Fosselius describes how Petersen at last responded to his proposal one day.

"He [Jacob] finally looked at me with excitement and said "You are fucking crazy, but if there is anyone who can pull it off, then it is us. But we will need the world's best frontend developer, so we can make a pretty interface, and the world's best product designer, because there is so much bad customer service software out there" (19).

After the two first founders agreed to build Dixa, they agreed to bring aboard two more founders that should have had experiences as developers. This shows the amount of experience and knowledge, referring to figure 9, the team was built up around. When building a team for a start-up idea, this element helps the founders analyze the customer service market and in finding gaps in which needed disruption. It also brought them investments all in which all together shaped the technology throughout. The team is, in relation to figure 9, the organization in this context. One of Dixa's first investors, Preben Damgaard, a venture capitalist, explains in an interview for Computerworld what he focuses on when investing (48).

"First and foremost, I invest in the team. My very first criteria do not focus on the idea, but what team, that is behind the idea. When the team is evaluated as an entity, looking for the technical competencies and the deep domain knowledge." (48).

What Damgaard refers to here in a CTA perspective is, when looking at figure 9 of the first four constitution components that shapes the technology, is that his first focus is on the team or the organization. He then explains how the idea, here the product in CTA, is of less importance than the organization and its competencies and knowledge, also called 'knowledge' in figure 9. When an investor chooses to bet his money on a company, his perception of the technology and the four constituting components within, both makes him, and other investors, a relevant social group. In addition to this, they also become a part of the four components themselves the minute they choose to invest or even interact (and somehow give feedback to the process) since technology is not a thing in itself but a result of the constructive process. Damgaard also explains how he prefer to interfere if he feels like the people with leader positions in the companies, that he invested in, does not act according to his ethical standards, or acts as "assholes" to put it in his words (48). By doing this, he has the ability to influence the process and outcome by interfering in the organization or/and any other of the four consisting components and thereby has a direct passage to influence and co-constitute the outcome and product. The influence of the product is therefore always in tension as different groups will try to drag it in their own desired direction. The Director of Product Management at Dixa, Rob Krassowski, gives an example of this in our interview with him.

> *"A good example [of different needs] is chatbots. We [inside Dixa] have some customers and salespeople who are responsible for those customers, they are advocating strongly for chatbots in the product, so that it is something to help deflection and increase efficiency. But from our [rest of people working in Dixa] perspective of the product, the value of Dixa, is not to be the most efficient platform but to be the platform that offers the most values for the customers. And we see chatbots as adding very little value actually, because they are largely inefficient, and they don't give a good customer experience. That's the sort of tension we often see, and we have to balance these kinds of viewpoints."* (Krassowski interview, appendix)

In the above quotation, Krassowski gives an example to how even inside the organization there are groups with different interests and meanings towards the technology. Each relevant social group will therefore try to influence and altercate the technology in certain directions because they themselves are placed in different settings that influence how they view and use the technology. Krassowski also mentions in our interview, that there are no specific criteria from investors other than demonstrating the changes of design, but this statement does not comply with Fosselius explanation of the criteria.

"On the customer side, it is pretty important to show traction in other countries than Scandinavia. That was the reason why we started earlier because we started getting sign ups from South Africa, USA and all kinds of countries. That was what we knew we had to demonstrate [to get the investors] in 2018, that we could continue to get international customers from different markets, and vi did." (19).

This means that even though the two are working at Dixa, they do not have the same perception of the investor criteria, perhaps because they are working in different positions in the company. Fosselius were the one who had to attract the investors back in 2018 while Krassowski, being the Director of Product Management, has to 'only' demonstrate changes to the product when in contact with their investors. The organization therefore does not work as a homogenic group but is a heterogeneous organization that has different field of work positions with belonging perspectives and perceptions of both their product and their internal as well as external relations. Dixa's platform is therefore full of intertwined socio-technical relations that is constantly affecting and being affected by technology and the different relevant social groups.

Hacked Flexibility

"The business idea itself has to be slim and do a few things only – but has to do it very efficiently" (48).

As multiple social platforms have developed and changed our possibilities within contact on a global and real-time level, the perception of when customer service is both "fast (enough)", accessible, and well managed in relation to the customers has also changed. There are even different normative social expectations to each platform. Take for instance the expectation of receiving an answer faster on WhatsApp compared to receiving an answer by e-mail. Furthermore, with the development of brands being accessible on social media, it seems naturally adjoining to the process to merge social media and customer service to give an easier and familiar experience to the customer which also helps brands build customer relation. The idea of building a platform that embraces both older communication channels such as e-mail and phone, while integrating it on their platform with newer communication outlets such as Messenger and WhatsApp, is to support both the social group of social media customers and the traditional customers which gives the technology flexibility.

In a sense, Dixa's software is still unstable as they are trying to embrace a current controversy between two relevant social groups that most likely will stabilize as people, born into the social media

customer-era, will continue while the traditional customers will fade. This theory of technology always stabilizes in the favor of only one relevant social group which is also underlined by SCOT (22). With that said, Dixa's software is in an iterative process which it was from the beginning. As they [Dixa] signed their first customer, Interflora, who believed in their very early-stage software, they made a collaboration to get feedback to improve their platform as they knew that things would not work properly in the beginning. This is also where the group of brands and customer service agents has influence on the technology, but with social media constantly developing and customer needs developing as well, Dixa will always find themselves in a process to keep up with the markets. This is the technological frame that Dixa's software operates within, but to understand how the technology within Dixa came to be as we know it today, we need to take a look at some of the social mechanisms that influenced it.

"Honestly, back then our software couldn't do that much back then, but the vision was spot on. Actually, we could only receive a chat and a call with a screen picture, besides that no other channels. So, there we were [at TechCrunch] and people kept talking about Zendesk and email, and why we were that different anyway.

So, our tech-lead, Mads, took a fast decision, and together with our co-founder then they, with sweat on their foreheads and on very short time, hacked some email into our pitches. We never ever thought that we would include email into our platform, because we thought that Zendesk had already a good grip on that, so we would just need to do a partnership with them, and then we would all be friends, and we are from Denmark and so on.

At that time, it was not even a feature that we had even thought about having, so it's a total hack, because we could feel the excitement [from investors] about us 'doing it all' so we said, "yes yes, we can do it all". But there were already back then a desire from brands to move away from Zendesk, so it was amazing that we got hacked back then, and the secret was of course that it never really worked back then, but since email is not in real-time, then you can fake it pretty well.
So, our fur was pretty quickly changed into 'the new Zendesk' killer, and then it took speed. We got crunch matched 17 times and had 15 speed dates with investors and went on a night club with the party-people." (19).

As Fosselius explains in his interview, they 'hacked' the function of e-mail into their technology as it was never intended (19). This is also a closure by redefinition of the problem, as a problem arises

within the meeting of investors at TechCrunch, because the investors seem excited about a platform that contains it all, including e-mail. The co-founders needed to keep the investors' interest and therefore "hacked" it into their pitch. This means that they then had to deliver what they had sold their investors in order to keep funding. The design of the platform came into conflict with what the founders had envisioned, and even though the founders chose to quickly stabilize the conflict by changing the design, the group of investors also redefined the technology into something that now embraces the traditional customers more than what the founders had planned initially. One conflict, the conflict of meeting investor needs, solved another by redefining a new problem of flexibility. Furthermore, the nickname given to them during TechCrunch was being the new "Zendesk killer" which worked as a powerful rhetorical closure that underlined the need for incorporating e-mail into their platform as it was mentioned that many brands were looking to move away from Zendesk and other customer service services since these had not been found successful. In an interview with TechCrunch, Fosselius describes their vision as a "customer friendship" platform that includes multiple platforms and channels, including e-mail. In another TechCrunch interview, he deepens Dixa's vision with the platform.

"We don't believe in tickets and siloed 'silver bullet' customer support solutions doing one thing or one channel very well, the world of customer support is moving towards conversational customer engagement or 'customer friendship' as we like to call it, where the strong bond and relation between brands and customers are the center piece." (49).

Fosselius explains their vision which is now coherent with the investors wish. The investors closure was thereby successful and Dixa has changed course and adjusted the technology. This change of course is also what we will discuss later as flexibility (49). In our interview with Krassowski, he also demonstrated the overall belief of flexibility that seems to be apparent in the organization.

"You have the product you build and the product you go out and sell. There is a tension in most start-up between those two things because usually the founders that goes 'I build this app, and it's the best app ever, and it is my dream, and I don't care if people buy it because it is what is say it is because I created it' or the commercial person who goes 'I am just going to go sell and you just build whatever I sell'. Ultimately those two both have pretty high limitations to the amount of growth that you can go capture. I think navigating between the tension what the market wants and building it in a way to capture that, I think is the trick. "You should be really stubborn about your vision and really flexible about how you get there." (Krassowski interview, appendix)

What Krassowski is referring to is that companies cannot be too fixed about you're the design of your product. The important part is according to him the vision, which Dixa has also stuck to. The vision, also called the purpose in CTA, is therefore the most important element to stick to, while the technique, knowledge, organization and product should be flexible.

Closure creating investor FOMO

Fosselius explains in a podcast "Iværksætterhistorier", that they at TechCrunch, had issues gaining interest of the investors (19). Their booth was empty, and they felt discouraged. Their co-founder had made, what they thought to be, a fun gimmick where they had made handouts and t-shirts that were circulating around the theme 'back to the future' (relating to the movie). He then explains how this gimmick ended up attracting the investors' attention.

"Suddenly all these staff from TechCrunch and several others, start to stop by our stand to ask for t-shirts and stickers, and at the end of the day this woman stops by, whom is part of one of UKs biggest start-up-network and asks if she can have some t-shirts and stickers. She was very active on twitter, and I huge fan of Back to the Future and just had to have both t-shirts and stickers for both her and her son. She was then generous and tweeted "coolest t-shirt and coolest customer software i ever seen". (19).

The 'Tweet influencer', as we call the investor that tweeted after getting 'Back to the Future'-t-shirts, is essentially part of the whole investor relevant social group since her influence by this tweet goes beyond private investors, and because the interests of these are the same in this particular situation. Fosselius explains in the podcast "Iværksætterhistorier" that the day after this, an 'insane' amount of people came by their booth at TechCrunch, both wanting handouts and an explanation on what Dixa had in common with 'Back to the Future' as well as investors showing interest (19). They now had their chance to communicate their vision for a platform with multiple communication options.

The good attention from TechCrunch definitely kickstarted some very different dialogues with potential investors, and it was from US and Europe, but Denmark and the north in general also woke up about Dixa, that we had before had a hard time getting through to." (19).

A rhetorical closure happens when the 'tweet influencer' convinces the investor group that this technology is not just unproblematic but also "cool". But for a rhetorical closure to happen, a social group that stands as counterpart to another has to convince the other group that this technology is

unproblematic, for instance by commercials as the tweet influencer did. This also means that with her tweet she went into the founders' social group, both in their attempt to convince the investor group of their technology but also in the interpretation of it. Fosselius lasty explains that *"sometimes there goes a bit of FOMO in venture funds, so when they see that others are interested, then everybody wants it, and then it goes all bananas."* (19). This suggest that there is a certain hype-factor at play when looking at how Dixa gained some of their investors. At the same time, it also emphasizes that a rhetorical closure has taken place, as the group of investors are now seeing the platform as unproblematic and desirable.

Chapter 5: Discussion

In this chapter, we will revisit the literature about criteria for successful start-ups explained in chapter 2 with the aim of comparing and discussing these to our findings in our analysis of our chosen cases. We will discuss the term 'flexibility' and what this means and consists of in relation to our theory and literature. In addition to this, we will discuss how flexibility is being presented within our chosen cases. Furthermore, will this chapter deal with previously found literature that focuses on the different criteria for becoming a successful start-up. However, when analyzing the chosen cases, we got to understand that flexibility was an element which our literature was not emphasizing which led us to reevaluate what the criteria were, and if in fact, flexibility was mentioned in other literature in regard to criteria for successful start-ups. We will therefore seek to discuss the relevance of flexibility and give examples where this element come to surface within Lithium Balance and Dixa which will lead us to how and what Techno-Anthropology can contribute to the field of evaluating technological start-ups.

In chapter 2, we gave the reader an insight to several sources that we had found during our investigation and research into the field of successful start-ups. We used several search engines to find relevant literature that would explain what the criteria for a successful start-up were. In our opinion, most of the literature we had found did not address the importance of relevant social groups nor the interpretive flexibility a technology might have. We have chosen SCOT and CTA as our theoretical framework for this discussion. These theories fitted well with our aim to explore the technological frame, and what criteria were essential for a start-up to be successful, e.g., what elements such as relevant social groups, interpretive flexibility, and closure had an impact on the technological development. In the following section, we will highlight some of the previous literature found and ague why we do not believe these to deal with elements such as relevant social groups, interpretive flexibility, and closure.

We will then discuss the complex local setting by using both Lithium Balance and Dixa as examples and look at which flexibility strategies can be used in different settings. Next, we will discuss the local setting in relation to flexibility and timing and argue why timing needs to be seen in relation to the setting and social interpretations. In the section of 'predicting the future', we will discuss why predicting technological success is so hard, while argue for an approach which will embrace uncertainty and flexibility. Lastly, we will take all the knowledge gained from this discussion and argue why the Techno-Anthropological perspective should be added in the field of assessing technological start-ups.

Assessment of criteria

As mentioned above, we had researched online to obtain information from several sources in order to understand what the criteria were for development of successful start-ups. In our previously found literature, we did not find these to emphasize the impact of relevant social groups nor the interpretive flexibility a technology or a product can have. In the upcoming section, we will give a deeper insight to our previously found literature and why we do not believe these to be concerned with the importance of understanding relevant social groups or interpretive flexibility.

One of the sources found was a list of 46 success criteria for successful start-up development by Tvede and Faurholt (31). The reason for choosing their list as a reference was because of their [Tvede & Faurholt] credentials and their knowledge and experience in developing start-up companies. When reading through their 46 criteria, 14 of the 46 criteria was about the founders and their skills and knowledge, 10 of the 46 being about the planning process, 12 of the 46 was about the business model and what strategies to go by, 4 of the 46 being about how to get funding, and 6 of the 46 being about the business momentum (ibid.). However, we only observe a verbalization of a potential relevant social group, besides investors and founders, within the last 6 of the business momenta being the potential users which could have an interpretive flexibility regarding the product. Nevertheless, they mention pivoting which, in the start-up world, means to shift to a new strategy which can be caused by different factors such as focusing on a different set of customers because you want to you seek a new market for your product (50). Although their [Tvede & Faurholt] explanation on pivoting revolves more around high-speed strategic readjustments which could be argued to be about understanding an interpretive flexibility, we do not believe this to be the case. We do not observe any regard or in-depth explanation when it comes to other factors that does not involve skills and knowledge or how to generate economic growth based on funding and strategies. However, keeping in mind that this list

does not go into detail but gives a quick understanding of what to focus on when having thoughts about creating a start-up.

We were also interested in understanding the evaluation of a start-up from the perspective of an investor. At the platform, Keystones, we came across a business angel, Rolf Garde, which had published his 9 criteria to look for when evaluating a start-up (32). Going through his list of 9 criteria, his priorities are how well the company is in creating dialogue with their customers, that the team consists of people that are great at building the company while others should perform well as salesmen. He also focusses on having a business model that is well put together, that the team knows how to execute and knows how to do a sensible valuation of their company, and finally that their geographical location is near by the investor (ibid.). Although he mentions the team as one of the criteria that has to have certain skills and knowledge, the rest of his considerations merely deals with the economical aspect (ibid.). We argue that these criteria do not even deal with the interpretive flexibility the product might have in reflection of the market it is pursuing. We do not believe that his considerations are concerning the different relevant social groups and how they each impact the development of the technology or the product in question. However, we did observe some sources that puts the team and its flexibility, meaning the different roles that the teams consist of, into perspective. In the introduction of this thesis, we mentioned Jesper Buch who elaborates on the team being the one thing he evaluates first, and if the team is fun to be around (13). In the danish version of the Dragon's Den, he almost always focusses on the people presenting besides the product in order to feel whether or not he likes their personalities. In thedailymba.com, Jarie Bolander elaborates on seeking for a specific talent within the team and mentions the importance of how well we treat one another (30). We would argue that Buch and Bolander puts the team and their skills and knowledge first because it allows them to see whether or not the team truly believes in the product or the technology they are developing. One might argue that even though the idea of a product might be great, if the team and its capabilities are not up to speed then their business model and pivoting might fail because of not believing in their vision enough. In this case, despite mentioning the team and the focus on its strengths, we do not believe either Buch or Bolander have elaborated or focused enough on the interpretive flexibility of the product or how relevant social groups impact the process and technology. Needless to say, we have not observed any material from either Buch nor Bolander where they go in-depth with importance of understanding the impact a technology or product might have to different people, or how different interpretations of a product might arise according to the environment it is launched in.

In relation to the above, we came across an educational book by Bill Aulet that actually deals with the importance of understanding the setting one launches a technology or a product in, and the importance of understanding the people you are launched to. In his book, he discusses 24 steps he believes to be important in order to create success in which market segment is necessary to understand (figure 11) (33). More so, he explains how important it is to see the world through the eyes of others *"you must work hard to identify and understand customers(…)"* (ibid.). Although this quotation seems a bit obvious, we argue that he understands the importance of customer impact and interpretation. However, we would also argue that he does not take other relevant social groups into consideration in relation to a technology or product which we believe to be just as important since they also would be able to construct or interpret the technology differently. Furthermore, he elaborates on the different steps to evaluate a potential target group within a specific segment which we have not observed being explained in our initial research.

Figure 14 shows 4 selected steps from the educational book by Bill Aulet (33).

We argue that the first three bullet points in figure 14 are to establish a specific customer within a certain market while bullet point 9 allows the start-up to investigate other possible customers. Here we argue that by trying to understand and identify other customers, the start-up enables itself to explore other relevant social groups and their possible interpretations of a given product or technology. By doing this, we believe that the start-up would gain to a much bigger understanding of their product and its influence on the different social groups it comes in contact with.

We have now elaborated on literature that we do not believe concerns themselves a lot with factors such as relevant social groups and interpretive flexibility, and furthermore explained which data sources that do verbalize some relevant social groups such as the team and its resources in skills and knowledge which we consider to be an important factor in start-up development. Another factor, which according to Bill Gross, founder of Idealab, has turned out to be just as important, is 'timing' (14). As mentioned in the introduction, Gross wondered why some start-ups became successful whiles other did not which is why he sought out to explore 200+ companies based on 5 factors: ideas, team,

funding, business model, and timing (ibid.). Although we do not have access to his study because it is not publicly available, his results showed that timing was essential for success and failure of a start-up. However, according to Barkler timing is not just black and white, and that timing might not be right for a certain segment at a given moment in time while it might be for another (appendix).

We have now explained and argued why we do not believe our previous literature incorporates or elaborates enough on the importance of understanding relevant social groups or interpretive flexibility of a technology or product. Despite some of our previously found literature emphasizing how one should work around the conception of customer needs and identification of target customers and other, we argue that the found literature does not focus on the socio-cultural settings that revolves around a technology or the acknowledgement or consideration on what impact a technology might have to different relevant social groups.

Can flexibility be a criterion for success?

Looking at flexibility from a SCOT perspective, the interpretive flexibility represents a construction of an artefact based on different social groups, and that the technology in which we take for granted today, previously has been involved in controversies between social groups (22). It is within these controversies that scholars find it more interesting to investigate because one has the opportunity to break down the controversies into different elements which allows the scholar to obtain a deeper understanding of what caused the controversy and how it evolved based on e.g., different relevant social groups.

Throughout our analysis we began to see a pattern in which flexibility became a common denominator in both of our chosen cases. Not only was there flexibility in the product or the technology, but also in the organizational structure of both companies because different relevant social groups were constructing the technology based on different interpretations which is why both companies had to be flexible in certain areas. If we go back to our previously found literature, some of our sources elaborates on the importance of pivoting and the ability to shift strategy quickly caused by several factors which we saw through interviews and in other of our data collection in relation to our chosen cases. In Lithium Balance, flexibility became clear within their product development when they made a deal with Varroc. The company required certain specifications in how the different components within the battery package should be combined which was a whole new setup for Lithium Balance. However, to reach those requirements it meant that Lithium Balance had to evolve their current production of battery packages which we argue is not a being a disruptive innovation, but a kind of

flexibility, not only in the actual product but also in their team. This meant that they created a new product which could reach more customers and the company could gain more profit. In this case we argue that their pivoting and ability to be flexible within both product and team was an important criterion for further acknowledgement and success within this industry. Another way we saw flexibility within Lithium Balance was when Barkler, who we believe is representing the team, realized that the industry he wanted to pursue, being the automotive industry, was not ready for their components or their vision. He then decided to change strategy to pursue other industries because he understood that the company could not be successful if he tried to convince an industry about the potential of lithium batteries knowing that the automotive industry was not ready for it. In relation to this, he also changed strategy in how to get investors which we argue is another way of being flexible within the organizational structure. Despite acknowledging the fact that the automotive industry, and investors that had previously invested in green energy was not going to jump onboard the lithium batteries train, Barkler realized that the company needed other types of investors in order to upscale their appearance and profit which led them to pursue industrial investors that understood the company's vision. In the case of Lithium Balance, we argue that being flexible within product development and within the organization created different possibilities of success which led them to where they are today because they kept their vision but chose to be flexible on the path to reach their goal.

When we analyzed Dixa, we also saw patterns of flexibility incorporated. If we take a look at how they handled the question about e-mail features at the TechCrunch, we will argue that Dixa, without even having thought about it, showed a flexibility in relation to the technology in choosing to implement the e-mail feature because there was a request. In this case, we argue that Dixa showed that being flexible does not need to be a thought-through process where one twist and turn the technology in order to shift strategy, but a quick shift, and that the aim of creating your own path to success can be enough. In this case, we believe that being flexible created an opportunity for Dixa which they had not thought of before which meant that their customer range had the possibility of expanding.
In addition to this, we would also argue that not only is Dixa able to be flexible in how they develop their technology, but also in how they view their customers and potential customers which we would label as being flexible within their organizational structure. This relates to figure 14, from the educational book by Aulet whom we have elaborated about previously since his book was one of our initial sources on criteria for successful startups (33). Figure 14 illustrates the notion of identifying other types of customers one could imagine using one's technology or product. In this case, we are talking about Dixa exploring and trying to understand the interpretive flexibility of their platform based on different relevant social groups. In an interview with the Director of Product Management,

Rob Krassowski, he explains that they wanted to build a collective customer communicative platform that prioritized value above efficiency. Their target group was a wide range of different kinds of people which meant that they had to explore each and every sub target group that would come in contact with their platform because it was possible that some groups needed a specific kind of feature whereas others did not.

"If we wanted to serve a company like Wolt, we need to have a product that can be in their mobile app because everything they do with their customers is in the app itself. So, all of their customer service is in the app. That means, in order to capture that customer, you need to build an app-based product which we would not need if we worked with a company that only supports over the phone or over e-mail. So, these are examples where we would have to build specifically for a market."

(Krassowski interview, appendix)

By Krassowski stating the above, we argue that the company valued and understood the importance of knowing the interpretations of their potential customers, and by understanding this, the company would be able to be flexible in terms of creating possible solutions in order to reach as many different kinds of customers as possible. According to Krassowski, their goal was to create the best possible solution for a collective customer service which meant to include every possible target group one could think of. However, he also believes that success, among other factors, are a result of being flexible on the path to one's goal, meaning that a company's vision should not be flexible, but the road towards it should be.

To sum up the two cases, we argue that flexibility was an essential factor for creating success within both companies, and that flexibility was not only a part of the technology, but also in how the companies chose to strategize in order to reach their goals and create greater opportunities.

Now, when discovering that flexibility played a significant part in both cases in terms of success, it made us investigate if there were other kinds of literature, despites the ones we had already found, that addressed flexibility as a criterion for success within start-ups. In relation to this, we found an article on a website for helping start-ups, Brainhub, which elaborated on 5 crucial roles within the team in a successful technological start-up. The article describes in-depth the meaning behind each role of the team which they believe to be essential for a start-up to make it besides the idea (51). They label different roles as "the dreamer", the one who believes in the idea despite other opinions. "The visionary", the one who has the vision and understands the purpose for the company and is able to

transform it into reality. “The doer”, the one who takes care of the problems and is solution oriented. “The hustler” which is basically a salesperson and can turn an idea into profits. “The architect” is the one that knows how to spread the word and to bring solutions together in order to publish to the wider audience. Finally, “the connector” who has the right contact information. The PR-guy with a lot of knowledge about marketing and connections (ibid.). Although some of our preciously found literature addresses the team, they do not go into much detail which is why it was difficult for us to understand the considerations they might have had regarding the team.

One might argue that flexibility is not only something a technology can be, but that flexibility can be ascribed to different elements of a start-up such as the team or even a process. Case in point, the team at Lithium Balance with how they chose to change strategies in terms of investors and seek other ways to enhance the company such as getting certified in an ISO Standard because they knew it would elevate their appearance towards larger companies (Barkler interview, appendix). In addition to this, Dixa chose to incorporate e-mail as a feature because they experienced a need despite not intending to create a feature for e-mails (19). In both cases we would argue that flexibility, within the team, has an impact as to whether or not the technology or product evolves because of decisions made by a flexible team in terms of the ability to adjust or just being great at pivoting. However, we would also argue that having diversity in a team, in terms of skills and knowledge, does not equal being flexible since each member of the team should be able to compromise for the greater good of the company. In an article for Business2community, Nidhi Dave elaborates on how important flexibility is within the team *“A flexible business leverages the strength of its workforce(…) Making teams that are flexible enough to handle a variety of challenges can also help in increasing your startup’s effectiveness”* (52). Based on the perspective from Dave, we wondered whether or not the framing of a business model was just as an important factor as the flexibility within the team or if these two correlated. In the introduction of this thesis, we mentioned Professor Saras D. Sarasvathy and the two ways of being entrepreneurial such as having effectual reasoning and casual reasoning (10). When an entrepreneur has casual reasoning, one begins with a pre-determined goal and a given set of means which leads to identifying the best, cheapest, most efficient etc. way to achieve the given goal. With effectual reasoning no goal is determined from the beginning (ibid.). Instead, the entrepreneur has a given set of means which allows potential goals to emerge over time with imagination and aspirations from different kinds of people such as founders or interaction with others. Working from a perspective of effectual reasoning allows the entrepreneur to explore different settings through his/her journey to the determination of the goal (ibid.).

We believe that both Lithium Balance and Dixa has chosen a strategy of effectual reasoning because even though they had a pre-determined goal and a given set of means, they allowed their means to emerge over time based on various factors such as the people they interacted with. Case in point, the people at the TechCrunch convention that preferred an e-mail feature, or Lithium Balance that chose to seek industrial investors to explore their opportunities. By imagining and implementing different elements, risk-taking, and allowing spontaneity in their company, we believe that this endorsed their effectual reasoning to live and breathe execution. This led to them be more flexible both in their organizational structure but also in how they interpreted their technology and its possibilities caused by the environmental conditions. However, Sarasvathy argues that one can use both effectual and casual reasoning at different times, but that most entrepreneurs use effectual reasoning in the beginning of a venture since the alternative strategy would otherwise limit their possibilities (10). In relation to our chosen cases, Lithium Balance tried to identify the most optimal, most efficient and/or alternative way to reach their goal, being a part of the automotive industry, but had to choose another target market with the highest potential due to various factors such as timing and interpretation of lithium batteries. We hereby argue that, despite Sarasvathy claiming that most entrepreneurs starting out having effectual reasoning, we believe that Lithium Balance started with casual reasoning. The company had a pre-determined goal which was a part of their casual reasoning, but due to factors such as no marketplace or a different interpretation of their product which limited their upscaling, they had to change direction and seek alternatives in order to move forward. In relation to this, Peter S. Cohan, President of Peter S. Cohan & Associates, argues that it is possible for a company to combine strategies as long as one finds the right balance between them, *"It's this balance between fixed values and a flexible approach -- one I believe every entrepreneurs needs to have(…)."* (53). We argue that there are several factors involved, and that this field has not been created by a certain set of rules or a specific standard but that every entrepreneur finds his/her own way which is a result of different interpretations of know-how, skills, and the capability of being flexible in several areas.

Interpretive flexibility is a complex phenomenon

According to social constructivism in science and technology studies, interpretive flexibility is a central concept. The observed phenomenon is caused by empirical observations and the purposes of the technology which allows different interpretations to a certain degree (54). However, despite Pinch and Bikjer applying the notion of interpretive flexibility to the development of technological artefacts, the framework of SCOT and the concept of interpretive flexibility still remains unspecified (ibid.). According to Schaeffer-Schulz and Meyer, there are a more specific way of looking at interpretive flexibility, and that this can be divided into different infinite regressions (ibid.). In their article "Three

Forms of Interpretive Flexibility", they specify the need to narrow the concept of interpretive flexibility because the notion is not specific to a technological artefact, and by pointing at the different meanings to a technological artefact from the perspective of a relevant social group is no more than defining interpretive flexibility by referring to it. One of the regressions they talk about is the *regress of usefulness* which means looking at the interpretive flexibility of the technological artefact and its functional features, and not the surroundings such as scientific claims or opinions about the technological development (ibid.). Putting lithium batteries into perspective, the interpretive flexibility revolved more around the different interpretation of its functionality, and whether or not it was useful in e.g., cars. One might argue that the reason for why the interpretive flexibility of lithium batteries occurred was depending on the respective purposes of different relevant social groups and on diverse requirements of different contexts of use. The acceptance of lithium batteries within the automotive industry became clear only after the industry had seen the consumers being excited over Tesla's Model S announcement which we argue is a result of usefulness. Yet, the decision regarding the acceptance of lithium batteries in cars had to be acknowledged before the batteries could be used.

What is the road to a successful start-up?

In one of our research questions, we asked what the criteria were for a successful start-up. Based on different literature, we realized that no actual methodology exists, and that there are different areas of focus and ways depending on who you are asking. According to Barkler, he would not label Lithium Balance as a success despite reaching a sales potential in the billions.

"We are headed towards making a billion in sales which is based on the customers that have chosen our product and what their production plan is. However, if I should look at our company from the perspective of what we could have done better, it would have been to be one of the first to join the automotive industry." (Barkler interview, appendix).

Despite nearly reaching a billion in sales while joining the automotive industry later than wished, one might argue that it was their approach that both gave them opportunities while also missing some. According to Barkler, their approach was quite "danish" in which they tried to save money as much as they could. However, he also believes that this might have be the reason for missing some great opportunities.

"I sometimes wonder if we should have prioritized differently or chosen another path, and if these changes had led to other opportunities (…) We were limited in customers as a result of their

production (…) We were depended on the evolution of the market, and our business could not have evolved because it took a long time before electric cars became a thing which is why we tried other segments." (Barkler interview, appendix).

As Schaeffer-Schulz and Meyer argues, there can be different ways to look at interpretive flexibility, and that it does not mean that one has to focus on the whole technological framework (54). In this case, one might argue that the chosen approach, in which Lithium Balance chooses, is flexible in regard to shifting strategy because the functionality of lithium batteries is not acknowledged by the automotive industry which leads the company to seek other potential customers. However, in this case there is a specific situation in which the technological frame is created upon which is why one cannot discard the whole technological frame because it is not that simple to break down the controversy on the functionality of lithium batteries due to several interpretations of it. Nevertheless, the question rising is then when one should be flexible and when one should pursue a dream without having to be flexible. Case in point, the announcement of Tesla's Model S. According to Barkler, Tesla had been working on producing an electric car for years, and despite not having support from the automotive industry, Tesla still went on to produce an electric car that took the whole industry by surprise. This takes us back to the question about timing (Bill Gross) and if in fact timing is right for some and not for others. One might argue that timing for Lithium Balance depended on many things because they were "only" producing components while Tesla had the resources, including components, to actually build a car which contained basically the same components as Lithium Balance was producing. In this case, an argument could be that having the resources to develop a complete product creates a better chance on nailing the right timing. However, this might sound like timing equals luck. According to Patrick Henry from Inc.com, many entrepreneurs went home from the Ted Talk held by Gross and thought that if timing was the essential factor for success and failure then these were significantly based on luck (55). According to Henry, it is all about knowing the socio-cultural setting of your target market and the ability to assess the ecosystem of things that you need for the business opportunity to ignite: *"look at your industry structure and how it can effect adoption of our solution"* (ibid.). One might argue that not only should a start-up understand the industry or the broader ecosystem one wishes to launch a technology or a product in, but nevertheless, a start-up should also understand how it will affect the industry and the structures that lies within.

Complex context

The road to a successful start-up may be different from company to company, but one place to start would be by looking at the setting in which the technology is embedded in. Looking at the complex local setting in figure 10, in which Lithium Balance and Dixa exist within, we obtain an understanding

of not only how technology and social settings co-evolve, but we also get an insight to why technology design, implementation as well as transfer are complex processes that are interconnected (not separate entities). In the case of Lithium Balance, some of the influential settings are environmental conditions, governmental regulations, and social norms as green energy was starting to influence politics, decision-makers, the general public as well as media, which spread to the financial and commercial sector. In the case of Dixa, some of the settings could be the social norms in relation to organizational culture when looking at what some of their investors had as criteria, such as social norms of leader behavior. Additionally, the social infrastructure is the setting in which users are divided into two relevant social groups (traditional users and social media users). This particular setting would also be relevant to analyze whenever moving into different cultural settings as the platform expands into other socio-cultural locations that might have different user groups or regulations in place. Krassowski explains in his interview, that they had chosen to have a broad segment of users who were medium range international companies who had potential for growth or continued stable growth. The target group of a wide range of companies within different industries makes it "a very hard job" to develop a platform that fulfills several customer's needs. He gives an example of if Dixa were to target a company like Wolt which is a food-delivery company.

"If we want to serve a company like Wolt, we need to have a product that can be in their mobile app, because everything that they do with their customer is in their app itself. So, the customer service needs to live there. So, in order to catch that customer, we need to build an app-based product. We definitely do not need that if we are working with a company that only does support over the phone."
(Krassowski interview, appendix)

This means that the setting of the targeted industry of companies as well as how the individual company's structure, sets the needs. So, if Dixa were to target another industry of customers in computer gaming for instance, they would have to consider that computer gamers would need other communication platforms like Discord. When implementing a given technology into a new setting there are three strategies which become apparent when transferring a technology as well as developing or implementing.

"1. The technology is adapted to the social setting of the receiver.
2. The social setting of the receiver is adapted to fit the technology.
3. Both the technology and the social setting of the receiver are changed or 'moved' to fit each other at some point." (27).

To give an example of where Lithium Balance uses the first strategy, which is to adapt the technology to the social setting, is when they choose to customize their product to the requirements of Varroc. An example of Lithium Balance using the third strategy above, is when they change their strategy from seeking investors within the automotive industry to industrial investors while the technological design naturally follows this choice. These strategies could also be seen as mechanisms of closure in a SCOT perspective, as the two theories overlaps in many areas with both the technological frame/complex social setting as well as the three strategies/closure mechanisms, all in which requires flexibility of a given technology and thereby also the social relations manifested into it and surrounding it (22).

Timing

As we have now discussed the setting of given technologies, we have chosen to use figure 10 which illustrates the complex local setting. We believe that the setting and the interpretive flexibility determines the element of 'timing'. By this we mean that the interpretive flexibility is representing the different meanings towards the technology from relevant social groups. In our previously found literature, we observe timing as an element, however, does the literature not put this element in relation to context or flexibility. In figure 15 beneath, we have illustrated how we perceive the relation between complex local setting, interpretive flexibility, and timing.

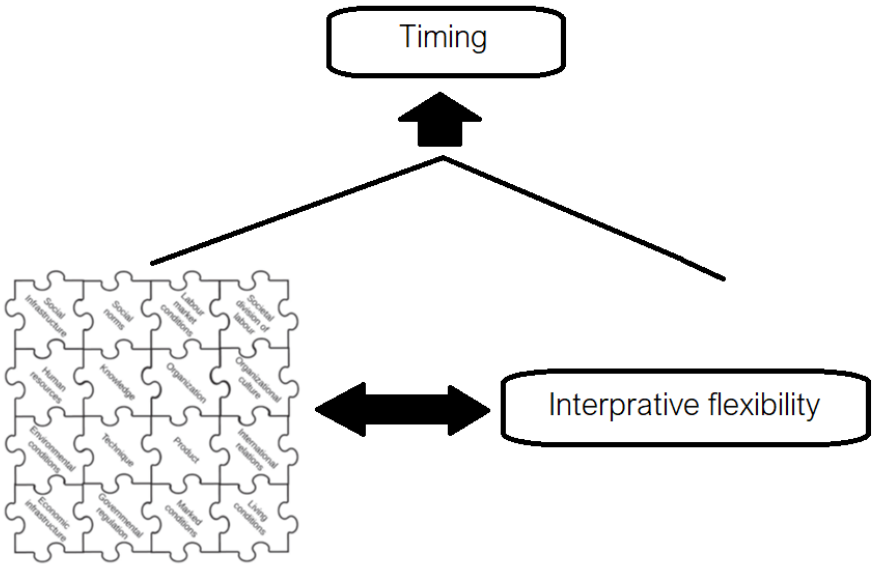


Figure 15. Timing in its relation to complex local setting and flexibility.

The double-pointing arrow between the complex local setting and the interpretive flexibility illustrates the interconnected relation in which we perceive consists of an equal influence. Meaning that the interpretive flexibility of the relevant social groups affects the complex local setting while we also

perceive the complex local setting to influence the interpretive flexibility of the relevant social groups (27). Furthermore, we believe that this interconnected relation, that bounces back and forth between the complex local setting and the interpretive flexibility, defines whether or not the timing for a certain technology is right or not.

To signify the importance of timing and to put it into perspective, we will exemplify it with Apples launch of the iPad since we believe that the timing of its launch was essential in order for it to become successful.

In 1990 Apple launched 'Newton' which was a personal digital assistant and was the company's first attempt to create what we now know as the iPad. However, it never became a success because the social setting, back then, had not advanced enough technologically as well as the customers' receptance of its usefulness (56). In 2010, Apple launched the iPhone which revolutionized the mobile phone industry, but also matured the users into seeing the capabilities of what the product could do. In addition to this, the users suddenly understood how the iPad could work as a multi-functional tool in a smaller and more convenient format. It can be argued that had the iPad been launched into a setting that did not understand its capabilities it would have failed which can be related to the 'Newton' back in 1990. Timing also relates to the importance of flexibility because the interpretive flexibility from the different relevant social groups determines whether or not timing correlates with the setting (27).

Does closure mean success?

Another important finding from our analysis of Lithium Balance and Dixa, was how significantly a start-up's position can change in relation to investors as well as customers and partner recognition or acceptance, when rhetorical closures happen in the start-up's interest. When the 'tweet influencer' performed a rhetorical closure, Dixa finally gained investor interest and recognition. So, when stakeholders, being either one or more investors themselves or other groups like users or partners, performs a closure in the interest of the start-up, then the technology is seen as unproblematic, and the meanings towards the technology changes as it did with Dixa's investor journey.

"Sometimes there goes a bit of FOMO (Fear of missing out) in venture funds, so when the others are interested, then everybody wants it and then it goes all bananas, right." (19).

Fosselius explains perfectly, in the quotation above, how the relevant social group, being the investors, acts as exactly what SCOT identifies as a relevant social group. A social group sharing the same set of

meanings towards a given technology. When closure happened, the product was now seen as desirable for other investors. Though, the technology in itself could be problematic, less desirable or even have unforeseen consequences. This means that a rhetorical closure does not necessarily mean that a technology will be successful, but that the design of the technology has stabilized according to one relevant social group's closure strategy (22). It is therefore also important to look at which relevant social groups has stabilized the technology as well as which one's has become non-users. Another thing is to identify who the current users are of the technological design, and how the future looks for this particular group.

To give an example of why this is important to bear in mind, we should look at the case of Dixa once more. In this case, both traditional and social media users were included in the product development and making it flexible. We could flip it around and imagine if the platform was envisioned for only the traditional users (much like Zendesk currently). If Dixa would have chosen to use traditional communication features such as e-mail and phone, then the social media group would have had to divide itself into either being a part of the traditional users or non-users. As predicted earlier, the traditional user group has an expiration date as the younger generation will outlive the older generation. So, if Dixa had only targeted the traditional generation, they would be left with no market at a certain point in time, while not having met the social media groups' needs. Another example from Dixa is when the investors saw Dixa gaining "traction" or gaining users from different countries as a success criterion. One social group, being the users, had to stabilize the technology for the other group (the investors) to find it unproblematic and desirable (22). The socio-technical process that happens within the word "traction" has been unfolded through SCOT. These socio-technical processes are essential to look at because a technology is never "just" a technological artefact of raw materials but is both constructed and constructing which affects whether a technology will succeed according to its vision and intend. This means that closure is not a success criterion because it, by some people, can be easily attained, and it might not be in favor of the technology's road to success on a given market.

Predicting the future.

Assessing which technologies will be successful is hard because the future is unpredictable. We can try to assess and predict, but even major companies like Google, who has market analysts hired, have poured huge founds into developing technologies that are now considered as a failures (57). One of these technologies are the Google glasses which launched in May 2014. The glasses failed as the inventors did not properly define and validate their users (or relevant social groups) or identified what difficulties this product was solving for them (what meanings each group had towards the product).

The investors, mistakenly, concluded that the product would sell itself because the hype would make it appealing to everyone (57). The need for understanding the technology and its settings is therefore vital.

"Even though we can identify a movement towards participation, comprehensiveness, and holism that engages with the everyday life of people and social groups, we can still see a fairly instrumental way of considering technology as a blunt tool that we have the capacity for controlling and steering. Admittedly, we are, within the participative, comprehensive, and holistic realms, not capable of foreseeing what might happen in the future when it comes to implementation and use of technology, and unpredictable and unintended consequences are often the result of these processes." (27).

The reasoning for trying to control and steer is also mentioned in Sarasvarthy's description of the casual reasoning (10). This does not only try to reach a certain goal by a set of means, but it also believes that *"to the extent we can predict the future, we can control it."* (ibid.). Especially in cases where both market and product are new, the marketing and casual reasoning are inefficient as shown in figure 16 beneath.

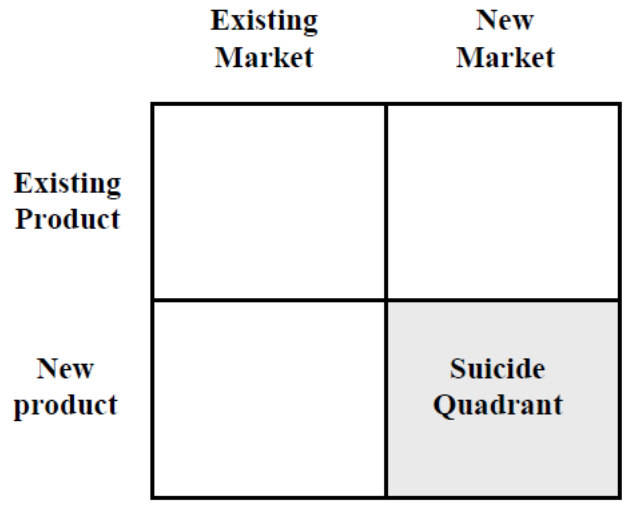


Figure 16. An illustration of the Suicide Quadrant (10).

The suicide quadrant illustrates how products are positioned in the market according to whether a launching product is new or already existing within the market (10). Likewise, whether the market is new or already existing. In this context, a new market is when there is no existing demand, but there could be. The grey quadrant named 'suicide quadrant' is when both product and market is new thus making any predictions about the success of a given product harder to steer and predict. In relation

to Lithium Balance, there was no demand for lithium batteries in the industrial nor the automotive industry when the company started. The product was also new in the market and therefore lithium batteries were, at that time, placed in the suicide quadrant. This could give another explanation as to why they had to reevaluate their [Lithium Balance] product in terms of what market they pursued. The flexible approach to their product and position in the target market, being led by industrial investors, enabled Lithium Balance to steer their company into a market that could form a demand for lithium batteries such as the automotive industry. As mentioned in the beginning of this section, it is impossible to predict any future with certainty, however, Sarasvathy argues for engaging in creating the future instead (10).

"Entrepreneurs are entrepreneurial, as differentiated from managerial or strategic, because they think effectually; they believe in a yet-to-be-made future that can substantially be shaped by human action; and they realize that to the extent that this human action can control the future, they need not expend energies trying to predict it. In fact, to the extent that the future is shaped by human action, it is not much use trying to predict it – it is much more useful to understand and work with the people who are engaged in the decisions and actions that bring it into existence." (10).

We are not arguing against existing traditional market analysis, but merely pointing out the importance of adding a socio-technical layer to the assessment and development of technologies, especially in start-ups that often bring about innovative technologies and technologies that are in the suicide quadrant which we have argued above needs flexibility. Lastly, it is important to acknowledge the fact that one cannot predict the future despite working around the different criteria for success. However, as Techno-Anthropologists we are able to bring another perspective in an assessment since we are neither developers nor salespeople which have their own agendas in terms of the technological functionality. With a Techno-Anthropological perspective, we are able to look at the technology in relation to other stakeholders and their possible interpretations of it.

Techno-Anthropological competencies

This section will discuss what Techno-Anthropological competencies can add to the field within assessments of technological start-ups by using knowledge obtained throughout this study.

Pivoting and flexibility is not exactly new to the field of investments and start-ups. What we believe Techno-Anthropology is able to contribute with, in this case, is to offer a new language and a deeper understanding of the socio-technical relations embedded into technologies and the development of

start-ups in moving towards success. We are able to perform a constructivistic technology assessment through STS theories such as SCOT and CTA. Hereby, we view ourselves as being competent to highlight the interpretive flexibilities between expert, users, and the technology. In relation to our chosen cases, we cannot separate Lithium Balance from lithium batteries nor can we separate Dixa from their communicative customer service platform. By this, we mean that it is important to look at the socio-cultural aspect of their technologies which the techno-anthropological field allows. Within this field, we are then able to highlight certain elements such as the team, the idea, the interpretations of either lithium batteries or the communicative customer service platform. Other elements such as flexibility within the technology as well as the company and other relevant social groups are also considered to be a part of how the technology is being assessed and, ultimately, if it will be acknowledged and accepted by society.

Chapter 6: Conclusion

To sum up, our intention with this thesis was to investigate what the criteria for developing a successful start-up were, and to highlight what Techno-Anthropology could contribute with. When we began our literature search, we experienced a rather 'black and white' industry where the criteria for developing a successful start-up were mostly revolved around the financial aspects. Different sources elaborated about focusing on the business model, the skills and knowledge within the team, funding, and market analysis for the desired product. However, we did find some sources that highlighted the fact that one should be aware of pivoting, customer needs, and seeing the world through the eyes of the customer etc. although these did not really go in-depth with relevant social groups nor interpretive flexibility of a technology or a product. In general, we experienced our initial literature to not really explain or, just mention, that there were several factors and elements as to why start-ups become successful which does not only rely on whether or not a company has a business plan or if the team has different kinds of skillset. We had chosen to analyze two Danish start-ups, Lithium Balance and Dixa, by using Social Construction of Technology (SCOT) as our primary technological framework, with Constructive Technology Assessment (CTA) as supplement, in order to obtain knowledge about relevant social groups, stabilization, closure, and interpretive flexibility. We chose these start-ups because we thought it would be easier to get in contact with companies within the Danish boarders, however, as we got to experience, it was not that easy since we first got in contact with Dixa one week prior to our hand-in. Nevertheless, we got to interview the CEO of Lithium Balance and the Director of Product Management at Dixa with supplement from podcasts, other interviews from different webpages etc. as our empirical data. In our analysis of the two cases, we saw that there was a common denominator in terms of flexibility which was not an element our initial sources [articles from

investors, business angels, Aulet, Gross etc. from the section of 'start of the art'] had elaborated about. Further into the analysis, we experienced that 'flexibility' was quite common in relation to how the companies chose to seek opportunities or change strategies in order create possibilities for further development and upscaling. Case in point, when Lithium Balance changed strategy in relation to which investors to seek, or when Dixa suddenly incorporated an e-mail feature because investors at the TechCrunch convention had asked about it. Our analysis resulted in understanding that the element of 'flexibility' had a huge say technologically as well as in the organizational structure within the company in relation to whether or not a start-up would move towards success although the term 'success' is broadly understood.

In our chapter of discussion, we argued that 'flexibility' was essential, based on the analysis of our chosen cases, if a start-up were to become successful. This led us to investigate if there were sources in relation to development of successful start-ups that elaborated about 'flexibility' as being an important criterion. We then discovered several sources that went into more detail regarding the team which we did not experience within our initial literature. One of the sources even stated that having flexible teams leverages the strength of the company, and that a flexible team enables the company to handle different challenges which ultimately helps increasing the effectiveness. This was different from what we had observed within our initial literature which now indicated that 'flexibility' actually was important, but that one might have to give credence to the element before knowing its importance. Our approach towards our literature search were iterative, meaning every time we found new knowledge in the theory or empirical data, we revisited the literature. This allowed us to dig even further into the field of technological start-ups and investment, and to give a more nuanced picture of the field instead of just sticking to what we had initially found and continuously 'verify' it.

In relation to flexibility, we also discussed how the context, or the socio-cultural setting had an impact as to whether or not a start-up could become successful. By this, we discussed how different elements are intertwined, and that a success is not just the result of some criteria from a list. In addition to this, the element of 'timing' came to surface where we argued that the interpretive flexibility of a technology or a product correlated to the socio-cultural setting, seen in figure 15, and that these two were impacting when the timing of a certain technology or product was right. We also discussed whether or not it was even possible to predict success with certainty. We found that the future is rather unpredictable, especially when it comes to technologies that are new in product and in market. We therefore argued that instead of being fixed on predicting the future, one could engage in shaping it. This could be done by taking part in the product's purpose, while keeping the four constituting elements flexible (figure 9).

With all the above, we as Techno-Anthropologists, are able to shed a light on a technology and its surrounding circumstances and socio-cultural settings that embraces the technology or the product. By this, we mean that we are able to look at the technology with a different set of glasses in which we have the ability to see different impacts and interpretations that engineers or salespeople might not see. We can use a different language to elaborate upon what we experience and observe when investigating the impact of a technology or product. Nevertheless, our conclusion of this master's thesis and the answer to our problem statement and research questions, are that there is no specific road to success, but the choices one makes on the path to success are what defines whether or not one will be able to obtain success. We firmly believe, in relation to our analysis, that flexibility is an essential factor for moving towards success and that we, as Techno-Anthropologists, can help facilitate this. That one should be flexible on the path to one's goal while having a fixed vision or purpose.

Chapter 7: Reflections

Throughout this master thesis, we have reflected upon possible changes or other ways in which we could have obtained empirical data. However, due to covid-19 and an interest in investigating into a field that holds a lot of confidential information, it has not been possible to gain access as much as we would have wished. If access had been granted, we would have liked to investigate further into both Lithium Balance and Dixa in terms of their organization and how their companies work. Meaning, being a part of different decision-makings in relation to their technologies or observing how their internal structure of their organizations functioned. In addition to this, it would have allowed us to dig deeper into the different constituting elements in which would have unfolded the interconnected relation between the social and the technical. Furthermore, this could have led us to different interviews with both investors and users, or just observations of their relationship with the start-up and the technology. For instance, we could have observed customer service agents communicating with customers using Dixa's platform which would have enabled us to obtain a deeper insight of user interpretation of the technology. In relation to the investors, we could have observed a pitch from a start-up and hereby get an insight to what investors are focusing on in terms of criteria.

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Appendix

A summation of the Interview with Rob Krassowski, Director of Product Management at Dixa

As explained in section of the Interview Guide, we finally gained access to Dixas' Director of product management, Rob Krassowski, one week before our thesis deadline. We have therefore chosen to give a summary of the interview while spending the majority of our remaining time on analyzing, incorporating and altering the interview and new knowledge into this study. We initially got an email on Krassowski, that we then send him our intended questions as a last-minute-last-shot act. To our surprise he responded that we could do a short interview. The interview was done as an online interview, we were given fifteen minutes and Krassowski already had received our interview questions by email, which is shown beneath.

1. Has there been any miscommunications, different views of product development, or wanting to go in a different direction with the technology from both internal and external stakeholders in relation to your platform?

2. Have you had any specific requirements from investors? (meaning if there has been any requirements in relation to your organization or to the technology)

3. Are you aware of why investors chose you? (specific features, criteria that you fulfilled or did not fulfil)

4. What are the considerations regarding your target groups?

5. What are the considerations about the flexibility of your platform? (meaning the different possibilities, it creates, different industries, target groups)

6. What do you think the criteria are for a successful start-up?

7. Do you think that Dixa is a successful start-up? And if so, please elaborate.

In the interview, Rob Krassowski starts by explaining why there can be tension between different groups internally in their organization. He says that ha has always experiences tension between sales and product groups as they have different objectives.

"I think there is always a variety of ways people want a product to take, both inside and outside the company. I think that there is always tension between a sales organization and a product organization. Because the sales

organization is trying to fulfill the most urgent request from particular customers, whole product organization is trying to balance that stuff [requests from particular customers] alongside the long-term product strategy, what customers are asking for in different groups, the market pressures. All these different things together. In terms of external stakeholders, I think It really depends on how you approach the market as a start-up. In terms of your segmentation model for how you do sales, if you have a really tightly intertwined group of companies that you sell to, there will be less of this. For Dixa we sell across a really wide variety of companies, so there is of course disagreement about what is the most valuable value proposition platforms."

Krassowski then goes deeper into the question and gives an example of different requests for the product inside the organization.

"A good example [of different needs] is chatbots. We [inside Dixa] have some customers and salespeople who are responsible for those customers, they are advocating strongly for chatbots in the product, so that it's something to help deflection and increase efficiency. But from our [rest of people working in Dixa] perspective of the product, the value of Dixa, is not to be the most efficient platform but to be the platform that offers the most values for the customers. And we see chatbots as adding very little value actually, because they are largely inefficient, and they don't give a good customer experience. That's the sort of tension we often see, and we have to balance these kinds of viewpoints."

Regarding the investors of Dixa, Krassowski did not wish to share any information as it was classified. He did mention that the criteria were not specific, but the investors did have certain requirements of demonstrating when certain improvements were being made or which customers were gained in what countries. We then asked Krassowski is they had any consideration regarding different target groups.

"We have what we call a needs segmentation model, in terms of companies that we approach. It makes it extremely complicated to build a product. It's not an easy job. So, a lot of time, when we talk about product, we talk about finding a product market fit. So, you have a very specific group of people that you are developing for. So, you may say 'I want to go after finance companies in New York'. So, you use geography and a vertical, so you make it more specific and say, 'I want to go after companies that have been founded in the last 10 years, that are on Facebook and twitter and so on'. It allows you to be very specific about the set of problems that you are trying to solve, that all of these companies share in general. So, the product you build solves this very little share of problems.

When we are looking at a broader need's segmentation model, we are caring about customers that are arranged around a super wide swot. They are vertical I geographies, how old they are, how they operate in the industry. But we care about the need they have to serve customers in a specific way, so we focus on that specific set of needs when we develop the product. That the need to be able to engage with customers through a wide range of channels, having a single customer view across those channels, to treat the customer like a human and focus on the experience rather than resolving tickets.

But what that does is that you can have a customer that is in gaming that has a whole different set of needs than one in finance, that might be more like compliance and so on. In entertainment you may have a set of needs that are more towards ecommerce or delivery. So, you have to be very clear about what you are trying address for the product and what you wont address. Sometimes that difficult for the organization, because it means picking and choosing who we serve"

As we asked Krassowski to give an example he explains where they might have to build products specifically for the market.

"If we want to serve a company like Wolt, we need to have a product that can be in their mobile app, because everything that they do with their customer is in their app itself. So, the customer service needs to live there. So, in order to catch that customer, we need to build an app-based product. We definitely do not need that if we are working with a company that only does support over the phone."

He also explains how they would need to available on for instance discord and twitch if they were looking to catch a customer within the gaming industry.

He then goes on to answer the questing of whether he thinks Dixa is a company with success, with yes, and deepens is with what he sees as success criteria for a start-up.

"I think that a successful start-up in one that wins market share. Has potential for growth. Continues the acquire funding. Continues to attract talent and deliver on their mission. We have been lucky enough to be able to do that. I think it required a balance between the commercial and product engineering sides of the company."

"You have the product you build and the product you go out and sell. There is a tension in most start-up between those two things because usually the founders that goes 'I build this app, and it's the best app ever, and it is my dream, and I don't care if people buy it because it is what is say it is because I created it' or the commercial person who goes 'I am just going to go sell and you just build whatever I sell'. Ultimately those two both have pretty high limitations to the amount of growth that you can go capture.
I think navigating between the tension what the market wants and building it in a way to capture that, I think is the trick."

When asked about reframing issues by changing position in the market Krassowski says, *"You should be really stubborn about your vision and really flexible about how you get there".* Then adds that you should be relentless about where you want to go but be flexible about the paths you can take. He furthermore thinks that a lot of people lose track of their vision in start-ups and therefore fail or loose the potential for growth.

Interview with Lars Barkler, CEO of Lithium Balance

Hvad er dit job i dag hos Lithium Balance?
Det ændrer sig meget undervejs. Nogle gange handlede det om leverandører, kundesalg, dialoger om produktudvikling. I dag er vi 60 medarbejdere og så har vi en ledergruppe som har nogle af disse roller, så mit job er blevet meget mere administrativt og skal sikre virksomheden som helhed og at denne fungerer; økonomisk opfølgning, det kulturelle, medarbejderpleje og så er det jo hele vejen igennem også fundraising - både investorer og andre steder, herunder tilskud til udvikling. Og så er der selvfølgelig hele opfølgning på de investorer der nu har været på et givet tidspunkt og i den bestyrelse vi nu har haft undervejs.

Hvad lå til grund for at bruge batterier nu når vi allerede havde olie?
I dag er der meget fokus på elkøretøjer som vej til at reducere CO2. Lithium gik faktisk i gang før der var fokus på det. Det er bedre at køre på batterier. Et eksempel kunne f.eks. være en gaffeltruck, der kører inde i en bygning – hvis du f.eks. kører med gas eller benzin, så får du noget udstødningsgasser som er giftige for de mennesker, der er inde i bygningen, så derfor har disse altid kørt på batterier. Du kører korte turer. Elbilen er meget mere komfortabel fordi den kører kun når du trykker på speederen, - der er ikke en motor som står og kører - så sådan nogle ting, hvor man skal starte og stoppe mange gange, er el meget mere komfortabel. Det er egentlig dét marked man startede med at kigge på. Man startede med at kigge på at kunne Lithium batterier der kunne erstatte blybatterier og give længere rækkevidde. Men omkring det tidspunkt jeg kom ind i virksomheden, var der meget fokus på CO2 og man begyndte at tale om elbiler. Og markedet blev pludselig meget større. **Så for at forstå det – det startede egentlig bare med at det skulle være komfortabelt?** *Vi skulle sådan set ikke ændre på om folk kørte på batterier eller ej. Denne her virksomhed skulle egentlig bare hjælpe dem som kørte på blybatterier kunne få en bedre løsning som lithiumbatterier. Vi var meget li-ion pionærer i starten.* **Og har det så stille og roligt udviklet sig til at fokusere på sådan noget som bæredygtighed?** *Ja.*

Dengang I startede, hvem var så interesseret i jeres produkt og hvem var ikke? Var der nogle konkurrenter? *Der var ikke særlig mange konkurrenter. Tror vi var 5 virksomheder i verden der lavede denne type produkt, så det betyder også at vi ingen markedsføring lavede fordi folk kom til os hvis de manglede noget. Men der var jo ikke mange kunder fordi markedet ikke var stort. Li-ion var jo stadig meget, meget dyrt, så det var jo typisk andre start-ups som havde nogle problemer de skulle have løst, hvor de store virksomheder først kom senere og blev interesserede i at bruge lithiumbatterier.*

Hvad lå til grund for at bruge lithium kontra bly? *Det vigtigste er at du har de samme mængder og volumen, men 4 gange så meget energi. Og i dag er der endnu mere energi. Men det er også derfor vi overhovedet snakker om elbiler, da de har været der lige så længe som almindelige biler. Men grunden til at elbiler er blevet interessante nu er pga. Lithiumbatterier. Det giver mere energi end hvad man har været vant til før i elbiler, og det giver markedet et nyt køretøj. Der er dog masser af andre eksempler; din smartphone, din pc, din mobiltelefon, din Ipad – det kan de i dag er baseret på lithiumbatterier. Det var ikke muligt med de udvalg af batterier før i tiden. Farveskærm f.eks. Det kører meget mere på strøm og det er hvad lithiumbatteriet giver – mere ydeevne. Men det har faktisk også mange andre fordele; større hukommelseseffekt – med din gamle mobiletelefon skulle du altid huske at lade den helt og lade den gå ud ellers mistede du kapaciteten, hvilket lithiumbatteriet ikke gør. Det er også mindre temperaturfølsomt, f.eks. ift. Gaffeltrucks i et frysehus. Det er også mere miljøvenligt. Det er den primære grund til at folk kigger på lithium er fordi den har flere fleksible funktioner end andre batterier.*

På jeres hjemmeside beskriver I noget som Battery Management – hvad indebærer dette? *Det er lige præcis det vi laver. Vi laver ikke selve batterierne, men styrestystemet bag batterierne. Det skyldes at lithium er meget brandbart, så hvis du bruger batteriet forkert, så kan du få en eksplosion eller en brand eller også bare at du ødelægger batteriet, og det er et ret dyrt batteri. Derfor vil man gerne have en meget lang levetid på batteriet, og det er sådan set det vi gør med Battery Management. Vi monitorer hver eneste celle der er i batteriet – og typisk i en bil er der 100. Vi monitorer cellerne enkeltvis for 1. sikre god sikkerhed, 2. sikre god performance og levetid, 3. batterisystemet styrer laderen og bilen, og hvor meget bil kan trække på batteriet hvilket er for at sikre at man ikke ødelægger batteriet. 2/3 af omkostningerne er batteripakken ved produktion.* **Er det en software I bruger til at monitorere?** *Det er både et stykke elektronik (måleinstrument) og det er også en slags computer*

(kontrolsystem), og det betyder at der selvfølgelig også ligger en masse software. Det er vigtigt at lave det godt og sikkert, men det er ved brug af algoritmer der sikrer kvaliteten fordi det er dér hvor intelligensen ligger.

Har det været noget i de algoritmer som I har været nødt til at vælge eller fra for at kunne få det her Battery Management til at performe bedst muligt? *Vi vælger ikke fra, men udvikler hele tiden. Før i tiden var vi kun 5, der lavede denne type monitorering, nu er vi måske 500 globalt. Men vi bliver normalt ranket i top10 selvom vi er en meget lille virksomhed, og det er baseret på at vi har været med hele vejen. Det betyder også at vi har lavet mange flere implementeringer end selv de største af vores konkurrenter. Langt over 1000, hvis ikke over 2000, forskellige køretyper og alt muligt andet, hvor vi har puttet vores produkter ind i, betyder at der ikke er to af dem der er ens. Der er masser af ting, der er anderledes hver eneste gang, og det betyder at vi nogle gange må forbedre vores produkt så det passer til den situation – og det har vi så bare gjort i 14 eller mere end 15 år nu. Og det gør selvfølgelig at teknologihøjden er ret modent. Vores slogan er at vi får batterier til at fungere, og det er nok derfor kunderne er hos os. Det fungerer bare bedre. På papiret er der måske ikke nogen forskel, men på algoritmerne og hvordan disse er støbet sammen er hvad der fungerer godt. Det kan kunderne se.*

Vi er også interesserede i den innovative proces, så vi tænker også om du har nogle eksempler på nogle tilvalg eller fravalg ift. jeres innovative proces i forbindelse software og hardware, eller optimeringer? *Jamen f.eks. en af vores vigtigste ting nu er at vi har prioriteret en ISO-standard 26262. Den hedder "Functional safety in road vehicles". Det er sådan meget en sikkerhedsnorm for køretøjer som gælder for alle køretøjer og ikke kun biler. Den er ret ny og ret svær at opfylde. Der er jo denne her fare ved batterier at de kan gå i brand og folk kan dø af det, så formålet er at opfylde den standard for at undgå at der sker fejl og det er ret svær at opnå. Og vi er faktisk de eneste der har opnået dette og er blevet certificeret i verden i dag. Så selv de helt store konkurrenter såsom Bosch har ikke implementeret den endnu. Så det har vi valgt at gøre fordi vi tror på at det enormt vigtigt – eller jeg skal kunne sove om natten velvidende at der er 1 mio. Mennesker der ligger og kører rundt i køretøjer med mit system i som er det der bestemmer om et batteri går i brand eller ej. Hvis jeg skal sove roligt, er sikkerhed ret væsentligt for os. Det er et valg vi har gjort som er dyrt og har taget tid. Det kan vi til gengæld se effekten af nu, da vi får mange kunder - også store kunder der måske ikke normalt ville have kommet til en lille virksomhed som os. De kommer simpelthen fordi vi har den standard, hvilket de har brug for. Og de ved måske ikke selv, hvordan de skal gøre. Det har altså åbnet nogle døre til de store kunder i markedet. Vi vokser ret meget pga. det. Et eksempel på et fravalg kunne være at nogle af de algoritmer i vores styresystemer. Alle gør det på forskellige måder. Vi har altid valgt at basere vores algoritmer på de simpleste metoder. Vi har flere kunder, der har testet vores metoder oppe mod nogle de meget svære metoder, og der kan vi bare se at vores metode er meget bedre præcis og robust – og det er teoretisk ulogisk fordi man burde skulle bruge en avanceret metode. Det er et fravalg fordi det ville kræve en større processer, hvilket koster mange flere penge og derved bliver vores produkt dyrere. Vi har tit valgt at gå den simple vej fordi det er billigere og fordi vi kan finde ud af det. Og det er også et sted, hvor vi ser konkurrence.*

Nu snakker du om forskellige virksomheder som bruger jeres batterier, er der også tale om forskellige industrier? *Det er måske en af de fravalg vi gjorde. Alle begyndte meget hurtigt at snakke om elbiler da jeg kom til virksomheden, og jeg kunne godt se at hvis markedet kom så langt som det er i dag ville det være mange penge. Men det firma jeg arbejdede i før, var vi underleverandører til bilindustrien, og jeg havde også snakket med flere af dem jeg kendte fra mit netværk. Det der var meget klart for mig som det første, var at de første år var alt bare forsøg. Der var ikke nogen som var ordentlig i gang med at sætte biler i produktion udover Tesla. De lavede masser af forsøg for vise politikkerne at de burde gøre noget, men der var ingen intentioner om at udvikle elbiler. Det vil sige at vi kunne have brugt alt vores tid på at forsøge at få kunder til at købe eller investere i elbiler, men bilerne ville aldrig komme i produktion og vi ville aldrig kunne sælge komponenterne. Det andet var at sådan nogle sådan store koncerner har meget svært ved at skulle købe fra et lille firma fordi de måske har brugt 5 år på at udvikle en bil som herefter skal kunne produceres de næste 15-20 år. De vil være sikre på at de kan få diverse komponenter hele tiden, så derfor vælger de typisk meget store underleverandører. For det tredje, hvis der nu er en fejl på en bestemt komponent, så vil de vide at de har en underleverandør der har råd til at få et "recall", dvs. at kunne erstatte eller få repareret komponenten ude på et værksted. Og hvis vi som virksomhed fik et "recall" ville det slå os ihjel. Det er bl.a. derfor disse virksomheder ikke køber hos små virksomheder. Derfor valgte jeg bevidst og meget tidligt og sige at vi blev nødt til at gå efter et segment, hvor vores størrelse og kompetencer matcher, og derfor valgte vi at gå efter industrisegmentet først. Det er f.eks. gaffeltrucks. Vi lavede faktisk den første gaffeltruck på lithiumbatterier hos Toyota. Et stort firma, men når man kigger på den afledning der typisk ladet den type produkter og hvem der arbejdede på produktet, så havde vi faktisk flere batterispecialister end de havde, og derfor var vi jo et godt match fordi de kunne se at vi havde den hjælp de*

havde brug for. Så det var den type firma vi gik efter i starten. Vi havde altid bilbranchen som vores teknologiske ledestjerne fordi vi vidste at dét marked ville komme på et tidspunkt, og vi skulle også den vej på et tidspunkt. Undervejs, især da vi var i start-up fasen, når folk kom og ville have et eller andet, så gjorde vi det fordi det var en måde hvorpå vi kunne få finansieret vores videreudvikling og få noget erfaring. Så vi har været med til at få lavet verdens første batterihelikopter, drejemaskiner, forskellige former for skibsvaretøjer, surfboards. Der er næsten ingen grænser for hvad vi har været med i undervejs. Men i den proces, så er det stadig vigtigt at vide, hvor man er på vej hen. Du kan godt lave noget til et andet segment end du plejer, hvis det fører dig i den rigtige retning. Vi var meget bevidste om at vi havde industrisektoren først, og derefter var vi dog ikke dirkete oppe i passagerbiler – vi er faktisk ikke særlig meget i passagerbiler. Men i andre typer køretøjer såsom busser og lastbiler, skraldebiler, varebiler har vi mange kunder. Vi er også senere hen kommet ind i toge – mange af de batteridrevne toge er baseret på vores system. Så på måde er vi i en bowlingally som man kalder det i start-up verden. Vi har set på alle de forskellige segmenter og vurderet, hvor vi har den største chance for at komme ind og blive dominerende eller hvert fald få en så stor position, hvor vi kan få noget anerkendelse for at være troværdige leverandører så vi kan tage det næste segment. Den bowlingally definerede vi allerede i 2008 og den har vi så siden fulgt.

Er der en industri eller et marked som ikke er med på el endnu som I kunne forestille jer at komme ind på? Eller føler I at er godt spredt ud på de markeder der findes? *Jamen det er et godt spørgsmål, og hvis du havde spurgt mig for 10 år siden, kunne jeg sagtens sige diverse markeder. Det som er sket, er batteripriserne er faldet efterhånden som produktionen er steget, og det er især bilmarkedet der har drevet det. Men det betyder at lithumbatterier koster under 1/10 del af hvad de gjorde for 10 år siden, og det betyder at mange nye produkter vil lige pludselig kunne betale sig at ændre til el eller hvert fald til lithiumbatterier. Det er bl.a. marinesektoren. Nu er der jo batteridrevne færger - det var der ikke for 10 år siden. Vi forsøgte med Ørsted, men det ville man ikke. Batteridrevne toge forsøgte vi også, men det ville man heller ikke. Mange af de sektorer er faktisk i fuld gang nu med at konvertere til lithium, og det eneste der ligesom er tilbage, er fly. Og det er lang rækkevidde transport. Skibe der skal sejle mellem kontinenter, og det er her man snakker om det skal være batteri eller om det skal være noget andet. Man prøver at finde et alternativ til fossile brændstoffer så man kan få dem væk og få CO2 belastningen ned. Det er dog ikke realistisk at flyve til USA på et batteri, så i øjeblikket går snakken mere på om det kan betale sig at flyve til Oslo på et batteri, hvilket formentligt sagtens kan lade sig gøre. Men man ved ikke hvilken teknologi der er mest afgørende endnu. Nogle tror på brint, andre tror på batteri. Ingen ve det endnu.*

Jeg ved ikke om I stadig er ude og pitche til investorer, men har jeres præsentation af lithiumbatterier ændret sig i årenes løb? *Da vi startede, var alt det er med lithium fuldstændig nyt, så derfor kalder jeg os lidt li-ion missionærer. For hver eneste kunde skulle vi forklare dem, hvad lithium var og dets fordele. Mange af de første kunder, vi har faktisk altid haft mange kunder, men de første mange år var egentlig bare pilotprojekter hvilket vi hjalp dem med. De afprøvede egentlig bare li-ion af på hvad de havde i forvejen. De sendte køretøjer til os, så vi havde faktisk et værksted med det hele så vi kunne ordne alt for dem for at de kunne prøve det. Normalt er det kunderne der kommer til os fordi de allerede har besluttet sig for at skifte til lithiumbatterier. De har allerede en plan for at gå i produktion og nu skal de bare bruge denne her komponent og vælge den rigtige leverandør. Så det er helt anderledes ift. hvordan vores position var for 10 år siden.*

Når jeres kunder kommer til jer og har gjort alt det forebyggende, er I så inde over noget oplæring ift. hvordan man bruger installerer eller sætter komponenter sammen? *Det har også ændret sig lidt. Faktisk mange af de andre komponenter som skal til for at bygge en batteripakke, herunder ladere, kabler, shunt osv. Tidligere var det sådan at over 50 % af vores kunder spurgte os "hvad skal jeg vælge på alt det andet?" Det vil sige at vi faktisk solgte mange af de andre virksomheders komponenter til vores kunder, fordi det var meget nemmere for dem at vi skaffede til de her pilotsystemer. Sådan er det dog ikke mere. Vi har nogle få kunder som køber disse komponenter fra os. Nu har vi fået etableret nogle leverandører og andre leverandørkæder, og kunderne har dygtigere folk. De har et helt projektteam der har prøvet det her før, så de kender godt de forskellige komponenter. Derfor skal vi stadig træne dem i vores BMS, men jeg valgte meget bevidst, da jeg kom til virksomheden, at vi var nødt til at lave en platform som var konfigurerbar - både i hardware og i software med henblik på at kunden selv skulle kunne konfigurere sit system. Det vil sige at vores træningstid for en kunde var meget lille, og det var nødvendigt fordi i starten var der ikke nogen kunder der havde volumen – det var alt sammen pilotprojekter. Og hvis vi skulle lave en prototype - altså da jeg kom til tog det 3 mdr. at levere en prototype til en kunde, og det betød at det tog lang tid før vi fik penge i kassen, og det forsinkede også kundens projekt - så vi skulle have noget hyldevare som kunne konfigureres meget, meget nemt. Så første gang vi leverede*

til Fiat fik de et system fuldt konfigureret, 24 timer efter de havde kontaktet os første gang. Der skilte vi os faktisk meget ud fra de fleste konkurrenter på det tidspunkt fordi de lavede prototyper, der var fuldstændig custom hver eneste gang. Og det er en stor fordel for os i dag for selvom – nu er der faktisk mange kunder, som er så store at de forventer at man tilpasser produktet til dem. De vil kun have den funktionalitet de præcis skal bruge, hvor vores platform dækker manges behov. Så man kan godt skære nogle omkostninger af, hvis virksomheden var stor volumen, men så skærer vi også de ting fra de ikke skal bruge. Men det er stadig afgørende at vi har en solid platform forså er det billigt og nemt at lave de tilpasninger til lige præcis den kunde der har et bestemt formål. På den måde kan der sagtens være noget oplæring, men det er betydeligt mindre end det var oprindeligt.

Kan du give os et eksempel på en kunde som skal have visse komponenter og skal have tilpasset produktet? *Vi har en meget stor kunde i Indien som vi kører et projekt for som vi gik i gang med sidste år. I Indien kører næsten alle på to- eller trehjulet køretøjer, faktisk primært tohjulet køretøjer. Der er mange motorcykler. Ift. hvor mange mennesker der er, så er der ikke særlig mange biler. Faktisk er Indien verdens største producent af motorcykler fordi de også eksporterer dem. I vores verden er det et relativt billigt køretøj, og i Indien der er de meget prisfølsomme. Deres normale fremgangsmåde er at finde den billigste leverandør på markedet og så leve med at kvaliteten ikke er særlig god. Denne her producent som vi arbejder med ville gerne have noget der var godt, og vi havde et batteristyresystem som de havde testet og kunne se at den havde en god performance. De havde dog nogle krav til omkostninger og nogle krav til at produktet skulle kunne nogle flere ting; de ville have et produkt hvor man kunne sætte flere batteripakker sammen, parallelt – hvilket vi ikke understøttede, så det har vi været noget vi skulle udvikle. De ville også gerne have at vi lagde nogle af de her kontakter som normalt er løse komponenter sammen, hvilket var en helt ny konstellation for os. Her har vi sådan set betalt os for at lave et produkt, der opfyldte deres krav og som også har en form med nogle mærkelige huller som passer præcis til deres batteripakke – det er fuldstændig tilpasset til dem. De har en stor volumen og forventer om nogle år at skulle producere op til 1 mio. af dem om året, og derfor kører de to leverandører på når de skal op og producere så stor en volumen på alle komponenter. Så vi har konkurrenter som vi kæmper med i udviklingsprocesser, og vi viser at vi kan gøre det bedre. Vi kommer begge to til at få noget af volumen, men den der gør det bedst får den største volumen. Med dét produkt har vi så sørget for at vi parallelle med at vi laver dette, så laver vi det som vi kalder et "standard produkt", ét som vi kan sælge til andre kunder som i princippet kan det samme, men har ikke de der mærkelige huller i, og måske har lidt flere features som gør at det er mere fleksibelt for andre – og det kan vi allerede se. Vi producerer ikke produktet endnu, men vi producerer prototyper. Jeg tror at vi har over 30 kunder, der har skiftet det nye produkt før det blev færdigt. Det er et eksempel på at vi må lave en kundetilpasning, og vi prøver at få noget mere ud af det så vi har større perspektiv for os end bare én kunde.*

Har I oplevet nogle konflikter eller nogle udfordringer iblandt jeres fagfolk og generelt organisatorisk, herunder nogle kommunikative udfordringer ift. Produktudvikling? *Denne her platform til netop denne kunde, det vi kalder for en "48 volt system", hvilket håndterer 15 battericeller. Til en elbil er vi oppe at snakke 450, måske 550 og op til en bus 750 volt, så det er over 100 battericeller, hvilket så er en anden platform man bruger. Det er netop denne som er blevet ISO 26262 certificeret, og her havde vi et stort kundeprojekt og et meget stort team på det. Da vi så fik det her nye projekt og skulle finde ud af, hvordan vi skulle lave det, så havde vi lidt af en konflikt fordi vi havde et tidspres og hvis vi skulle tage det her store team som havde lavet denne her højspændings BMS [battery management system] og den nye platform som er dén platform vi gerne ville basere vores fremtidsudvikling på, så kunne vi se at vi både ville få problemer i forhold til omkostning, men også udviklingstid. Alternativt til det var bare at lave et andet afspændingsprojekt der mindede om, hvad vi allerede havde i forvejen som vi egentlig havde besluttet at ville bruge mere tid på i forhold til vores fremtidsudvikling, men det endte vi med at måtte gøre ellers kunne vi ikke nå det til tiden eller til de omkostninger som kunden havde gået med til. Det gav nogle konflikter, og der kan man godt mærke senere når man havde behov for ressourcer fra højspændingsprojektet over i lavspændingsprojektet fordi vi jo havde sagt til kunden, hvordan vi ville lave det og nu ville vi pludselig gøre det på en anden måde. Så skulle de føje sig og gøre det på en måde som de ikke syntes var lige så god. Vi havde tænkt at det var billigere, hvis vi gjorde det på den samme platform som vi plejer at bruge. Men så er det i konflikt med kundens tidshorisont og hvad de vil betale for det, så det kan være et konfliktområde. Det andet kan være ressourcekonflikt fordi vi får rigtig mange opgaver ind og det kan være svært at nå det hele; hvad vi skal prioritere og hvad vi skal sige nej til.*

Hvad har været jeres business strategi for at nå til hvor I er i dag? Har der været nogle specielle faktorer, der ligger til grund for, hvorfor I har opnået succes? *Når jeg ser tilbage, kan jeg godt tænke om vi kunne have gjort det bedre, hvilket vi kunne. Man kan sagtens sidde og tænke på om man skulle have prioriteret noget fremfor noget andet eller om vi valgte den rigtige vej at gå, og hvis vi havde valgt noget andet havde vi så haft flere*

muligheder osv. Jeg tror at vores primære begrænsning ift. eskalering handler om vores kunder og om vores produktion med et produkt. Hos os er det jo komponenter, så hvis ikke der bliver lavet noget med vores komponenter, jamen så sælger vi jo ingen. Derfor har vi været meget afhængige af markedets udvikling, og vi har ikke kunne udvikle i vores forretning hurtigere end markedet, fordi der var rigtig mange år, hvor elbiler ikke rigtig tog fart. Det var derfor vi prøvede at finde andre segmenter. Jeg kan godt ærgre mig over at vi ikke er store på bilbranchen, fordi vi jo egentligt havde forudset det. Men sagen var bare at vi ikke havde størrelsen, så vi har ikke kunne vokse hurtigt nok i forhold til at skulle blive en troværdig leverandør. Det tror jeg meget er et pengespørgsmål. Selvfølgelig afhænger det også af tålmodig. Vi har jo faktisk ikke tjent penge endnu. Efter 16 år som virksomhed har vi stadig underskud, så på den måde har vi jo været mega tålmodige, men omvendt kan man også sige at hvis vi havde været i USA eller Kina havde vi også fået endnu flere penge. Og så havde det været ligegyldigt fordi vi bare skulle være de største. Der har vi en mere dansk approach at vi er nødt til at strække pengene så langt vi kan, når pengene er små. Det tror jeg betyder at vi har misset nogle af de helt store markeder. Vi er godt på vej mod en milliardomsætning, og det kan se alene ud fra de kunder som nu har valgt at bruge vores produkt og deres produktionsplaner. Men hvis jeg skal se på hvad vi kunne have gjort bedre, så var det nok at se om vi kunne have været én af dem som kom tidligt ind i bilsektoren.

Kan du beskrive, hvad jeres investorer har lagt væk på når de skulle investere i jeres virksomhed? *Jeg tror at jeg har pitchet over 300 gange fordi de oprindelige investorer var innovationsmiljø, dvs. Staten og så nogle business angels, og de har været med hele vejen frem til exit i januar - altså business angels. Innovationsmiljø fik vi købt ud da Ørsted kom ind som investor i 2008. De her business angels har hele tiden haft dét mål med at ville sælge deres aktier indenfor 2-3 år, hvilket betyder at meget af min tid er gået med at skulle pitche til forskellige typer investorer for at se om vi kunne finde nogen som ville dé aktier ud, hvilket er fuldstændig urealistisk for en start-up. Der er ikke nogen af den type investorer, såsom venture fonde, som vil gå med til at købe nogen andres aktier. De vil godt komme med pengene til udvikling af en virksomhed. Det endte med at de investorer vi fik ind, har været industriinvestorer. Det har faktisk været investorer, der kunne se at de selv kunne bruge produktet eller at det passer med hvad de solgte i forvejen. Først Ørsted og så senere nogle kinesere som er Kinas største producent af batterier til bilpakker og så i sidste ende amerikanerne. De industriinvestorer løste nogle af vores problemer herunder at virke troværdig overfor store kunder og at kunne stå imod et "recall". Og det var helt bevidst at vi gik efter dem. Da vi startede, var der ikke særlig stor fokus i at investere i grøn energi. Mange af investorerne havde brændt fingrene på forskellige former for solcelleenergi, hvor det endte med at kineseren kom med gammaenergi, hvilket nedsatte prisen og det resulterede i rigtig mange konkurser i solcellevirksomheder i Europa og USA. Derfor trak mange af store venture investorer sig fra grøn energi. Samtidig var der meget fokus på apps og internet applikationer. Og hvis du kigger på en type virksomhed som vores så er det ikke unormalt at det tager op til 10 år for at få udviklet et produkt og teknologi før man begynder at blive en kommerciel succes. Og det havde investorerne ikke tålmodighed til. For hvis du kunne investere i en app, så kunne de gå fra power points til en million brugere på et år f.eks. og der var et helt miljø omkring at kunne lave exit til dem der ville tage næste skridt, og det kunne vores type virksomhed simpelthen ikke konkurrere med. Hardwareteknologiudviklere havde en stor udfordring. Sagen er anderledes i dag fordi der er rigtig meget fokus på grøn teknologi og det er et kæmpe vækstmarked og der er rigtig mange der gerne vil med. Nu forstår de også batterierne, hvilket de ikke forstod dengang. I dag kan de jo se væksten i markedet, hvorfor de gerne vil med. Der er også kommet fonde med fokus på hardware og de kan også godt se det i forhold til at der er potentiale og muligheden for et meget større afkast end apps. Samtidig er det også blevet muligt for start-ups at kunne blive børsnoteret som vi heller ikke havde dengang. Så der er kommet nogle nye veje til at få kapital ind. Men det er ved at blive svært at finde noget at investere i fordi alle har været ude og købe sig ind i alt, hvad de kunne finde.*

Hvorfor troede man ikke på batterierne og deres effekt dengang I startede? *Investorerne kigger udelukkende på om der er et marked, teknologiens effekt, konkurrencefordele herunder beskyttelse via patenter, teamet osv. Jeg kan se på mine gamle slides at jeg hele tiden har skullet forklare, hvorfor der var et marked og at elbiler var vejen frem pga. CO2 osv. Men alle forudsigelserne dengang er fuldstændig som tingene har ændret sig til i dag. Jeg kunne tage de slides igen i dag. Det kan godt være at pitchen er god, men følelsen skal stadig være der i maven. Nu har de set nogle cases med Tesla og hvor stor en bølgebryder de blev, så nu vil alle gerne være med fordi de godt kan forstå pointen. Det er ikke nødvendigvis godt at være tidlig på den fordi der skal være et marked. Man kan ikke sige at dét at være tidlig på den, er det samme som succes. Det er måske nemmere i dag at spotte, hvem der kan blive til noget end det var for 10 år siden.*

Vil du mene at det var Tesla, der åbnede dørene for at bruge batterier? *Jeg var ovre at besøge Tesla dengang virksomheden bare var en garage. Det var bare et stort værksted og Elon Musk var slet ikke med på det tidspunkt.*

Tesla har nærmest på egen hånd gjort elbil acceptable. Det skete da han introduceret model S. Hele branchen vidste at den kom, men bilproducenterne troede ikke rigtig på at den ville få succes. De gad ikke bruge tid og kræfter på at producere noget selv. Så lancerede han model S, og den fik 6 stjerner. I Danmark tog han 30 % af alt luksussalg på én måned. De tog en kæmpe markedsandel, hvilket kom fuldstændig bag på konsulenterne som sad og rådgav bestyrelserne hos de store bilproducenter, herunder Audi, Mercedes osv. Der var ramaskrig på gangen fordi ingen havde forudset den succes. Han fik så meget opmærksomhed, og alle forbrugerne sagde "det er en fed bil". De rige mennesker som havde råd til at købe, blev bølgebrydere, hvilket det jo er tit. Når der kommer nye trends, så skal nogen gå først, og tit spejler man sig i dem der har penge – og så kan man som forbruger tænke "hvis de køber den, så må den også være noget og så vil jeg også være med". Det betød alverden for elbilbranchen, og det betød at mange af de store virksomheder måtte sadle om. De måtte erkende at de måtte udvikle elbiler selvom de før havde forsøgt at undgå det til hver en pris. F.eks. har VW sadlet fuldstændig og de putter alle deres penge ind eldrevne biler samtidig med at erkende at de er 7 år bagud. Og det var ikke sket uden Tesla. I 2017 annoncerede han at ville lave en giga factory som skulle producere batterier i Nevada til hans elbiler. Den fabrik alene fordoblede verdens produktion af lithium-ion batterier. Én fabrik. Og noget andet han sagde var at han ville producere batterier til $150 pr. Kg. Watt i timen. Det var markant under hvad branchen på daværende tidspunkt producerede, hvilket lå på omkring $400-500 pr. Kg. Watt. Faktisk havde amerikanske energimyndigheder lige vurderet at den laveste pris ville ligge på omkring $250, hvilket de estimerede at nå indenfor 5 år. Men så kommer han sørme og siger at han kan gøre det $100 billigere. Det startede hele boomet for lithiumbatterier i branchen fordi alle bilproducenter, som havde elbilprojekter, gik tilbage til deres batterileverandører og sagde at de skulle gøre det bedre. At de skulle sætte deres priser ned. Det betød at der blev annonceret diverse giga fabrikker til lithiumbatterier. Der går ikke en måned uden at der bliver annonceret nye giga factories. Det var Elon Musks udmeldning der gjorde alt. Og nu er vi på vej mod $50 pr. Kg. Watt. Det åbner markedet. VW har udmeldt at de kommer til at tjene flere penge på en elbil end en benzinbil. Mange flere penge. Den er billigere at lave, hvilket er helt vildt forså handler det ikke kun om man vil det grønne eller ej, men at de kan komme til at tjene flere penge. Og det åbner dørene for at kunne bruge batterier i mange flere brancher. Lige pludselig snakker vi om energilagring til alle vindmøller, solceller. Vi begynder at snakke om batteridrevne færger osv. Nu går det rigtig stærkt. Og det kan betale sig.

Figure 12.

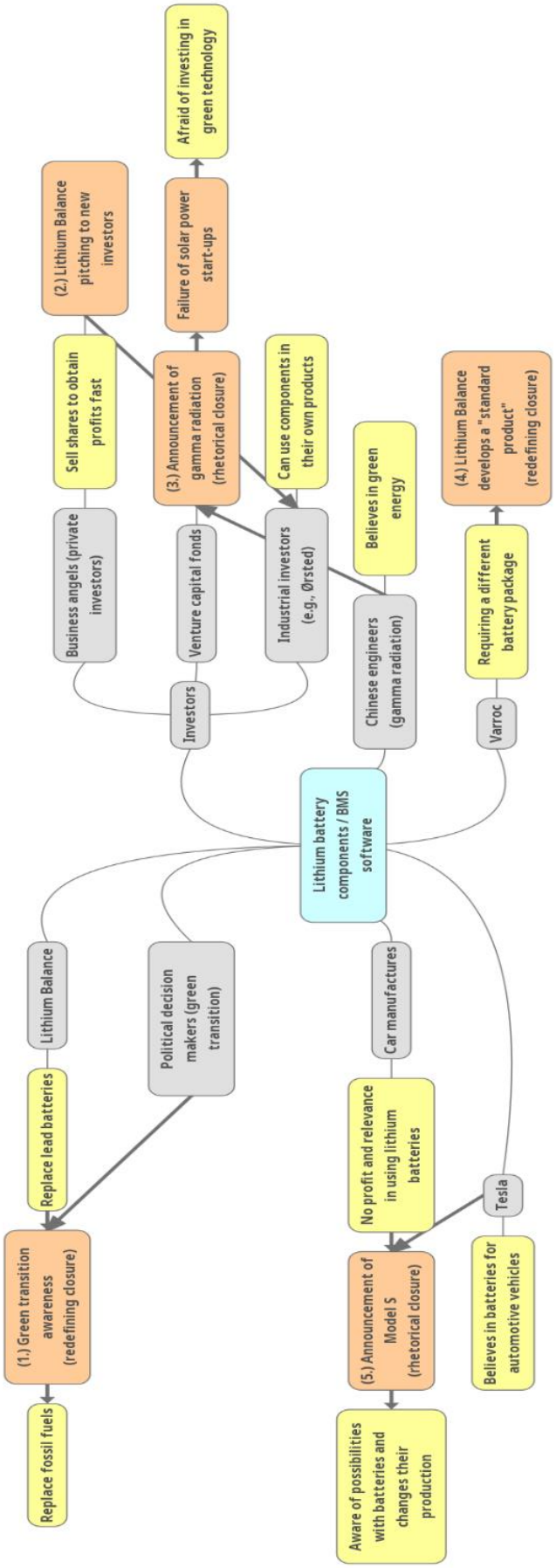
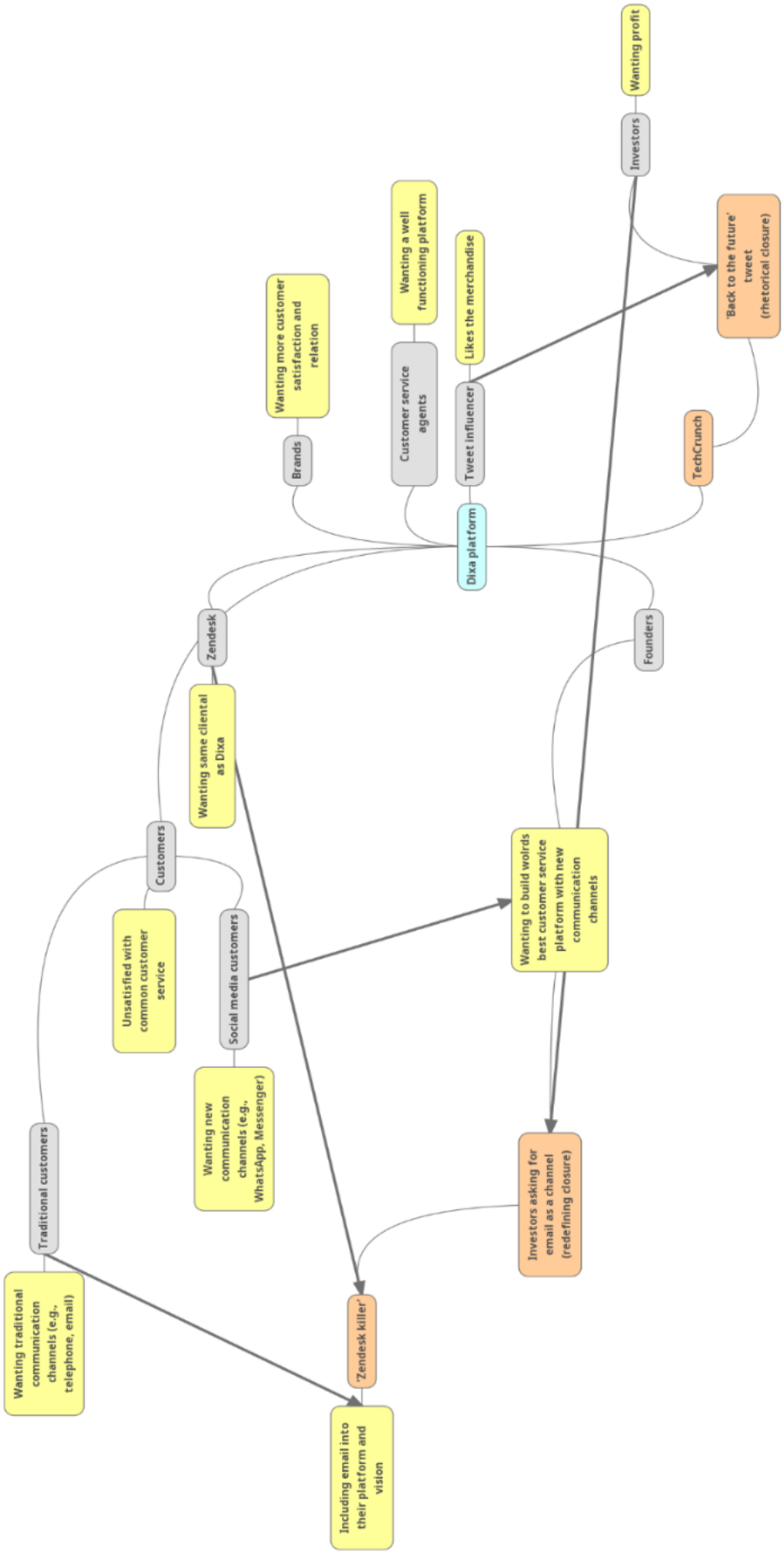

Afraid of investing in green technology
(2.) Lithium Balance pitching to new investors
Failure of solar power start-ups
Sell shares to obtain profits fast
(3.) Announcement of gamma radiation (rhetorical closure)
Can use components in their own products
(4.) Lithium Balance develops a "standard product" (redefining closure)
Business angels (private investors)
Venture capital fonds
Industrial investors (e.g., Ørsted)
Believes in green energy
Requiring a different battery package
Investors
Chinese engineers (gamma radiation)
Varroc
Lithium battery components / BMS software
Lithium Balance
Political decision makers (green transition)
Car manufactures
Replace lead batteries
No profit and relevance in using lithium batteries
Tesla
(1.) Green transition awareness (redefining closure)
(5.) Announcement of Model S (rhetorical closure)
Believes in batteries for automotive vehicles
Replace fossil fuels
Aware of possibilities with batteries and changes their production

Figure 13.


Wanting profit
Investors
'Back to the future' tweet (rhetorical closure)
Wanting a well functioning platform
Likes the merchandise
Wanting more customer satisfaction and relation
Customer service agents
Tweet influencer
Brands
TechCrunch
Dixa platform
Zendesk
Founders
Wanting same cliental as Dixa
Customers
Wanting to build wolrds best customer service platform with new communication channels
Unsatisfied with common customer service
Social media customers
Wanting new communication channels (e.g., WhatsApp, Messenger)
Traditional customers
Investors asking for email as a channel (redefining closure)
Wanting traditional communication channels (e.g., telephone, email)
'Zendesk killer'
Including email into their platform and vision