

TDT4252 - Enterprise Architecture for Enterprise Innovation

Magnus Lauritzen Holtet <magnulho@stud.ntnu.no>

Department of Computer Science



NTNU

Kunnskap for en bedre verden

Table of Contents

| | |
|--|-----------|
| 1. Enterprise Modeling | 2 |
| 1.1. Case Description | 2 |
| 1.2. Case Processes | 3 |
| 1.3. Purpose | 3 |
| 1.3.1. Goals | 4 |
| 1.3.2. Success criteria | 4 |
| 1.4. Model Design | 5 |
| 1.5. Design of the Model | 6 |
| 1.5.1. 4EM Models | 6 |
| 1.5.2. ArchiMate Models | 10 |
| 1.6. Modeling Tools | 12 |
| 1.7. Using the Model | 13 |
| 2. Open Service Innovation and Service Design | 15 |
| 2.1. Method | 15 |
| 2.2. Create a Customer Journey | 17 |
| 2.3. Blueprint | 20 |
| 2.4. Reflections | 21 |
| 3. Business modelling | 23 |
| 3.1. Business and Value Modeling | 23 |
| 3.1.1. Business Model Canvas | 23 |
| 4. Redesigned enterprise model | 28 |
| 4.1. Changes in the Enterprise Model | 28 |
| 4.1.1. The Changed Actors and Resources Model | 28 |
| 4.1.2. The Changed Business Process Model | 28 |
| 4.1.3. The Changed Enterprise Model | 31 |
| 4.2. Enterprise Model & Enterprise Architecture | 33 |
| 5. Reflection | 34 |
| 5.1. Model Evaluation | 34 |
| 5.2. Reflections | 36 |
| 6. Bibliography | 38 |

1. Enterprise Modeling

1.1. Case Description

The selected case and its focus will be on the student association, Online [5]. 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 items 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 actual restock may not happen immediately. It is a common practice to wait for Kiosken to be almost out 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 are 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 certain grocery stores with an agreement benefiting both parts. 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 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. No unnecessary information will surface, and the models have a logical easy-to-follow structure. By getting an overview of all sub process, actors and goals, 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. [9]

— 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 visualization-goal, a precise sub-goal will be to **create the model in such a way that the committee 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. [9] mentions competency questions and quality criteria. One can also apply a framework such as SEQUAL. Common to all, is to evaluate how well the model fulfills the defined 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 [9].
 - 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 [9].
 - 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 and confusion, i.e regarding processes or involved actors.

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.

The enterprise model was created using a top-down method. The goals are provided first, followed by the processes 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.

To begin developing the models, I concentrated on the goals. Once I had an outline of the goals, I focused on the processes with its sub-processes. When the processes were finished, I had a few new ideas regarding how I could concretize the goals, and I did so by creating sub-goals and detailing a bit more.

Once the processes were identified, the actors manifested themselves intuitively. To avoid extraneous information, the models incorporate just relevant actors. One may question why the actors are included when there is only one actor performing the actual tasks in the first models. The reason is to acknowledge the existence of Dotkom, as they bring the opportunity to create the proposed service. In the latter models, the actors include the very important developers both creating and maintaining the service.

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 me in deciding on a language.

1.5. Design of the Model

1.5.1. 4EM Models

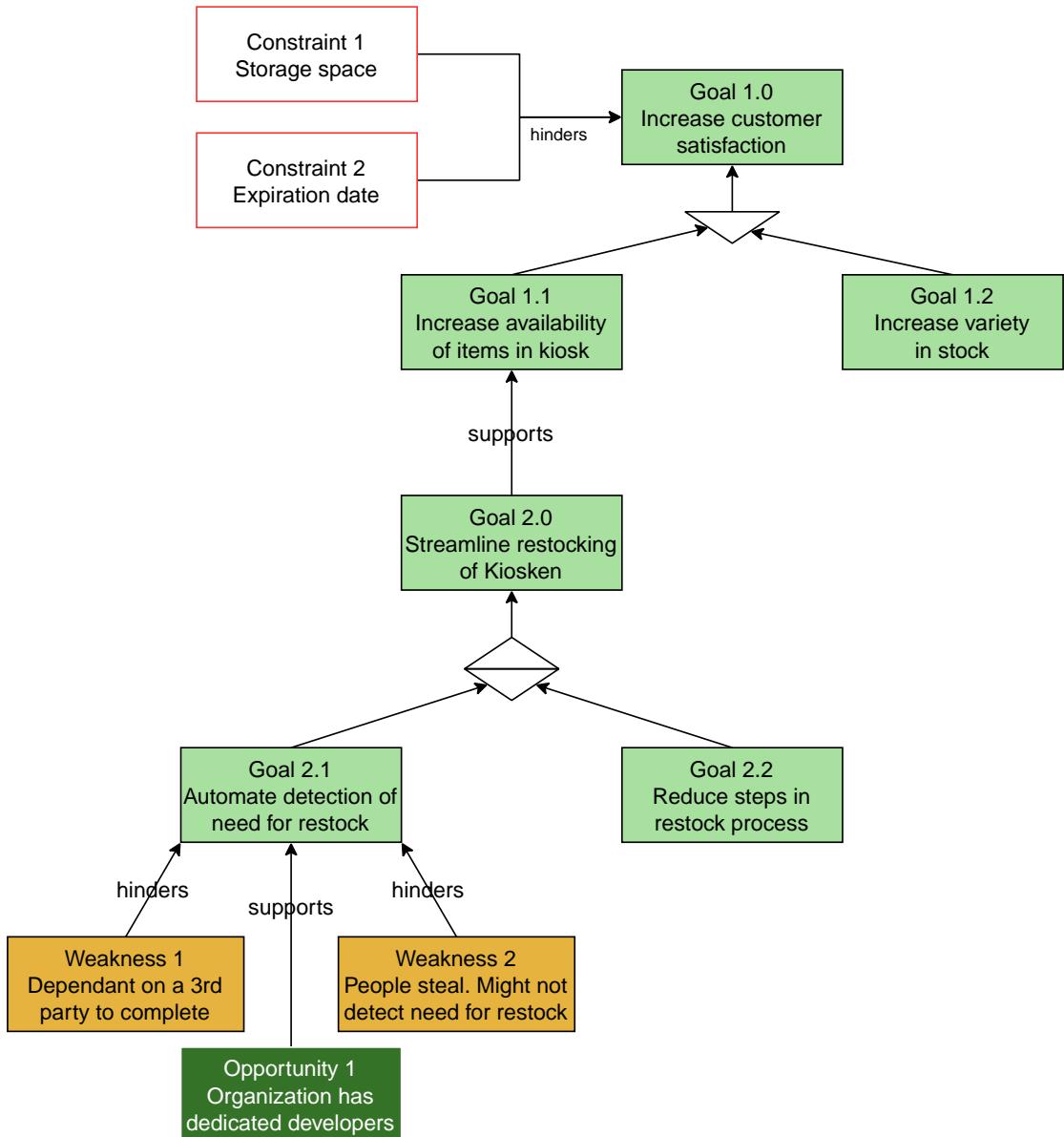


Figure 1. Goal Model // 4EM

Trikom's overarching goal is to 'Increase customer satisfaction.' This goal is difficult to measure, and it may never be considered as *reached* simply because. However, having this as the main goal makes it easier to create supporting and achievable sub-goals. The sub-goals to achieve this are given as 'Increasing the variety of items in stock', or by 'increasing the availability of items.' The inefficient restocking process, which is the key bottleneck of item

supply, must be streamlined. It is the increased availability-part that will be the focus of this report. 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.

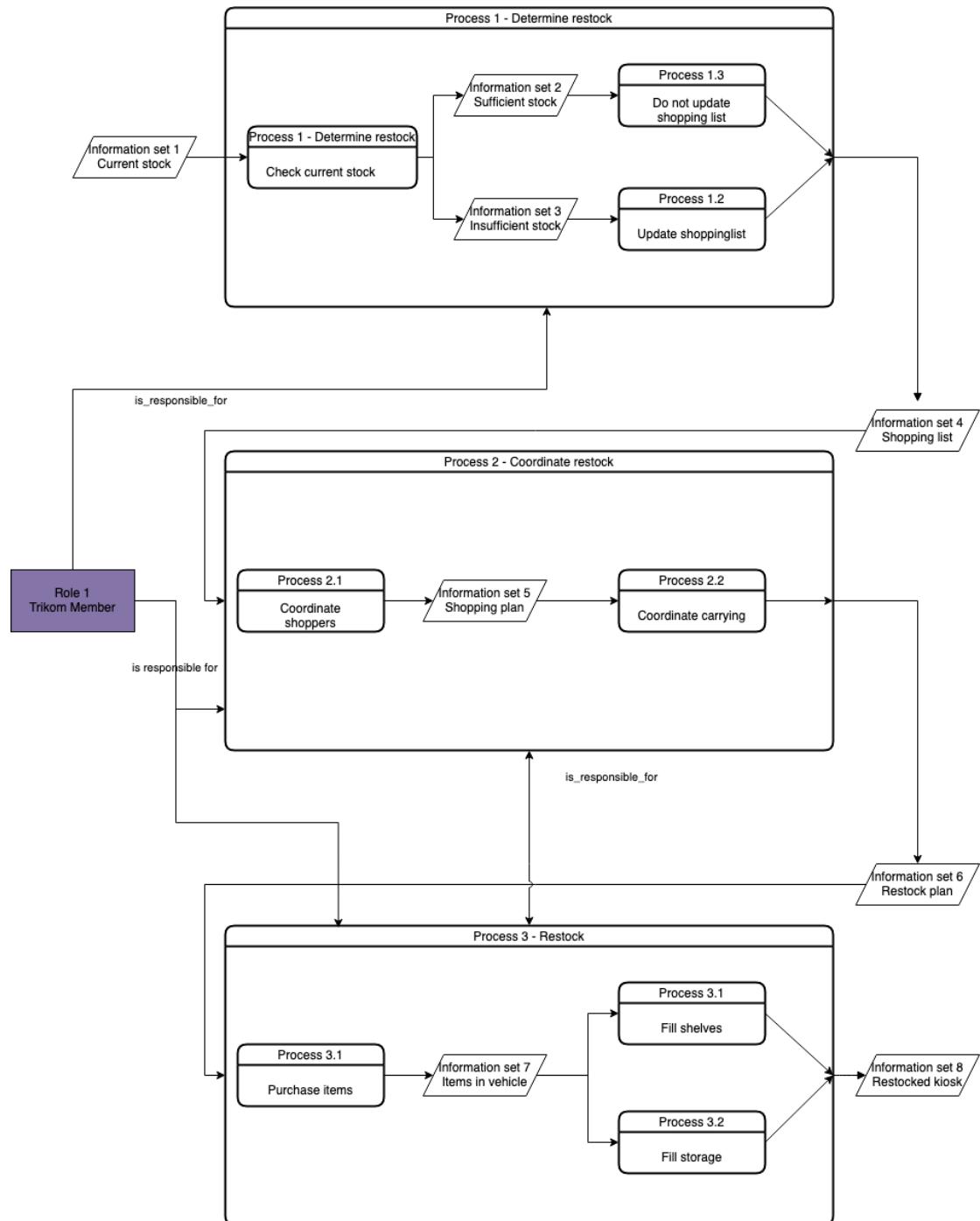


Figure 2. Business Process Model // 4EM

The **Business Process Model** is more in-depth. The view depicts the case's important processes as well as the actor 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.

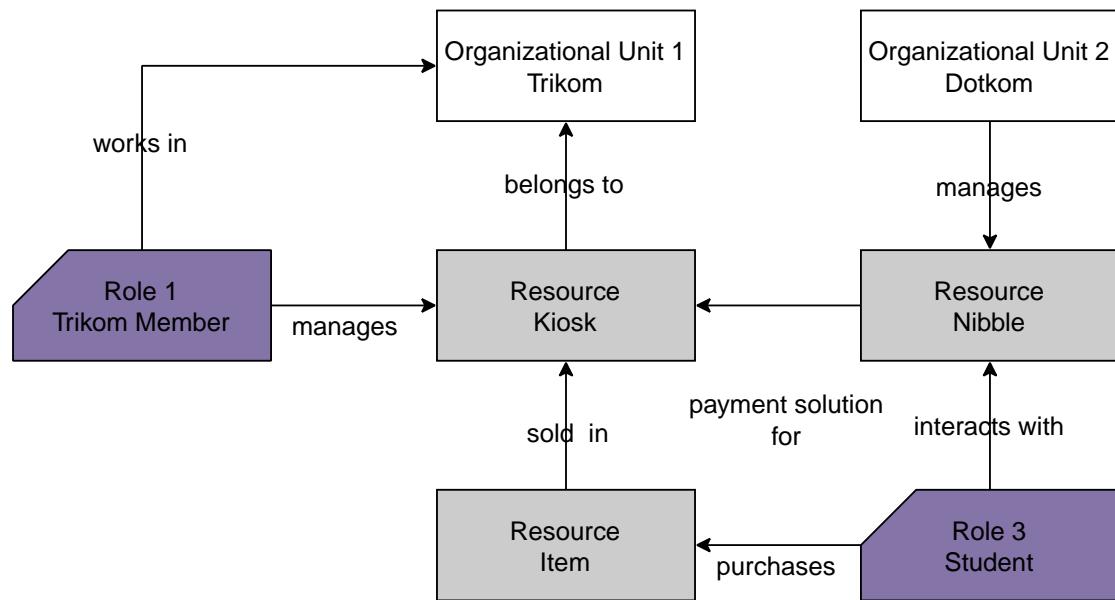


Figure 3. Actors and Resources Model // 4EM

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. [Section 1.4](#) goes a bit more into detail regarding the use of this model.

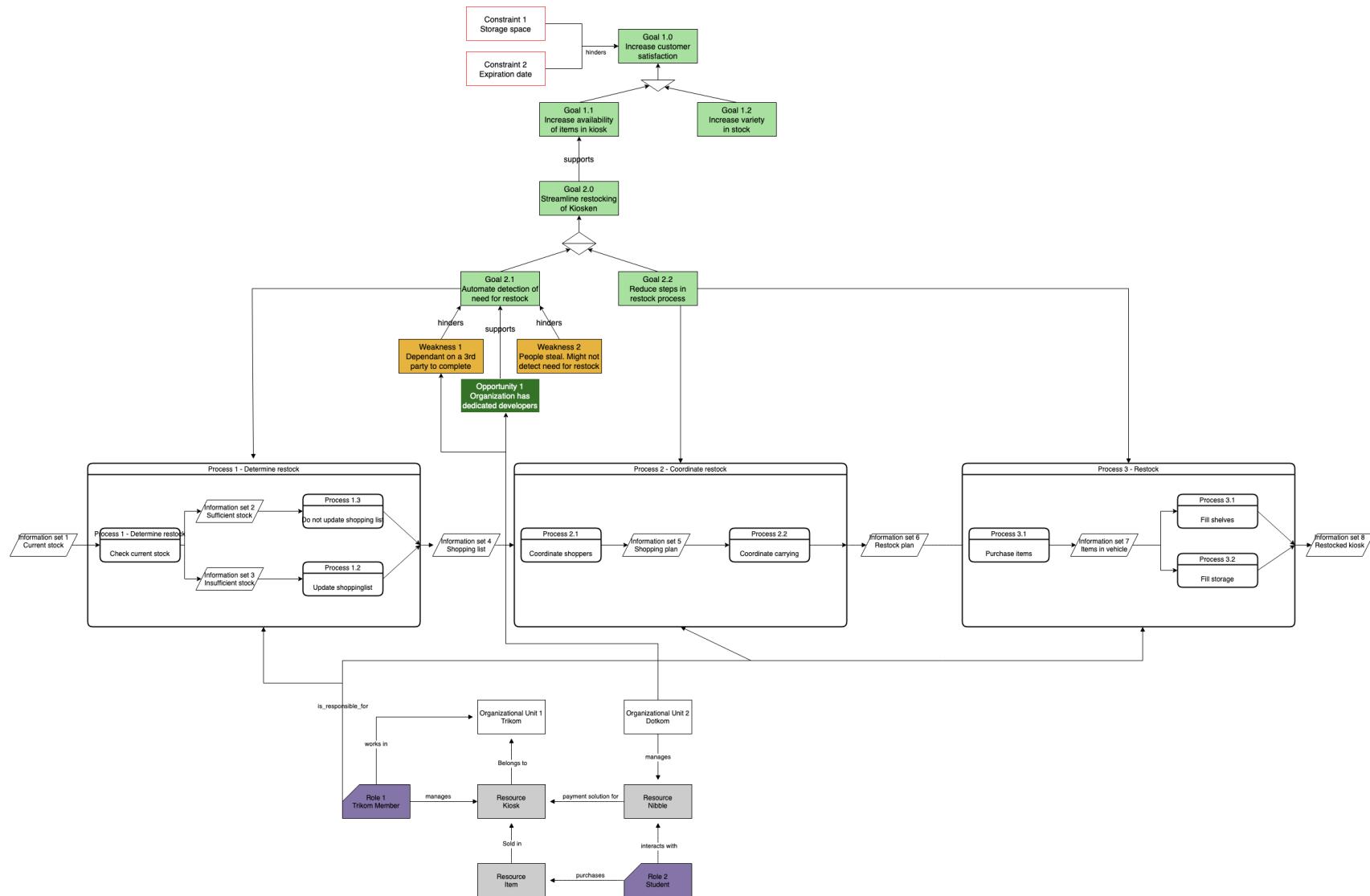


Figure 4. Enterprise Model // 4EM

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, and how Dotkom can be utilized to reach the goals.

1.5.2. ArchiMate Models

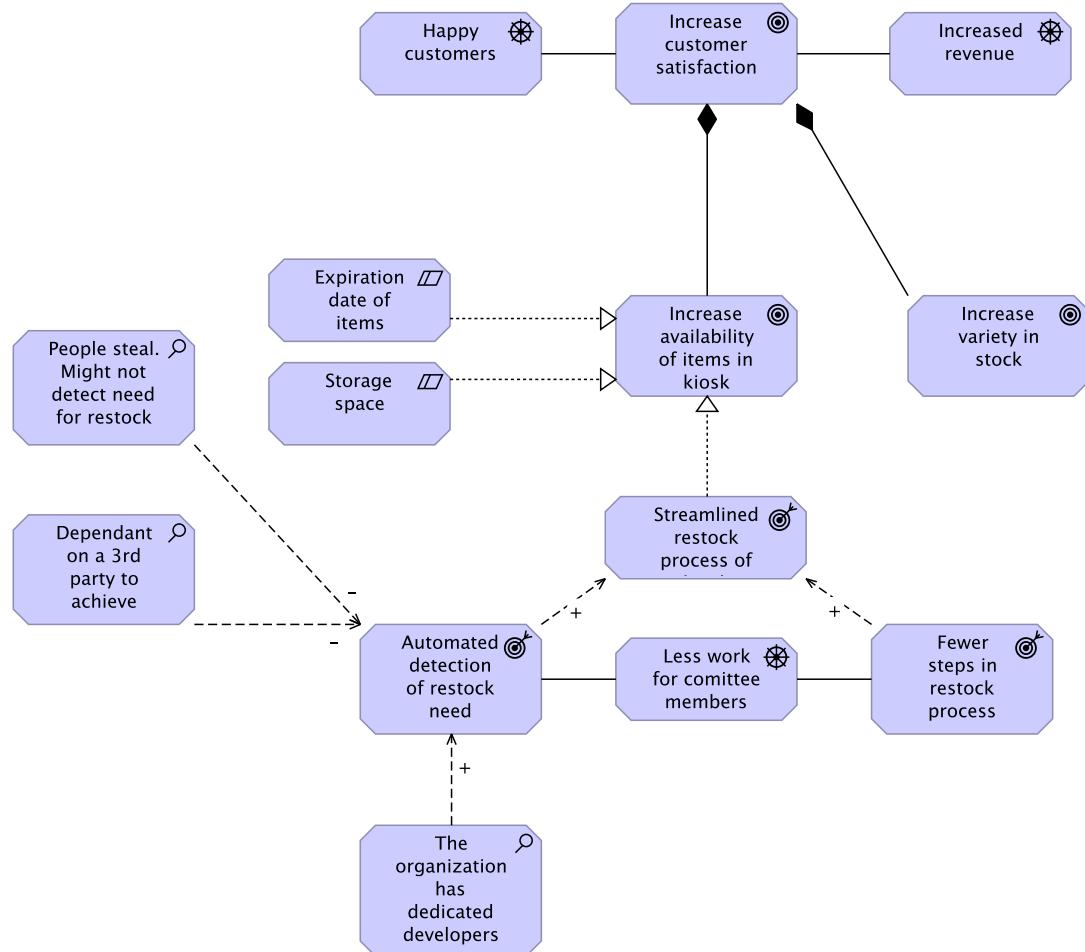


Figure 5. Motivational View // ArchiMate

This view displays the drivers and overall goals. Constraints and assessments are included. The description of the goals are the same as for Figure 1.

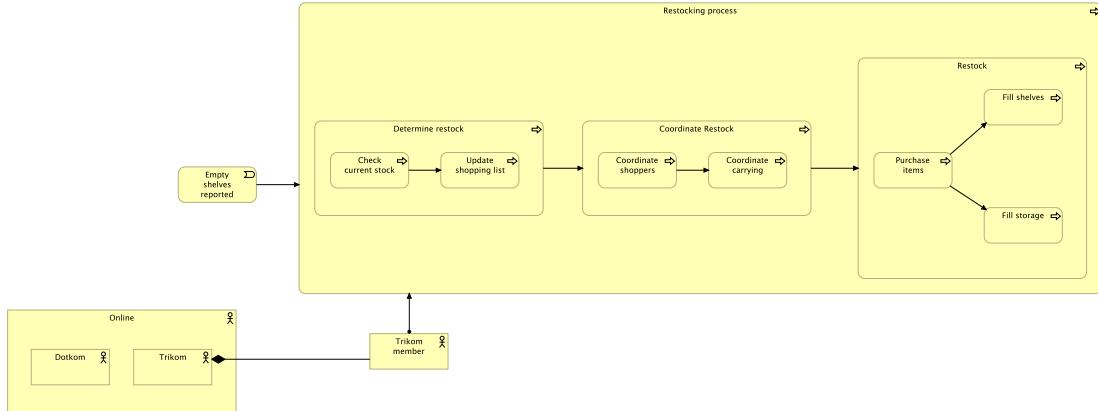


Figure 6. Business Process View // ArchiMate

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.

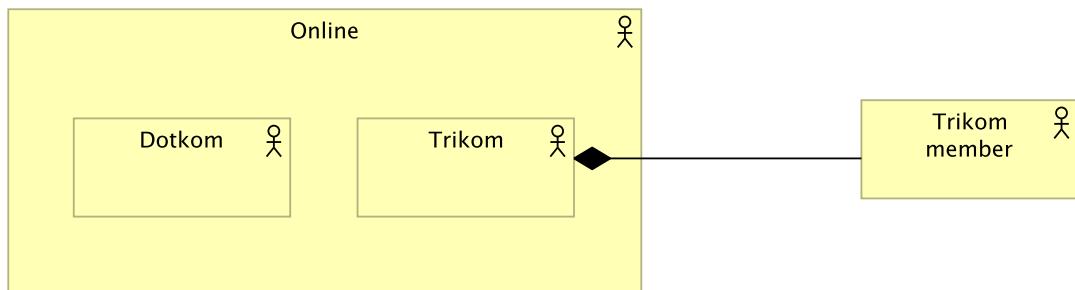


Figure 7. Organizational View // ArchiMate

This view is straightforward. It displays the case's relevant actors and the placement within the organization Online. Section 1.4 looks more into the utilization of this view.

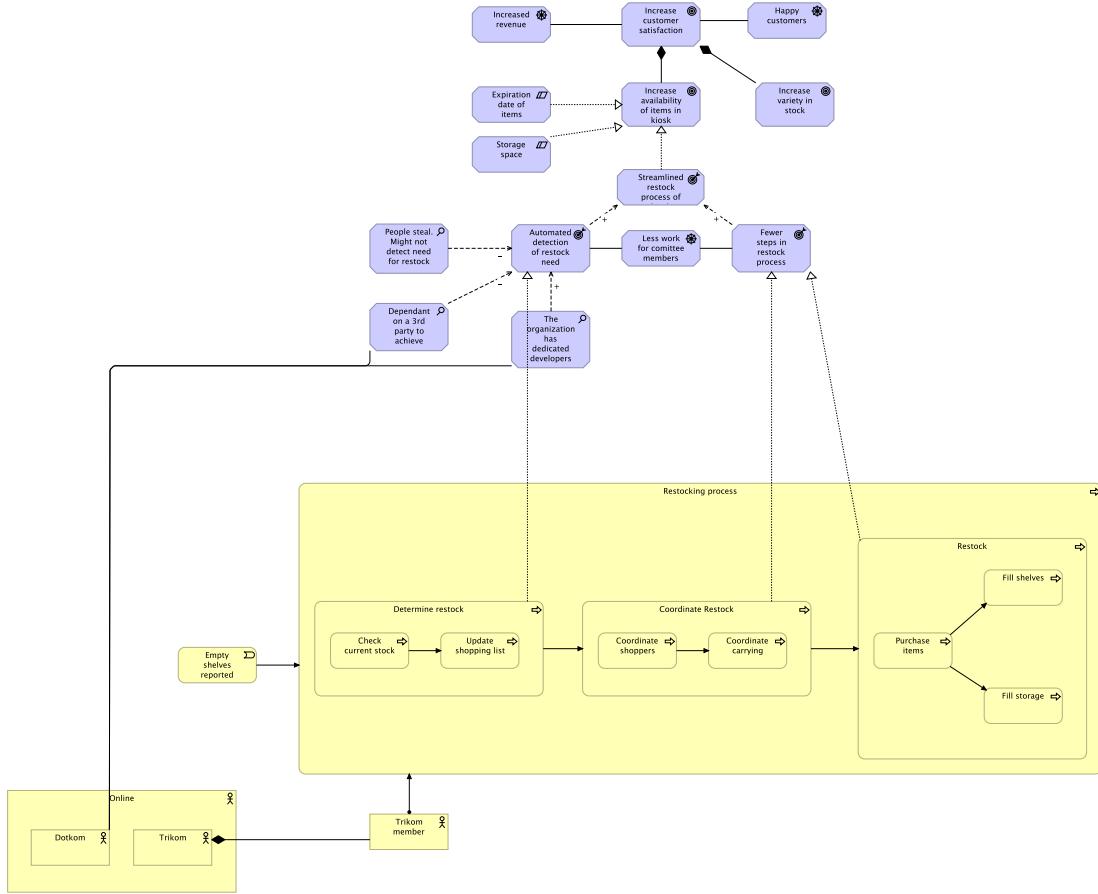


Figure 8. Enterprise View // ArchiMate

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

1.6. 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 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 frustration associated with this may have influenced the conclusion of the preferred language, but I still 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.

1.7. 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 also 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 sub-processes depicted in the [Business Process Model](#) 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 alternatives 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 [6] 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.

Discover

During the *discover*-phase, one creates an understanding of the issues in the enterprise [4]. We will look into a service innovation 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. To the customer, when it will be completed or even if the notice is received is unknown.
- 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 also has to be counted and the dates verified. 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.

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 have been thought of. The idea is to implement a new *digital service* into the custom made kiosk-app called Nibble [3].

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 there, 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.

Develop

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

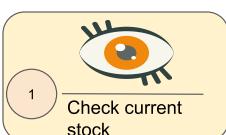
Stock Tracker Service

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. As for the development phase, Trikom'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 Nibble, 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 Nibble with the new service is run on a local server in Kiosken.

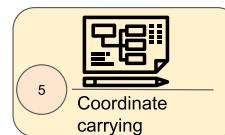
2.2. Create a Customer Journey

The Stock Tracker 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 focus lies on the Trikom members as the goal is to streamline their workflow. Customers' benefits are in-direct consequences of the innovation, 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.

Before



During



After

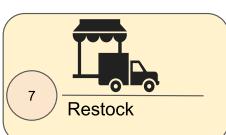
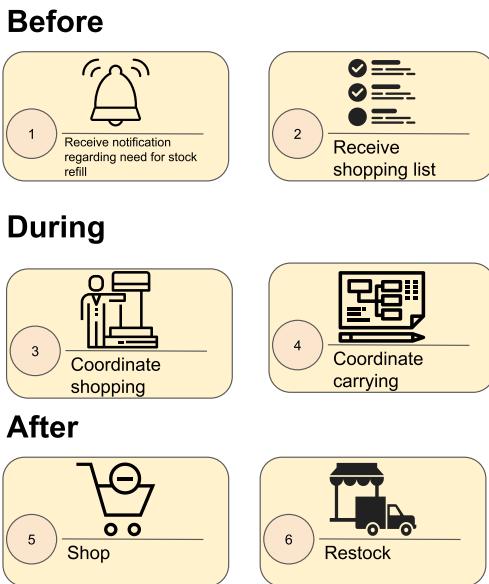


Figure 9. Before Innovation // Customer Journey

[Figure 9](#) shows the customer journey *before* the innovation.

Before the actual restocking process begins, a Trikom committee member has to do a manual checkup on the current stock. When a restock is determined to be necessary, the member must calculate how much of each item should be shopped. A shopping list is created, and then Trikom has to figure out how to perform the shopping. When the shopping is done, one has to finish the process with restocking the shelves and the storage.

The important parts are those happening before and during the journey. The discovered issues regard the manual check of the current stock and the manual counting and determination of a restock. These parts are time consuming and very unpredictable for the customers of Kiosken.



[Figure 10. After Innovation // Customer Journey](#)

[Figure 10](#) shows the customer journey *after* the innovation.

There is one less step than in [Figure 9](#), and the total steps are evenly distributed throughout *before*, *during*, and *after*.

The most significant change occurs before the journey starts. There is no longer a manual step in which committee members must decide whether or not to restock. There is also no need to prepare a shopping list. A tailored shopping list is generated, along with a notification informing Trikom that a restock is required. The restocking goes as usual, however the customers will receive a notification telling them when Kiosken is restocked.

In other words, a considerable portion of physical and time consuming effort is

eliminated, freeing up resources that may be used elsewhere.

2.3. Blueprint

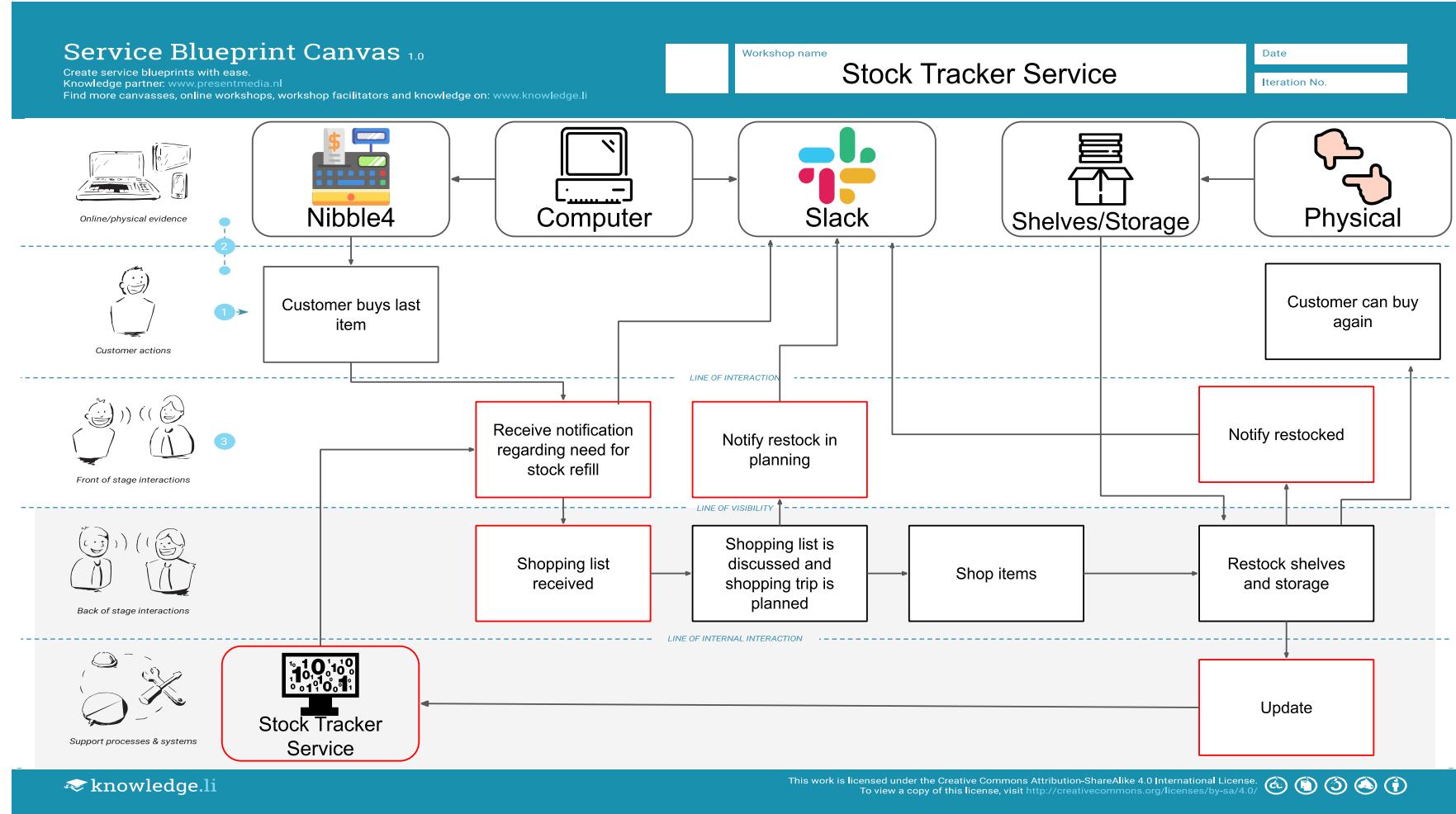


Figure 11. Blueprint

The blueprint encompasses both indirect interaction with the customers and what happens at the back of the stage. The red borders emphasize the significance of the new service.

The notifications are the most visible difference for regular customers. They are now notified when a restock is planned as well as when it is finished. This may be seen at the *front of the stage*-part of the blueprint.

The true strength of the new service may be seen at the *back of the stage* and in the *support procedures and systems*. The tailored shopping list allows committee members to notify restock plans while also saving substantial time spent on creating the list. They may also notify customers when the restock is finished and update the Supply Tracker service with the new stock.

2.4. Reflections

Online is a non-profit organization that prioritizes the well-being of its members. The student association must be creative in order to receive financing from the institute, generate money to give back to members, and so on. The revenue is assured as long as the members are pleased; but, keeping it that way is difficult. There are several competing student organizations and associations vying for members. To maintain Online's long-term viability as a popular and preferred student organization, they must always be the best option.

To be innovative, it is not enough to just provide new services and retain existing members, - it is also about expanding the member base. Through the Kiosken-innovation with the Stock Tracker service, Online and Trikom may have the finest kiosk at NTNU. It is available to members outside of Online as well, and it is an excellent marketing tool for both the association and the field of study, Informatics.

The models undoubtedly aid in providing an overview over ongoing processes, goals and those involved. The customer journeys aid in providing an overview of the steps for the various actors engaged at particular phases. Creating journeys before and after the innovation also provides valuable information into what changes and how it impacts users. Enterprise models often focus on one point of view or generalized interactions, and as a complimentary service, such models help us grasp the many points of view more clearly.

The user experience and service appeal are at the forefront of service design. When compared to enterprise models that focus on higher-level insight into processes and services, service design provides excellent, comprehensive

information and approaches giving insight into the customer's needs. I.e the blueprint clearly conveys a sense of practicality and worth to the enterprise.

3. Business modelling

3.1. Business and Value Modeling

So far, it has been discussed how the proposed service would influence the users. The next chapter discusses how value is created from a business perspective. To prevent any ambiguity: The new service benefits both Trikom committee members, Online as an organization, and Kiosken users on a regular basis. These are critical distinctions to make.

3.1.1. Business Model Canvas

Business modeling is frequently concerned with increasing income. Because Online is a non-profit organization, presenting the immediate financial advantages of revenue streams was challenging, but other values are provided.

There are various business models that can be utilized. Because it is aimed at startups [10], a *Lean Business Canvas*, a version of the *Business Model Canvas*, was not chosen. The lean business canvas includes a metric termed *unfair advantage*, which tries to differentiate the company from competitors. This is not suitable for the provided scenario in this report, as the proposed service of the business model should be the focal point.



Figure 12. Lean Business Canvas // Source: [10]

The *Value Proposition Model* is another alternative. This approach is rather straightforward, focusing on value propositions and how they relate to the

customer.

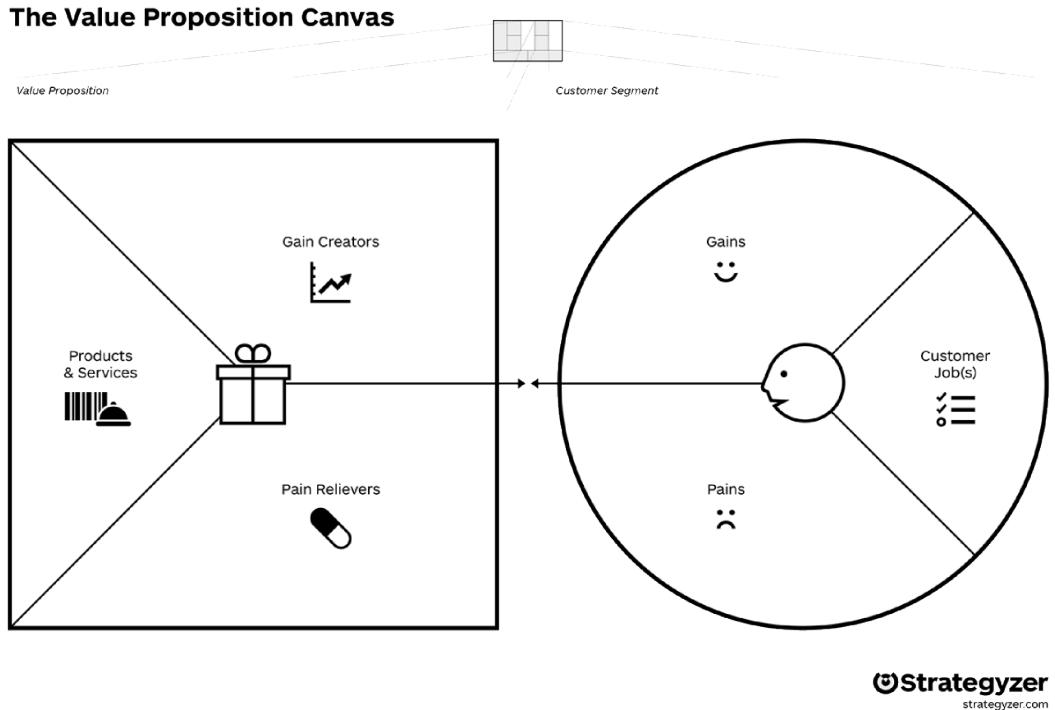


Figure 13. Value Proposition Canvas // [Source](#)

My model's goal is to investigate how innovation provides value for both customers and the business overall. I decided to use the *Business Model Canvas* to do this. This model incorporates essential interactions with customers as well as how key partners, such as Dotkom, bring value to the service.

Key Partners

The key partners are those who will help bring the service to life and make the business model function. These are for the Stock Tracker service:

Software Developer

They are the ones who are in charge of developing and delivering the service. They play an important role in ensuring that the service operates properly at all times.

Trikom Member

They are the ones who will use the service after it is completed. They will be able to influence whether or not the service is good. It is critical that they provide timely feedback so that Dotkom can make required modifications to the service.

Partner at stores

Trikom has various partners in local stores who help them achieve lower prices on Kiosken items. They frequently plan their shopping with those partners ahead of time to ensure a seamless procedure. As the service results in more regular visits, a robust interaction with these partners is critical.

Key Activities

The key activities are those that occur in Kiosken and are related to the proposed service. There is no need for the service if there are no sales because there is no need for restocking. The other process, restock planning, determines how a restock will be carried out. This is significant since it makes extensive use of the service's tailored shopping list.

Key Resources

These are the most significant assets necessary for the business model to function properly. As mentioned, there is no need for the service if there are no customers. The service will not be created until Dotkom developers are available. For the service to function properly it needs access to the stock data. Without this access it will not be able to notify when certain items are running out.

Value Propositions

The propositions describe the value that the invention provides. The values range from reduced workload to reduced uncertainty for consumers.

Workload Reduction

Because the Stock Tracker service seeks to eliminate some manual tasks, the total workload is expected to be greatly reduced. It's great not to have to count items or make a shopping list. Furthermore, because the service allows for more frequent restocking in lower amounts, the total effort is decreased.

Less uncertainty

The service includes notifications for all Online members, who are also the most frequent customers. This, along with more frequent restocking, allows customers to readily determine whether or not Kiosken is stocked. If an item is out of stock, it is realistic to anticipate it to be available within a reasonable amount of time.

Customer Relationships

The relationships describe how the service interacts with its users. Trikom needs to interact with the Stock Tracker. Because the interaction part of the

service is intended solely for those members, their preferences are critical to enhancements and usage. When a restock is done, they must update the current stock with the most recent numbers. The service also initiates the entire restocking process with its notification.

One can mention the regular customers as well. Their loyalty to Kiosken will be strengthened if the service functions well and they are satisfied.

Channels

This section covers the channels that the Stock Tracker service will use to reach out to clients. The service is automated, and it will communicate via Slack. It is worth noting that the service will operate through two channels. One for messaging to Trikom, and another for public messages.

Customer Segments

In terms of the value generated, Trikom members are identified as the most significant. The innovation is primarily intended to benefit these, but regular customers are also included because they are indirectly impacted.

Cost Structure

The cost structure specifies which activities the business must be willing to dedicate resources to in order for the business model to succeed. As a non-profit organization run entirely by volunteers, Online will not have to budget for the service. However, in order for the model to be successful, time and effort must be invested. Once established and in use, the service must be maintained and maybe enhanced until it is excellent. Allocating additional time for the initial restocks with the new service may also be advisable, since the service may fail and unforeseen events occur.

Revenue Streams

The revenue streams are not monetary, as stated in the introduction. However, revenue may be measured in terms of less time spent on monotonous and repetitive tasks. There is a significant reduction in the amount of time spent on such duties, which might inspire committee members. The time saved may be used to benefit other social contexts. Another revenue may be the increased positive reputation for Online. Kiosken's good reputation may lead to increased sales and consequently pleased customers and members.

The Business Model Canvas



Figure 14. The Business Model Canvas

4. Redesigned enterprise model

4.1. Changes in the Enterprise Model

The models will be redesigned in this section to complement the planned innovation. Changes will be made to the 4EM-models. The affected models are both the Actors and Resources Model and the Business Process Model. Naturally this affects the Enterprise Model as well. All notable changes in the models are highlighted with red borders (does not include constraints in Goal model).

4.1.1. The Changed Actors and Resources Model

This model has been updated to include the developers from Dotkom. The developers play a significant role in both the creation of the proposed service as well as its maintenance.

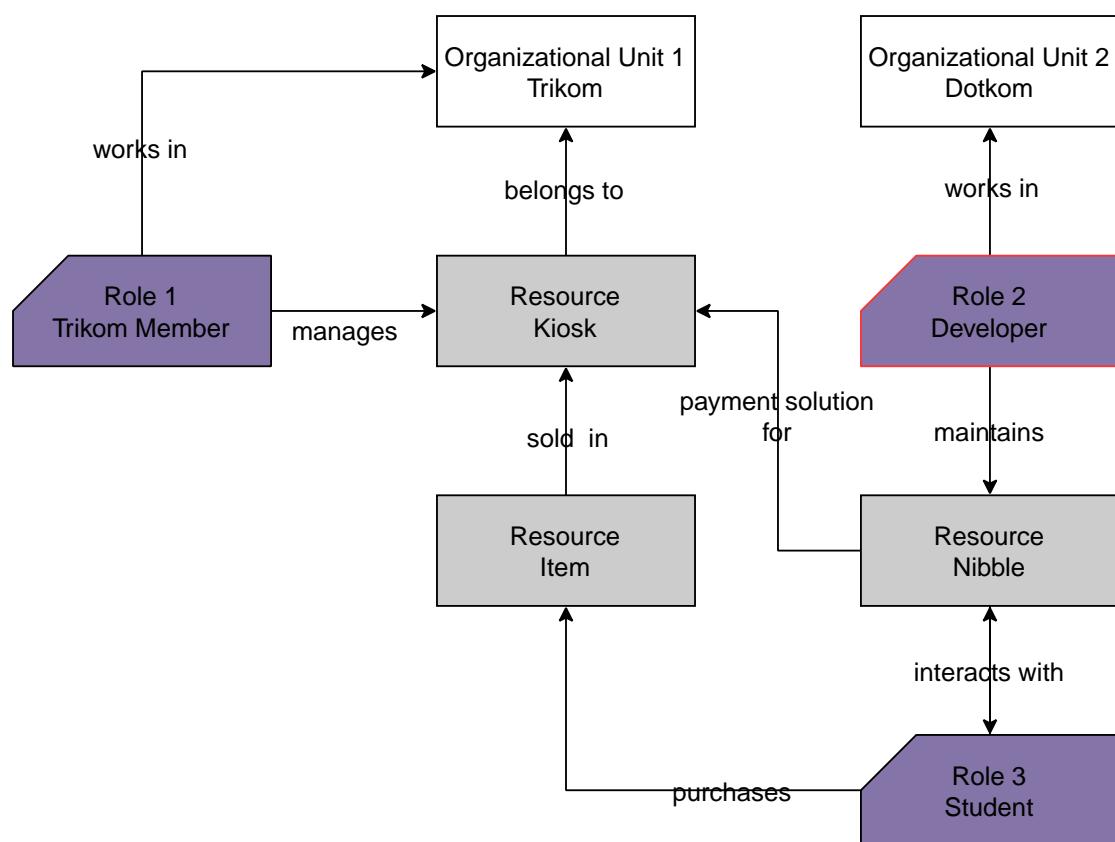


Figure 15. The Actors and Resources Model// 4EM

4.1.2. The Changed Business Process Model

The most significant change appears in this model. The first process is totally eliminated, and the new process starts with the old process' output, namely

Information set 2 - Shopping list. In line with the goals defined in [the Goal model](#), the proposed service has streamlined certain parts of the restocking process. Previously the shopping list was created manually, and the need for a restock uncovered in the same manual way.

The notification, *Information set 1*, remains the same, however the way it is created is new. This is not shown in the model, but described in this paragraph and previously. The proposed service, the Stock Tracker, keeps track of the items in stock. When a certain threshold is reached, it sends a notification to Trikom with a tailored shopping list.

A Slack-notice (*Information set 3*) is issued as a new element in *Process 1*. This tells all of Online's members that a restock is in the works. As a result, the stock is more predictable, which motivates the goal of enhanced customer satisfaction.

A new information set is shown in *Process 2*. This information set offers data about the current stock following the restock. This data is added to the Stock Tracker to keep it up to date. When this is accomplished, a notification is issued to all of Online's members informing them that Kiosken's items are once again available.

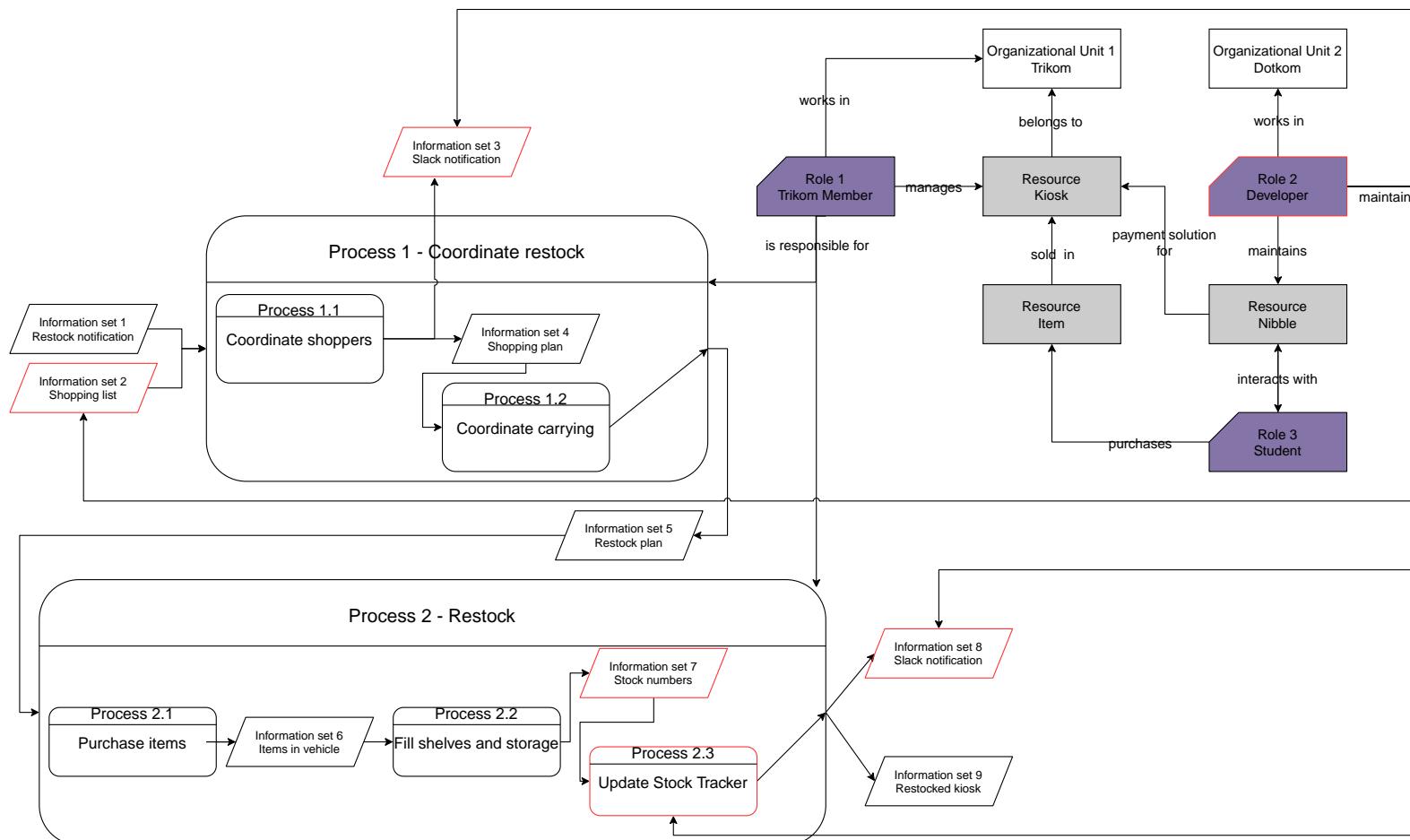


Figure 16. Changed Business Process Model // 4EM

4.1.3. The Changed Enterprise Model

The modified Enterprise Model is depicted in [Figure 17](#). The components have been reorganized in order to improve readability.

The goals' arrows have been revised to point to more specific areas of the processes, making it clearer how the innovation affects them. The same is applicable for the Trikom members' roles and interactions. [Section 4.1.1](#) highlighted the modifications for Dotkoms developers and their involvement in the maintenance of the Stock Tracker.

The revised model should be easier to grasp, and provide a more natural picture of the overall business and its processes, relevant to the case.

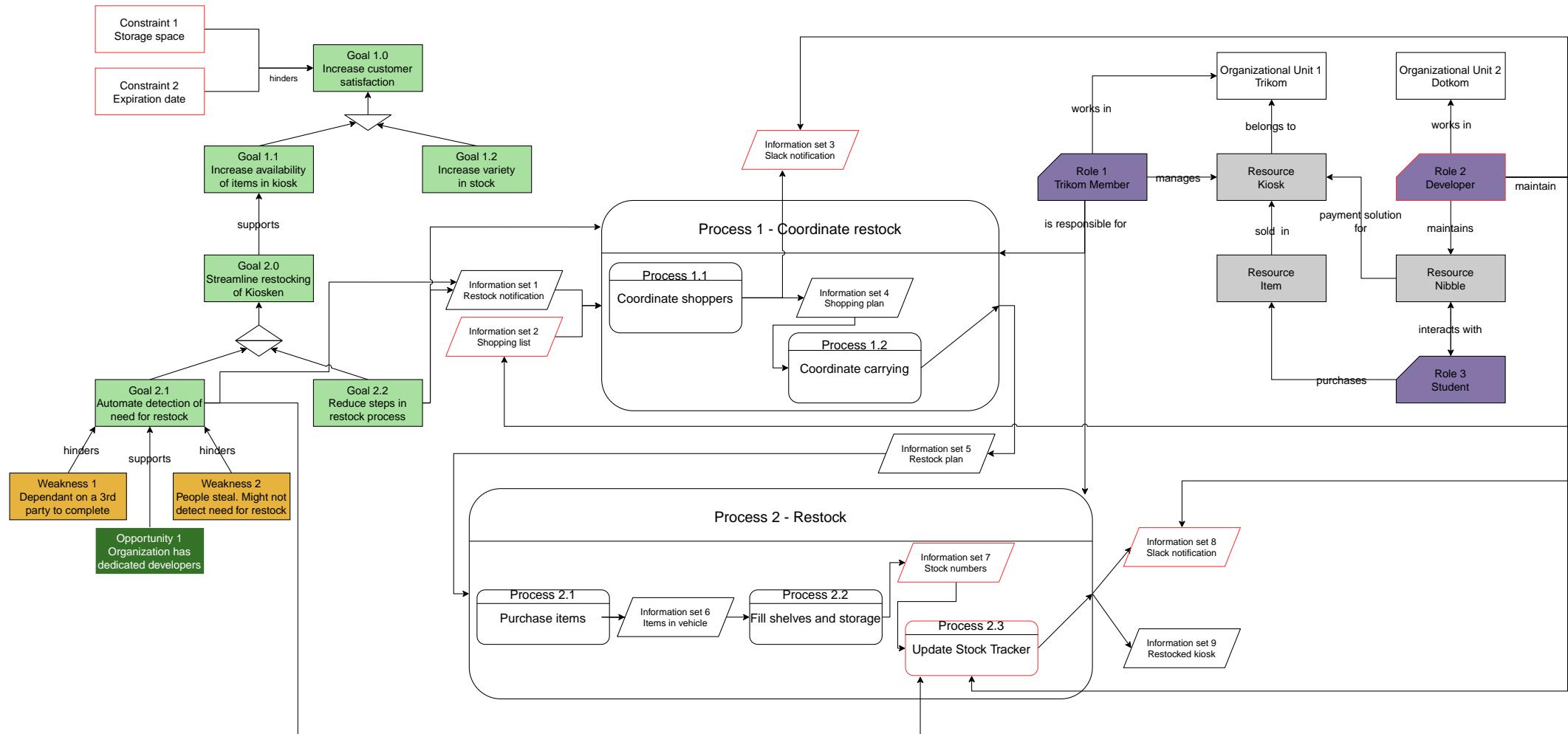


Figure 17. Changed Enterprise Model // 4EM

4.2. Enterprise Model & Enterprise Architecture

To understand the relationship between Enterprise Modeling and Enterprise Architecture, the concepts must first be defined.

Enterprise Modeling can be understood as 'the process of creating an integrated enterprise model which captures the aspects of the enterprise required for the modeling purpose at hand' [9].

— Sandkuhl et al.

This type of model is made up of related sub-models that cover various parts of the business. The model is created in such a way that all stakeholders participating in the modeling process understand it.

Enterprise Architecture is a coherent whole of principles, methods, and models that are used in the design and realisation of an enterprise's organisational structure, business processes, information systems and infrastructure [8].

— Lankhorst et al.

An enterprise architecture, as described expressly by the TOGAF framework, gives an overview of business processes, with a priority on IT, and the infrastructure that supports these activities. Enterprise Architecture functions as a map containing information about the existing situation (for instance, a business) and its elements and dependencies [9].

The biggest difference is that an EA simply describes the different aspects of an enterprise, but that an EM focuses on goals and how IT systems may produce value.

The models redesigned in [Section 4.1](#) are considered to be enterprise architectures as well. The redesigned [enterprise model](#) shows how a digital innovation (Stock Tracker service) is implemented to create business value. This is supported by the overall goals defined in [Section 1.3.1](#), namely for the model to be *beneficial to analyze the business processes* and to *visualize* the business processes.

5. Reflection

5.1. Model Evaluation

In this section I will evaluate the models created. In [Section 1.3.1](#) I described the goals, sub-goals and purpose as the following:

1. The model should **be beneficial to analyze the business processes**
 - a. It should be able to **identify possible innovation(s)**
 - b. 1.2 It should **identify potential threats to reach the business goals**
2. The model should overall **visualize**
 - a. It should be **created in such a way that the committee members of Trikom is able to utilize it**

To evaluate the models I will use **quality criteria**. **Quality criteria** are utilized because, while it focuses on the models and how accurate they are in terms of modeling the business, it allows for subjective quality. I.e it covers the models usability and understanding, which are very important parts for those going to utilize them.

According to Krogstie et al., 'what quality criteria are relevant and how strictly they are to be followed depends on the purpose of modeling or goals of modeling' [7], and this is taken into consideration for this section. The criterias **simplicity** and **integration** is omitted as own paragraphs as they are covered sufficiently in the other criterias.

NOTE

All definitions in the following paragraphs are by Sandkuhl et al. [9]

Usability

The ease with which the enterprise model can be used for its intended purpose.

The models were designed to be useful in analysing business processes. It has shown to be useful in identifying a potential innovation, namely the Stock Tracker service. It also covers potential threats that stakeholders / intended users should be aware of. Its design is straightforward, and the Trikom committee members should be able to use it. The proposed service innovation should have a clear impact on the existing business process and it covers the required changes to achieve so.

The *usability* of the model is evaluated very good.

Understanding

The ease with which the concepts and structures in the enterprise model can be understood by the stakeholders.

It is worth emphasizing that the stakeholders that use this model will be quite familiar with all of the existing Kiosken-processes. Because I was aware of this during the modeling process, I may have been less detailed than I would have been if the users were less familiar. This is compensated for by textual descriptions.

Certain arrows in the Enterprise Model are a little difficult to follow. They are quite lengthy and have several pathways. Textual descriptions compensate for this as well.

The *understanding* of the model is evaluated good.

Completeness

The degree to which all relevant facts of the problem domain are included in the enterprise model.

The case considers a specific process, namely the restocking of Kiosken. All sub-processes and models included are related to this. The goals are realized by the processes and the proposed service. The actors presented are either performing actions related to the overall process, or essential to the Stock Tracker.

The *completeness* of the model is evaluated very good.

Correctness

How well the enterprise model conforms to the rules of the modeling technique.

In my case, the modeling technique of choice was 4EM. This criterion assesses how effectively my model adheres to the language's scope and makes use of the language's current syntax and rules.

The model adheres to the syntax and rules of the language. I may have overlooked certain elements of the language that would have made modeling easier, but the finished product should meet expectations.

The *correctness* of the model is evaluated good.

Flexibility

The ease with which the enterprise model can cope with changes in the modeling domain.

Everything was created using [draw.io](#). Within the tool, the various sub-models are separated into their own tabs, making it simple to make modifications to only certain components. As a consequence of the multiple sub-models being separate, the model is particularly adaptable and robust to dealing with changes within the domain. Furthermore, because the model is not very complicated, the amount of work required to make necessary adjustments would be manageable.

The *flexibility* of the model is evaluated very good.

Overall quality

The model's *overall quality* is rated as good, although there is space for improvement. More experienced architects might definitely use sections of 4EM that I am not familiar with, improving both understanding and accuracy.

5.2. Reflections

I found the entire process to be rather challenging. I haven't been able to attend as many lectures as I had anticipated, but I've done my best to stay up-to-date through available learning materials and engagement with fellow students. The main issue was connected to many big words and definitions I was not familiar with, and at some point had misunderstood. Fortunately, this was mostly resolved during exercise lessons.

It was a lot of fun brainstorming potential cases. I took one case early on, and worked on it extensively until I concluded it just would not work. Starting from scratch with a new case was a little discouraging, but I had learned a lot and the process went much more smoothly the second time. The largest advantage was taking detailed notes and describing the case thoroughly before modeling.

I'm glad I have some prior experience with information systems and modeling. Modeling my case was challenging using new tools, but it became fun after I got the hang of it and the many elements fell into place. It took several modeling iterations until I was satisfied, and I am pleased with the outcome.

If I had to do it all over again, I would surely do certain things differently.

Before modeling, I would familiarize myself with both 4EM and ArchiMate so that I could have a better modeling experience. Even while it was fascinating at times, I spent a lot of time overwhelmed and confused by conventions and syntax. I would also consider getting familiar with more of the frameworks for evaluation and enterprise architectures.

All in all i think it was a challenging process, but I feel I have gotten rather good insights into business and enterprise modelling, as well as service innovation and the methods for analyzing them [1].

6. Bibliography

- [1] “Course - Enterprise Architecture for Enterprise Innovation - TDT4252 - NTNU.” <https://www.ntnu.edu/studies/courses/TDT4252#tab=omEmnet>.
- [2] “Trivselskomiteen,” *Linjeforeningen Online*. <https://old.online.ntnu.no/wiki/online/historie/trikom/>, Nov. 2021.
- [3] “Nibble4.” Appkom, Nov. 2021.
- [4] “Double Diamond (Design Process Model),” *Wikipedia*, Nov. 2021.
- [5] “Linjeforeningen Online,” *Linjeforeningen Online*. <https://online.ntnu.no/>, Nov. 2021.
- [6] 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.
- [7] J. Krogstie, “Quality of Business Process Models,” in *Lecture Notes in Business Information Processing*, Nov. 2012, vol. 134, pp. 76–90, doi: 10.1007/978-3-642-34549-4_6.
- [8] M. Lankhorst, *Enterprise Architecture at Work: Modelling, Communication and Analysis*, Fourth. Berlin, Germany: Springer, 2017.
- [9] 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.
- [10] M. Skowron, “Lean Canvas vs Business Model Canvas: Which Should You Choose?,” *UIG Studio*. <https://uigstudio.com/insights/lean-canvas-vs-business-model-canvas-which-should-you-choose>.