TDT4252 - Enterprise Architecture for Enterprise Innovation

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Kunnskap for en bedre verden

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1. Enterprise Modeling

1.1. Case Description

The selected case and its focus will be on the student association, Online [1]. Online is one of the most significant student associations at NTNU, with nearly a thousand active members. Hierarchically, Online is built up by several committees, some larger than others. Out of the nearly thousand active members, at least 160 of them are committee members powering Online.

The case will specifically target a process in one of the committees - Trikom [2]. Trikom is the committee for well-being. The committee is in charge of the kiosk at Online's office and organizes smaller social events, to mention some.

The case itself regards the kiosk, hereafter called 'Kiosken.' Kiosken has a relatively broad selection of both snacks and soft drinks. Students purchase these items through an internal economy connected to the student ID cards.

Students would like to have all items available at all times. However, through some research and personal experiences, it is clear that the availability of items is unpredictable. For example, students experience empty shelves of their favorite snacks for an extensive period, and there is no way of knowing when a restock happens.

As for the committee members of Trikom, there are several annoyances as well. The restocking process appears to be quite comprehensive and unpredictable. 'When will it happen,' 'who is responsible,' and 'who does what' are frequently asked questions. Further, it appears to be much micromanagement which in an ideal world would not exist.

As a member of Online, I am a frequent user of Kiosken. The problems mentioned above significantly impact me as a regular customer. My biggest motivation for the presented case is to figure out how to streamline the restocking process and thus provide better and more predictable availability of the goods in Kiosken.

By utilizing an enterprise model, from Trikom's perspective, one can hopefully understand the underlying processes of the restocking and identify innovations to streamline those.

1.2. Case Processes

The overall process of keeping Kiosken restocked, is a combination of several smaller processes. The following paragraphs are meant to give a brief introduction to these.

The Process of Identifying a Need For a Restock

As of now, there is no concrete process of identifying the need for a restock. The need is identified by regular users reporting a lack of items, or by Trikom members checking manually. Even though regular users report few items, or they are identified as out of stock by Trikom themselves, the actually restock may not happen immediately. It is a common practice to wait for Kiosken to be almost out of stock of all items before a restock is even planned.

The Process of Planning a Restock

When a restock is about to happen, a shopping list is to be made. All items in Kiosken is counted, and how much of each should be bought is calculated. A part of the planning is also to check the dates of existing items, as well as checking the storage room for space for the new ones. When the storage is checked, and the shopping list is made, the Trikom members have to coordinate the shopping trip. Assigning different tasks to different Trikom members, varying from driving and shopping, to carrying and filling shelves and storage.

The Process of Restocking

A car has to be rented and several members have to perform the actual shopping. The shopping is done at a partner. When the shopping is finished, either the same members as those who shopped, or others, have to carry all the new items into the storage unit and restock the shelves.

Once the entire restocking process is initiated, it is time consuming and involves many parts. Ideally certain sub processes can be be improved or even eliminated by innovation.

1.3. Purpose

Most business constantly aim to increase their profit. However, the operation of Kiosken is a zero-profit project for Online. Better availability will not generate more revenue, but the user satisfaction will greatly increase, which is in line with Trikoms goals.

This model should serve as a beneficial overview of the key processes of the restocking of Kiosken. The current models give a precise overview of the relevant parts of the case AS IS. No unnecessary information will surface, and the models have a logical easy-to-follow structure. By getting a overview of all sub process, actors and goaals, Trikom could identify steps and processes that could be greatly improved. Through this, innovation can be applied, and Trikom optimize their processes, thus resulting in a better service for Onlines members.

1.3.1. Goals

There are many reasons to create enterprise models.

> A model is a generalized representation of a piece of reality, with only relevant real-world properties taken into account during modeling. [6]
>
> — Sandkuhl et al.

In other words, models help to represent and understand how an enterprise works. The model represent a relevant piece of reality, aiming to give greater insight into information, functions, behaviour and further on.

In this case, the overall goal of the model is to be **beneficial to analyze the business processes**. Some sub goals will be to **identify possible innovation(s)** and **identify potential threats to reaching the business goals**. Further, a goal is to **visualize** the business processes to get a hands-on look at what is actually going on. Related to the vizualization-goal, a precise sub goal will be to **create the model in such a way that the committe members of Trikom is able to utilize it**.

1.3.2. Success criteria

There are several ways to evaluate models. For instance, Sandkuhl et al. [6] mentions competency questions and quality criteria. One can also apply a framework such as SEQUAL. Common to all, is how well the model fulfills the goals. For this case I will use the **quality criteria**.

There are many possible quality criteria one can apply. The criterias fitting the case the best are the following:

- **Usability** (Goal 1): The ease with which the enterprise model can be used for its intended purpose [6].
    - The model should be able to identify possible innovation(s). To achieve

such, it has to include enough information with relevant details and perspectives/views. The goal is not met if the model is designed in a way that does not provide sufficient perspectives to analyze for possible innovation(s).

    - If Trikom is unable to identify potential risks, the model is not adequate enough.

- **Understanding** (Goal 2): The ease with which the concepts and structures in the enterprise model can be understood by the stakeholders [6].
    - The models have to be precise and understandable. Only the relevant information should be provided, and it should be in such a way that the Trikom committee members can make use of it.
    - The criteria is not met if the model leads to uncertainties or wrong conclusions.

1.4. Model Design

The enterprise models presented are mostly concerned with the business process. By concentrating on the business process, one may see both the important procedures and the individuals involved. The goals are also significant since they serve as the reason why the tasks are carried out.

To begin developing the models, I concentrated on the processes. It was critical to have a thorough grasp of how a Kiosken operates. When the processes with it's sub processes was modeled, I focused on the goals. To begin, I had some rough thoughts about the goals, but when the processes was clear, the goals were concretized and split into subgoals. Once the processes were identified, the actors manifested themselves intuitively. To avoid extraneous information, the models incorporate just relevant actors.

The enterprise model was created using a top-down method. The goals are provided first, followed by the procedures and the essential actors. The model's user is supposed to first comprehend the goals, then what is currently happening and what may be improved.

Both 4EM and ArchiMate employ comparable perspectives in this case. The perspectives chosen were the most appropriate for the model and situation. Because we were only going to use one modeling language for the report, having similar models aided us in deciding on a language.

1.5. Design of the Model

1.5.1. 4EM Models

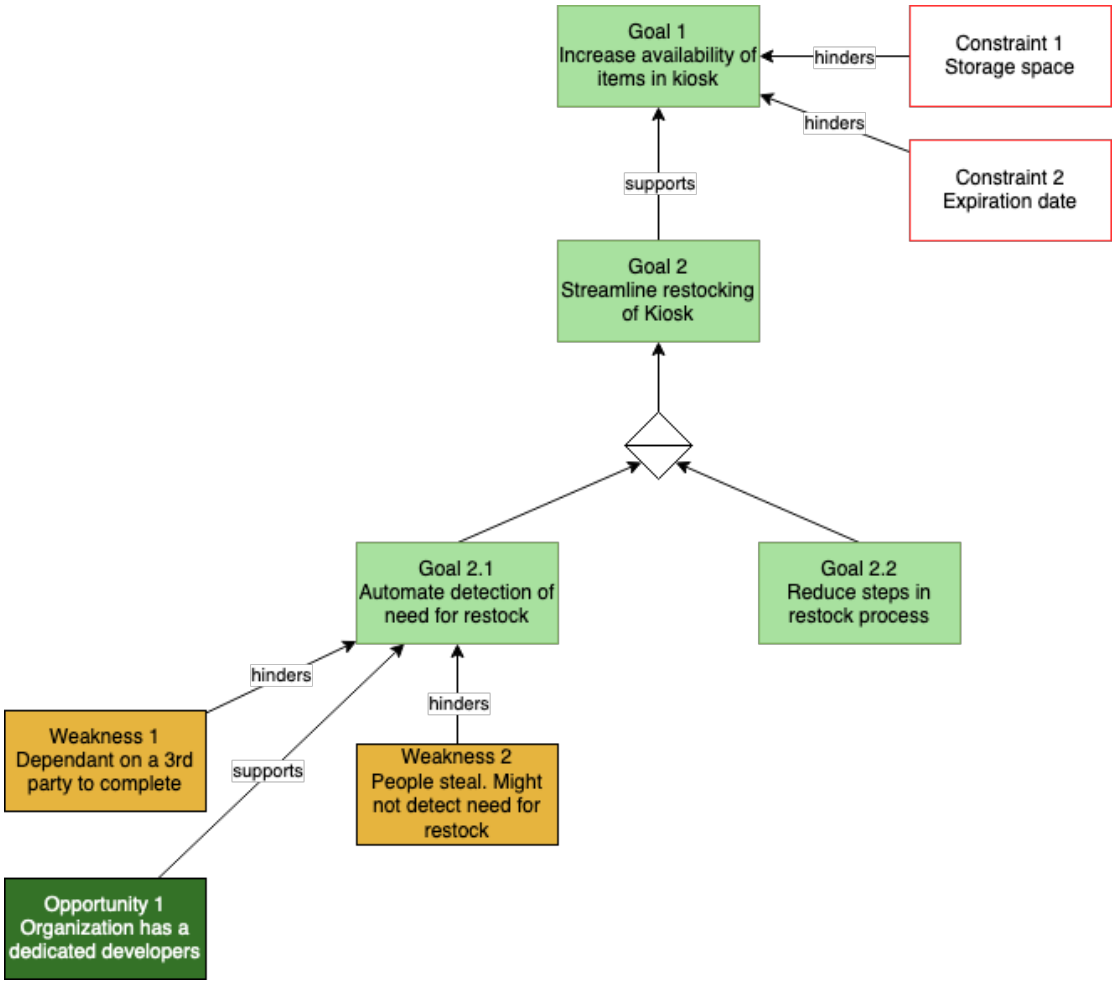

Figure 1. Goal Model || 4EM

Trikom's overarching goal is to "increase the availability of items in Kiosken." The inefficient restocking process, which is the key bottleneck of item supply, must be streamlined. Goals for streamlining the restocking process include reducing the number of steps in the restocking and automating the detection of need. Opportunities as well as threats are addressed. Further, possible constraints are highlighted.

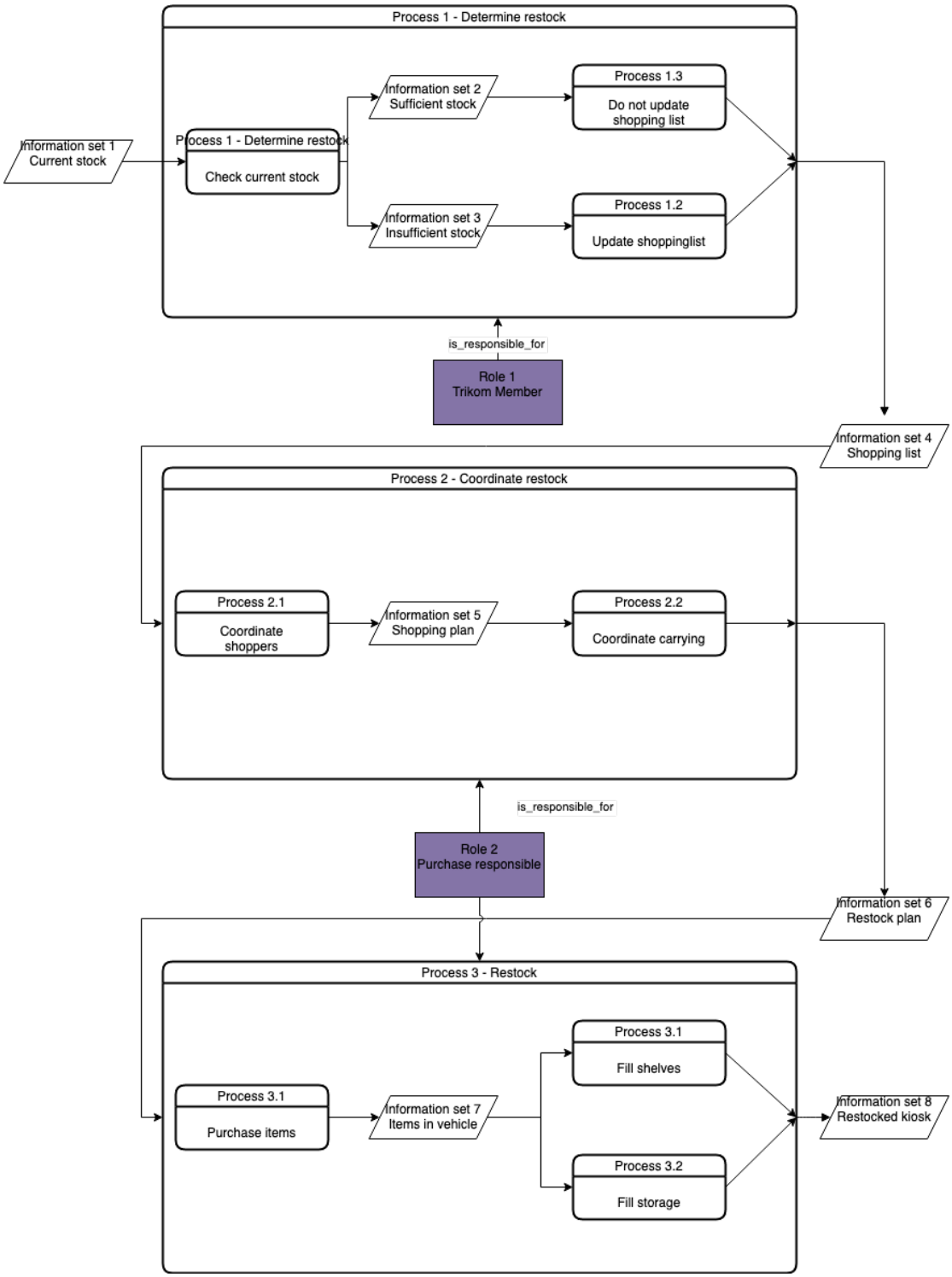

Figure 2. Business Process Model // 4EM

The **Business Process View** is more in-depth. The view depicts the case's important processes as well as the actors involved. Section 1.2 provides a more detailed explanation of the processes and what is happening. It is worth noting that the information sets are important as the output of each process is essential for the next.

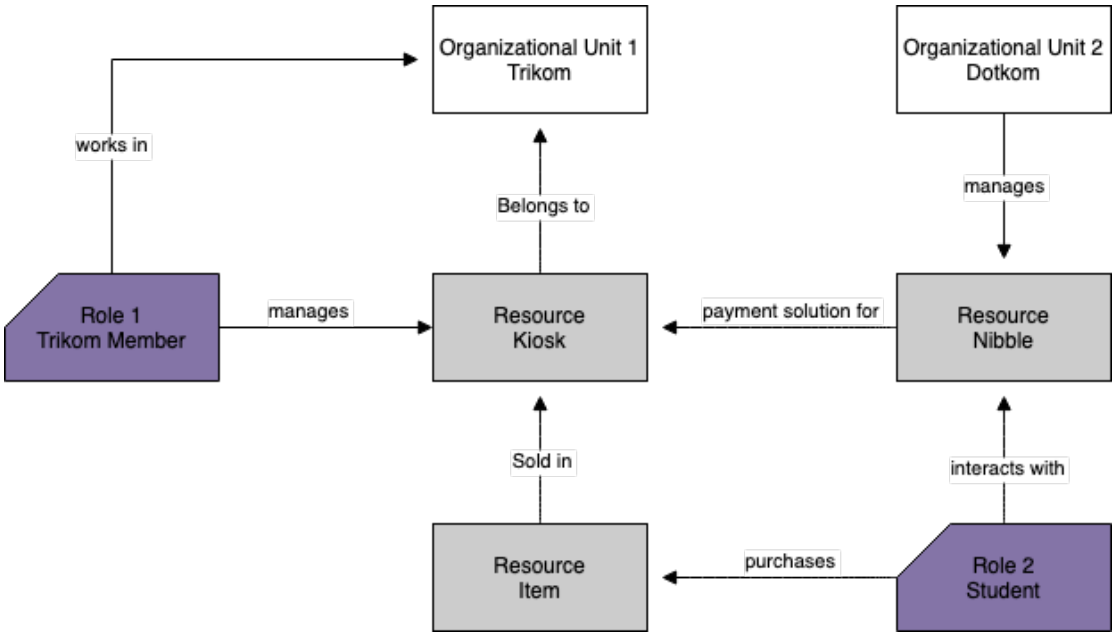

Figure 3. Actors and Resources Model || 4EM

This perspective depicts the many organizational units, roles, and resources. Furthermore, the model's user gains an understanding of how the various pieces are linked.

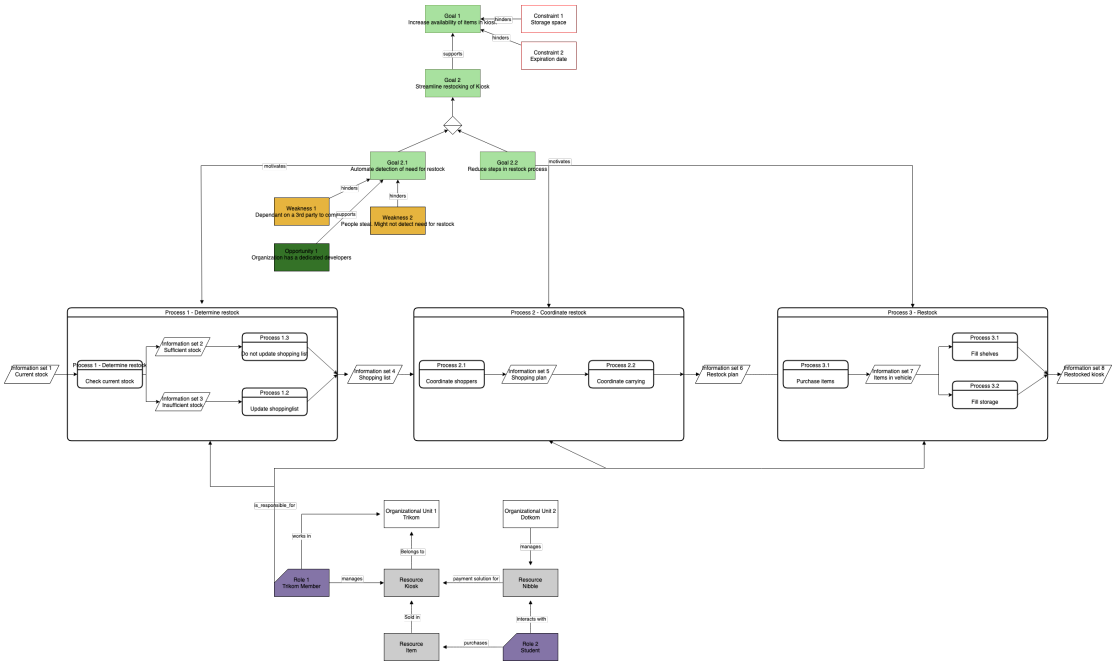

Figure 4. Enterprise Model || 4EM

The Enterprise View depicts all pertinent information about the case. The processes are linked to the goals, and which actors do what. The model provides a high-level overview of Trikom's operations.

1.5.2. ArchiMate Models

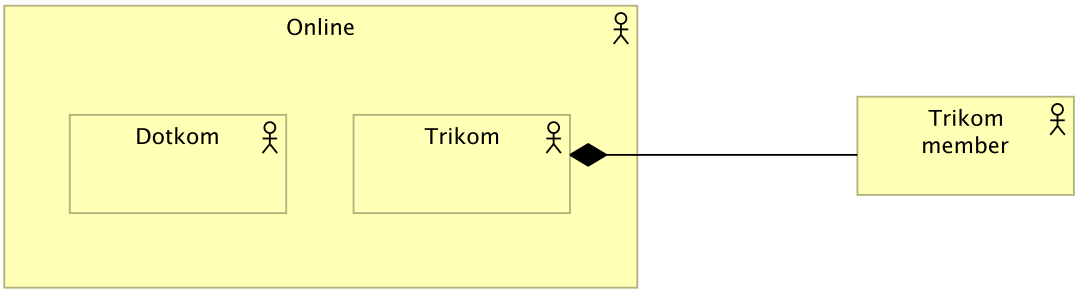

Figure 5. Organizational View || ArchiMate

This view is straightforward. It displays the case's relevant actors and the placement within the organization Online.

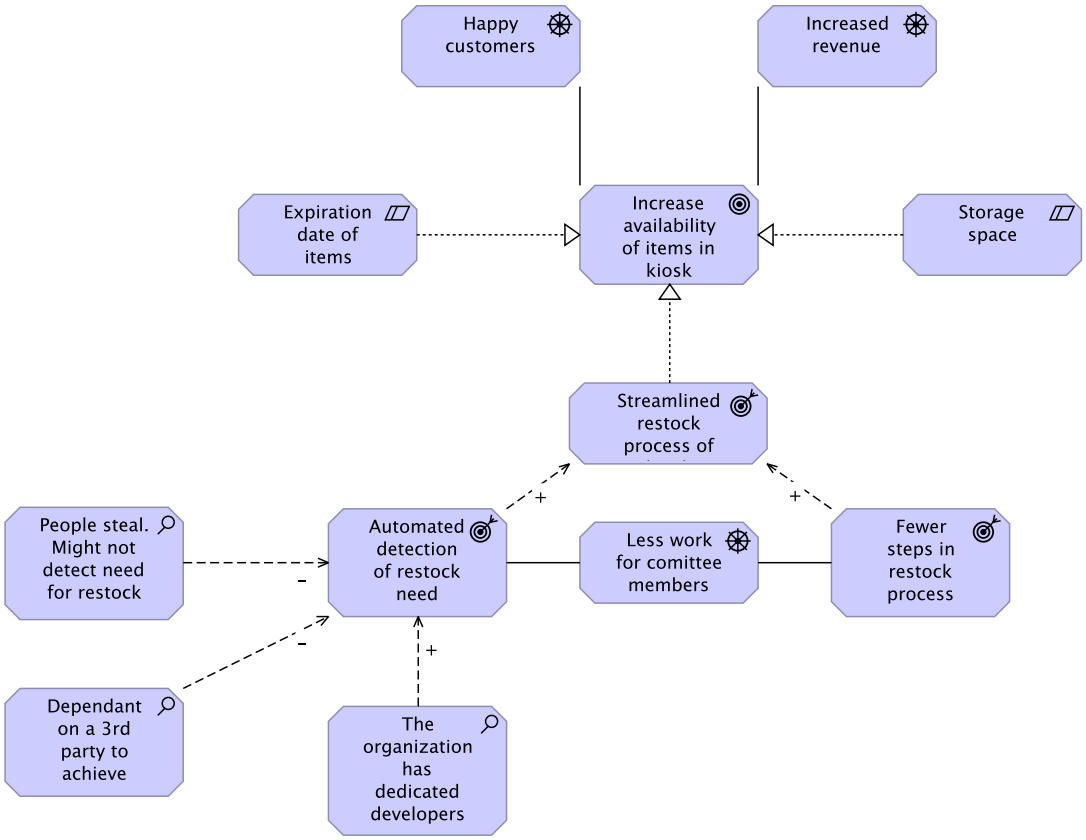

Figure 6. Motivational View || ArchiMate

This view displays the drivers and overall goals. Constraints and assessments are included.

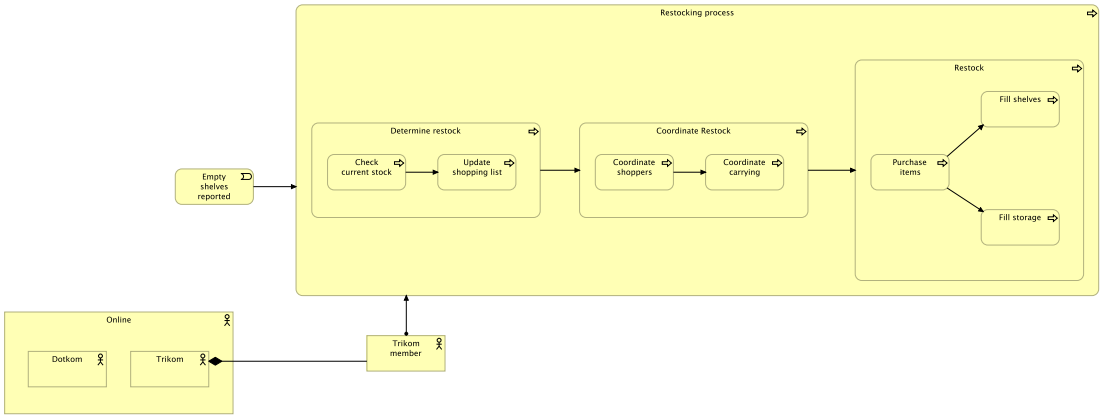

Figure 7. Business Process View // ArchiMate

The important processes, as in the 4EM-model (Figure 2), are presented, together with the appropriate actors. The absence of information sets is a significant distinction between this model and the 4EM model.

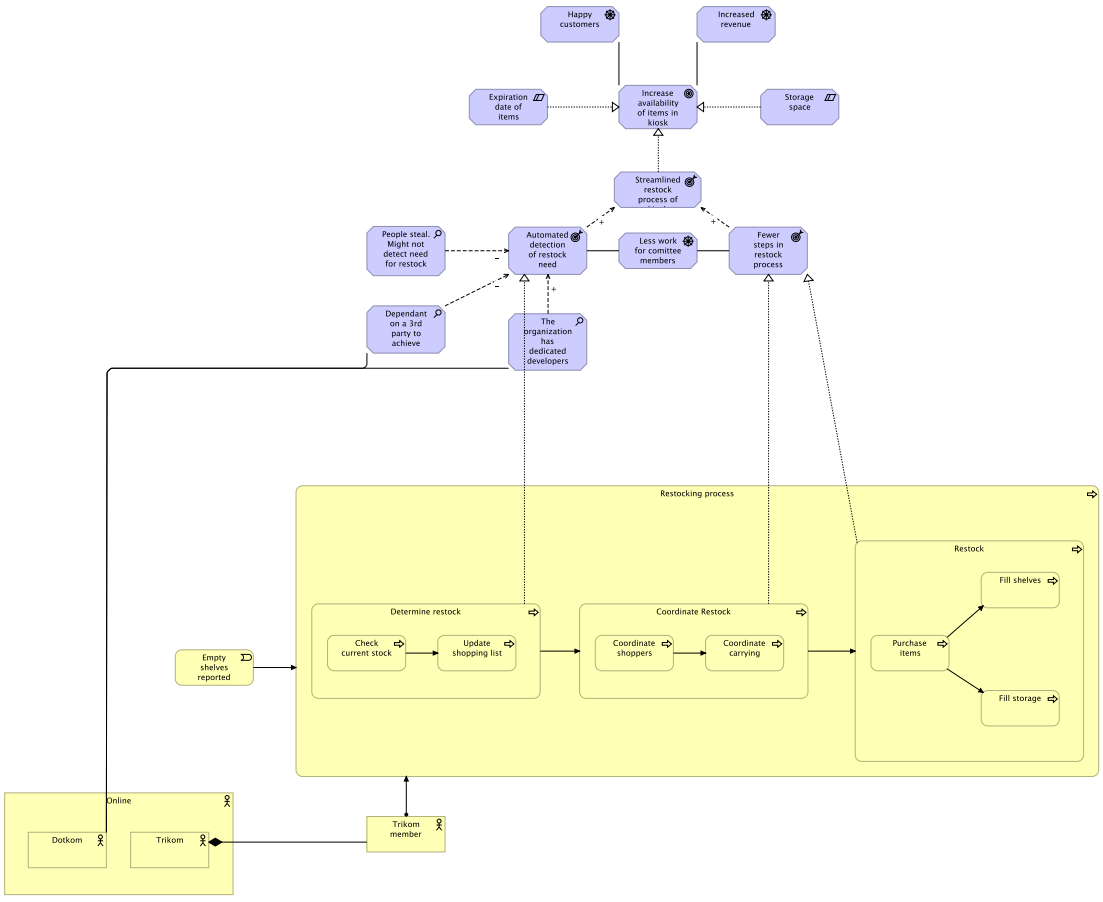

Figure 8. Enterprise View // ArchiMate

The enterprise model illustrated here, like Figure 4, incorporates all important information for the case. It is clear how the drives and goals are related to the actors and processes.

1.6. Perspectives/Aspects

Expectations	Theory related
The model should include at least three perspectives/aspects of an enterprise in both 4EM and ArchiMate. Enterprise models by definition contain models of several perspectives (referred to also as sub-models), and they relate to one another. Note that the relationships across the perspectives are very important.	In your report, you should explain them and how they relate to one another. An Enterprise model vs. several models of a single aspect is important here; hence the relationships across the different aspects and layers must be described and explained. The student should demonstrate that they understand the relevance of the relationships across the different aspects.

1.7. Modeling Tools

4EM has been chosen as the language to use moving forward. The parts that follow provide some reflections and reasons behind this.

4EM

When I first started modeling in 4EM, I rapidly realized how much the language has to offer. 4EM was simple to use, and I enjoyed how everything was structured.

In contrast to ArchiMate, I quickly learned how to use 4EM because it was comparable to prior modeling languages I had used. The use of information sets fit my case perfectly, and the ability to compose and decompose processes was ideal. I utilized a program I was familiar with, draw.io, and altogether, modeling with 4EM was a positive experience. Its approach to process management was ideal for my situation, and when paired with a nice user experience, it quickly became my preferred language.

I didn't have the most complex case, but I could imagine 4EM being a bit restricting with anything more sophisticated. Because the language has a somewhat rigid structure, I suppose it would be difficult to utilize in a situation including multiple processes, actors, and other notions.

ArchiMate

I started modeling in 4EM, thus ArchiMate was first perplexing to me. The concepts and their names were difficult to translate, but I eventually got the

hang of it.

I tried out the Archi Modeling Tool and had mixed thoughts about it. It was excellent to guarantee there were no technical faults, but I encountered several unexpected errors as well as problems with the general usage. The irritation associated with this may have influenced the conclusion of the preferred language, but I continue to feel 4EM was the greatest decision.

In my perspective, 4EM excels in the process modeling, but ArchiMate is overall decent in all areas. Archimate's layers provide an advantage in that they indicate how processes are carried out and goals are attained from the business layer to the technology layer in a top-down approach. Because my case was fairly process-oriented, I found ArchiMate to be a little weak, particularly in terms of the information shared between the processes. 4EM shines when it comes to showing how different views relate to eachother.

Because the models will be utilized by Trikoms members who may be unfamiliar with modeling languages, it is critical that what is provided is intelligible and does not cause misunderstanding. ArchiMate, with its diverse variety of components and levels, may be harder to grasp for those unfamiliar.

1.8. Using the Model

Because I've decided to go with 4EM, I'll be referring to these models from now on. As mentioned in Section 1.3, the model should serve as '**a beneficial overview of the key processes of the restocking of Kiosken**.'

Initially, the model is intended to be used to discover better solutions and potential improvements for the restocking process. However, it should not be overlooked that the model can be valuable for new members of the committee as well. By default, the committees' methods are introduced verbally, and most people learn by doing. Having something solid will ensure that everyone receives the same information.

By putting the goals in print, all committee members will have a common foundation. This perspective of view can spark debate and issue solutions. It may be simpler to make choices and judgments if the goals are broken down into smaller sub-goals. The goal model highlights important weaknesses, opportunities and obstacles. Having them displayed aids in overall comprehension and ensures that potentially key events are not overlooked.

All essential actors and resources are shown in the Actors and Resources model. By illustrating the relationships between them, as well as how they are linked to the processes in the enterprise model, ambiguity about how duties

are divided and who performs what is avoided.

The subprocesses depicted in the Business Process View allow model users to gain a clear picture of what is going on. This is where the potential for innovation are uncovered, and it is evident which stages could be shortened.

2. Open Service Innovation and Service Design

As previously stated, Kiosken issues with product availability. Members of Online have additional possibilities outside Kiosken, although they are at competitive student associations. To keep students pleased and maintain a good reputation, Online and Trikom must be better in terms of item availability.

2.1. Method

The Double Diamond Design approach [5] was utilized to perform service innovation in an attempt to overcome the previously identified challenge. The approach, which is similar to the more generic Open Innovation process, comprises four separate phases. The relevant tools and methods provided by the Double Diamond Design process are detailed in the following paragraphs. In particular, the phases *discover*, *define*, and *develop* will be covered.

2.1.1. Discover

During the *discover*-phase, one creates an understanding of the issues in the enterprise [3]. We will look into various service innovations that can hopefully fix these issues later. As stated in the introduction, there are some issues with the restocking process. The following aspects can be improved:

- The item's availability must be manually confirmed. This is normally done at random by both committee members and ordinary Online members. There is no set procedure for dealing with items that are out of stock, other than sending an email to Trikom or addressing it to a committee member. When such a mail is sent, or the message passed on, no more information surfaces until the kiosk is restocked. It is unknown when it will be completed or even if the notice is received.
- Trikom must prepare ahead of time in order to carry out a restock. First and foremost, all items in Kiosken's shelves must be counted and date verified. The items in storage must then be counted and the dates must be confirmed. A shopping list must be created once the current supply is

counted. The quantity of each item required must be estimated depending on both popularity and storage availability. A shopping session requires a lot of repetitive and manual labor. There is no computer aid, therefore it is time-consuming and prone to human mistake. In the worst-case scenario, purchasing too much of an item may result in it going bad and needing to be thrown out prior to sale owing to a lack of storage capacity. This is not beneficial for the economy as a non-profit kiosk.

2.1.2. Define

Two issues were discovered during the *discover*-phase. The first is the manual labor of checking item availability and registering a restocking request. The other is the time-consuming and human-error-prone procedure of organizing a shopping trip. As the identified problems are experienced close to first hand, a few possible improvements has been thought of. The idea is to implement a new digital service into the custom made Kiosk-app called Nibble4 [4].

The service is designed to maintain track of item stock at all times and alert Trikom when it is time to restock. Trikom will resupply more often, but in lower quantities. Shopping trips will be shorter, and transporting and arranging items in storage and shelves will be easier. Naturally, the availability of things will improve, as will consumer happiness.

Trikom members update the current stock counts while restocking Kiosken. As time passes and items sell, the service will tell Trikom that a restock is imminent. Along with the message, a completed shopping list is sent, and there will be no need for extensive item counting. Because Online's members are frequent Slack users, the service will also send a message via Slack, letting everyone know when a restock is recommended and when it is accomplished.

Due to their comparable origins, the suggested solution should be able to tackle both of the identified problems. The service attempts to lessen the degree of uncertainty surrounding item availability while also eliminating human labor associated with item counting.

Dotkom, another committee in Online, will be utilized in the development of the innovation. They are unrelated to Trikom's processes, but the committee is in charge of technology solutions for all of Online's committees. The presented solutions does not need a large rearrangement of the restocking process, but it will have a significant impact. The service will be referred to as the 'Stock Tracker' service from now on, and one sees that in Figure 2, the *Stock Tracker* service will replace the first business process and parts of the second.

2.1.3. Develop

A Blueprint is provided later in the report, in its own section, to add to the develop phase.

Stock Monitoring Service

The service can be created with limited cooperation from Trikom's members. Other than to the Dotkom developers, how the service is implemented is unimportant as long as the end result is as desired. Dotkom's sole involvement and contribution is required for the design of the notice and shopping list. Despite the fact that the service is customised in a way that is unique to Kiosken and Nibble4, the innovation is open. All code is open-source, and innovative ideas are gathered outside of the company's walls. The service will be created in-house, but with the assistance of existing external libraries. Many of Dotkom's services are cloud-based, however Nibble4 with the new service is run on a local server in Kiosken.

2.2. Create a Customer Journey

The Stock Creation Service will be displayed from the perspective of a Trikom member. This is an actor who will be directly impacted by the innovation. Regular consumers at Kiosken will be impacted indirectly since item availability will be more consistent. Furthermore, clients may have a reduced wait time for a resupply. Even though the innovation benefits the customers, the focis lies on the Trikom members as the goal is to streamline their workflow. Customers' benefits are in-direct consequences of the invention, which has a direct impact on Trikoms members and their workflow. As a result, only customer journeys from the perspective of Trikom members will be offered.

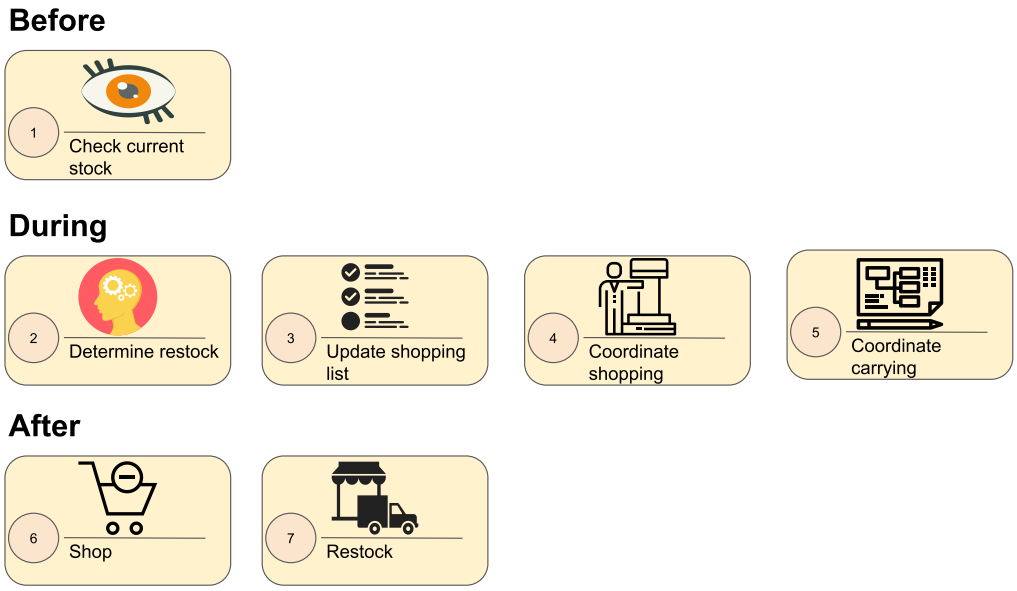

Figure 9. Before Innovation || Customer Journey

This model is very interesting because of this and that

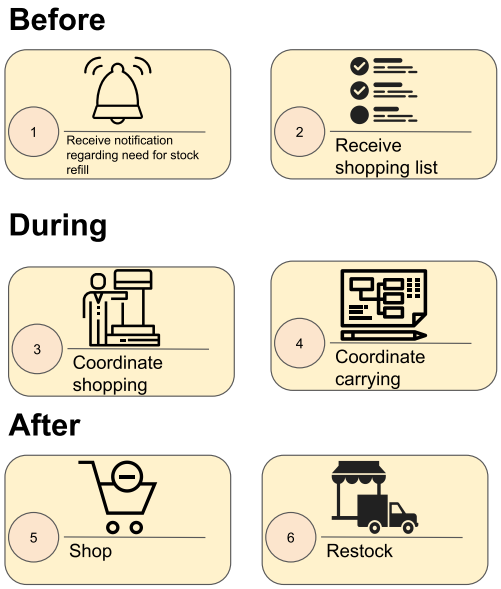

Figure 10. After Innovation || Customer Journey

This model is very interesting because of this and that

2.3. Blueprint

Expectations	Theory related
Model the blueprint for the service. Include this in the report.	Describe the details of realising the service and where technology is relevant. Describe in detail how the ICT components are affected or how any new components will be integrated into te current Enterprise Architecture.

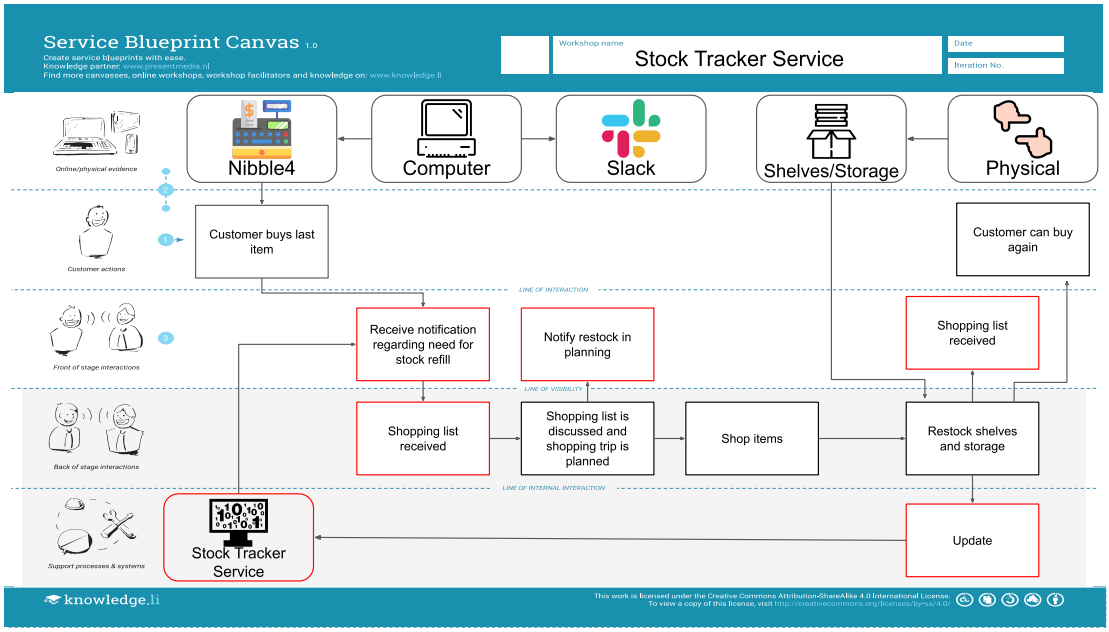

Figure 11. Blueprint

This model is very interesting because of this and that

2.4. Reflections

Expectations	Theory related
	Reflect on the revelance of innovation and the use of complementary of modelling methods. Identify the main differences between service design and enterprise modelling. Explain how service modelling complements enterprise

3. Business modelling

3.1. Business and Value Modeling

Expectations	Theory related
Create a sustainable business model or a value model for the new (innovative) services in your enterprise using the relevant templates. Include this in the report.	Explain the choice of your business modelling framework and why it is the most appropriate for your case. Explain the business or value model you have created and the value proposition.

4. Redesigned enterprise model

4.1. Changes in the Enterprise Model

Expectations	Theory related
Identify the changes that you have to make in your enterprise to realise the business model and deliver the services. Enhance your 4EM or Archimate model from part 1. The new model should be submitted. (Hint: did the service innovation create more goals for your enterprise? If so, are there implications for the processes, roles, technology, etc. in your enterprise?)	Explain the changes in your enterprise model and how they would support the service innovation e.g. new or changed processes, new organisational structure, new competences and therefore new roles and actors, perhaps new technological solutions, etc.). Note: again, it's important to be clear about the purpose of the model as was relevant for part 1.

4.2. Enterprise Model & Enterprise Architecture

Expectations	Theory related
Structure model according to an Enterprise Architecture Framework, e.g. TOGAF	Reflect on the relationship between Enterprise Modelling and Enterprise Architecture.

5. Reflection

5.1. Model Evaluation

Expectations	Theory related
Assess if your model meets its purpose. You can use any of the methods we learned for evaluating models or any other means. (Hint - connect your model to its purposes and ask if it meets the purpose	How did you evaluate yur model - what evaluations methods (from theory) did you consider? Justify your choice of evaluation method(s). Describe how you evaluate your model, using the model and include screen shots of the relevant parts of the model. Describe why you think your model is good and meets the purpose (or not).

5.2. Reflections

Expectations	Theory related
Describe what you have done. Reflections and lessons learned. Reflect on the work, the process you followed and share some of your thoughts.	Also discuss the modelling experience. And what would you do anything different next time?

6. Bibliography

[1] "Linjeforeningen Online," *Linjeforeningen Online*. https://online.ntnu.no/, Nov. 2021.

[2] "Trivselskomiteen," *Linjeforeningen Online*. https://old.online.ntnu.no/wiki/online/historie/trikom/, Nov. 2021.

[3] "Double Diamond (Design Process Model)," *Wikipedia*, Nov. 2021.

[4] "Nibble4." Appkom, Nov. 2021.

[5] D. Council, "What Is the Framework for Innovation? Design Council's Evolved Double Diamond," *Design Council*. https://www.designcouncil.org.uk/news-opinion/what-framework-innovation-design-councils-evolved-double-diamond, Mar. 2015.

[6] K. Sandkuhl, J. Stirna, A. Persson, and M. Wißotzki, *Enterprise Modeling: Tackling Business Challenges with the 4EM Method*, Two thousand, fourteenth. Berlin, Germany: Springer, 2014.

7. Appendicies