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Developing a website solution for REKO model

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The purpose of the study was to examine issues experienced by REKO food group users and develop solutions to the observed problems. According to previous studies, the REKO food group users think the food groups are beneficial to them but they experience difficulties using the food groups. This has had a negative effect on the number of active members and the user experience in the food groups.

The REKO network and the food groups' operations were analyzed in the study, after which a questionnaire was shared in 10 REKO food groups in Finland. The questionnaire was used to gather information about the positive and negative user experiences in the food groups as well as to map out both the users' satisfaction with the current REKO operations and interest in an independent platform designed for the REKO retail and distribution model.

Together with the analysis and questionnaire, it was identified that the biggest issues related to Facebook being an unsuitable platform for the REKO activity especially if the REKO food group had many members or if a member was part of various food groups. The most important issues found were difficulties finding what products are sold, placing and tracking orders, and reluctance to use Facebook.

Based on the observed issues a website was developed. The website was created with a light implementation without a real database or user authentication. Instead, the backend was mocked, so that the development could focus on improving the REKO operations and user experience. The outcome of the study was a published website that either partly or completely solved the problems identified in the analysis and questionnaire results. In the future the website can be shared in the REKO food groups to demonstrate it as a possible alternative to Facebook as the platform for the REKO network.

Keywords	Local food, website, REKO

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Insinöörityön tarkoituksena oli selvittää REKO-ruokaryhmien käyttäjien kohtaamia ongelmia sekä kehittää ratkaisuja havaituille ongelmille. Aiempien tutkimusten mukaan REKO-ruokaryhmiä pidetään hyödyllisinä, mutta niiden käytössä koetaan hankaluuksia, mikä vaikuttaa ruokaryhmien aktiivisten jäsenten määrään sekä ruokaryhmien käyttökokemukseen.

Insinöörityössä tehtiin analyysi REKO-verkoston ja ruokaryhmien nykyisistä toimintatavoista, jonka jälkeen kymmenen Suomessa sijaitsevaan REKO-ruokaryhmään jaettiin kysely. Kyselyn avulla kerättiin tietoa REKO-ruokaryhmien jäsenten positiivisista ja negatiivista REKO-käyttökokemuksista sekä kartoitettiin tyytyväisyyttä nykyisiin toimintamenetelmiin ja mielenkiintoa REKO-myyntimallille suunniteltuun alustaan.

Analyysin sekä kyselyn perusteella havaittiin, että suurimmat käyttövaikeudet liittyivät Facebookin soveltumattomuuteen REKO-toimintaan etenkin, mikäli REKO-ryhmässä on paljon jäseniä tai mikäli jäsen on osa useampaa ryhmää. Tärkeimpiä löydettyjä ongelmia olivat vaikeus löytää tietoa myynnissä olevista tuotteista, tilausten tekeminen sekä seuraaminen, ja haluttomuus käyttää Facebookia.

Havaittujen ongelmien perusteella päätettiin suunnitella verkkosivusto. Verkkosivusto luotiin kevyellä toteutuksella ilman oikeaa tietokantaa tai käyttäjän todentamista. Sen sijaan sivustolle luotiin tietokantajäljitelmä, jonka avulla kehitys voitiin keskittää käyttäjäpuolen kehittämiseen. Insinöörityön lopputuloksena oli julkaistu verkkosivusto, joka ratkaisi insinöörityön analyysissä ja kyselyssä havaitut ongelmat osittain tai kokoneen. Insinöörityön loputtua verkkosivustoa on mahdollista esitellä REKO-ruokaryhmissä mahdollisena vaihtoehtona Facebookille REKO-toiminnan alustana.

Avainsanat	Lähiruoka, verkkosivusto, REKO

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List of Abbreviations

REKO   Rejäl konsumtion. "Fair consumption". Name of the retail and distribution model for local food and produce sold directly from producers to consumers without middlemen.

API   Application programming interface. Computing interface used by two applications to communicate with each other.

REST   Representational state transfer. Architectural principles that define a set of rules.

UI   User interface.

UX   User experience.

CSS   Cascading style sheet.

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1   Introduction

The interest in purchasing locally and organically produced food has grown significantly in the last few years. As more consumers have started to look ways to purchase food and products from local farmers and producers, more companies and solutions have risen to answer the growing demand. One of the solutions developed is the REKO model.

The REKO model is a retail and distribution model, where it is easy for both consumers to purchase products from local farmers and producers, and for producers to sell their products directly to the customers without any middlemen [1]. The name "REKO" comes from "rejäl konsumtion, Swedish for "fair consumption", to encapsulate the REKO model's core principles: locally and ethically and organically produced products, transparency on how the products are made, and no resale.

The REKO model is implemented via groups, often called "rings". The groups are run by volunteers who receive no compensation for their work. Often the volunteers are consumers or producers in the same group as well. The customers and producers agree on the orders and deliveries inside the group. The producers then deliver the ordered products to the delivery events, commonly organized once a week, and distribute the orders to the customers. [1.]

Although originally designed by a farmer Thomas Snellman for himself and the local producers near him, the REKO network has grown notably since it was launched in 2012 [1]. Nowadays REKO groups can be found in other Nordic countries as well. However, in Finland many groups can be observed to have thousands of members, yet only a fraction of them are active. It is clear that there is interest in the local products sold in the REKO groups, but issues with customers ordering in the group.

This thesis is going to analyze and recognize the issues in the current way the REKO network operates. The findings will then be used to create a prototype of the solutions that address the found issues and that could help the REKO model improve and become more widely and actively used.

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2   Project Structure

2.1   Project Background and Requirements

Currently the REKO network is operating through closed Facebook groups [4]. The REKO group volunteers work as moderators in the group, accepting new members and producers in, monitor all the posts in the group and add coming delivery dates as events. Producers post a message in the group where they list what they are selling for the delivery. Customers can then place their orders via comments under the producer's Facebook post in the REKO group. On the delivery date, all the customers and producers meet at a specified time at a predefined place, so that the customers can pay and receive the products they had ordered. A producer can also be selling their products in several REKO groups, just as a customer can be part of multiple REKO groups. [1, 4, 7.]

The REKO network has been working in a specific way and has not changed much since it was originally launched. This means that whatever the eventual implementation of the thesis project is, it is important to make the prototype as easily adoptable and familiar as possible to the producers, customers, and volunteers of the REKO groups. The prototype made for this thesis project should have the same core features, concepts and strategies that are currently used in the REKO model, such as groups, volunteering group administrators, delivery dates and placing orders. Any issues that are identified during this project should be addressed either with a working implementation in the prototype or a feature proposal if the implementation is out of scope for the thesis project.

At the end of the project, there should be a demonstrative prototype that potential users can test. The prototype is not required to be a fully featured, production-ready implementation, and it can lack certain features if they are not necessary. This means that the prototype does not require a real database or authentication if its features can still be demonstrated effectively to the potential users testing the prototyped solutions.

2.2   Project Plan

The project starts by researching and analyzing how the current REKO network operates on Facebook. The preliminary analysis is done from the perspective of a customer, a

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producer, and a REKO group administrator. The entire lifecycle of the user is studied, from finding a group to finishing a delivery. Once the preliminary analysis is done, a questionnaire is designed for the users of the REKO groups. The questionnaire is shared in Finnish REKO groups on Facebook to gain user insights and feedback of the current system. The preliminary analysis guides the questions of the questionnaire.

The questionnaire results and the issues raised in the responses or in the preliminary analysis guide the thesis project in the development stage. With the information gathered from them, the type of implementation is decided and an outline for the implementation prototype is drafted. The technologies used in the development of the prototype are chosen according to the outline of the prototype. Once the draft is complete and technologies chosen, the technical development of the implementation is started.

3   Development Processes

3.1   Preliminary Analysis

3.1.1   Producer Lifecycle

A producer's lifecycle starts by finding one or more REKO groups on Facebook. Once they have been accepted in the group by one of the group's moderators, the producers are able to post an introduction about their business as well as products and start selling their products. Like customers, producers can be part of multiple REKO groups, both as consumers themselves and as producers.

When a producer decides they want to participate in a delivery event, they publish a post in the REKO group (see Figure 1). In the post they specify the delivery date, a list of what they are selling and for how much, and optionally they add images of their products. They have to manually keep track of the orders placed by customers in the comments section. They may also have to track their stock across the different groups and deliveries, and inform the in the comments section of their post if orders are closed for a product.
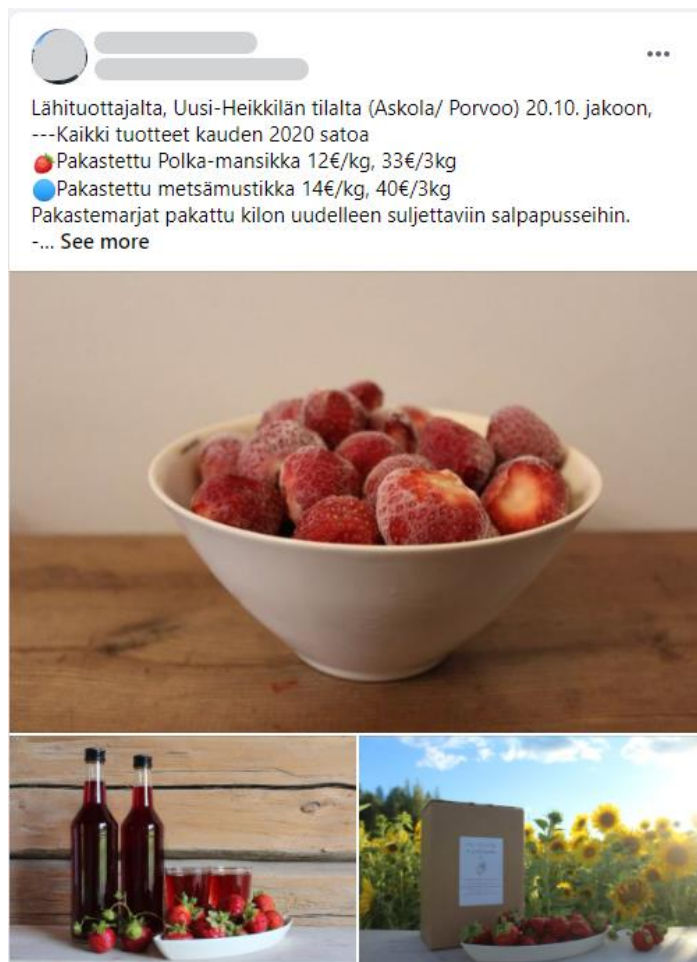
Figure 1.   The Facebook post of a local food producer selling berries.[1]

During the delivery events a producer hands over the ordered items to customers and handles the possible payments. They might keep track of whether an order delivery was completed to a customer. Customers might not show up to the delivery events, and due to permits required for marketplace activities, a producer in a REKO delivery event cannot sell their surplus products to people who have not placed orders in advance. This means that the producer might, in some cases, not sell all the products that were ordered

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[1] The English translation of the producer's Facebook post: "From local producer Uusi-Heikkilä farm (Askola/ Porvoo) to the delivery on 20 October.. All products from 2020 harvest season. Frozen Polka strawberry €12/kg, €33/3kg. Frozen bilberry €14/kg, €40/3kg. The frozen berries are packed in one kilo bags that can be closed again."

from them, resulting in revenue loss as well as lost time and resources required to produce and deliver the product.

3.1.2 Customer Lifecycle

Similar to a producer, a customer's lifecycle starts by finding one or more REKO groups on Facebook. Once they have been accepted in the group by one of the group's moderators, they are able to get to know the producers, see the coming deliveries and start ordering products. A customer can be part of multiple REKO groups and participate in whichever delivery they choose to. When a customer wants to order products, they leave a comment under the producer's post for the chosen delivery date (see Figure 2).

Figure 2.   REKO customers placing orders by commenting on the producer's post.[2]

The customers must manually keep track of what they have ordered and for how much, from which producers and for which delivery dates. The common payment methods are cash as well as credit card, if the producer has a payment terminal in use. Other seen payment methods are MobilePay or invoicing. If the customer pays with cash, they should also keep track of the total of their orders for a specific delivery.

3.1.3 Group Administrator Lifecycle

A group administrator's lifecycle in a REKO group begins when they decide to create a new group. They need to create a closed group on Facebook and add location details, rules, and other additional details on the group's page. They decide when and where to

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[2] The English translation of the 1st comment: "One open egg carton. Thank you." Translation of the 2nd comment: "One package of bacon and one carton of eggs, thank you!"

hold delivery events. They also accept every member into the group individually. Sometimes a group might have their own additional rules and guidelines which the members must agree to in order to join the REKO group.

For every delivery date in the REKO group, a group administrator creates a new event, where they share the event details such as location, time, and any additional details. They moderate the posts in the group and remove posts or members if they violate the group's rules. In some REKO groups the group administrators remove the posts for previous deliveries, whereas in other groups the removal of the old posts is the responsibility of the post's author.

It is notable that REKO group administrators do not get any monetary compensation for the work they do in the groups. Some group administrators volunteer in multiple groups. A REKO group administrator might be a producer or a customer or both in the same group they volunteer in.

3.1.4   Issues

The first step for a user, whether a producer or a customer, is finding a REKO group nearby. Most commonly the groups are named according to the city, town, or area where they hold the delivery events, but more often than not the user needs to know almost exactly which group or groups they are looking for. There are websites where the REKO groups in a certain area are listed, but the user needs to be aware of their existence to utilize them. This can make it difficult for users, especially those new to the REKO network, to find the groups operating near them.

Once a user has become a member in a REKO group, it can be difficult finding information about the producers. Not all producers make introductory posts about themselves and their business. Different REKO groups show the producer introductions in different places, and some do not have a comprehensive list of the producers selling in the group. It is also possible the user will not be able to see what producers or products are sold in the group before joining, if the Facebook group's settings do not allow reading the posts for users outside the group.

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Even though most deliveries can be observed to happen at the same place and time at a regular interval, for example every Thursday at 5 pm, the administrators in a REKO group need to announce all events manually and create an event for them. They also have to spend time moderating the posts and comments, since there is no specific format they can enforce on the producers' posts or customers' comments under them. Users can post irrelevant posts and messages to the wall, which takes the administrators' time unnecessarily.

Ordering products is easy for customers in the Facebook groups; however, it is unnecessarily complicated to keep track of the orders when they are in the form of comments under posts that might have several other customers' comments as well. Customers need to come up with their own ways to manually keep track of what products from which producers they have ordered. Research has also revealed that many consumers find getting food from REKO groups instead of a grocery store more difficult [8]. The issue is even more exacerbated if the customer has ordered products from several producers or several different groups. Poor maintenance in a REKO group makes finding the posts relevant to the user difficult.

Likewise, a producer also has to keep track of the orders manually for the coming deliveries. Some producers might have stock limitations to monitor as well. This means they must keep track of the amount of orders and update manually when some product can no longer be ordered. It is common for a producer to be part of multiple groups. Maintaining all this information is time consuming [8] and extremely error prone. If a producer misses a comment under one of their posts, it can lead to lost sales, resources, and bad customer experience.

The last issue found in the customer and producer processes is payments. Currently all payments are agreed between the producer and customer and carried out or confirmed during the delivery event unless the producer and customer have agreed to handle payment through invoicing. However, handling payments is an additional task to do during the delivery events that takes time away from interaction between customers and producers. Producers have also reported not having enough time to have conversations with their customers or fellow producers during delivery events [7]. Other customers have to queue longer, which might affect them getting the rest of the items from other producers during the same delivery event.

There also seems to be no good system in place for the producer to contact their customers. The only information the producer has of their customer is the username displayed on Facebook. If a customer does not pick up their order during the delivery event they agreed upon, or if the producer cannot deliver an ordered item, there is no reliable way to contact the customer to inform them.

3.2   Questionnaire

3.2.1   Questionnaire Structure

The questionnaire's goal is to gather feedback on how the current system works as well as to gain more insight to how the REKO network is currently used. In addition to that, the questionnaire (see Table 1) can help validate the issues discovered in the preliminary analysis.

Table 1.   Questionnaire questions

Question	Required	Answer type	Options
1. You are a REKO ring…	Yes	Multi-select	Customer, producer, moderator/admin
2. How many REKO rings are you a member of?	Yes	Text	
3. How often do you use REKO rings?	Yes	Scale from 1 to 5	1 = less than 2 times a year, 2 = less than monthly, 3 = monthly, 4 = weekly, 5 = daily
4. Are you satisfied with how REKO rings work currently?	Yes	Select	Yes, No
5. What would you improve about how REKO rings work? What doesn't work well?	No	Text	
6. What do you most like about REKO rings? What works well?	No	Text	
7. Would you like to use a service built for REKO rings?	Yes	Select	Yes, No

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The questionnaire is shared in 10 Finnish REKO groups mainly focused in the Helsinki area. The questionnaire is available in all groups until the end of the thesis project. Additionally, it is published in both English and Finnish to be able to gather data from a larger audience. The platform used to create the questionnaire is Typeform, which also provides information about the type of device a participant's response was sent from.

3.2.2 Results

The questionnaire has received 107 responses: 11 responses in English and 96 responses to the Finnish version of the questionnaire. The responses contained answers from all three types of member roles in a REKO group observed in the preliminary analysis of this study. Although the questionnaire is initially shared in 10 groups, some are later removed with or without a warning, which means that not all groups had an equal opportunity to answer to the questionnaire.

As seen in Table 2, most of the people who answer the questionnaire are customers, with some responses that reported multiple simultaneous roles. Due to the number of customers answering, the responses provide great insight and possible reasons behind the number of inactive members in many REKO groups. In contrast, not many conclusions could be drawn from how group administrators view the current state of the REKO network.

Table 2.   Amounts of roles represented in the questionnaire responses

Role in REKO groups	Amount
Customers	83
Producers	18
Administrators	10

The most mentioned issue among the responses is ordering difficulties on both customer and producer side. This issue relates to a many smaller problems, such as the reports of some posts occasionally disappearing from the Facebook groups, or the inability to see a summary of the ordered products in a Facebook group. Another common difficulty

related to ordering is finding what products are being sold for the next delivery event, eventually resulting in loss of sales for producers, and frustration on the customer side.

Facebook as a platform for the REKO network is mentioned as frequently as the ordering issues. Unless a person has a Facebook account, there is no way to be part of the REKO network or find more information about a specific REKO group. Furthermore, Facebook's group feature offers no possibility to enforce a certain data structure across the different REKO groups, which participants say leads to information that is missing or hard to find even as a member of a group. This is especially frustrating for people new to the REKO network.

Some producers mention about the problem with orders not being picked and having to manually ask after the customer. Simultaneously, some customers report not always getting their orders or the orders being changed without being informed about it. Communication between customers and producers is perceived to be unreliable and often not possible according to the responses.

Customers also bring up short delivery times, caused by most producers handling both payments in addition to the distribution during the delivery event. Both customers and producers express an interest in an online payment system to make the delivery events more efficient. In addition, representatives of both roles feel orders should be more binding for both parties involved.

In addition to the most frequently mentioned challenges in the current systems, one customer raises awareness of the lack of privacy. All group members can see what a customer has ordered in the comments section of a post, and there can be customers who wish to keep their orders private. However, keeping the orders private is not possible with the way the REKO network is currently operating on Facebook.

Language barrier is an additional issue for non-native customers. Few producers translate all their products lists and posts, which makes it challenging for non-native speakers to find what is offered. Even if the producers add images of their products to the post listing the products, without a translation, it can be difficult to tell what kind of products they are selling. This can deter non-native customers from ordering products in REKO groups.

As observed in Figure 3, most of the questionnaire participants sent their response through a mobile device. Because the questionnaire is shared only in REKO groups, the assumption is made that most of the participants use the REKO groups with the same device they responded to the questionnaire with. Facebook in general is accessed mostly via mobile phones, with 79.2% of their users accessing the platform only with a mobile phone, 19.1% using both phones and computers, and 1,7% using only a computer [2]. This further validates the assumption that most of the members operate in REKO groups via mobile devices.
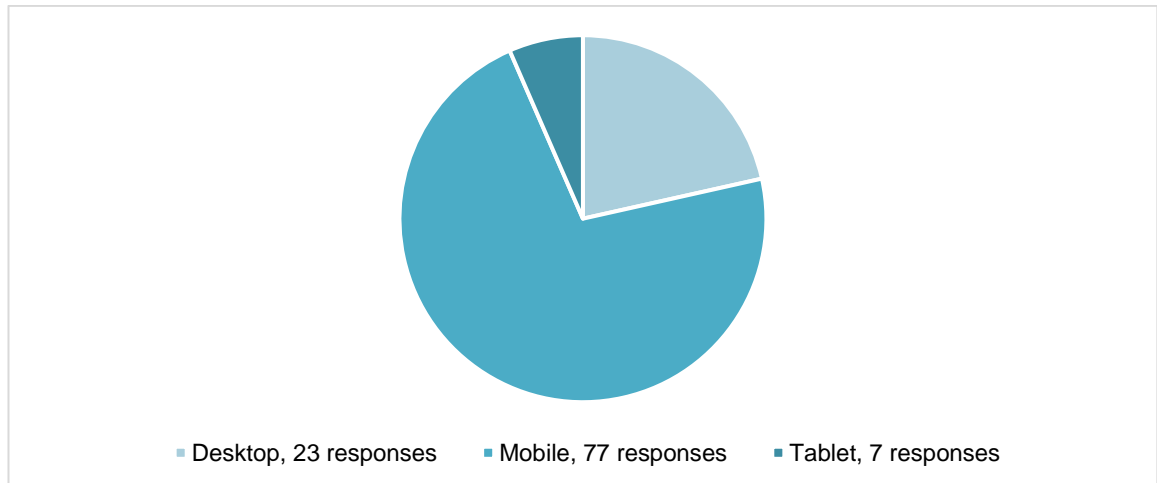

Figure 3.   Breakdown of devices used to respond to the questionnaire

The questionnaire participants report being satisfied with the direct sales model of REKO groups and the transparency that comes from customers meeting producers face to face during the delivery events. The customers are interested in supporting local farmers and producers. They want to continue to be able to access fresh, organic, and local food easily. Most of the participants are also satisfied with the REKO retail and distribution model itself, despite the issues experienced in the logistics of ordering and delivery.

In summary, the participants report being happy with the REKO model and the value it brings to them. Still, the participants also report multiple logistical issues that are mostly related to the platform that the REKO network operates on. If the groups are small and have a clear set of rules and structure on how the group operates, the current system seems to work adequately. However, the bigger the group is, and the more groups a producer, customer or volunteer is part of, the harder it is to use the system effectively.

3.3 Solutions

Most of the issues experienced in the preliminary analysis and the questionnaire can be mapped back to the platform the REKO activity operates on. Facebook and its closed groups do not seem to scale well for REKO groups, because the information there is unstructured, and the platform itself can be changed very little to suit the needs of the REKO model. Not only that, but if a customer does not want to use Facebook, there is no other way to join a REKO group. This excludes people and limits the amount of information that is available to the public. All these problems work against the transparency in local food production and accessibility to fresh, ethically made food and products that the REKO model was designed for.

The most important change that can be made in the project's prototyped solution is improving the ordering system for both customers and producers. All products available for ordering should be listed clearly for customers to find them easily. This would give all producers and their products equal visibility. Customers should also be able to view a summary of what they have ordered. Their orders should be accessible at any given moment, with minimal effort required from the customer. Equally, producers should be able to view the current stock as well as what has been ordered from them and by who.

Facebook has a Buy and Sell Groups feature that can be added to a normal Facebook groups, where group members can buy and sell products listed in the group. However, it is not possible sell products in quantities or link the products to a certain delivery event. Consequently, making any notable improvements in the REKO groups' ordering system within Facebook is difficult.

While the prototype's most important and prominent feature is the ordering system, other key features are finding local groups easier, finding delivery event information faster, and making delivery events more efficient. Although an online payment system is beneficial for the efficiency of delivery events, implementing it is out of the scope of this thesis project. However, it is a feature that should be considered if the prototype development is continued later.

Because of the lack of features required to improve the ordering system on Facebook, it becomes apparent that the solution prototype should be developed outside the Facebook

platform. The two solutions considered are a website and a mobile application. As Figure 3 shows, most of the questionnaire participants used a mobile device to answer the questionnaire. A mobile application would allow native push notifications and offline content and more native user experience to the mobile users. However, it is unclear which mobile operating system is most used among the mobile users. Making the prototype availability dependent on the device is not ideal since the prototype should be widely adoptable and accessible. Compared to a mobile application, a website is accessible via any type of device that can access the Internet. Therefore, it is decided that the prototype should be a website.

3.4 User Interface Design

Despite the prototype being a website instead of a mobile application, it is important to take the mobile users into account when designing the website. The prototype design is started from the mobile layout to ensure lean design with prioritized features. Scaling the design up to tablets and desktops will then be easier after solving the layout restrictions on the mobile first. [12.] The mobile-first approach helps to ensure the prototype can offer a similar user experience across devices.

The user interface should be as clear, simple and accessible. Research on buttons has found that to avoid errors, button size should be 11 mm x 11 mm or bigger [3]. Converted to CSS pixels, 11 mm is 41.5 CSS pixels. Thus, the website uses buttons with the height of 44 pixels. The body text's font size is set to 16 pixels for readability, and the body text is displayed on white or light grey background for adequate color contrast between the background and the font. Green is picked as the accent color to highlight the most important information and actions on the site, while the rest of the website continues using mainly monochromatic colors to reduce cognitive load [6]. To avoid usability problems, the number of features available are reduced to only the relevant ones to complete the main action on every page [5].

The focus in the website's design is directed towards clean, clear, and simple user interface (UI) and user experience (UX). Although animations often improve user experience, they are not considered mandatory for the website prototype. Instead, it is important to map the most used features for each REKO user role. For example, an administrator

should see a list of all the groups they are managing somewhere on top of a page. Similarly, groups that a customer is a member of should be prioritized over a list of other groups. Any feature used often should be placed to the top of the page to avoid needless scrolling or multiple clicks to achieve a task. [12.]

3.5 Technology

3.5.1 Requirements

The purpose of the REKO website prototype is to demonstrate how the REKO operations can be improved without charging a fee from the customers or producers for using the separate website. This complies with the REKO model's idea of no middlemen or third parties receiving compensation. It is thus emphasized that only open source or free tools should be used while developing the prototype.

Because the prototype is developed for browsers, the code will be written using JavaScript, HTML, and CSS. Since the thesis project is only a prototype to showcase possible solutions, a full backend of the prototype is not considered to be a compulsory part of the solution. Instead, the backend services such as the database and API are mocked.

3.5.2 Vue.js

The website consists of various UI elements that are visible and interactable by the end user through the browser. To make the development faster, the frontend logic is developed using the Vue.js framework.

Vue.js is a JavaScript framework for building powerful and seamless user interfaces. It is an open-source project, meaning that anyone can modify and redistribute the code. Vue.js was created by Evan You and it was first published in 2014 [10]. Since its publication it has gained a significant number of users and is now one of the most popular JavaScript frameworks. Vue.js is a progressive and incrementally adoptable framework that supports rapid prototyping with data binding and components [9], making it a suitable tool for the website prototyping.

Vue.js comes with many benefits, such as supporting libraries tailored for Vue.js and advanced project scaffolding that speeds up the project setup [10]. One of the powerful features of Vue.js are single-file components (see Listing 1), which are utilized heavily in the development of the thesis project to separate the code into smaller parts. It makes the components easier to reuse and maintain effectively in the thesis project. Together with the project scaffolding and useful libraries, the Vue.js ecosystem gives the website prototype a powerful start and keeps the development cycles short.

```
<template
  <button
    class="button"
    :class="{ secondary: secondary }"
    v-on="inputListeners"
  >
    <slot />
  </button>
</template>

<script>
export default {
  props: {
    secondary: {
      type: Boolean,
      required: false,
      default: false
    }
  },
  computed: {
    inputListeners() {
      const vm = this
      return Object.assign(
        {},
        this.$listeners,
        {
          click(event) {
            vm.$emit('click', event)
          }
        }
      )
    }
  }
}
</script>

<style lang="postcss">
.button {
  @apply bg-green-600 border-2 border-green-600 text-center text-white font-
medium py-3 px-6 leading-none rounded-full;

  &.secondary {
    @apply bg-gray-300 border-gray-300 text-gray-700;
  }
}
</style>
```

Listing 1.   A Vue.js single-file component for button component that consists of the component's template, JavaScript logic and styling.

3.5.3 TailwindCSS

The frontend development with Vue.js is paired with TailwindCSS, an open-source low-level CSS framework for fast custom user interface styling. Unlike CSS frameworks like Bootstrap or Vuetify, TailwindCSS does not offer predefined styled components. Instead TailwindCSS provides highly customizable utility classes that can be combined and stacked to create versatile styling (see Figure 4). [11.]


```
<div class="bg-red-500 sm:bg-green-500 md:bg-blue-500 lg:bg-pink-500 xl:bg-teal-500"></div>
```

Figure 4. TailwindCSS utility classes and breakpoint prefixes used to change the background color of the div element according to the breakpoint.

Although Tailwind enables customizing the theme from which the utility classes are generated, the default theme provides all the needed utilities for the website. By default, TailwindCSS has four breakpoints according to common device resolutions. It uses a mobile first breakpoint system, which applies unprefixed utilities on all screen sizes, and prefixed utilities at the specified breakpoint and above. This helps substantially while designing and developing the user interface for the prototype using the mobile first principles.

3.5.4 MirageJS

To allow the prototype development to focus on solutions that benefit the end users the most, no real backend is created for the website. Instead, MirageJS is used to mock the backend. MirageJS is an API mocking library used to build, test, and demonstrate JavaScript applications. It enables building production-ready products without using any backend services. [13]. This saves development time and resources and allows testing the prototype without implementing real authentication or a fully structured database, while still providing a foundation to build the backend on, regardless of the services ultimately used to build the backend, in case the prototype development is later continued (see Figure 5).

```
// src/server.js
import { createServer, Model } from "miragejs"

export function makeServer({ environment = "development" } = {}) {
  let server = createServer({
    environment,

    models: {
      user: Model,
    },

    seeds(server) {
      server.create("user", { name: "Bob" })
      server.create("user", { name: "Alice" })
    },

    routes() {
      this.namespace = "api"

      this.get("/users", (schema) => {
        return schema.users.all()
      })
    },
  })

  return server
}
```

Figure 5.   Basic example of MirageJS mock server with a user model, seeded users and an API endpoint to fetch all the users from the mocked database

MirageJS is a powerful tool while building a mock database. Its users can create complex relational data with Mirage models and factories [13]. The Mirage server can be seeded with initial data that can then be modified using the mocked API routes. Not only are these features useful while developing and testing the website, the dynamic data accelerates designing the website UI.

3.5.5   Netlify

Netlify is an all-in-one platform for automating building and deployment of git-based projects. Its purpose is to make tasks related to continuous deployment as easy as possible, which is why the website is hosted and deployed by Netlify. [14.] While Netlify is not open

source, it does offer a free plan that is sufficient for publishing and sharing the website prototype.

Building the project requires minimal setup. It is first connected to the GitHub repository of the project. Once the repository is connected, the build command and publish directory are added to the Build settings. The project requires only two environmental variables, that are simple to add in the Environment settings. Netlify is then told to deploy from the repository's master branch whenever it detects new changes in the branch. Once the initial setup is done, Netlify starts hosting the project automatically and continues to update the content whenever the master branch is updated. After the setup, no further actions are required on Netlify for the rest of the thesis project development.

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4   Results

4.1   Implementation

4.1.1   Accessible and Transparent Information

An unauthenticated user of the prototyped website can see more information than is currently available on Facebook for a user who is not a member of a REKO group, or alternatively, who is without a Facebook account. They can search for REKO groups according to their exact location if they choose to share their location with the website. Alternatively, they can search groups according to cities. The user can view a group's city, name, number of members, number of producers and the next event date already in the group listing view (see Figure 6). These changes fix the issue of a user having to know the names of the groups to find them on Facebook. They also give the user more information about a group without needing to be a member of it first.
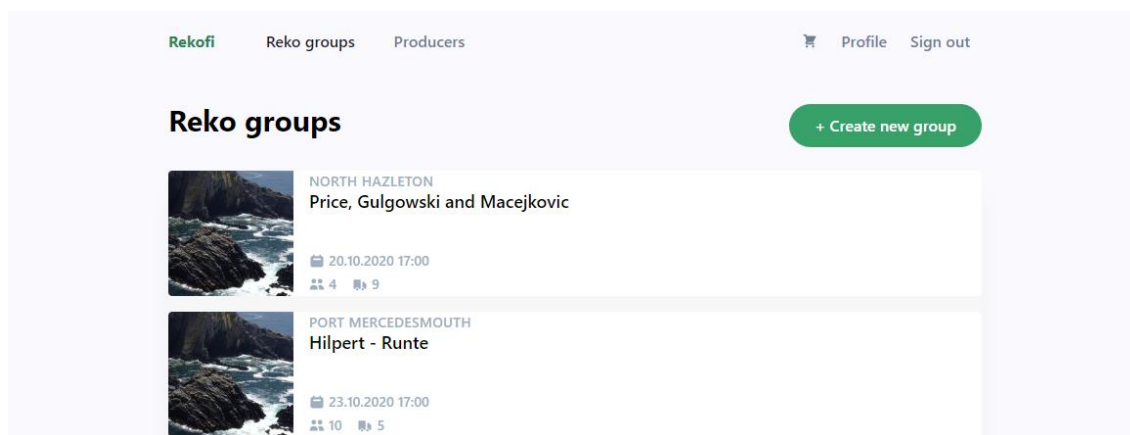

Figure 6.   List of REKO groups

By clicking on a group in a list of REKO groups, the user is taken to a page of the REKO group (see Figure 7). On that page the user can find the group description, the exact location of the group's usual delivery events, coming delivery events and a list of all the producers selling in the group. The delivery events listed show the name, date, and time of the event as well as the location, if it is different than the usual location. The list of

producers only shows the name of the producer, with each list item being a link to the producer's profile page. All this information is made available to both authenticated and unauthenticated users, so that users are not required to join a group to find out what is sold and where.
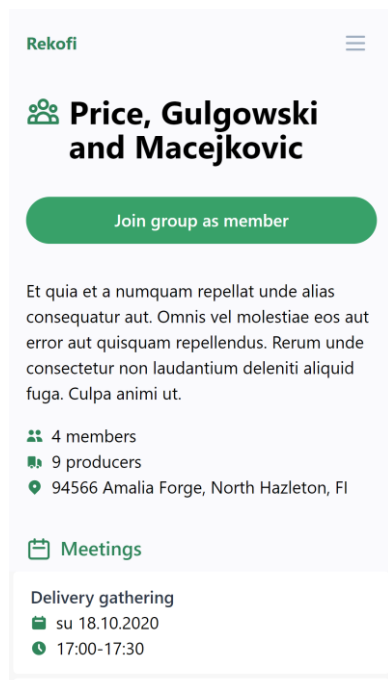

Figure 7.   REKO group page with mocked data on a mobile device

When the user clicks on a delivery event link on the REKO group's page, they are directed to the delivery event page (see Figure 8). In addition to the basic details of the delivery event, such as the organizing group, date, time and location, the user can find from the page what products can be ordered for the delivery event. The user can also find a list of the producers participating in that delivery event.
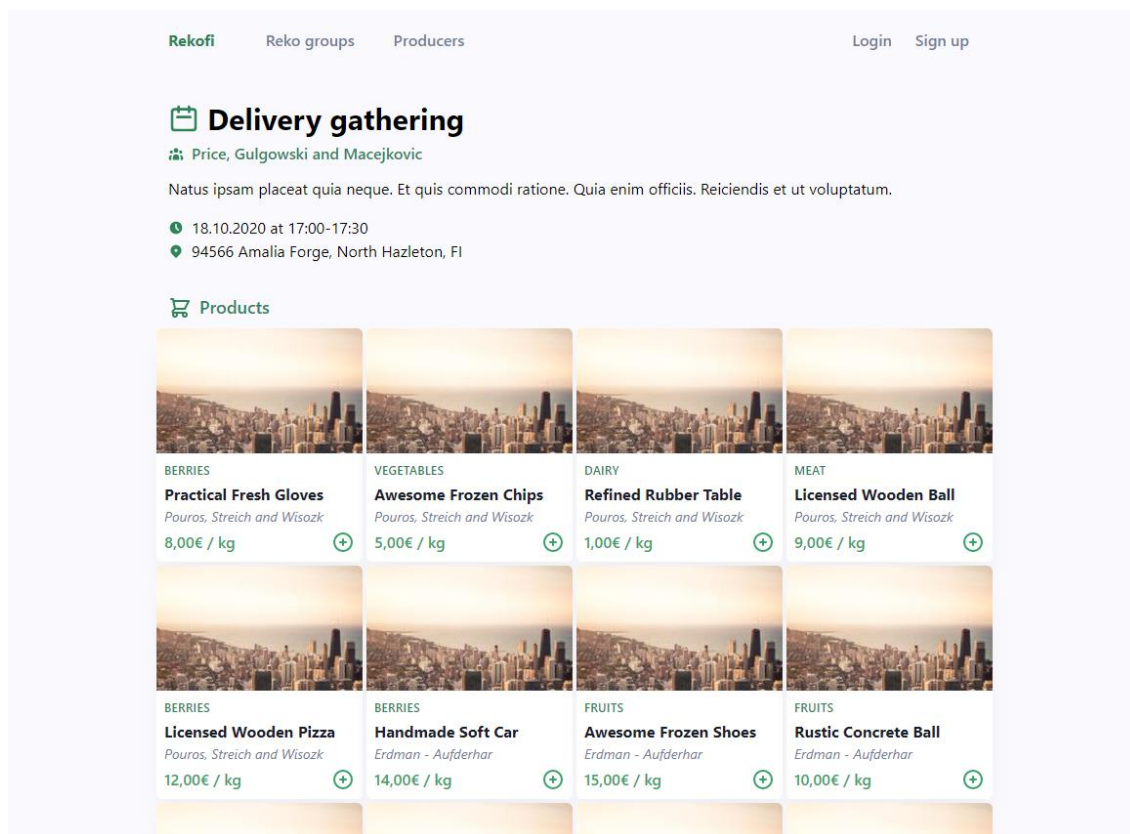
Figure 8.   Delivery event page with mocked data

All the previously mentioned information is available to all website visitors without requir-ing the user to ever log in. This is expected to make finding adequate information about the REKO groups easier for both regular REKO network users as well as those without any prior knowledge of REKO groups.

4.1.2   Clear and Simple Order System

To streamline the ordering system, several smaller changes are made to every step stage of the ordering process. The products available for a delivery are always found from the same location, on the delivery event page, to avoid users having to look for the products from multiple places. All the products are then displayed in a uniform manner and contain the same information. The product details consist of the name of the product, name of the producer, product category, image of the product, and price of the product per unit. This makes browsing the products easier and more efficient. The user experi-ence of adding a product to an order is made to resemble an online shopping experience

by allowing the user to add the products to a shopping cart straight from the list of products with one click. This is notably faster and less prone to user errors than writing a free-form comment and less error-prone.

In an effort to minimize the work required for a producer to sell their products, a product register is added to the prototyped website. Once a producer has been accepted to sell in a group, they can join the group's delivery events. Although the procedure is manual, it only requires one click from the producer. Due to the product register, the producer can choose which deliveries to participate in without having to list all their products every time they want to join a delivery event. Once the producer has joined a delivery event, all their products in the product register are immediately available for ordering for that event. This means the producer saves time whenever they want to sell their products for a specific delivery.

One of the most prominent improvements to the ordering system is a separate page for all orders. All orders are event specific in the prototyped website. This allows customers to view on the orders page which delivery events they have made orders for and how much the order is worth in total. Clicking a specific order redirects the user to an order specific page, where they can see the full breakdown of the order as well as the date, time and location of the delivery event where they will pick the ordered products from (see Figure 9).

Figure 9.   Orders overview page

The order page is also meant to aid the customer during a delivery event by acting as a checklist to make sure the customer picks up all the items they ordered. The pickup process is further simplified by grouping the ordered products according to the producer. Producers are also given a page to follow which shows what has been ordered from them for which delivery event. The orders for a delivery can be grouped by product or the user, depending which is more useful for the producer. By compiling the orders to the user, the chances for order and delivery errors are expected to lower. They also save time from having to gather all the orders manually for every order made and is expected to significantly improve the user experience.

To address the privacy concerns raised in a questionnaire response, customers and producers are not able to view names of other people in the group. Members and volunteers managing the group cannot see what another member has ordered, and producers can see only the names of their own customers to help organize the orders for a delivery event. The volunteers managing the group are the only people able to see the full list of members and producers. This way the orders are kept private between the customer and the producer and the user's privacy is increased without affecting the transparency of the REKO model critically.

4.1.3   Quick Access to Relevant Information

To access information and perform common actions faster, users are displayed links and lists on the front page of the prototyped website according to their user roles and groups they are part of. An unauthenticated user can quickly search for groups and events to find local producers easily from the front page. An authenticated user, on the other hand, can view a list of the REKO groups they are a member of, the coming orders they should pick up, and future delivery events by the groups they are a member of. In addition to what a normal authenticated user can see on the front page, a producer is also served with a quick view of the future events where users have ordered their products. All the information and links on the frontpage are chosen based on the preliminary analysis as well as the questionnaire responses to fit the user's individual needs.

4.1.4 Efficient Group Administration

For group administrators most features are the same as in the current system. Like on Facebook, any authenticated user can create a new REKO group on the prototyped website. By creating a new group, they automatically become the administrator of the group volunteering to maintain the group. They can accept or reject join requests from users and producers alike as well as remove them later from the group. In addition to the basic information of the group, such as the name, description and location, the group administrators can also add a link to the original Facebook group's page. This can help members and producers to transition from Facebook to the website as well as make the co-existence of the website and Facebook groups easier to manage.

The prototyped website was able to remove some administrator tasks altogether. By introducing a database with structural data and eliminating free-form messages in the ordering process, tasks such as moderating the Facebook comments and deleting old posts become obsolete. Administrators also do not have to maintain lists of producers, since the database keeps the list updated. Creating a delivery event is made easier by allowing administrators to save some default values for events. The location, the start and end time, description and event name can be given a default value, so the simplest event might only require an administrator to confirm the date. Like events on Facebook groups, an administrator can create events beforehand without publishing them, so they can use their time more efficiently and create future events in bulk well in advance if they want to. With the mentioned changes, managing a REKO group is expected to become easier and to require less volunteer work by reducing the amount of time required on administrative tasks.

4.2 Unimplemented Features

Due to time limitations, not all features currently possible for the REKO network on Facebook are implemented in the prototyped website. If the prototype development is continued, those features are required to make the website a working alternative for running the REKO network on Facebook. However, the unimplemented features are not considered necessary for demonstrating the true benefits of moving from Facebook to an independent platform designed for the REKO retail and distribution model itself.

There are various reasons not to implement a specific feature. Some features are not implemented due to prioritizing other features above them. For example, an administrator being able to accept a user in a group is considered more important than administrators being able to add custom rules for the groups that the users must agree to before sending a join request. Implementing the latter feature is not technically challenging, but it does require time that can be used to develop more solutions to the ordering system or to ensure optimal access to information. Other features are not implemented because more user input is needed from customers and producers alike. Such features are locking an order so it can no longer be modified by the customer and deciding whether to make producers' product stocks global or event specific. It is observed that the closing times for ordering varies greatly between producers on Facebook REKO groups, with some producers clearly stating until when ordering is available and some not informing the users about it at all. Likewise, it was not possible to deduce from the preliminary analysis how producers keep track of their product stock, so the product stock is made global across events by default in the prototype. Implementing these features is possible, however not critical for prototyping the website as a platform for REKO model.

Some features that are currently possible on Facebook but not implemented in the prototyped website are

- cancelling items from an order
- making some products temporarily unavailable
- showing additional questions for user to answer in their group joining request
- administrator adding or removing other administrators
- administrator leaving a group
- marking an order as delivered
- automatically creating and publishing events according to a predefined time interval.

In addition, the REST API endpoints and actions performed on the website have minimal validation and error handling. While these features are not considered less important than the implemented features, they do require more time, resources, user feedback and research than what is possible in the thesis project's time scope.

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4.3 Challenges

The challenges related to the thesis project are rooted to some of the same issues that the current REKO network users on Facebook have. Because the REKO network is neither a company nor an organization, but various independent groups operating under the same principles it is challenging to find information and to get an accurate understanding of what are the common practices across groups and what is unique to some groups.

Finding REKO groups on Facebook, sending a join request and getting approved by various groups is slow and takes a different amount of time depending on the group and its administrators. Some groups reject the join request outright due to not being a customer nor a producer but a third party. Other groups approve the join request, yet do not allow sharing a link to the questionnaire because some administrators consider it marketing. Thus, gathering information is challenging and in turn slows down the entire development process of the thesis project.

The questionnaire is found incomplete only after publishing it. Asking the REKO group where the participant found the link would give a more accurate picture of how many groups have participated in the questionnaire.

Another challenge is related to the future of the prototyped website. Since the REKO model prohibits any middlemen and monetary compensation for volunteers, financing the maintenance of the website is difficult if the prototype development is later continued. The users of the website cannot be charged for using the service, because it would make the website a middleman itself. It is unclear whether voluntary donations are also prohibited. One possible solution is to add advertisement to the website and use the income directly to cover the cost of hosting the website. However, advertisements are an unreliable source of income and might not cover all the website hosting costs. It remains unsure how an independent website hosting could be financed reliably.

5   Conclusion

The goal of the thesis project was to research the issues in the current way the REKO model operates in Finland and to develop a prototype that resolves the issues. The vast and growing amount of REKO groups strongly suggest the REKO retail and distribution model as a sales model is great for local food and product sales and distribution. However, the thesis project's preliminary analysis and questionnaire results suggested the current implementation was not built for such a wide-scale use, and its issues increase exponentially the more members, producers and products a group has and the more groups a customer, producer, or volunteer is part of.

The issues are not in the model itself, but in how the model is implemented on Facebook. The preliminary analysis and questionnaire results revealed most of the issues in the REKO network are caused by Facebook as the platform and the inability to customize it to fit the needs of the customer, producers, and volunteers. The majority of the issues related to placing and tracking orders and finding information of the REKO groups.

The solutions were prototyped on a mobile-first website. The website solves most issues the users experience on Facebook. The ordering system is clearer and faster to the user, and the orders can be tracked and accessed from one location. Information about REKO groups is available to everyone without login. The prototyped website is extremely scalable because the number of orders or groups does not increase the complexity of the ordering flow for customers or producers.

If the website is translated into more languages, it could be used as such in multiple countries. However, this thesis focused only on the REKO groups in Finland. The way the REKO model is implemented in other countries may vary greatly and scaling the independent platform may require additional work to fit the needs of REKO groups in other countries.

All in all, the website prototype offers the REKO model a promising platform alternative to Facebook. The biggest future challenges of the platform are getting users to start using it alongside the existing Facebook groups, and being able to cover the costs of hosting the website. If these challenges can be overcome, the website has a promising future as the REKO platform.

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