General car rental

# Final report TDT4252 Enterprise architecture for Enterprise innovation

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## 1. Introduction

## 1.1 Case description

This is a small car renting company with a with multiple cars parked in multiple different location, varying from 50m, to 800m from the front desk. Currently, the customer must come to the front desk, pick up the keys, and the employee must show them to where the car is parked. This can leave the front desk unattended for some time and leave other customer waiting. At the same time the customer service representative is overwhelmed by phone calls coming in from rentals in process where the renter is requesting information about included miles, rules and restrictions, hand in time etc.

The current software library of the company consists of a mixture of proprietary software and of the shelf solutions. The proprietary software consists mainly of their car fleet management software, which stores information about their cars onto a database with repair, and service details attached. This is an old, but simple application and could easily be improved but new potential developers. Their off the shelf software is a simple calendar application that keeps track of which vehicles are available, and not available at any time. Updating this calendar is somewhat automated, but a lot of the upkeep is done by the order manager.

#### 1.2 Who is the model for?

The model is for the company to identify areas where their customer experience can be improved. The model will be a basis for service innovation which will have the same main goal as the models and will give an overview on how the business may be altered to accommodate the innovation.

#### 1.3 What is the purpose behind the model?

To map out the current state of the business and identify any areas where improvement is necessary. It would also be used to identify other, previously missed areas where improvements could be beneficial. Mainly since customer satisfaction is very low, it would be advisable to focus on areas which the customers are reporting the most dissatisfaction. This could come in the form of identifying other areas customer are dissatisfied with, but not necessarily complaining about.

## 1.4 Stakeholders

The stakeholders would consist of individuals and/or groups that can have an impact, or be impacted themselves, du to the business probably going to change in the near future. Therefore, the stakeholders are anyone who may be affected by this innovation. The customers will receive a different service that previously, the employees will probably have their responsibility and duties changed, and the owners will hopefully going to see a change in public perception and increase their overall business revenue.

# 2. Enterprise models

Here I will present my models first in ArchiMate and then in 4EM. The first 3 layers/perspectives are the same between the enterprise modelling languages. This is done to get a better grasp on the strengths and weaknesses for both languages, as I do not have a lot of experience with either of them. I will first explain each sub-model individually, and then make some small comment on the 'overview' model, which is the sub-models connected. Most of the descriptions for each sub-model will be similar, since they cover the same reality, but I will comment on differences/discrepancies between the different versions.

## 2.1 Design of the model

When I first started designing the models I started with the goals/motivation model. This was done to make it easier to figure out what perspective/view to continue modelling, as my case have a very clear problem/goal they wish to archive. I did this in both 4EM and ArchiMate.

Secondly, I started with the business process, as understanding the main process the business abide by is essential to identify possible innovation. Then I tried to connect the goals and subgoals to the process model, but I found it difficult to expand on the basic business process and get it to a point where it would be adequate.

#### 2.2 4EM models

#### 2.2.1 Goal model

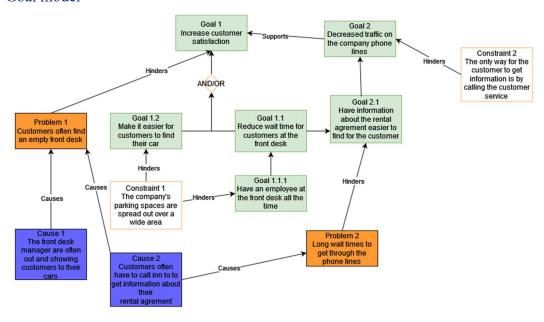


Figure 1: Goal model 4EM

#### **Description:**

The main goal here is to increase customer satisfaction (Goal 1), this is supported by decreasing traffic on the company phone lines (Goal 2), to make it easier for the customers to

find their car (Goal 1.2) and/or reduce wait time for customers at the front desk (Goal 1.1). this is again supported by (Goal 1.1.1), which is a much more specific sub goal that is a requirement to fulfil the main goal. As the main goal, it is natural that it is supported by other more specific goals. It is also having a problem directly hindering its accomplishment. This is problem 1, which is "customers often find an empty front desk".

This problem has 2 causes; Cause 1 and cause 2. Cause 1 points to an obvious problem that was mentioned in the case description, that the front desk manager often find themselves out of the office to guide customers to their cars (Cause 1),

Decreasing traffic on the company phone lines (Goal 2), is a goal that sets out to reduce the workload on the front desk manager, as I will show later, have caused reduced customer satisfaction. This goal is hindered by constraint 2, "The only way for the customer to get information is by calling the front desk". This is really one of the core issues that the enterprise models are trying to address, as this constraint overload the already excising infrastructure in place. Then we have (Goal 2.1) that support (Goal 2) and is supported by (Goal 1.1). (Goal 2.1) wants to address an increasing customer demand that information about the lease conditions that can only be acquired through calling the front desk.

#### 2.2.2 Process model

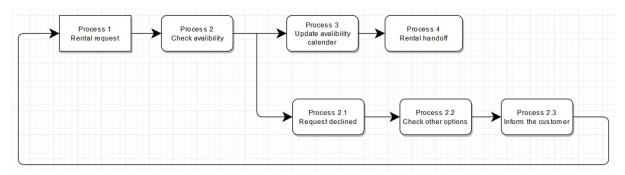


Figure 2: Process model 4EM

#### **Description:**

For the business process, I chose to map out the main process that drives the business. This is to set the rest of the enterprise models into context and make it easier for the users of the models to understand how all the elements fit together.

It starts with (Process 1) where a request is received from a customer. This leads to (Process 2) that checks if the requested rental is available, and this splits into either a sub process, or continues with the next process. The sub-process is for when the desired rental is not available, or some other conditions make the rental not possible. It starts with (Process 2.1) which simply states that the request is declined based on the conditions listed above. This leads to (Process 2.2) which states that other options will be considered and proposed to the customer. This is the responsibility of the order manager role, which will be modelled in the upcoming model. Further (Process 2.3) is to inform the customer, this will again fall under the responsibility of the order manager. After this last step in the sub-process, the process will begin again, and the rental request will start over. The rest of the business process consists of

(Process 3), and (Process 4). The third process simply updates the availability calendar which is required for the rest of the business process. Process 4

This perspective could probably have been elaborated on further, especially on (Process 4) which the previously mentioned goal model, and further models/innovations tries to improve on.

#### 2.2.3 Organization model

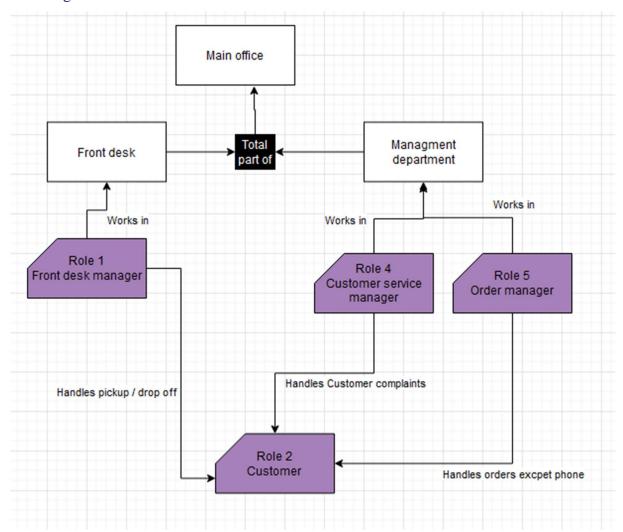


Figure 3: Organization model 4EM

#### **Description:**

Figure 3 depicts the individual positions that are associated with the firm, and what department they belong to. All the positions are marked as roles, and all the positions interacts with the customer (Role 2). This is specified by the text next to the arrows going to the customer (Role 2). Firstly, we have the main office, that have two distinct 'parts' or 'departments'. The first is the front desk, which the front desk manager (Role 1) work in. We can see that the front desk manager is responsible for pickups and drop offs, and even though it doesn't show in the figure, the role also has the responsibility for the company's phone line. This is made clear in the case description.

Furthermore, we have the management department, which consists of two roles. The first role is the customer service manager (Role 4) which handles customer complaints. The second role is the order manager (Role 5), which handles incoming orders from customers. This role also has a shared responsibility for handling insurance claims with the order manager (Role 5). I had trouble visualizing this aspect in 4EM,

Both the management office, and the front desk belong to the same physical location. This is visualised through the 'total part of' black box that intercepts both departments.

## 2.2.4 Overview of 4EM model

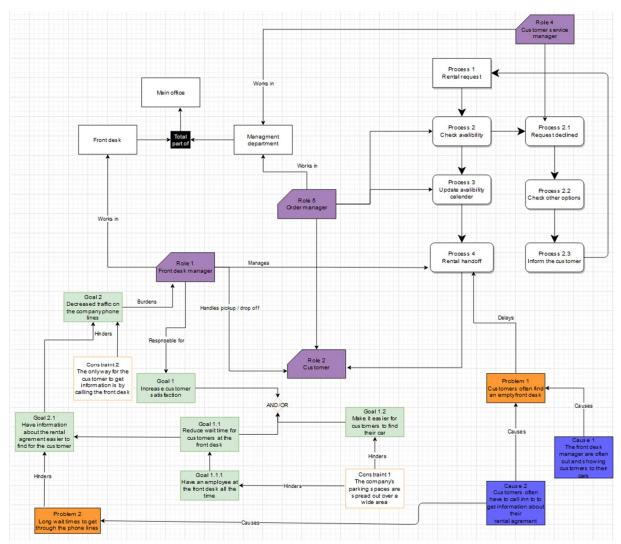


Figure 4: Overview 4EM

#### **Description:**

The overview model is all the previous mentioned models all interconnected. This will be quite useful to get a better picture on how different aspects of our enterprise comes together. The structure of some of the models have been changed to better fit in with the rest of the models. The main changes have been done to the process model, which have been rotated 90 degrees, to make it easier to map roles and goals to it. For the other two, some of the

individual nodes have been moved away from its 'normal' placement, to avoid unnecessary long lines and illegible spaghetti soup

The individual roles are connected to what process they are involved in. They may also have lines going from and to individual goals, for which they either can be burdened, or be responsible for. This will help us understand what will directly/indirectly be affected by a possible service innovation. For the reworking

#### 2.3 ArchiMate

#### 2.3.2 Process model

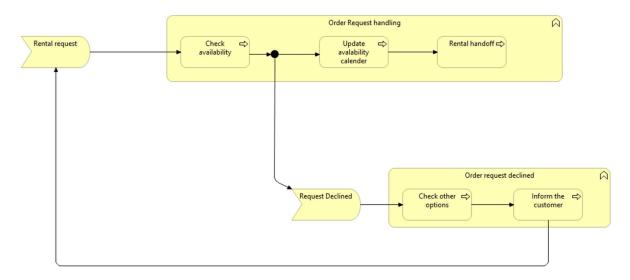


Figure 5: Process model ArchiMate

#### **Description:**

The business process model here in ArchiMate (Figure 5) is rather similar to the one in 4EM (Figure 2). Therefore, I will rather describe the unique ArchiMate elements, rather than describe the same thing again. The first node in the main process and sub-process are both represented as business events, which indicate that something triggers and start the process. For the rental request node, an incoming rental request will trigger and start the process. For the request declines event node, it will be triggered based on the results of an earlier business process, which is the check availability business process. We can also see that several business processes are grouped together in business functions. The first one is the 'Order request handling' which is the main business function that drives the business. It is in this business function

#### 2.3.1 Goal model

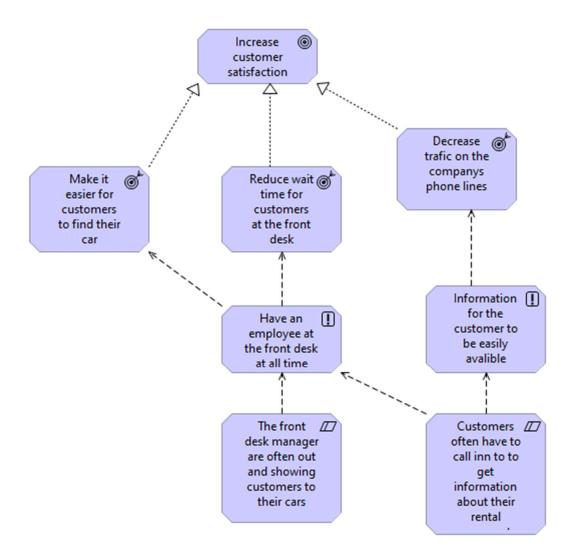


Figure 6: Goal model ArchiMate

#### **Description:**

The goal model in ArchiMate is quite different than in 4EM. Here I have identified one central goal, and what would be sub-goals in 4EM (Figure 1), is now an outcome. The goals, and sub-goals, are mostly similar as those in 4EM, but due to the difference in modelling language some have been included in others or flouted. The problems and causes in the 4EM sub-model (Figure 1) have been replaced with principles and constraint, represented as the exclamation marks and parallelograms. The principles here represent a broad intent that applies to our goals and outcomes. In my models they set out that the intent is to; 'Have an employee at the front desk at all times', and 'information for the customer to be easily available.

The constraint nodes are a limitation, or a barrier that prevent the goals to be achieved. In my model, the constraints are based in the business current situation, and current difficulties that are facing the business. They are connected to the other principles which restricts or prevents the intent to be fulfilled.

#### 2.3.3 Organization model

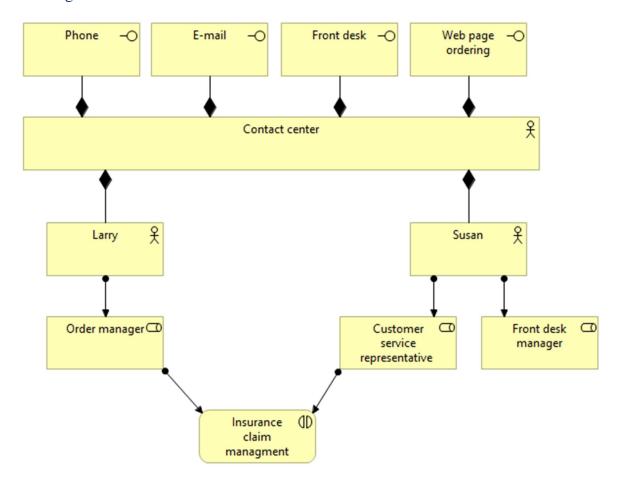


Figure 7: Organization model ArchiMate

#### **Description:**

The organization model depicts how customers contact the business. On the top I have several business interfaces that depicts with what means customers contact the business. Just beneath that I have a business actor called 'contact centre', which act as a layer that divides what contact method goes to which business role. The contact centre exists the two main employees, modelled as actors, that handles incoming business inquiries. Their names are random to make it easier to understand the model in when I connect them all together. The actors have each one or more roles associated with them, and it also exists a business interaction to handle complex insurance claims. This interaction exists between the order manager and customer service representative.

#### 2.3.4 Overview of models

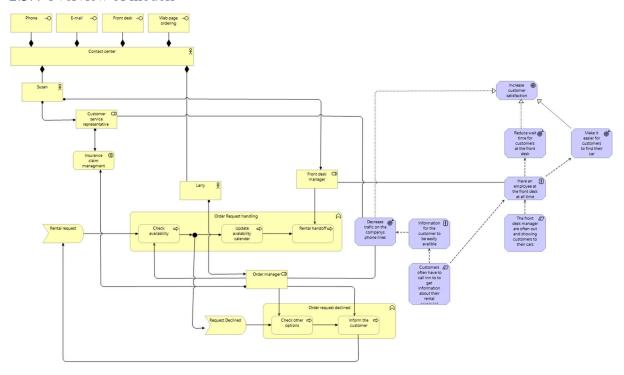


Figure 8: Overview ArchiMate

## **Description:**

The overview for the ArchiMate models connects the separate models together. I begam by putting the business process in the middle and placing the rest of the models around it. After that I connected the individual nodes in the goal model to the business roles that mostly affect/related to them. After that I tried to connect the business roles to the business processes that mostly affect them, or they are responsible for. I had to drag some of the elements far out, leading to a bit of connection soup, especially in the middle around the 'order manager' business role. This is not something I am entirely happy with, but still I think I made it legible, and it will not affect the usage of the model.

# 2.4 Usage of the model

The usage of the model should be to analyse the current business practises and identify areas where improvement may be possible. This could be on how different computer system interact or how the current business processes work. It will also be used to get an overview of the current situation both for the management staff, and for potential future endeavours that may need insight into how the business functions and operates.

#### 2.5 ArchiMate vs. 4EM

When I started modelling with both 4EM and ArchiMate I found that 4EM was way much easier than ArchiMate to wrap my head around. 4EM relations between nodes was much easier for a lay person to instinctively to understand, compared to ArchiMate. ArchiMate has abstract relation symbols, which makes it harder to instinctively understand how the nodes

connect to each other. The ArchiMate software, 'Archi', was quite daunting for a new user, and quite hard to get a grasp on. For 4EM I used general modelling software that was quite intuitive to use and had a lot of additional resources. When I just had a single model in both 4EM and ArchiMate, it thought I was going to move on with 4EM, since I could draw a good model with 4EM in a short amount of time and with quite ease.

When I had finished 2-3 models and it came time to connect them, I found it a quite challenging task. I hadn't really got a good grasp on the Archi software, but to have the software remember what connections you have used previously was very helpful. After I had a bit of training, I found it somewhat easy to model in ArchiMate. Therefore, I will be continuing with ArchiMate for my case.

## 3. Service innovation

## 3.1 Description of the innovation

My innovation for the enterprise will be a mobile app that will display information about the lease agreement and where to find their vehicle to make information easier to find, and more accessible for the customers. This innovation will intergrade with the already existing internal booking system and will include a in app map that will give the customer exact directions and location on where the car is parked when they come to pick it up.

#### Key features:

- 1. **Parking map:** The app will be able to show the customer where the car is parked when they go to first pick it up after receiving the keys. As well as show them where to park it when they go to drop it off
- 2. **Information about the rental agreement:** The app will be able to display relevant information about the customers rental agreement without them having to call in to the front desk. Information such as: how many included miles are there, what terms and conditions apply, what to do in an accident, etc.

## 3.2 Customer Journey

Customer journeys are a great way to understand how customers use and experience your service. Customer journeys are often made with personas. Personas are made up hypothetical customers that illustrates a customer segment relevant to your business model. For my innovation I have made two customer journeys, one before the innovation, and one after the innovation. I used the personas John and Alice respectively.

- The first customer journey shows John, a businessman that are super busy and need things to happened fast. He is met with long wait times on the phones, at pickup and at drop off. Figure 9
- The second one is Alice, who is visiting family in the area. She is on a tight schedule, and don't want to wait around all that much. Figure 10

#### 3.2.1 Before innovation

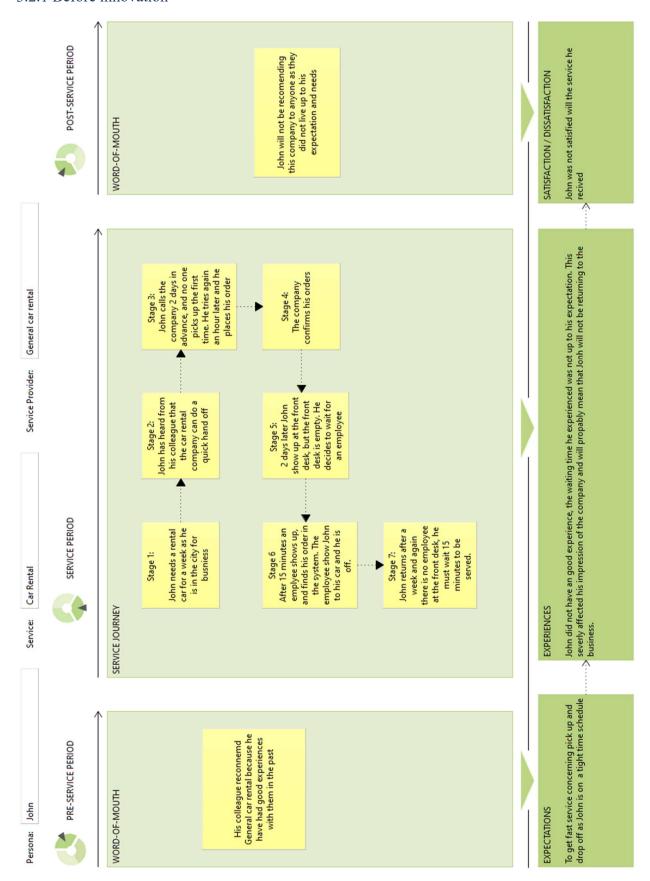


Figure 9: John - Customer Journey before innovation

#### 3.2.1 After innovation

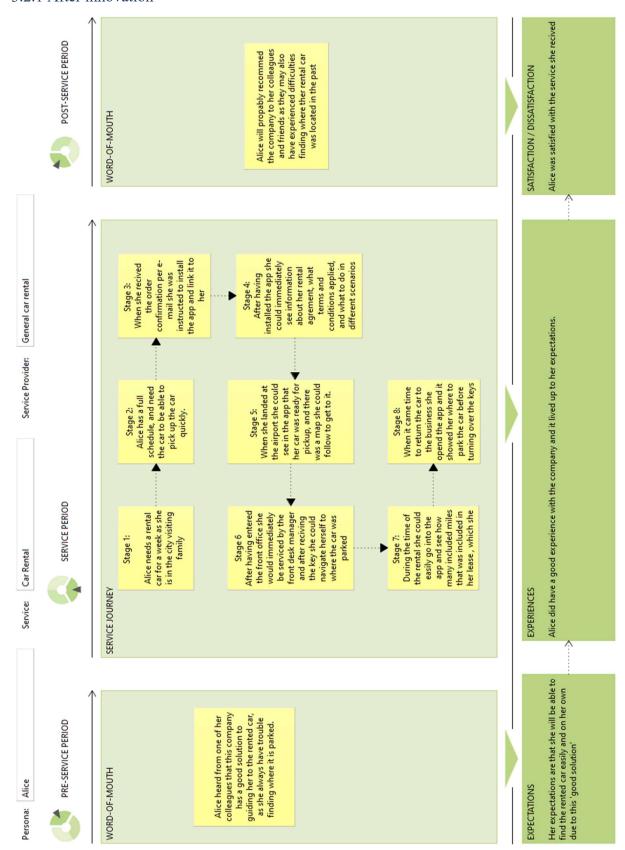


Figure 10: Alice - Customer journey after innovation

# 3.3 Service Blueprint

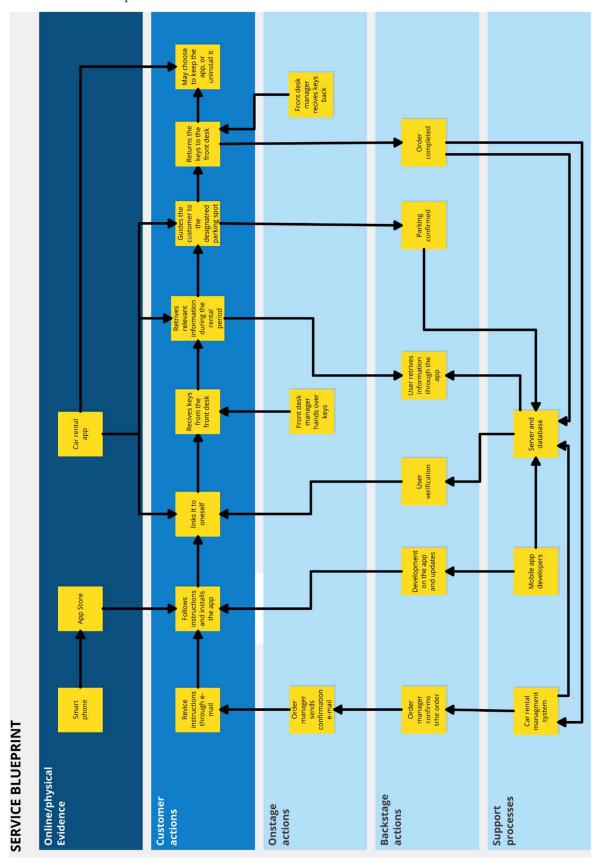


Figure 11: Service blueprint

#### 3.4 How to realize the innovation

From the service blueprint, it can be deducted that smart phones and internet access is a requirement for the innovation to be successful. We can also see that new IT infrastructure need to be implemented to support a mobile application, as well as be integrated with already existing systems. This means that the IT infrastructure and app development can be delivered as a package and possibly even be outsourced. The cost of hosting a in house development team is quite steep, so outsourcing would be a very tempting prospect. This would however mean having to grant access to a third party to their already existing servers and systems. This could pose a privacy risk, so if it is to be outsourced, it would be best to go with a reputable company that is capable to handle sensitive data.

Another issue that may need to be addressed is that already existing IT infrastructure may not be able to handle all that extra traffic a new mobile application would bring. So an upgrade of the IT infrastructure which already exists may become an unforeseen cost that should be investigated in advance.

## 4. Business model

For my innovation I have examined important aspects onto a business model canvas to get a better understanding of how it will work with the current business model. This will be displayed in (Figure 12). The important aspects of the business model canvas are pre-defined, and are as follows, value proposition, customer segments, channels, customer relationships, revenue streams, key resources, key activities, key partners, and cost structure. Afterwards I will provide a brief description of each of them on what is included and why.

#### 4.1 Business model canvas



Figure 12: Business model canvas

## 4.2 Description of the business model canvas

#### • Value proposition:

Value proposition is all about what value are we creating for the customer and the business. In my model canvas I have identified a new value created for the customer, in this case the '... information to be more available'. This is a new promise to the customers that they can get the information they desire in an accessible manner. The second proposition is a solution that this innovation set out to find in the first place.

#### • Customer segments:

The customer segments identified are not specific to this innovation itself, but are the general customer segments the business are aiming for. Since this innovation aims to solve a business problem that do not concern itself with what kind of customer, but

rather the number of customers. Therefore, for the innovation to be impactful we need to address all the customers the business services.

#### • Channels:

The initial communication will happen through e-mail, as their order confirmation will include instructions on installing and using the app. Further communication will mainly be through the app, as all any type of information the customer may require, they will receive through the app.

#### • Customer relationships:

The customer relationship this innovation aims to establish with the customer is a kind of self-serving system through an application. This is where the company supplies the tools necessary for the customer to do it themselves, rather them having to call/send an e-mail to the company to receive the desired information.

#### • Revenue streams:

As you can imagine, it will be no direct monetary gain, although the customer experience will improve, and hopefully drive lead to increased business.

#### • Key resources:

Under key resources I have identified smart phones, internet connection, and IT-infrastructure. IT infrastructure is the main one for the company to focus on, due to it being something they must manage themselves. Today, one can expect nearly everyone to own a smartphone with an internet connection 24/7. So, these key resources are up to the customer to manage, but they are listed here as it is essential for the innovation to be effective.

#### • Key activities:

The key activities consist of 'upkeep of the mobile app', and 'keeping the system updated...'. These activities are necessary for the innovation to have full effect, and essential for the customer to have a good experience. Upkeep of the app is essential to ensure continuing functionality and keeping the user experience when using the app at a maximum. The second activity to keep the system updated. A potential scenario would be if the business is slow to enter information from accepted rental requests into the main system, which would make the information not available to the customers and they having to call in. That defeats the whole purpose of the innovation and therefore it is listed as a key activity.

#### Key partners:

The key partners of this innovation would be the mobile app developers, as well as the customers. The developers would obviously be responsible for creating the app itself, and this task would probably be outsourced to a third party. The second key partner is the customer as they ultimately must utilize the innovation for it to have its desired effect. That the customer is on board is essential for the innovation to be a success, and in the worst-case scenario is that it may sway potential customers away from the business

#### • Cost structure:

The cost structure of the innovation consists of the app development and IT infrastructure that is required for the innovation to be implemented. However, there is a great possibility that it may be costly, and options for outsourcing for both the development and maintenance of th4e IT infrastructure must be considered.

#### 4.3 Business proposal

With the business model canvas in mind, what can the company expect in return by this innovation. Here I will be listing some of the bullet points:

- Reduced load on the phone lines: By customers serving themselves though the mobile application the amount of phone calls coming in will be drastically reduced. It will always be those that can't or won't use the app and still need to call in, but these customers would be miniscule compared to today's situation.
- Customers can actually find their car: With the apps map feature that will show the customers exactly where their cars are parked, it will make it much easier for them to locate the car.
- An employee always at the front desk: As a natural consequence of the previous two, the front desk manager will finally be able to do her job, actually serving customers coming to the front desk.
- **Better company reputation:** A good customer service experienced is crucial to reign in new customers.

This will all work towards the main goal which is to improve customer satisfaction. The stakeholders may be pleased when they see the bullet point mentioned above working in tandem produce results.

# 5. Redesigning the enterprise models

#### 5.1 Adding a new layer

When I have been thinking about my innovation, I have but the modelling part of it aside for a while. I didn't really see a need to look back at my models to conceptualize the innovation I had in mind as I was caught up with the business model canvas, customer journeys, blueprints. I later realized, rather late to be honest, that I would be needing an application layer to express how this innovation would be taking form. So, I went ahead and created one, first without the innovation, and after that with the innovation. I chose to introduce it here to show my thought process, and where it finally hit me that my models were not adequate. They were not adequate as they didn't really show anything from what my innovation wanted to accomplice.

#### 5.2 ArchiMate model before innovation

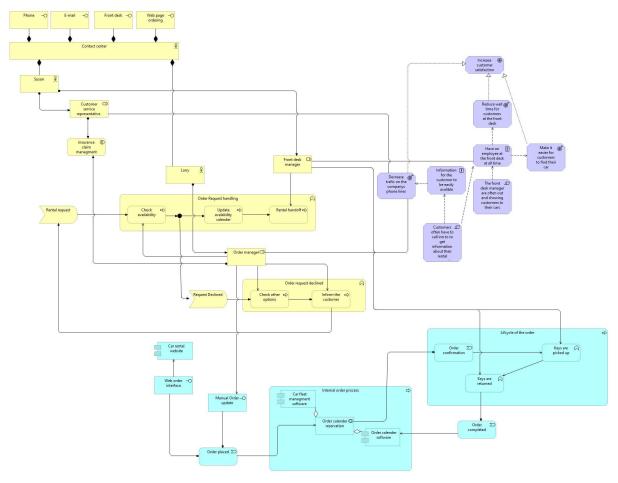


Figure 13: ArchiMate model Before innovation

#### **Description of the new elements:**

The new elements added shows how the various applications fit into the business process and how the innovation may affect that. Firstly, I added a car rental website component (to the bottom left) that would trigger an application event called order placed. There is also a manual order update interface that triggers this event. This is served by the order manager business role, which leads us into the internal order process. Here we have an application collaboration called 'order calendar reservation', which is a collaboration between internal management software, car fleet management and order calendar respectively.

From the 'order calendar reservation', it triggers another application event called 'Order confirmation', which exists inside of the 'lifecycle of the order' process. This simply consists of picking up keys and returning keys as application functions. I was unsure if this was a correct approach, but with regards to the innovation I think it will make sense. It should also be mentioned that the front desk manager is responsible of the application functions mentioned above. After that the last function triggers an 'order completed' application event, which exists outside of any application process. This will also update the 'order calendar software' application component mentioned earlier.

## 5.3 ArchiMate model after innovation

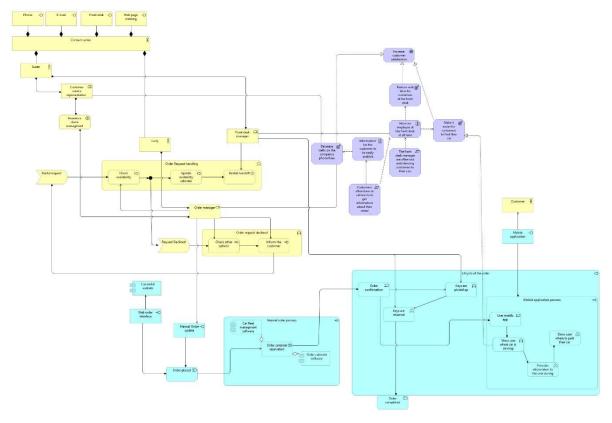


Figure 14: ArchiMate model After innovation

#### **Description of the new elements after the innovation:**

The changes I made after the innovation begins in the 'lifecycle of the order' application process and is triggered by the 'Order confirmation' application event. This will begin another application process called 'Mobile application process'. This process consists of three application functions which describes what the mobile application does. We can also see there is an interface for the mobile application simply called 'Mobile application'. This is served by a business actor called 'customer'.

## 6. Evaluation of the models

In my assessment of the models, I will be utilizing the SEQUAL framework (Krogstie, Retrived 10.11.21). This framework defines several quality aspects a model generally has and assigns them different measuring criteria to evaluate the models after. The framework consists of many qualities, but I have chosen to evaluate my model with the most important qualities. Which are: physical, empirical, syntactic, semantic, pragmatic, and social qualities.

Physical quality: This quality concerns itself with is this model available to those who
may need it, and if relevant tools and utilities are available. Yes, the model will be
made available for the relevant actors and further development is possible as the
software I have been using 'Archi' is still being supported

- 2. Empirical quality: This quality concerns itself with the aesthetics of the model, such as readability, layout, etc. I would say that my models mostly fit this criterion, but at some sections it can become a little bit busy, and some sections tend to turn into spaghetti soup with lines all over. Overall, I would give my model a passing grade, but not full score regarding this quality.
- 3. Syntactical quality: This quality concerns itself with if the formal syntax of the language in use is being followed and if there are any tool supported error detections. I have used the in-built error detection tools in Archi called the validator which warns me about unused elements, missing relations, hints for improvement, etc. By listening to the validator, I have cleared out any errors and followed most of the hints. So far I am concerned, my model is consistent with the formal rules of ArchiMate.
- 4. Semantic quality: This quality concerns itself with does the model contain everything it requires the answer the problem and are all elements of the model relevant to solving the problem. I have already touched upon this in section 5.1 Adding a new layer. But to elaborate, I do think I have included everything needed to solve the problem at hand, but I also recognise this model could be expanded to solve the problem at hand.
- 5. Pragmatic quality: This quality concerns itself with can others read and understand your model. A model no-one can read, no-one can use. So far, I have only showed my model to my classmates, which have followed the evolution of the model from the very beginning. They have mostly been able to read it and understand it, with some clarification from me from time to time. This is not very ideal, as it should be an outsider who would judge this. As far as I know, my model passes this quality, with a very thin decision basis
- 6. Social quality: this quality concerns itself with agreement between different actors which possess knowledge about the enterprise being modelled. At this moment in time, there is no way for me to figure out is such agreement exists or does not exist. Therefore, I will be skipping this quality in my assessment.

My model passes most of the evaluation criteria, with some questionable decisions basis in some areas. Personally, I don't feel that my model is the best, as it lacks the complexity I foresaw in the beginning. And a part of that being the lack of an application layer. After I got that sorted, I felt I actually got a model to be satisfied with, even though it could be even better.

## 7. Reflection

When I first started with my case, I was optimistic and felt like I had a good grasp on the material needed to complete an undertaking like this. I struggled in the beginning with enterprise modelling, and I felt like I took baby steps and second guessing myself at every turn. Especially on what perspectives/views I should model first/next/last. After having created the models in both languages and chatted a bit with my classmates on how they were doing, I started going in the right direction. But I haven't given much thought about my case, and many of my problems were due to not having a well-defined case to work with. What I would do differently next time is to do a general business model canvas for the business as it is before innovation. This would have given me some better parameters to make a more well-defined case, and in turn would have helped with starting out with enterprise modelling.

As mentioned earlier I realized rather late that I would need another layer for my models to make them fit in with the innovation I hade come up with. Preferably I would have included the application layer from the start, but due to lack of any kind of experience with enterprise modelling I did not foresee what a hassle it would end up becoming. Since I now have gotten my feet dirty in this field, I won't be making the same mistake again.

But after having finished this course, I feel like this have been a great learning experience. As I did not have any experience with enterprise modelling beforehand, gotten stuck and frustrated, I feel like I managed to pull myself out of the gutter and pulled through.

# 8. Appendix

I have created a folder structure to make it easier to find the figures and source file for my enterprise modelling.

The folders are:

- 4EM: Contains all the pictures used for 4EM in this report, and a drawio file where its source may be found
- Archimate: Contains all the pictures used for ArchiMate in this report, and a
   .archimate file for the program Archi where its source may be found. The source file is
   updated to feature the model after the innovation. Here you can also find the source
   for the customer journeys.
- Others: Contains the pictures for the business model canvas, customer journeys, service blueprint

## 9. Sources

Krogstie, J. (Retrived 10.11.21). Quality of models, SEQUAL [Powerpoint slides, lecture TDT4252].

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