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Master's Thesis



StudySpace - The Development of an IT Concept

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Abstract:

This master's thesis explores the usability of Eric Ries's Lean Startup in developing a concept for an IT solution, based upon the problem of students in Aalborg center not being able to find available publicly accessible study space. This specific problem is initially chosen, as the project authors has personally experienced, that the city has very little capacity compared to demand. To facilitate this exploration, we chose this thesis question:

"How can a concept be developed for an IT solution, through the use of Eric Ries's Lean Startup?"

The process of this thesis is iterative, seeing the advantages and disadvantages of using Lean Startup to test ways employees at study spaces could monitor their visitor count, which ends up with us deciding the act of estimating visitor density as the best method, based upon our results.

Our conclusion is that applying Lean Startup to concept development, when one is faced with limited time and are working with a small scale startup, requires modifications and selection of specific tools, as some of Lean Startups elements are not directed at concept development. We furthermore conclude, that when developing a concept from an idea, using Ivan Aaens Prospect scenarios, can provide a better depiction of possible problems and solutions. Based upon a process of testing a feature in iterations and further developing our business model from a previous semester, we designed a MDP, depicting our current concept showing what we believe can solve our thesis problem.

Definitions

As a part of enhancing understanding, this is the clarification of a few terms that we use through the project:

StudySpace:

"The name of the project, concept and application in development".

Study space:

"A publicly accessible establishment providing internet and seating".

Students:

"The name of the customer segment who uses the StudySpace application to browse study spaces".

Owners:

"The name of the customer segment that possesses, administer, or have a deciding role at an establishment, when it comes to using the StudySpace app".

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1.0 Introduction

1.1: Goal of the project

The purpose behind this project is to create a concept for an IT solution to a specific problem, while using the method of Eric Ries, the Lean Startup, as a process to do it. The specific problem the project is trying to solve, is the problem of finding a place to work study-related in the town of Aalborg as a student. To identify these specific places, where students can work, we have coined the term "study space" to indicate any location, that offers space for students to use for studying while also providing free internet. The focus of the project will also be to create a business framework around the IT solution, taking actions as start-up entrepreneurs, making use of business models and looking for ways to create a profitable product. This project builds upon previous research made by the project group, which looked at what knowledge students in Aalborg had about different study spaces, what experience they had with problems involving study spaces and what interest there was in using an app to improve their experience (Madsen & Jensen, 2019).

1.2: Origin of project idea.

In the past 5 years, we, the project writers, have been frequent users of different study spaces around Aalborg, to write projects and papers for the university. This experience has not been without its problems, as despite the large number of study spaces that are open to students in Aalborg, it is not always easy to find room or a seat to work at, as the amount of students making use of the study spaces is high. This has lead to a number of bad experiences with popular study spaces, especially when working together in groups, where time is wasted travelling to locations, only to find them not to have seats for all. As we kept encountering this problem through our student life, we came to know of less known, and therefore less occupied, locations around town, and started using those instead. While this has improved the project writing experience greatly, it came late in the student experience and leaves behind many bad experiences, which could have been prevented.

We felt something was missing to help with this problem, a tool to guide students to study spaces that are free and away from places which are already at full capacity. Instead of having to use years on encountering filled study spaces and only finding less popular ones

through trial and error, students could be given a way to see these different study spaces and even get a live feed of how occupied they are.

1.3: Concept idea

Our initial idea to solve this problem was to create an app, that would show the different study space locations in aalborg, give information about them and show the current amount of free seats. This number of free seats would be counted by employees at the different study spaces at frequent intervals in their opening hours. Students could open the app as they left their home and have a clear view of which locations currently had room for them to work at.

1.4: 9th semester continuation

In the previous project, we aimed to validate the problem and solution on the user side (*Students*), through interviews and balsamiq testing. The interviews indicated that both students whom had experienced difficulties finding study space, and students whom did not, would use the app, if it was an option. This could point towards the solution as not solely solving the problem of supporting students finding available study space, but perhaps also being valuable enough as a convenience tool to reach students not experiencing difficulties finding available study space. We created a balsamiq prototype, in order to validate what the users would use to locate the study spaces with the most space. The prototype allowed users to interact with a map over Aalborg, showing the location of 3 different study spaces around town. These locations were either red, yellow or green, indicating the number of available seats compared to maximum capacity, with the specific number of available seats also shown above the location. Even though the prototype featured both red, yellow -and green colors and numbers, all the testers mentioned the colors as being the pointer towards highest availability and guided their interaction based upon the color, when asked to look for the best place to sit.

To gain some insight regarding how study space *Owners* thought of our idea, we established an interview with the Study space *Owner* from local study space Studierummet. Here, she explained that they are not really interested in data showing how many visitors they have had, but that they indeed would be interested in the exposure that would follow with having their study space listed next to other study spaces. This leads us away from one of the earlier planned main values of the system, which was statistics of visitors, and more towards exposure as being a clear main value.

In this project, we continue validating availability estimations on the study space side (*Owners*), to pinpoint which method is the most suitable, in order to enrich the value proposition on both *Student* and *Owner* side and thus how to develop the concept.

2.0 Theory of Lean Startup Method

As the method for this start-up process of launching and developing the Study Space app, we have chosen to follow the method set out by Eric Ries in his Book *The Lean Startup*. Ries's management and production method is based upon his experiences creating the virtual social platform IMVU and with consultation work he has done with both startups and already established companies(Ries, 2011, 38-54). The method is comprised of a number of different activities and guidelines when it comes to working as an entrepreneur and manager of production, whether it is with a new product or a complete new start-up company as a whole. We have chosen to use this method, as we are working with an IT product and are extremely limited in both resources and time. The Lean Startup Method aims to provide a way to work productively within limited time and has a process, that aims to reduce waste in time and resources throughout the process(Ries, 2011, 9-10). It also gives guidelines to create an overall more successful product and coming to this point faster through strengthening decisions by measuring progress not through resources spent, but on the amount of validated learning gained (Ries, 2011, 8-9).

In this chapter, we will chose to a select number of a Ries tools which we see as relevant for our situation and explain them, thereby separating out a number of his terms as they deal with a level of a startup, that we will not reach in this project. This will involve the parts of the Lean Startup involving Growth, Innovation Accounting and how to sustain progress(Ries, 2011, 206-224, 150-160). Growth involves how to maintain innovation, a good production cycle and growth when a product has gained foothold and as we will not get to the point of establishing our product on the market, this part of the method is irrelevant. Innovation accounting and sustaining progress in the Lean Startup deals with accountability within a company, but as we are a two man group, these elements does not match our size or scale.

2.1: What is the Lean Startup?

Eric Ries created the Lean Startup as a reaction to his own failures as an entrepreneur and developer (Ries, 2011, 5-8). While learning things through his own startup experience, Ries found himself asking, Could we have learned these things earlier on somehow, so that we could have avoided so much waste? Are there ways we could have made this process smoother? (Ries, 2011, 38-54). As he talked to entrepreneurs around the world, he came to understand, that he was not alone in facing these problems and asking those questions. This lead him to create a collection of activities and principles, inspired from his experience with IMVU, that aided him into making fewer mistakes and work more effectively, which can in turn aid other entrepreneurs do the same in their future endeavors (Ries, 2011, 55). He also uses this method to promote the perception of entrepreneurs as managers and managers as an entrepreneurs, as they are often set with the same hurdles (Ries, 2011, 8, 24). When working on IMVU, Ries found himself making a lot of features for his product, that ended up not being useful for his customers and therefore not adding value to his product. These features were originally made because Ries assumed, that they were needed for the products success and not because his customers were actually asking for them (Ries, 2011, 44-47). To reduce the risk of work being wasted in such a manner, Ries recommends the use of Minimal Viable Product, MVP, when creating a new product for an extremely uncertain market, and measuring progress in what he calls Validated Learning, instead of traditional progression milestones (Ries, 2011, 18-19). When making use of these two tools through **Build-Measure-Learn** iterations, BMLs, and ending these iterations on reflection points which he calls Pivot-or-Persevere Meetings, Ries argue that productive and accelerated work in startups is in an optimal environment(Ries, 2011, 8-10).

2.2: MVP

A MVP is a prototype of an intended product, containing only the most needed features. If a feature does not aid with the functionality of the product, or with an assumption being tested, it should not be implemented (Ries, 2011, 93-94). While many features might feel intuitive or as a must when developing, it is important to remember, that the product is being made for the customers, not for the developer. It is the job of entrepreneurs to make assumptions of what the customer might need, but in the end, it is the customers who decide what they want, not by asking them, but seeing them buy (Ries, 2011, 38-39).

The MVP's main purpose is to test fundamental business hypotheses, but it is also useful to show functionality and potential with early adopters, customers who feel the need for the product and who are willing to ignore low guality (Ries, 2011, 62, 94, 170). Making a MVP and launching it can aid in validating or rejecting different assumptions about the product, without wasting time and resources on extensive or supportive features, which customers might not directly interact with or need. The idea is that these early adopters will not care about extensive design and high quality, as it is the core function that they are interested in, and are as a customer group willing to use the product no matter how it looks (Ries, 2011, 94-96). Keeping the quality of design to a minimum and focusing on only essential features, also allows for precise testing and minimal wasted work, thereby increasing the speed of which the MVPs can be developed, allowing more MVPs to be made, which in turn can increase the amount of validated learning gained in a limited time window (Ries, 2011, 136-138). With each launched MVP, new knowledge is gained about the customers and the market, that the business tries to reach or establish. This can be used to make new assumptions to be tested in future MVPs, creating the purpose behind the loop of iterations in BML.

2.3: BML

At the core of Ries' method is his work process BML - Build, Measure, Learn (Ries, 2011, 76). BML is a process built around iterative loops, where a product idea is **built** as a MVP and launched to customers (Ries, 2011, 112-113). It is supposed to be built with minimal effort and time spent on it, with only the most necessary elements and features implemented to secure core function, with clear ways implemented to gain feedback from the use of the MVP (Ries, 2011 77). The use of the MVP is then **measured** in the form of feedback, code or answers from the launch. This can be done by seeing at user activity, taking contact to customers and ask them directly about their experience or see at how many people have bought the product over a period of time (Ries, 2011, 9-10). The outcome of this is then used to **learn** if real progression is being made at making a better product, and what needs to be done in the next loop to increase the products value, which new assumptions need to be tested and whether or not a change is needed in the product as a whole (Ries, 2011, 77).





As we construct our different loops in this project, we will follow a specific model taking these elements into account. We will first dedicate a number of assumptions, that we seek to validate with each loop. This can involve value hypothesis and growth hypnosis. We will then specify the MVP we have built for the BML loop, the features it contains, and whom the intended users are.

2.4: Pivot or Persevere

At the end of each iteration of BML, Ries recommends the use of another important element of his method, the decision to either pivot or persevere (Ries, 2011, 77). As a defense against non-innovative ideas, Ries promotes that entrepreneurs set up pivot/persevere meetings on a regular basis throughout the entirety of their start-up, to help avoid wrong focus points(Ries, 2011, 165-167). The pivot/persevere meeting gives entrepreneurs the opportunity to ask themselves a number of important questions about their product: *Are we giving the customer what they want and need with our current path of features? If our product is getting traction and attention, are we getting it from the right people?Are we actually making a product customers will pay for?* These considerations differ from iteration to iteration, from MVP to MVP, but they all end with the same question - should we persevere on our current path or pivot to something else?(Ries, 2011, 164-172) If a pivot is

¹ (https://www.slideshare.net/startuplessonslearned/minimum-viable-product/6-Minimize TOTAL time through the)

chosen, it should be followed by a new hypothesis about the product, business model or engine of growth, that can be tested (Ries, 2011, 172-173). Depending on what basis the pivot is chosen, the new hypothesis often follows one of several different pivot patterns(Ries, 2011, 175). An example of such patterns is the zoom-in or zoom-out pivot. A zoom-in pivot happens when a startup decides to have a single feature in a previous product, become the entire product, zooming in on something specific and building upon that. A zoom-out is where the opposite happens, where a start-up decides, that their current features are not enough and that they need to zoom out, adding more features and having the previous features become part of a larger product(Ries, 173-176). The pivots patterns can help indicate what path a new startup can take after a pivot has been chosen.

2.5: What is Validated Learning?

The entire BML process is designed to grant entrepreneurs what Ries calls Validated Learning: information or knowledge gained from assumptions, that have been validated through direct interaction with customers and which can show how far a product is in its progress (Ries, 8-9). Validated learning stands in contrast to assumptions and is the product of assumptions that have been tested. This validated learning is according to Ries extremely crucial for entrepreneurs, as it is the only data around a startup, that can be trusted completely and which is not based on guesswork (Ries, 8-9,19). Learning is at the base of being an entrepreneur, as the main focus of an entrepreneur is not as much knowing how to build a product, but learning how to make a product, that a specific customer group finds value in (Ries, 22). Any developer can make a good functional and well designed product, but it matters little to none if the product is not useful for the customer, as it will either gather no interest or lose its traction and growth shortly after launch. By using validated learning as the indicator for progress, it will always be clear if a product is getting closer to being successful or if a feature is making the product go in the wrong direction.

By working through BML loops with MVPs, planning the startup process through Pivot or Persevere meetings, and seeking information in the form of Validated Learning, Ries believes, that startups can remove much of the risk of working on start-ups, that needs to create a new product or service for an extremely uncertain market, at least compared to traditional entrepreneur methods(Ries, 2011, 8, 15-16). Ries does not make many limitations for the use of his method and whether the size of the company or the product it is trying to make, the Lean Startup can be used to aid in the entrepreneurial journey (Ries, 2011, 8, 27). In this project, we diverge from the traditional way Ries recommends his method should be used in, in product development, and uses it in concept development instead.

In the next chapter of this project, we will explain why it is that we choose to diverge from using the method in product development, look at the limitations that are set up for us when using the Lean Startup in concept development, and what modifications we need to apply to make his method usable in our specific situation.

3.0 Limitations of Lean Startup in concept development

3:1: Limitations of resources - Focus on monetary resources and low quality MVPs

One of the primary components of the Lean method is to keep expenses down regardless of progression in product development, by creating low quality MVPs and finding answers to early product assumptions by making a new MVP with each iteration of BML (Ries, 2011, p. 76-77). While this process provides a cheap way to gain validated learning, especially compared to building a finished product to learn from its potential failure, creating new MVPs from scratch again and again is still an expensive task, as they have to be sellable. Low expenses are all relative when working on a such small scale as we are, and Ries's 'low' is still very 'high' compared to what resources we have available in general and to launch MVPs (Heitmann, 2014, 3). Furthermore, we are working with a multi-sided pattern when looking at users and therefore need to establish interaction between two interdependent customer segments for our product to be launchable. Launching a MVP for this pattern will be extra difficult because of our sizem and much more of a hurdle than compared to many of Ries's examples, even if we bootstrap one of customer segments (Ries, 2011, 38-54, 99-102, 103-106). This is because Ries encourages, that the targeted usergroup of the first MVPs should be *early adopters*, when launching the first BML loops, to allow a narrow customer segment, even down to starting with just one customer. This is possible as Ries mainly has to do with product development, while we are working on a service, which functionality depends on the simultaneous use of two different user groups, which the Lean Startup does not account for (Andreessen, 2012). Starting with a small amount of users, or with early adopters, is simply not a functional start for our MVP because of the customer pattern we are working within, and the value proposition we aim to offer.

The problem of adopting the idea of MVP to our project comes from two further elements, which Ries does not focus on in his method: the involvement of time as a limitation and possible problems with building a new low quality MVP every iteration. Ries writes that he is very much against the idea of money as the guiding factor for a startups runway time and instead points towards the amount of pivots or iterations possible as the way one should determine remaining runway (Ries, 2011, 160-162). Still what limits the amount of pivots and iterations is nonetheless monetary, as he states himself (Ries, 2011, 161). While reducing costs and waste throughout the startup will increase the runway, it does not remove monetary resources as a limiter and it is still the primary problem for many users of the Lean method (Heitmann, 2014, 3). When it comes to estimating limiters for startups, he does not talk in detail about other possible ways that startups can be held back. This makes it hard for us to estimate our own runway for our project, as our prime limiter is not money, but time, as we already have a close deadline (Madsen & Jensen, 2019, 16). This is not to blame on the Lean Startup as a method, as it was not directly designed to be used by neither university students or people with infinite monetary resources over short time periods - but it does require us to find our own way to estimate runtime for our BML loops.

3.1.1: Our own modification of MVP and BML

For us to be able to use the MVP as a tool with our low resources in both money and time, we need to modify how a MVP is perceived in our project compared to how Ries describes it. In order to learn about customer opinions, we mostly work with the idea of testing assumptions about features by giving them to users in a low quality format. But since we are trying to create a product concept which we are not intending to sell at the moment, building complete MVPs will not be needed. Instead we intend to build low quality MVPs in the form of paper mockups or questionnaires, with which we aim to gain validated learning, similar to what we would get from a completely functioning prototype. We therefore reimagine the idea of MVP from being a launch- and sellable low quality product, to a low quality testable feature, that can be used to test assumptions. This reimagining is also done to combat alienating our customer segments with low quality concept product, which is a risk when a market has limited customers, such as our study space *Owner* segment (Andreessen, 2012)

3.2: Limitations of Marketing - Focus on development

When explaining the Lean Startup, Ries discloses early on, that while he explains many of his company's problems as problems of production, he sees it through the lens of a

developer and that his own bosses stood for management and marketing (Ries, 2011 5). The result of this, is that the Lean Startup as a method is very technically orientated, focusing mostly on development and to an extent sees past the need for marketing and customer acquisition when it comes to creating a new start up (Heitmann, 2014, p. 5). This leaves the question of how to reach customers, open, as the Lean Startup method is more focused on finding out how to show the product to potential customers, than actually finding out to reach these customers. Putting up ads online, setting up billboards and going directly to meet customers is mentioned in paragraphs, but none of the method is dedicated to find the best marketing method, when it comes to new startups. Instead, Ries focuses on early adopters and their use of a low quality MVP as early as possible in the design process to get the ball rolling, yet distinguishing the early adopters and how to supply them with a MVP, is left unexamined (Heitmann, 2014, p. 5-6). This becomes a problem when making use of Lean Startup in our specific circumstance, since we as stated before, are not able to test a functional MVP with just *early adopters*. Furthermore, as one of our customer segments, the study space Owners, are small in numbers, we do run into the risk of alienating them with poor quality MVPs, which can start a bad customer relationship (Heitman, 2014, p. 2-3). Customers do not care about the learning of the entrepreneurs, they care about good products with high quality and consistent value, and if they are given nothing but low quality MVPs, the likelihood of them seeing the idea as a waste of time increases highly (Heitmann, 2014, p. 3)(Fernandez, 2012).

3.2.1: Modification of Marketing

This leaves us with no clear low-resource-approach to reach our customers and thereby requires us to find our own way to get our MVPs into the hands of customers. As a way to do this, we decided to solely make use of personal contact as a way of gaining users or testers for our MVPs. This does limit the amount of users we can interact with and have made us decide to focus mainly on interacting with study spaces and not *Students*. This will give us more resources to do iterations, and lets us do marketing interaction, that is cheap and low risk of alienation, ensuring positive relations for future interactions.

3.3: Limitation of scale - Working on a small scale with a large scale theory

As have been guite clear through the previous chapters, working with the Lean Startup in a university project context does require some modifications to the original method. After looking at the elements of MVP usage, resource management and the need for an added marketing method, it is also clear to us, that the size of our project group, with only being two persons, has a further effect on how much we need to modify Lean Startup. When setting his method into perspective, Ries gives a number of examples of startups or existing companies, that made successful products, through the use of an element of Lean Startup, either directly or indirectly (Ries, 2011, 68-72, 130-148, 150-160). While the examples vary, from a one person startup to a company with hundreds of employees, the scale of these examples are in comparison to our project still large, either in available manpower or available time and skill. The Lean Startup is a method with no definitive end in mind, as it can be used to maintain and innovate on growth even after a product have found success on its market, but it does have a series of milestones when it comes to the journey of a startup(Ries, 2011, 18-19, 117-119). When looking at our small team, reaching these milestones, such as launching an MVP to the entire customer segment, testing MVPs through different launches or reaching a point of clear growth, seems unlikely.

3.3.1: Modification for Scale

We have therefore decided to not try and reach many of these milestones, by limiting the scope and use of Lean Startup. As stated in the chapter about MVP, we will create modified MVPs, that are not sellable products to gain validated learning, but we will furthermore focus this validated learning on a single feature in our product rather than on the entire product itself. We will somewhat move away from doing product development and instead work on the concept of StudySpace and the value of estimating available seats in study spaces for both study space *Owners* and *Students*, and the functions which allows this cuntning.

3.4: Conclusion on modifications

Eric Ries's Lean Startup is method which is aimed at product development in startups and companies, which have time and resources to follow the product to reach a profitable state, if not also keep it in a place a of constant growth. To make use of it for our project, we have modified the method by changing how we classify and build MVPs, by limiting the scope of

how far we intend to reach in the entrepreneurial process, by moving from product development to concept development and by adding our own ideas of marketing and runway estimations. We still intend to use iterations of BML when it comes to testing our concept and to see validated learning as our way of measuring progress, but with a goal of creating an MDP, a Minimal Desirable Product, with the seat counting feature which we have tested in the iterations implemented(Chen, 2009). The MDP compared to the MVP is not about providing a low quality product for *early adopters*, but present the simplest experience necessary to prove out a high-value, satisfying product experience for users. We wish to go for a MDP, as we believe with our two-sided customer segment, that we need to provide something of a rather high quality to secure users on both customer segments. In the next chapter, we will explain how we intend to plan our BML loops with our modifications implemented.

4.0: Planning BML loops

Eric Ries gives a number of examples on how his method can be used throughout *The Lean Startup*, but does not give a definitive way one should use it when making a completely new startup (Ries, 2011, 38-54, 64-66, 99-102, 150-160). Ries paradigm is after all a collection of tools entrepreneurs can use and not a set-in-stone method, that one can follow to the tie. To keep a constant standard for the different loops and to make sure, that our actions are following the ideas and lines set by Eric Ries, we have made a model for how the BML loops are constructed, making use of a number of tools as they become useful while asking the same questions before the BML loop and afterwards. The process have been made into a model to make it easier to replicate as we do iterations through the project and to make our actions easy to follow.

Testing	Planning
Assumptions: - Leap of faith assumptions(- Value hypothesis - Growth hypothesis	Every loop starts with a number of assumptions, assumptions which are supposed to be validated or rejected, at the end of the loop.
Targeted Customer(s):	Since we are working with several customer segments in this project, the assumptions of

	a loop might be directed at a specific segment, which is why the segment is specified.
Testing environment	In what location, environment or situation are we gonna test our assumptions?
MVP & building method	Information about MVP, how it is built, which features does it contains and what programs/tools do we use?
How long and how much (limitations):	As we are greatly limited in resources, we will limit each loop to a specific period of time or amount of participants.
Lean Startup specifications:	Outlining what elements of the lean startup is use and, if necessary, what elements of the method have been changed to fit some circumstances of the loop.
Post-testing	
Outcome:	In each loop, something is measured and assumptions are tested. Out of these tests, general knowledge about the users and the to-be-product will be gained, which can lead to more questions.
Errors:	Things do not always go as planned, so what went wrong?
Reflection on method and theory.	What does the information gained through this loop lead to? What new questions and assumptions can we create based upon this loop?
Next step:	How did our use of theory help us? Did it lack in some areas?

5.0 Project Diary

In the following chapter, we will start out by explaining what was done to prepare for this project, followed by a walkthrough of our different BML iterations as we completed them, giving insight into our thought process from iteration to iteration and finally giving a conclusion to what we gained the entire process.

5.1: Iteration 0

After building and testing balsamiq prototypes through the 9th semester, it became clear, that we were lacking knowledge and skills to develop a functioning MDP. We also found ourselves needing a guiding central theory throughout the project, in order to make decisions based upon theoretical work and not just inspired by it.

The first few months of the project period was spent on deciding on a specific theory, and learning a code language in order to build a possible MDP. We decided upon Eric Ries *The Lean Startup*, as we have earlier been acquainted with the theory, and see the time optimization and decision making as as a good match with our project. In order to minimize time waste we furthermore decided to learn React Native, a cross-platform framework, which broadens the potential reach of the MDP, when it comes to getting *early adopters* and later on mainstream customers if it was ever to be launched. We also decided to prepare possible testing possibilities for MVPs by taking contact with the different study space locations around the town of Aalborg and about their interest in our idea. Our purpose behind this was to gather information and opinions from study space *Owners*, to have a partial idea of what was necessary, to have them pay for a future product and if they were interested in working with us in testing.

This contact gave us mixed results. Three out of four study space *Owners* which we contacted came back with positive feedback for our idea, giving insight into possible problems when it comes to using the StudySpace app in different study space environments, with all of them showing an interest in the product when it was ready for launch, but not when it was just for testing MVPs. Despite the lack of cooperation from the side of the study spaces, we got into contact with a study space *Owner*, who was willing to work with us, giving us a space to test our MVPs and a source of continitive feedback if it was needed. With a theory in place and researched, with a coding language chosen and learnt, and a study space partner found in which we could facilitate our tests, we went ahead and started to plan our first iteration.

5.2: Iteration 1

For our first loop, we set out to follow one of the core ideas of the Lean Startup, which is to start as early as possible and with as limited a scope as possible (Ries, 2011, 6-9). To do this, we have created a MVP, which is a single page of paper with a list of timestamps. The prototype is representing a simple version of the counting function, and will allow us to test the use of the app, without actually having the app ready for use. While the final product is supposed to be used by both *Students* and study spaces, we have at this point in the process not been able to get a group of *Students* set up with the app to do any testing and the app itself is still lacking elements for full testing. To not waste time, we focus on the counting process for this loop and look into a number of assumptions we have with that interaction. While this will make it so, that the first loop does not include feedback from the *Students*, we will be able to get important validated information from the use of the counting app and the information gained through the counting process. With the last semester being focused on student behavior, opinion and interacting with the app, we are still lacking validated knowledge about our study spaces and their employees use of the app. This loop's purpose is to grant us this.

Before setting the loop in motion, we started out by setting up the circumstances of what the loop needed to do when it comes to building the MVP and facilitating the testing, which got divided into six sections as shown in the BML planning.

Pre-testing: Loop 1	Planning:
Assumptions:	(Leap of faith) Value assumption: We expect, that the information we gain from people counting in precious, within a margin of 4 free seats. Value assumption: Counting can happen without disrupting the workflow of workers. Value Assumption: we assume that gathering seat information every 1 hour is enough to give a stable number from hour to hour.
Targeted Customer(s):	The targeted customer group is the study space providers, as we are looking at their interaction with the product and how their feedback is on its use.
Testing environment:	The tests will be held within a single study space location, on 2 weekdays in start Maj,

	which have 76 available seats for students to use as a work environment.		
MVP & building method:	The MVP is two paper lists. The lists are paper mock-ups of how the app will look like and function.		
	They were made within a google docs document, with one printed out for use by a study space employee with the other being updated online by a project member.		
How long and how much(limitations):	The loop will last 3 days. 2 days are set off for testing while 1 day is set off to measure the feedback and figure out what can be learned from the loop.		
Lean Startup specifications:	The concept of building a MVP very early on in the startup process with using as few resources as the circumstances will allow on complexity and quality. Changes:Instead of launching the product, allowing the testers to experience the MVP as a buyable product, the MVP is instead used for testing and the testers are aware of this.		

5.2.1: Assumptions

In this loop, we started with a 3 assumptions: one leap of faith assumptions and two value assumption. The first leap of faith assumption is that the people who are set to counting, the employees at the study spaces, will be accurate in their counting when they are set to do it throughout the day, with margain room of error set to 4, which is based upon the size of the test study space. The 2nd leap of faith assumption, that the counting can happen without disrupting the work of the employees, is closely related to this, as if either is not correct, then it is not viable to get our counting information from employees. As our current idea relies on information gained from these employees, then if they can't bring in consistent information, within a set margin, that information will be invalid for *Students* and the product loses its purpose.

5.2.2: Targeted Customer Segment

This loop is designed to be purely focused on the interaction of the studyplace employees with a mock up version of the final app. Thus the customer segment of this app is only the study space locations and does not involve feedback from *Students*.

5.2.3: Testing Environment

The test of this iteration will be done at Studenterhuset, a study space which have seating for 76 people. We have chosen to do the test at this location as it has employees, that can do counting and is a size, where we estimate counting in precise numbers is possible.

5.2.4: MVP and building method

The MVP in this loop is a really simple build, and consists of 2 pieces of paper with the first having a time model on it, as depicted below.

Time	Time of counting	Number of people
12:00		
13.00		
14:00		
15:00		
16:00		
17:00		
18:00		
19:00		
20:00		

Figure 2: Example of paper MVP for 1st iteration.

The 2nd model have double the amount of time stamps, with one every half hour between 12- and 20 o'clock. The purpose of this MVP is to keep track of the amount of filled spaces at the study space location in which we have chosen to make this test. The first model have been given to the employees, while the 2nd are to be used by one of the writers of the

project. Not only does the 2nd model serve to check the data being given by the first, but also to look at what happens when the data is doubled, from being recorded every hour to every half hour.

5.2.5: How long and how much?

This loop will last 4 days, with 1 day for MVP production, 2 days for testing and 1 day for measuring the data gathering from the testing and identifying what can be learned from this measured data. The MVP production is extremely simple which is why it only lasted for 1 day. The testing has been given 2 days, because it was deemed needed to gain a good picture of how counting would realistically happen when done as part of an average workday. On the 2nd day, we expect that the employees have some familiarity with the counting and that it is no longer a completely new thing for them. It also allows the counters from the projekt team to gain experience from counting themselves and allow wiggle room if changes need to happen after the first day.

5.2.6: Lean Startup method use

In this loop, we intend to use the lean startup in the following areas: When it comes to choosing when is the right time to start testing and jumping into the market, as we have chosen to to start early without a finished product(Ries, 2011, 92), and when it comes to designing the MVP for testing, as we have built it as minimal as the test would allow while still keeping full functionality where it matters (Ries, 2011, 96).

Post-testing	
Outcome:	Leap of faith assumption : By comparing the employees counting and the project members counting, it is clear, that getting a precise number from employees counting is not possible. Value assumption 1: Employees could work quite undisrupted by the counting, as it could often be combined with cleaning tables. Value assumption 2:. Counting requires too much work and effort to do a repeated task so often, especially since it is supposed to be done while working and doing other tasks.

5.3: Results of iteration 1

Non-optimal elements	Some instructions on the MVP was misworded and had to be edited during the testing. Inadequate instructions were given to the employees at the studylocation, which have had an impact on the precision of the counting, thought not to a critical degree.
Reflection on method and theory.	In Ries's method, he puts a large focus on the acquisition of validated learning, by confirming or denying assumptions about customers or the product. We therefore tried to focus the loops test on proving or disproving assumptions. While this was successful, with all assumptions being either or, the validated learning did not come as expected. Instead the areas of our assumptions grow more complicated as we looked into them and we were left with knowledge, but less things validated than expected. The use of a very early and basic MVP, was quite useful. Information was gained, that would have taken more work and more time if we were to make a more designed test product.
Next step:	Learning that employees counting in precise numbers is not possible, removes the need for the precise numbers in the app. Instead we have to find other ways to get this information or find other methods to present it, so direct numbers are not needed. Getting validated learning is much harder than initially reflected in Ries's lean start up. The needs of our customer group are more complicated and getting validated learning from them will require exploration into finding ways to solve their problem.

5.3.1: Outcome

After the MVP had been in testing for two days, we were left with 4 pages of visitor information, 2 from the employees at the testing study space and 2 from project members counting separately and double as frequent as the employees. The data showed granted us the following validated learning:

- Counting from employees is rarely reliable and can vary widely from what is true.
- Counting every hour does not disrupt workflow for employees when visitor intensity is low or medium.

- Counting every half hour gives a better view of the flow of visitors, but is most likely too demanding of a task if workflow is to be kept undisturbed.'

When comparing the numbers counted by the employees versus the project member, the number of counted visitors varied on average by 4,6(Appendix p. 6). Furthermore, while the difference between some countings was as low as 0 or 1, somewhere also as high as 14(Appendix p. 4-6). With the assumption, that the project members got a more accurate count, as their primary purpose was the counting task, and that getting a visitor number which was accurate within a margin of 4 is important, it is clear, that useful precise counting is not feasible with employee counting the number of visitors every hour. Our initial assumption that counting could be accurate is therefore rejected.

5.3.2: Non-optimal elements

When starting the tests both days, one of the project members were there at the first counting at 12:00, helping to initiate the process and showing the on duty employees how the counting should be done. What we forgot was to not only instruct the employees on duty at the time, but also leave some form of guidelines for counting to the employees who came later on in the day. Forgetting to hand the information on to all the personal, who were tasked with counting the 2 days, have lead to inaccurate data, where the number of visitors in the last half of both days became inflated because more seats than intended was seen as student appropriate. This inaccuracy has though been deemed not very critical, as the extra area was rarely used throughout the counting periode, only affected less than half of the countings and added no more than 6 more seats to the study space location, which already had 76 seats, only increasing the space by 6%.

When creating the MVP, we started out with wanting to count the number of available seats in the study space, but because we got feedback from the study space, that they found it hard to count the number of seats, we instead changed the element we counted into number of visitors to ease the counting. This was though not changed on the final MVP, when we delivered it to the study space, forcing us to change the MVP with a pen on the first guided counting on the first day. While this does not seem to have had any impact on the counting, it still might have created some confusion for the employees later on in the day.

5.3.3: Reflection on method and theory

Working with an MVP this iteration has been very successful. Instead of waiting with testing and putting a lot of resources into features, that might not be useful, on an MVP which

resembled close to our intended product, we built something very simple and got useful information from it. As Ries's method preludes, we wasted as little as possible when gaining validated learning and did it at an accelerated pace (Ries, 8-9, 17-19).

The gaining of validated learning by doing these test has shown us, that validated learning as seen by Ries is not as easily gained as he sets it out to be. While structuring our tests around assumptions and ways to validate or reject them was a success, the validated learning did not come out clear as expected. The leap of faith assumption in this iteration, that employees at study spaces could count accurately, was rejected, yet it did not give a clear indication, why this was the case. The assumption lead to more questions and not a clear next step for the product to take in its process.

5.3.4: Next step.

As we have learned, that getting precise seat counting in study spaces is a challenge for employees, the next step for us to take from here is to look at other ways to get seat information, which we can present to students. As we sat and counted, we also saw that employees had to do a lot of walking to get the information, so we need to find a way for them to do the counting task in less taxing way.

For this, we will try to build upon an idea of last semester, where we show the available space at a study space, in a green-yellow-red color scheme. Trying to get employees to count in estimates instead might solve both our problems.

5.4: Iteration 2

Throughout testing the validity of availability data, gathered by study space employees, we discovered that counting, can quickly become a burden, hence making the collected data less reliable. Therefore we want to test the possibility of using subjective estimates of the availability through the colors; red, yellow and green. To test the "validity" of the employee's subjective estimates, we will ask the guests at the study space for their estimate in the same periods that the employee logs it.

By doing this, we hope to find similarities between the employee's and the guests' subjective estimates and hereby interpret a common truth. The thought behind this method is, that the information given to the users does not need to be precise, but merely commonly understood in order to be appreciated.

Testing	Planning
Assumptions:	Leap of faith assumption: The estimate of employees of how busy the study space is, will match up with the estimate of guests/ <i>Students</i> at the same study space. Value hypothesis: The visitors of the study space will have somewhat of the same opinion when it comes to occupatience density at their current location. Validation hypothesis: Employees will find it easier to estimate visitors density than counting exact number of visitors.
Targeted Customer(s):	In this test, our targeted customer groups are both study spaces and <i>Students</i> , as we are testing assumptions involving the participations of both.
Testing environment	The tests will be held in a single study space location, the same as the previous test, which have space for about 100 visitors.
MVP & building method	The MVP is two different paper lists. The first lists will be used by employees at the study space, where they will indicate the visitor density on a scale from 1-7 each hour. The 2nd list will be distributed to visitors at the study space, where they will indicate their skim of visitor density as either green, yellow or red. They were made within a google docs document, with one printed out for use by a study space employee with the other being updated online by a project member.
How long and how much (limitations):	The test will be facilitated over a single day, between 10-17 o'clock. This has been judged enough time to get appropriate data, as the high activity time for <i>Students</i> are in that window and testing over several days is unlikely to change the result or give improved data.
Lean Startup specifications:	In this iteration, we will make use of A-B testing. While Ries example of A-B testing is when launching two different products with distinct features, we will instead do different tests, where we ask participants the same question but with different measurement units, to later compare these different units.

5.4.1: Assumptions

For this test, we have 3 assumptions: one leap of faith assumption, a validation hypothesis and a value hypothesis. The leap of faith assumption is that the estimation of both visitors and employees will be possible to compare and find a meeting point between them. It is a leap of faith assumption, as our new design idea for counting is dependent on this functionality - If the estimates of visitors and employees can not be matched, counting in estimations is not a valid option.

The validation hypothesis is, that when the visitors give their estimation, they will have somewhat of the same estimation. If their opinion varies wildly, then it will be hard to estimate what visitors, as a group, feel about guest density in the study spaces. The value hypothesis is that the employees of a study space will find it easier to estimate the current density of their location than if they had to count them in precise number.

5.4.2: Targeted Audience

In this test, we will look into the behavior and opinion of both students and study space employees. We will look into how both groups estimate guest density at a place, and once again, hear about the experience of counting as an employee.

5.4.3: Testing Environment

The test will be done in the same study space as the last test, the Student House. In the last test, we counted only the seating locations, which were 76, but as we are looking at guest density in general now, we are making an estimate over the entire Student House, which have room for about 100 people.

5.4.4: MVP and building method

The MVP is split into two different paper lists, one to be used by employees at the study space and one to be used by visitors. Both paper lists are a modification of the previous MVP (see figure 2), with the counting method being different. The employees will instead of counting precise numbers, give an estimate of guest density at the location on a scale from 1-7, counting again every hour from 12 to 17 o'clock. The guests themselves will give an estimate of guest density in one of the three colors, green for low density, yellow for medium density and red for high density every hour they are in the study space (Appendix p. 8). It is not expected, that the guests do this estimation for the entirety of the test duration, but that they will together give a good collective indication of the entire period.

The MVP was split done between google docs and google sheets, to present better data.

5.4.5: How long and how much?

The test will be done in the span of a single day, from 12 to 17 o'clock. It has been deemed, that gaining data over a single day is enough to gain valid information to confirm or deny our assumptions, as we expect enough people to answer the paper to get a good perception of

visitors opinion and since the number of visitors during weekdays seems somewhat constant.

Post-testing	
Outcome:	Outcome 1: The students and employees estimations did somewhat match together. They see the population in a location with somewhat the same eyes Outcome 2: Students did not agree completely on their estimation, yet did not diverge much either, which indicates a softer bridge between different levels of estimation for students than employees. Outcome 3: Employees found it very easy to do estimations throughout the day compared to counting.
Errors:(Titel skal ændres)	Low number of visitors participating in estimating than what would have optimal. The number of visitors on the test day was smaller than the average day, which gave a more narrow fluctuation of visitors than expected.
Reflection on method and theory.	A-B testing gave the expected amount of data, but the method did not grant us optimal data. Working in iterations are helping us stay a bit more structured in our approach and process, but we are lacking validated knowledge from tests to really make decisive decisions.
Next step:	Integrating a color estimation system for the app. Interview study space <i>Owner</i> about their opinion about negative colors and the potential of using StudySpace as a communication channel.

5.5: Results of iteration 2

5.5.1 Post-testing - Outcome of assumptions

At the end of the testing we ended up with 5 hourly estimates from the employees at Studenterhuset and 18 different estimation papers from the visitors, each varying in number of personal estimations from a single time estimation to 5. This is because many of the visitors giving estimations, arrived and left throughout the day, therefore only being able to give estimations for the limited time they were at the location.

The employees estimations came out quite simple, giving a density score of 1 out of 7 at 12 o'clock and then upping it up to a 2 for the period of 13 to 17 o'clock, reflecting the stable presence of students throughout the day (Appendix p. 9). Even with a change of who was estimating, with a shift happening mid through the test, the employees estimation did not change, reflecting a good overview over the visitor number, atleast to a point where they did not find a reason to increase the number for estimation compared to earlier in the day. The students estimations are a bit more complex, as more people came with estimations and in different intervals. However a tendency can clearly be seen, as all the students started out green at 12 o'clock, but changing up into yellow more and more as we hit the afternoon, returning to green again as the testing period ended. Already at 13 and 14 o'clock, student estimations becan to be a bit yellow, with 2/11 and 4/15 estimating yellow respectively (Appendix p. 9). At 15 and 16 o'clock, we hit a near split between green and yellow, with 5/11 and 3/7 saying yellow(Appendix p. 9). While it thinned out at 17 o'clock with 4/4 estimations being green, it does show that students are more likely to see a place as more busy compared to how the employees do(Appendix p. 9). While there are many who estimated yellow throughout the day, it is also clear that some of them did not see this as a "hard" yellow, as they switched back between yellow and green without a big difference in visitors being observed by the project group. This gives an indication, that the difference between green and yellow is not that big for students, as they started out with a low bar for green and moved to yellow without a big noticeable difference in density.

We can conclude from our test, that when the density is rather low, both employees and guest have similar experience. However, a tendency can be seen as 9 of 18 testers at some point chose 'yellow', when the employee choose 2 out of 7. This might indicate, that the guests experience a study space more occupied than the employees of said place would. This can come from different reasons. Students might not have a complete overview a the study space from where they are located and can therefore only give an estimation from what they see. It might be because employees have seen both extremes of density, with it

being empty and completely filled to the brim, thereby giving them more experiences to compare to than the student would have. So when the student sees most of the sofas being occupied, they see yellow while the employees would first estimate average density, when at least half the tables and all the sofas were occupied. It is also possible, that as the attention of the employees was not required much that day, they did not find themselves "busy" enough to make a higher estimation.

The real answer is probably a mix of them all. As we conducted the test, most students rarely left their seat at Studenterhuset, giving them only a view of what was around them and making it impossible to read the entire location. Asking the employees, they answered that its "quiet" for them, when the bar is mostly empty and only the sofas and some tables are being used. Unless the tables are in use and the bar is used frequently, they would never go above 2-4 in estimation. While some of the students who gave estimations, showed some experience with being at Studenterhuset, the employees have without a doubt spent more time with reacting to density and therefore have a more accurate with evaluating density.

Furthermore, when asked about the experience of giving estimations, the employees indicated that the task was much easier and less time consuming than when counting in the first test, as they did not have to leave the bar to do the estimation and could easily tell if there was a big enough difference in visitor density to change the number each hour. This validates our assumption, that the act of estimating is easier than counting for employees and is less time consuming.

5.5.2: Errors

As we began the testing, it became quite clear for us, that the amount of students we could expect to give an estimation was lower than expected. Studenterhuset was close to empty and within a few hours, it was clear that it would probably stay like that. We tried to get the best out of the present guest, but compared to an optimal environment where Studenterhuset was busy, the amount of gathered data was low, to a point at 17 o'clock, where we only got 4 estimations from students. The test is still reliable, as we still see the different nature of estimation, but there would without a doubt have been a more clear difference if more visitors had been at Studenterhuset during test day.

Under optimal circumstances, the amount of guests at Studenterhuset would be much higher and fluctuate more, requiring students to also estimate the availability while the study space being more busy. As we only saw a low amount of visitors, most of our estimations were at the low end, not changing much in density for employees and students to react to. We would probably have gotten a better picture of which thresholds the students and employees had if there was more people at the location, maybe even seeing some of the students estimate red at some levels. With that said, the data gathered does give a clear picture of how estimations are done on an average day, where the numbers might not be very high, which gives a more realistic picture of the daily environment at the study space.

5.5.3: Reflection on method and theory

We managed to validate our assumptions, gather data and put it in a useable contexts. The modified MVP structure is doing its purpose, allowing us to put some assumptions to the test.

We persevere from this point, not finding need to pivot, but want to gain more direct feedback than what we got in the test.

5.5.4: Next step

With our validated assumptions, it is clear that when it comes to showing students the seating situation at study spaces, doing estimations is easier for study spaces and also gives a better indication of space overall than counting exact number of free seats. The next thing to do, is then to implement this concept into our idea, showing how it would look like in the app MDP.

We have furthermore also gained insight into the limits and possibilities of the color scheme. To gain better insight into the value gained from these colors, we need to talk directly with a study space *Owner* to get further insight into what things we need to be aware of when implementing the color estimation tool, what other things they might be able to use the colors for and if they can see other uses when it comes to reflecting estimations. But before doing the interview, we need to explain our current business model to have a stepping stone for the interview and feedback it might give us.

6.0 Business Models

During the previous semester project we created a business model using Osterwalder's 9 building blocks principle from the book *Business Model Generation,* as seen below. As explanation for the building blocks we refer to (Madsen & Jensen, 2019, 13-14).

KP AAU: Doesn't have enough space for all students. Might want to support better occupancy-percent age, of study space.	KA Platform/Network Platform management, service provisioning KR Physical: servers, Intellectual: App, database Human: counters	VP Users: Mobile app v mapping of a public studer Customers: Monitoring o and statistic: Exposure an occupancy-p	vith list and available nt spaces f visitors s of these. id improved percentage	CR Customer retention driven. User: Self-service Customer: Personal assistance CH Direct contact Advertisement User stories Website statistics Customer service	CS Segmented into: subsidized users: Students (people looking for a place to study) Paying customer: Study-space owners (institutions and organizations with study facilities).
C\$ physical: servers (varable cost) Intellectual: platform dev. & maint. (fixed cost)		R\$ Service - re	curring revenue stream thro	ugh subscription fees	

Figure 3. Earlier business model from (Madsen & Jensen, 2019, p. 19)

The business model in development, as seen below, has had some slight changes since the last project for various reasons that we will get into later:

KP Study space owners: In order to fulfill our value proposition we require employees at the study spaces to count. hereby we have a strategic alliance with a non-competitor.	KA Acquisition of new customers, Scaling of platform KR Intellectual: App, Human: counters (acquired from key partners)	VP Users: Mobile app s local study s availability. Customers: Exposure, in occupancy-p increased re	howing paces and proved vercentage, venue	CR Customer acquisition driven. User: Self-service Customer: Personal assistance CH Direct contact Customer service Advertisement at study spaces	CS Segmented into: subsidized users: <i>Students</i> (people looking for a place to study) Paying customers: Study-space <i>Owners</i> : (establishments, organisation, institutions with space to study. This is furthermore grouped in: <i>Owners with</i> <i>revenue</i> , and <i>Owners without</i> <i>revenue</i>).
C\$ Intellectual: platform dev. & maint. (fixed cost), Firebase database platform subscription (fixed cost) Advertisement (volume dependent))	R\$ Service - re	curring revenue stream thro	ugh subscription fees

Figure 4. Current business model

Customer Segment:

This business model relates to that of a double-sided pattern, with two customer segments - of which one is subsidized (Osterwalder, 2010, p. 77-78). The *Student* segment subsidized, as we dont believe that they have any intention of paying for an app, solely providing them with convenience. The *Student* segment are the users, who uses it to look for study space and check availability hereof.

What we want to emphasize, which we did not do last semester is, that as it is now, StudySpace is a service made for study space *Owners*, enabling them to show their users or customers their current availability, and through this raising their customer satisfaction, occupancy-percentage and revenue. These are also the reasons that the *Owners* segment are the ones we plan will pay. We have furthermore created to subsegments of *Owners*: '*Owners* with revenue' and '*Owners* without revenue'. The reason for this is the variation of value proposition that the study spaces offer their users, and hereby the change of value proposition we can offer them. If the libraries and and archives offer their users space to study, but do not actively sell anything (beverages or food), the occupancy-percentage obviously cannot result in a higher revenue from that.

Value Proposition:

The value proposed to the *Student* segment is a heightened experience of using the public available study space. Being able to locate and navigate to study space is essential as respondents of interviews we conducted last semester shows a common lack of knowledge about locations of study spaces in Aalborg (Madsen & Jensen, 2019, p. 27). As well as locating study space, the StudySpace app displays the availability of the given study spaces, preventing *Students* arriving in vain because of the lack of space free space.

The value proposition for the Owner segment is dependent on the circumstances for the single study space. The earlier mentioned interviews with students using public study space (Madsen & Jensen, 2019, p. 41-75), indicates a lack of space at public study space in Aalborg. The respondents were found in the main library of Aalborg and in StudieRummet, a public common room, provided by building entrepreneur A. Enggaard, and widely used by students. The widely known study spaces, fx. The main library and the university library in Nordkraft, are the ones most often mentioned as full by the respondents. Both this and the problematic circumstance of not having a not well known study space, can help solve one another by displaying the different study spaces alongside each other. This way, the Students can be faced with alternatives if their 'usual' study space is full, through exposure of the unknown or less used study spaces. This can similarly prevent bad experiences for the Students which in turn will lead to higher satisfaction of the study space. In cases like the libraries where revenue is not a primary goal, the use of the app can increase the occupancy-percentage, to report to the municipality for expansion. The study spaces which in addition sell beverages, food or host events, can increase their income through the increased occupancy-percentage and exposure of offers.

Channels:

In terms of reaching the *Owners*, the connection will be direct contact, in order to properly present the product idea. The initial contact to *Students* will be through direct contact at the given study spaces which *Owners* validate to have interest in testing, if *Students* are found. After testers have been recruited, we will again approach the *Owners*, showing them the found interest in the product.

Furthermore we have added advertisement at the given study spaces, to lure the visiting students to become *Students*. The advertises will be managed by the study space but provided by us.

Customer Relationship:

As Osterwalder also mentions, multi-sided platforms often face a "chicken and egg" dilemma, as the platform relies on two distinctive but interdependent customer groups (Osterwalder, 2010 ,p. 78). This leads to us have a changing customer relationship focus over time, starting with acquisition. The needed code for the application to function is simple and not itself something worth a lot.

The real value on the contrary lies on the simplicity and low expense scaling, until a critical mass has been reached. After this, the focus can slightly change towards retention, which could be through further development of the value proposition.

Revenue Streams:

As we in this business model subsidized the *Student* segment, the *Owners* are the ones we are intending to have paying. The revenue will be an ongoing payment through recurring subscription fees, and will be negotiable, dependent on the circumstances of the given study space (*Owners* with -or without revenue).

Key Resources:

Although simple, the StudySpace app is one of the key resources, and the platform facilitating the the value proposition.

Last semester we calculated network servers as being part of the key Resources. This has although changed as the prototype is connected with firebase Realtime database which is a backend service that functions both as server, API² and datastore. Because of the simplicity,

² API - Application Programming Interface

we intend to keep developing and maintain these key resources ourselves. Another key resource are the people estimating the availability at the study spaces. This resource is acquired from the individual study spaces.

Key Activities:

Acquisition of new *Owners* is one of the key activities and with that comes scaling of the platform. With the simplicity of the code, we don't expect platform management to be a major key activity, but necessary through scaling.

Key Partnerships:

We categorize *Owners* not just as customers, but also as partners, as we rely on them to provide us with availability estimates, which are crucial for our value proposition.

Aalborg University has been discussed as being an obvious partner to provide advertisement directly to its students. We have although chosen to not include them as, their interest in our idea was solely to implement it in one of their own apps.

Cost Structure:

Even though the code is simple and can be developed by ourselves, a fixed cost for hourly developer salary will be included.

Firebase database requires a monthly subscription when holding a certain amount of authenticated users and up/downloading a certain GB data. The amount of data - and structure hereof is however small and simple.

As direct contact to every *Student* will be impossible we need to pay for advertisements at the partner study spaces. This could be posters or signs, which could possibly be bought for a volume dependent price.

7.0: Interview with a study space Owner

To end our tests of availability estimation methods in a study space, we set up an interview with the study space *Owner* of Studenterhuset, Mathias Jensen. We have had contact with Mathias for about a month before the interview, and he has been a spectator to both of our tests at Studenterhuset.

We conducted the interview with the intention of having a general guided approach, with some set questions we wanted answered, but were ready to follow any subject that might come up (Patton, 2002). Some questions were about the test, while others were about his opinion of StudySpace in general, and how to improve it.

The interview was recorded with the permission of the interviewee and parts of the interview, which we refer to, will be found transcribed in the appendix.

The first question we asked him, was if he would be alright with indicating to guests, that their location was full or if he would rather have them come no matter what and risk them having a bad experience?

He answered:

"So, we would probably never send people on to someplace else, i would never see that as an advantage.."⁸

When asked the reason it would never be an advantage, he answered:

"I have a hard time imagine us being in a situation, where we would not have a seat for everybody(...) Ideally we would like to have as many come to our place as possible while still having room for them.^{*4}

Obviously, he does not like the idea of turning people away with showing the red color in the estimation system. We asked him further if there was any positive things he could see about showing their location as very busy:

"Well i can see positive things about it, but personally have i never been one to trust the signs, who told you how many parking spots there are, so i can see a problem in persuading people, but if it shows the wrong thing once, it's really a long way home after that.(...) But I

³ Interview Appendix: Section 1

⁴ Interview Appendix: Section 1

can still easily see the advantage of it, that people don't have to go in vain, totally. I don't have problem with counting or the counting process as it is, totally."⁵

So for Mathias, there are both clear advantages and disadvantages of showing the color red in the estimation. It is positive when it comes to communication and removing the inconvenience of arriving somewhere in vain, although negative as it is never good to turn away people as they strive to have more guests. On top of that comes the concern of giving a wrong estimation.

This indicates that we somehow need to improve the idea of turning people away with the red color estimation. An idea for improvement could be, that instead of just showing red and saying that it is full, the study space could add a note to the red color, explaining why it is busy and giving a chance to communicate better who should come.

When talking about the customers at Studenterhuset, Mathias started talking about how they communicate with their customers and what they want to communicate to them:

"Well I would say, that we have a very varied crowd down here(...)You could say right now, now that the question is asked, that it is very interesting, because we are trying to broaden the knowledge of us, because there are so many who don't know what Studenterhuset is really or what we stand for or what we can be used for. Like some people think that you have to have a student card to use us, which is untrue."⁶

When asked if Mathias think that Studenterhuset have an image of being a place for an alternative segment, he answered:

"Yeah i think so. But that is not at all how it is."7

Mathias is looking for ways to communicate information about Studenterhuset and wants to make it more visible to a broader audience. As mentioned before with the idea of communicating more information through color estimations, this comment supports, that we should give the study spaces the possibility to either link to their webpage, or write information about themselves in the app.

⁵ Interview Appendix: Section 2

⁶ Interview Appendix: Section 3

⁷ Interview Appendix: Section 4

Trying to get some direct feedback on this idea, we asked directly what he would want to communicate with our app, to what he answered:(12:30)

": There needs to be communicated out, quite simply, what kind of sizeable thing we are, because i think there is very much doubt about that.(...) Its not like the place is empty or anything, but people comes down to study, to relax and people allowed to bring food down here when they study and, and there is a friday-barn normal bar and events(..).⁸

This answer again solidify, that we need to give study spaces the option to communicate more with their customers in our app, other than just showing density of customers in a 3-color scheme.

The conversation then lead into talking about Studenterhuset as a social space and as a provider of other things than just as a study space. We asked about the possibility of them using the app as a bar as well as a study space, where they could promote friday bar and other more socially focused events:

"Well it could be ideal for us, if there were many who saw us, after X o'clock, as a bar, because we have a bar, we have a lot of space and fine facilities to sit in.(...) At fridaybar, we have cheap beer between 15 and 20, there a half a liter of beer costs 15 kr. It's hard to find much cheaper." ⁹

While we have focused on creating StudySpace as an app to guide *Students* to good and available study spaces, we could also make the app, so it also supports the social aspect of being a student. As Mathias points out, Studenterhuset functions as both a place to study, but also as a place to be after your day of studying is over. This supports the idea of expanding the concept of StudySpace and supporting the different needs of *Students*, while also giving exposure to different elements of study spaces.

To gain a deeper understanding of what communication area StudySpace could fill, we asked Mathias which communications channels they make use of when it comes to broadening their customer base:

⁸ Interview Appendix: Section 6

⁹ Interview Appendix: Section 7

"(...)we ofcourse have something like Facebook and Instagram, which is what we focus on right now and then we have some coming additions in the form of newsletters which we need to get going with, and then we are represented in offline medias with posters and etc. So that is what we have focus on right now, and we have a lot of focus on our cafe and our more social events(...).^{*10}

While Facebook and Instagram gives some online presence, they are only making use of media where people have to follow and sign up to receive information. Studyspace could fill the role of a communication channel, where Studenterhuset could communicate to *Students* who might not follow them on social media or who might not even know they exist, and thereby enhancing their visibility.

The interview with Mathias has given us clearer vision of what study space *Owners* with revenue, want to use our app for and which elements they would focus on. As we learned last semester through our interview with a study space *Owner*, showing yourself to customers and creating visibility is important for *Owners*, but creating a path of communication, especially when it comes to supporting the estimation colors, is important as well.

¹⁰ Interview Appendix: Section 5

8.0 Building a MDP for testing

To be able to test properly, we spent time learning our way around Javascript and the React Native framework. The reason we chose to work in this particular framework, is based on experience through previous projects and the elimination of time-waste due to it being cross-platform. Instead of paying for a server and database, we implemented Firebase Realtime Database, which is a backend service, being both API, server and a datastore. Firebase allows a specific amount of downloads, uploads, and users per month without paying, which was the most resource friendly solution. Meanwhile, the Firebase is built on Google infrastructure and provides easy and cheap methods in terms of scaling, which is one of the concept's key points in order to succeed.

As earlier mentioned, we last semester tested a balsamiq prototype on the *Student* side, which featured a static map of Aalborg center, with red, yellow and green dots with numbers as study spaces. As we never validated whether a map is desired or even required by the *Students*, we instead chose to build a list showing the local study spaces, which links to their individual addresses in Google Maps upon touch.

Upon hand-in, the prototype contains 6 different screens, which we will now go through, as well of their functions:

- Login screen
- Sign up screen
- Loading screen
- Home screen
- Study spaces screen
- Update availability screen

The first screen the user encounters after download, is the sign up screen as shown below:

Kamera III 4G 12.07	76 % 💻 🗘
Study Spac) UP
Sign Up	
Email	
Password	
Sign Up	
Already have an accour Login	nt?

Figure 5: Sign up screen

This screen will open the first time the app opens and give the opportunity to create a new user, with an email address and password. If you already have a user, you can click the login button below, which will direct you to the login screen:

Kamera III 4G	12.14	81 % 💻 , +
Study	Spac	e
Login		
Email		
Password		
L	ogin	
Don't have a	n account? S Up	Sign

Figure 6: Login screen

In case you already have a user, the login screen takes your email and password - or you can choose to go back to the sign up screen. When you create a new account or log in, the application will remember your login credentials the next time you open the app, to make sure that you do not have to log in again. The screen you are directed to from here is the home screen, as seen in the below figure:



Figure 7: Home screen

From the home screen, the user can go to either the study spaces screen or the update availability screen, as seen below:

Kamera III 4G 12.08 77 % () 4	Kamera 💵 4G 12.08	77 % 💻 🥍
Back	Back	
Study Space	Study Spac	e / spaces
	♀ Nordkraft Bibliotek	\$
Choose studySpace	Create	
Aalborg Universitetsbibliot	Hovedbiblioteket	
	Studenterhuset	
Green Yellow Red	Studierummet	
Update		

Figure 8: Update availability screen

Figure 9: Study spaces screen

In the update availability screen, the user selects which study space to update through a picker, and hereafter set the availability to either green, yellow or red. The data is then submitted to the database upon clicking 'Update'.

The study spaces screen, shows a list of the collected study spaces, as well the availability of the individual places - shown in colors. The list as well has a feature, enabling the user to click the study spaces, and get directions through Google Maps.

At first, the update availability screen required the user to input the number of free seats at the study space, which would then be shown in the study spaces list. We however found out through iteration 1, that counting the free seats at study spaces, is quite a heavy task, which would make it less likely for *Owners* to accept our value-proposition. Other than that, the availability data we received from the employees was unreliable, making this method of data gathering unusable. In iteration 2 we found out that estimation of space is far easier for the study space's employees. Furthermore we sought to find a common understanding between the employees' and the guests individual estimates. This is also the reason that we incorporated the green, yellow red estimation instead, as we believe it to support the value-proposition better.



Figure 10: Get directions screen



Figure 11: Directions in Google Maps

There are a few minor changes, which needs to be implemented, before the MDP is ready for testing. This is for example displaying the last time the last availability submission was made for the individual study spaces in the study spaces screen, to ensure the user that the information shown is not decrepit. Added authentication for the update availability screen is also needed, in order to only have the study spaces themselves update their availability. These changes will be implemented shortly after our hand-in, in order to be able to present the MDP at our exam.

This build will however be sufficient for testing with a group large enough to leverage the amount of possible users to relevant study spaces.

9.0 Discussion

With us reaching the end of our iterations of BML and with us having set up a business model for our future endeavor, we will now dive into elements of our process, that we believe are worth discussing, such as our use of Lean Startup, the different business models that have opened up for us during the project and how our prototype could have turned out.

9.1: Lean startup troubles and it's origin from Lean production

One of the main focuses of this project, have been to see how Eric Ries's Lean Startup method could be used in creating a new startup and developing a concept for a new product. The process of implementing the method has not been effortlessly, and as can be seen in some of the previous chapters, we have had to modify several elements of the method, before we were comfortable with using it in our process. Even after we had modified in preparations for our BML iterations, we still had problems with translating Ries's guidelines into tests and clear results. While the reasoning behind these modifications have been based upon Ries's development perspective and him not designing Lean Startup with small university projects in mind, it might also be, that some of our problems with using Lean Startup might come from its origin.

Ries have partly based his Lean Startup method upon the method of Lean Manufacturing, a japanese production method, which tries to optimize production in factories and reducing waste when able to(Poppendieck & Poppendieck, 2003, 1-2). Replace "manufacturing" with "development" and you can see how much they remind of each other, with a core focus on waste reduction, but the difference between them is still really big. Jon Burgstone, a professor at UC Berkeley points out, that going from manufacturing to development changes things a lot and creates problems, especially when it comes to making MVPs and planning ahead (Burgstone, 2012). The reason for why Ries adapted the method into development is obvious, as he himself is a software developer (Ries, 2011, 5). We are however not manufacturing nor developing a product, but a concept. If Ries have taken inspiration from Ries Lean Startup in order to develop concepts, then we are really using a 3rd hand method, going from manufacturing, to development, to concept.

While no method fits all situations, the Lean Startup method is criticized widely for not being very universal within the field of entrepreneurship(Burgstone, 2012)(Pelling, 2011). By translating Lean Startup into our project and modifying it, we might have encountered more of it's problems, due to its inspiration from lean manufacturing, than we would have if we had used Lean Startup in an environment Ries would recommend.

The question is then if Lean Startup as a method for concept development, is even a good choice. While it is a method, that can not be taken into complete use, it can be argued that its process of BML does give a good framework to build a concept development process around. Elements such as learning about your customers through direct interaction and building a product based upon only what is needed to grant value to the customer, have been proven in our project useful in concept development, just as in product development. The usefulness of building MVPs based upon the current concept-in-development seems to depends on the situation. It can be argued, that building MVPs for a concept is a waste of time and that talking to customers or having them test prototypes is much more useful, but having a MVP is in itself a way to show concept and can be used in both tests and in customer interaction. As it can be seen in our project, there are just some circumstances where too much work needs to be done before a MVP can be useful, as a MVP based upon our main feature requires two customer segments to be already established and in use at the same time, before it can even be launched and tested fully. It would arguably require a circumstance, where the MVP could be made quickly and cheaply, and be functional in the hands of customers without the need for an established relationship.

9.2: Convergence process

Another factor in the use of Lean Startup has also been, that while we have attempted initially to keep our process close to what framework Ries sets up, the process ended up quite different. When using the Lean Startup method, the process of product development is supposed to follow a strict convergence path, where an idea is developed into a valuable product. While we started out with the intention of following a similar process, concept development does not follow a strict convergence, as it per default is a matter of trial and error. Several problem areas and proposals to solutions are identified, where one is pursued. The convergence through this process is however anything but strict, as new information can require exploration of new problems and requirements in order to create a fitting solution. Through the interview with Mathias, we gained new information and requirements crucial to fulfill our value proposition, which forced us to diverge and ideate over new solutions before being able to converge again. When it comes to using Lean Startup, whenever feedback is given that indicates a want for change, specifications are narrowed to fewer solutions, coming closer to customer satisfaction. We assumed, that the problem we were trying to

solve was estimating the availability for both the users and study spaces, but from the interview we learned, that they were not interested in that. Instead, we needed to diverge and change our solution, to something that would create value for them as well.

9.3: Prospect Scenarios

As the problem area, that we engage through the project is different from the one that Lean Startup deals with, we looked into another paradigm, which we thought could be better to explain our process. In a meeting with Ivan Aaen, he revealed further unpublished research on his Essence paradigm, and in particular Vision Scenarios (Aaen, 2018, 14-28). This research gives a guide for an innovation tool called 'Prospect Scenarios', which purpose is to develop ideas for defining problems or solutions(Aaen, 2019). This is done by defining four unique quadrants bounded by two axes, where the ends of both axes symbolizes something mutually exclusive to the other end. The quadrants are then used to develop different understandings of the problem and approaches to solve it. The Prospect Scenario is a combination of sub-scenarios: the *Problem Scenario* which aim is to explore Problem Domain, and the *Solution Scenario* that aims to explore the Solution Domain(Aaen, 2019)

As Aaen's Prospect Scenarios, in contrary to Ries' Lean Startup, is a tool made for concept innovation, we will try to explain our process through the use of that.

Through the project, the problem that we intended to solve, was providing students with data about where they could currently find publicly accessible space to study at, to avoid them going somewhere in vain. Therefore, we have Students and study space Employees in one axis, and Study Spaces and Social spaces in the other axis, to depict the Problem domain. For the Solution Domain, we have chosen to use Autonomous and Manually for one axis, and Precision and Estimation for the other.

We made these choices, as we from the beginning were aware of several types of spaces, where one type were study spaces without revenue, such as the libraries, the city archive and Studierummet. At the same time, another type is social spaces with revenue eg. cafes and bars, where some of them feature students studying there.

For each quadrant there would be a prospect with four different forms of representation fitting the surrounding axes, all emphasizing different aspects of the solution.

These forms are *Prototype* - suggesting a physical design, *Metaphors* - suggesting major design strategies and principles, *Proposition* - defining the goals of the projects and *Icons* - that depicts the fundamental qualities which the project aims to pursue.



Figure 12: Prospect Scenarios

9.3.1: Earlier Prospect

From the Prospect Scenarios above, we decided to follow *Quadrant IV*. We made this choice based on the iterations earlier in the project, where we tested the different data gathering methods, as well as the fact that we are bootstrapping, and therefore not spending money on sensors. The surrogate measurements seemed rather invalid to us, as trying to translate eg. the individual social space's revenue per hour to how occupied it is, is hard as people can buy something to go or sit there for longer periods without buying something. You could ofcourse measure other things, such as water use and connect data. This would however be a technically much more complicated solution and would also be harder to scale, due to social spaces use of different technologies, which would need to be implemented.

As Aaen explains the term Prospect is used to depict the solution that we at the time think will solve the problem, if the product is properly built and used as intended. What needs to be emphasized here, is that it is a prospect for a solution, as our ideas of problem and solution could possibly change while progressing. New knowledge regarding either problems or solutions could thus lead to a change of focus - or new prospects.

9.3.2: Change of Prospects and axes

As earlier discussed, we had to change our ideas of both problem and solution after the interview with the *Owner* at Studenterhuset, Mathias. As showing estimates of availability alone to their customers is not attractive for them, the solution to gathering this data suddenly became a question solving another problem for them.

He says that communicating further than just availability - including offers and general information about the place, would be more intriguing for them, as they are both a study space -and social space. A lot of social spaces in Aalborg can be places in the same category, which leads us to look at the social-only-spaces. Bars and bodegas are for many students a go-to place for socialising, which makes us think that a symbiosis can be achieved by coupling them to the StudySpace app as well. This way, students who use the app to find study spaces, would also be exposed to offers from social spaces and bars, which in turn goes the other way around as well.

Instead of changing a Prospect, Ivan Aaen suggested at a meeting, that we tried looking at possible changes for the axes in the Prospect Scenario table. This lead to us switching Precision and Estimation out with Information and Marketing, as seen below.

Students

A	utono	omous		
Prototype: - Client/Server: entrance monitorization Metaphor: - Entrance turnstile Proposition: - StudySpace displays occupation based on monitorization of guest entrances - and exits with sensors Icon: - Abacus			Prototype: - Client/Server: Auto display of offers through social media connection, estimation of availability Metaphor: - Screen duplication Proposition: - StudySpace sorts the study spaces social media posts into displayable offers and events alongside estimations Icon: - Hashtag	
udy Spaces		1	Sc	cial Spaces
Information	ш	IV	M	arketing
Prototype: - Client/Server: Thorough counting by employees Metaphor: - Warehouse cycle counting Proposition: - StudySpace displays occupation based on employee input data Icon: - Clicker			Prototype: - Client/Server; employee controller marketing, estimation of availability Metaphor: - A promoter Proposition: - StudySpace displays offers and e based on employee input alongside estimations Icon: - Newspaper ad	d vents
E	mplo	oyees		
	Mani	ually		

Figure 13: Altered Prospect Scenarios

By changing the Solution Scenario, we end up with two new prospects in *Quadrant* I and IV, each giving a proposal on how to solve the marketing aspect. *Quadrant* II and III, are meanwhile still focused on providing Students with information of availability or occupation at the study spaces.

As discussed, the 'preproject' or concept development stage, is difficult to approach systematically, with the use of Lean Startup, as this term is barely touched by Ries. We can however try to imply how a concept innovation method can be used to explain our progression in defining a problem and possible solutions. These solutions we will now discuss regarding the business model.

9.4: Business Model

The interview with study space *Owner* Mathias, opens for new possibilities regarding our business model. It is of course not in their interest to send people somewhere else, while still having space. It can however be discussed whether the customer segment, *Students*, needs to be expanded even further, to cover the diversity that Studenterhuset is aiming for. This can meanwhile be grouped with the question of implementing a less 'study space' focused aspect of the value proposition, in order to capsule another facet that is often associated with student life, which is socialising. The study space Studenterhuset, and the *Owner* Mathias, are a part of the segment that we call '*Owners* with revenue', as part of their existence relies on them having an actual income. These types of *Owners* can be a crucial part of our customer segment, as they do not solely rely on support from the region or municipality, but have money to spend where they see value. Seen in contrast to study spaces like the university libraries, the city archives and Studierummet, these establishments offer their customers a directly revenue-creating value proposition, which is essential for their sustainability.

Studenterhuset is a bar and event house, as well as it is a study space, which makes the solution of showing their guests the amount of free space based on being able to study there, conflicting with the study spaces interests. Instead, we need to reach another customer segment, whom's interests does not lie in studying, but in the bar and events, also facilitated there. This customer segment is not necessarily isolated, but can also be a part of the *Students* segment.

In order to reach this 'Socials' segment, we need to change a few things in the business model.

In **value proposition** we could add, providing the users with information about offers, daily and ongoing events at the study spaces, alongside the color estimation of availability. This resource of information would be added as part of the **key resources**, and would be obtained through **key partnerships** with the individual study spaces like the estimations. While having *Owners* and *Owners* with revenue as two different groups paying customers, it would possibly make sense to add a third one, 'Social space *Owners*'. This term could cover *Owners* who only possess social space, like bars - which are also heavily used by students. Finding a free table in a bar, can as well as finding available study space during the day, be difficult on wednesday till saturday nights. No matter if people are looking for a less -or very crowded bar, the concept we are developing for study spaces might be transferable. The value proposition would be the same as for *Owners* with revenue, which is also the reason, that we are discussing the possibility of this *zoom-out pivot*, as Ries calls it (Ries, 2011, p.173). He explains that the zoom-out pivot is when a single feature is insufficient in supporting a whole product, but what we thought would be the whole product instead becomes a feature in a larger product.

The synergy of study spaces, study spaces with revenue and social spaces, could possibly be better for the concept, as Studenterhuset needs further value than availability estimation, which can be provided through event and offer promotion. This value proposition could as well be interesting for bars both in -and outside center to improve visibility of both location and offers. Meanwhile it it is possible, that the users who originally were only using one of these kind of 'spaces', would be attracted to the other ones, through their visibility in the app.

We earlier mentioned the study space *Owners* to *Students* relationship as being problematic, regarding revenue streams. We never really looked into the possibility of charging *Students* for their use of StudySpace. A lot of technology and value propositions that people have are subscription based, which in turn can seem positive. However with StudySpace mainly being a convenience app for the *Students*, it's pure speculation to discuss whether they would pay a monthly 10 kr subscription, unless they would be offered eg. discounts or secret insight.

9.5: Prototype

It is as earlier mentioned not beneficial for Studenterhuset to 'send' *Students* somewhere else, even if they are heavily occupied. It is although beneficial for them to be able to market offers and events, to users whom also study there or study somewhere else, which could be possible through the app.

By implementing a feature, allowing both study -and social spaces to write something about themselves or link to their webpage, as well as promote a daily offer or event in the study spaces list, we could possibly leverage the idea having them display their availability as well. Estimating every hour might not be sufficient, in order to give users a feeling of current availability. At the same time, if wrong estimations are given, it won't be long before users start discarding it. This is also something that the *Owner* from Studenterhuset, Mathias, mentions in the interview, as most likely being a dealbreaker for the users. It is possible to support the employees in giving better estimates by easyning the useflow for updating the availability even further. In order to make them susceptible to update more often, we could

discard the 'submit' button and solely have them click the color estimate, which would then be highlighted and sent to the database. The next time they go to the screen, that color would still be highlighted, but they could click it again or click another color to update the last update time. Furthermore, the amount of clicks needed to update could be reduced, by having the app open in the update menu if the hashed user is authenticated to update that study space.

Another human factor that could result in bad estimates is memory. If employees forget to update, the estimates are possibly obsolete when users see them, which can result in bad user experiences. To support this, a timer could be implemented in the 'update' screen, to send push notifications every 30 minutes. These push-notifications could even contain action buttons with estimates to avoid having to open the app more than once every day. These elements are all part of, what we at this point see as possibly fitting solution, solving both the marketing aspect required by Studenterhuset, and the display of availability, supporting *Students* finding available study space.

10.0 Conclusion

When beginning this project, our goal was to develop the concept of StudySpace, helping students find publicly accessible study space. We did this, trying to apply a partial and modified version of Eric Ries' Lean Startup method, progressing through two BML iterations of experiments. The use of Lean can in our circumstance be proved problematic, due to several factors: Lean Manufacturing, from which Lean Startup originates, focuses on production optimization. Ries got inspiration from this and applied it to software development in Lean Startup, and now we took inspiration from Ries and tried to apply it to concept development. Besides using a '3rd hand' inspirationally modified method, we in time discovered, that Lean Startup does not really deal with concept development, but only with developing established concepts. Meanwhile, the extreme limitations of resources and our general scale made optimal use of primary Lean Startup elements such as planning and MVP construction, difficult.

Based upon the two iterations, we further developed the business model started in our previous project, and implemented the changes supporting the new solution. Based upon an interview with the *Owner* at Studenterhuset, we needed to partially change our idea of both problem and solution, which we through discussion of our use of method, realised had been easier depicted through use of Aaen's Prospect Scenarios. This, as Prospect Scenarios deals with 'preproject' - or concept development, allowing a less strict convergence, compared to Lean Startup.

These changes required discussion of the business model, where we decided to add an additional customer segment, social spaces. This, as the new marketing focused prospect solution for Studenterhuset could possibly embrace this customer segment as well, and create a symbiosis. Based upon the new requirements, we discussed which features to implement in a possible MDP, in order to minimize the probability of bad estimations. Here we decided that minimizing the required interaction from employees through the use of timed push messages with action buttons, would be most ideal. In order to facilitate study -and social space marketing on the platform, we deemed that, having employees input information and current offers manually in the app, as most fitting, based upon our available resources.

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