

Pradip Bade

SHADOW FOODS ONLINE FOOD ORDER

Bachelor's thesis

Bachelor of Engineering

Information Technology

2022



South-Eastern Finland
University of Applied Sciences

Degree title	Bachelor of Engineering
Author(s)	Pradip Bade
Thesis title	Shadow Foods Online Food Order
Commissioned by	Shadow Finland Oy
Year	2022
Pages	39 pages, 4 pages of appendices
Supervisor(s)	Timo Mynttinen

ABSTRACT

In this modern world of digitization and automation, everything has been simplified. Many things have been a lot easier and time-saving than they used to be before. Since the evolution of eCommerce, you do not need to be present at the shop to buy things. You can directly order from the computer or smartphone without even stepping out of the room.

It is the same with the food as a customer would not have to wait in the restaurant for the food to be prepared. With the help of many online apps, one can order their favorite food delivered to their door or even pick it up from the restaurant whenever they want.

Shadow Foods also solves a similar problem as it enables customers to order or schedule their food online and make payments online. It also solves the problem of a single restaurant order. With Shadow Foods, a customer can add items from different restaurants in the same order without any extra charge. It not only serves the customers but the restaurants too. They can see the order in real-time after it has been placed, which helps the production more efficiently.

The outcome has worked out well. It might still need some improvements, but it has achieved the objectives that we were looking for.

Keywords: eCommerce, online order, payment, Shadow Foods, restaurants

CONTENTS

1	INTRODUCTION.....	5
1.1	Company Background.....	5
1.2	Project Introduction	6
2	PLANNING.....	7
2.1	Objective and Requirements	7
2.2	Analysis.....	8
2.2.1	Market in Finland	8
2.2.2	Similar Products.....	8
3	THEORETICAL/RESEARCH BACKGROUND.....	9
3.1	What is E-Commerce?	9
3.2	Payment Gateway	10
3.3	Data (Menu) Integration	10
4	DESIGN & DEVELOPMENT	11
4.1	Tools	11
4.1.1	Visual Studio.....	11
4.1.2	MS SQL Server & Management Studio	12
4.1.3	Microsoft Azure.....	12
4.1.4	Postman	12
4.2	Programming Languages & Frameworks	13
4.2.1	.Net Framework, .Net 5 & .Net Core MVC	13
4.2.2	C#.....	14
4.2.3	HTML/CSHTML/CSS.....	15
4.2.4	JavaScript/jQuery	15
4.2.5	SQL	16

4.2.6	API.....	16
4.2.7	JSON.....	17
4.3	Third Party Services.....	17
4.3.1	Deliverect.....	17
4.3.2	Viva Wallet.....	18
4.4	System Architecture.....	18
4.5	UI/UX Development.....	21
4.6	Backend Development.....	21
4.6.1	Database.....	23
4.7	Features.....	25
4.7.1	Login.....	25
4.7.2	Select Items/Cart system.....	26
4.7.3	Scheduling Order.....	29
4.7.4	Online Payment.....	30
4.7.5	Admin Dashboard.....	31
4.7.6	Menu API.....	32
4.8	Deployment.....	33
4.9	Customer Ordering Flowchart.....	35
4.10	Future Update.....	35
5	CONCLUSION.....	36
	REFERENCES.....	37

1 INTRODUCTION

The online business model has been one of today's most trending and useful models. It has numerous advantages as there won't be any geographical limitations, and it is cost-effective in the long run.

There are eCommerce models like B2B, B2C, C2C and C2B. Shadow Foods adopt B2C (Business to Customer) model. From Shadow Foods, the customers can order their food and make the payment online during the order time. Then, they can go to the Shadow Foods counter (Location) and pick up their order.

1.1 Company Background

Shadow Finland Oy is a company that operates Shadow Foods. They created the concept of a cloud kitchen system called Shadow Kitchen. According to Kauppalehti, Shadow Finland build and rent delivery kitchens, help to manage the operations by offering order management software, handle the deliveries to the courier partners, and combine their restaurant partners in the virtual food court.

Shadow Kitchen builds and rents ready-to-use kitchens for restaurants and provides online order management software. Shadow Foods itself is one of the order management systems. They are planning to launch six kitchens in Helsinki.

1.2 Project Introduction

Shadow Foods was officially started in July 2021. The company wanted to develop an in-house food ordering application. There are already a few popular names in this field. There are always a few advantages with one's software, and especially it will reduce the cost associated with the different delivery partners.

Shadow Foods started with the basic concept of enabling customers to order items from the restaurants under the roof online. A few important things needed to be considered to achieve the objective.

We looked upon the already available online applications serving in a similar market during the research process. But Shadow Foods was a little bit different concept as it enables the customer to choose items from different restaurants in a single order.

Other kitchen management systems/tools are included alongside Shadow Foods in the overall process. It helps the whole process automate without much human effort. It will, of course, increase the productivity in the kitchen as the staff would only need to prepare and package the food most of the time. There will be an order manager working for all the restaurants to manage the orders and the pickups.

This project includes customer registration, login, admin panel, cart system, online payment integration, menu mapping from Deliverect, and a live order notification system. The customer can also schedule their order for the future starting from the one hour of the order, and the scheduling is spanned for 30 minutes.

2 PLANNING

Shadow Finland Oy created the idea of Shadow Foods. There was a brief meeting regarding the requirement specifications. The company had already started to build restaurant kitchens when I was introduced to the company.

The main idea was to develop a system that would allow people to order from the restaurants under the roof. I was given full flexibility in my schedule and development process. The company's co-founder, Elias Riihelä, has provided instructions on the requirements and helped me manage the resources. But during the development process, we have made many changes to the previous plan. There were various phases where we needed to rethink the whole process.

2.1 Objective and Requirements

Our objective for this project was clear from the start. To allow the customers to order online, managing all the menu from the same system, making the payment online, allow restaurants to see their orders from the customers.

The major requirements were listed at the beginning of the development. Those requirements include selecting the restaurant, choosing items into the cart, customer login, administrator login for the application's configuration, different roles for the admins, online payment integration, menu integration with the Deliverect, etc.

A kitchen management system is installed to manage orders from different platforms (including Shadow Foods). That system is configured with the POS system to make an automated process chain.

2.2 Analysis

After knowing the primary requirements of the application, we had to study the market for the online business in Finland. There were already a few big names in this market with a similar niche. Additionally, individual restaurants have their applications to fulfill the customers' orders.

2.2.1 Market in Finland

According to Statista, Finland's online food order/delivery will reach €245.95m in 2022. In which, Restaurant-to-Consumer is estimated to be €213.07m.

Looking at the numbers, it is safe to say that Finland's online food business is huge. And with the new investments and ideas, it is only going to rise in the future.

2.2.2 Similar Products

Many small to big businesses in Finland serves the same idea as Shadow Foods. Some of them developed an application for their restaurant, and some developed for other's restaurants. But two big players in the Finnish market have changed the whole online market: Foodora and Wolt.

Foodora and Wolt both serve as mediators between restaurants and customers. Both have hundreds of restaurants in their business and accept orders for the restaurants coming from the customer. They are not only online ordering applications but also delivery partners. They pay per delivery to the individuals known as delivery partners. Additionally, they both have features for taking away from the restaurant, which is more like the idea of Shadow Foods. Wolt and Foodora both charge the restaurants for using their services and the customers for ordering home delivery.

The main difference between Shadow Foods and those two big companies is that the former does not make home delivery. Wolt and Foodora only allow customers

to choose items from a single restaurant at a time, whereas Shadow Foods offers customers to order from different restaurants at once.

3 THEORETICAL/RESEARCH BACKGROUND

Let's talk about on background of e-commerce and its surroundings. The Internet has changed the world in almost all aspects of the ecosystem. This topic will discuss the e-commerce/online business, e-commerce application, payment gateway, and data integration for various platforms.

3.1 What is E-Commerce?

According to Wikipedia, "E-commerce (electronic commerce) is the activity of electronically buying or selling products on online services or over the Internet." These products can be physical products or services like online learning or entertainment.

To operate e-commerce, we need an application for the users to buy and sell the products. An e-commerce application is a software application specifically designed to support creating an e-commerce website or mobile app or adding functionality to it. Shadow Foods is also an example of an e-commerce application.

The online business contributes a significant portion of the total business in the world. According to Statista, retail e-commerce sales amounted to approximately 4.9 trillion U.S. dollars worldwide in 2021, which is predicted to increase by 50 percent over the next four years, reaching about 7.4 trillion dollars by 2025. The US Census Bureau published a report in which it is estimated that E-commerce sales in 2021 accounted for 13.2 percent of total sales. Total e-commerce sales in the United States for 2021 were estimated at \$870.8 billion, an increase of 14.2 percent ($\pm 0.9\%$) from 2020.

3.2 Payment Gateway

A payment gateway is a service that facilitates the acceptance of payments and provides an easy way for merchants to do business with their customers.

According to Forbes, “A payment gateway is the mechanism that reads and transfers payment information from a customer to a merchant’s bank account. Its job is to capture the data, ensure funds are available and get a merchant paid”.

Generally, it is a system where a customer makes the payment of the product or service they purchased online or in some other medium. A payment gateway is provided by an e-commerce application service provider that authorizes credit card or direct payments processing for e-commerce systems.

In Shadow Foods, we used Viva Wallet as a payment gateway provider.

3.3 Data (Menu) Integration

Shadow Kitchen wants to create an application from which they can sell their products from the restaurants they were operating. So that is when the idea of Shadow Foods was born. But they would also use the already existing popular brands like Foodora and Wolt to sell their food.

To maintain the menu across all the platforms, including Shadow Foods, it was needed to integrate all the items from one place. The whole process can be called data integration, where all the platforms would share the same item and price data.

According to Wikipedia, “Data integration involves combining data residing in different sources and providing users with a unified view of them.” In Shadow Kitchen, we have used the service provided by Deliverect to maintain the menu on all platforms.

4 DESIGN & DEVELOPMENT

This section discusses all the relevant topics linked to the development of Shadow Foods. There was some dilemma on which tech stack should be used, choosing the color theme for UI/UX, how the design work should be done, integrating with Deliverect, which payment integration should be done, etc.

Many features and tools were added and updated during the development process. We thought to make Shadow Foods an independent application during the project's first phase. But later, we realized that it should be integrated into the whole system to work more efficiently.

4.1 Tools

Tools are applications, services, and resources used or implemented during the development process. Let's discuss the essential tools used during the Shadow Foods project development.

4.1.1 Visual Studio

Visual Studio is an Integrated Development Environment developed by Microsoft. It can be used to develop web applications, websites, mobile applications, and desktop apps. According to Wikipedia, Visual Studio supports 39 programming languages, including C#, C, C++, F#, Visual Basic, HTML, JavaScript etc.

The latest version of Visual Studio is the 2022 version, released on March 31, 2022. Shadow Foods was developed using C# programming language in the application's backend.

4.1.2 MS SQL Server & Management Studio

SQL Server is a relational database system that Microsoft developed. It is software used to store data and retrieve data as per request. SQL Server Management Studio (SSMS) is an application used for accessing, managing, and configuring SQL Server database or another database like Azure SQL Database. One can access the database by connecting with the SQL Server or Database Server in the system or remotely.

4.1.3 Microsoft Azure

Microsoft Azure is a cloud computing platform created by Microsoft. The main services provided by Azure are App Services, Websites, Virtual machines, DevOps, Database services and many more.

Shadow Foods use App Services provided by Azure to host the web application on the web. Azure also provides a database system.

4.1.4 Postman

Postman is a great tool for testing APIs. It is an API platform for building and using APIs. Postman simplifies each step of the API lifecycle and streamlines collaboration so you can create better APIs faster.

In Shadow Foods, Postman is used to test the APIs while integrating with Viva Wallet and Deliverect. Postman is also used when menu map API is being developed for testing purposes.

4.2 Programming Languages & Frameworks

Let's discuss the development works that were implemented during the project cycle. There are many frameworks that an application can be developed. But as I am more comfortable with C# programming language, I opted to choose the .Net Framework to work with. Here are some of the tech stacks that were used in Shadow Foods.

4.2.1 .Net Framework, .Net 5 & .Net Core MVC

.NET Framework is the original implementation of .NET developed by Microsoft. It supports running websites, services, desktop apps, and more on Windows. The two major components of the .NET Framework are the Common Language Runtime and the .NET Framework Class Library.

Shadow Foods is developed in the .Net 5 framework. When the project started, .Net 5 was the latest release of .Net Framework. .Net 5 is the successor of .Net Core 3.1. Microsoft has already released .Net 6 in 2022.

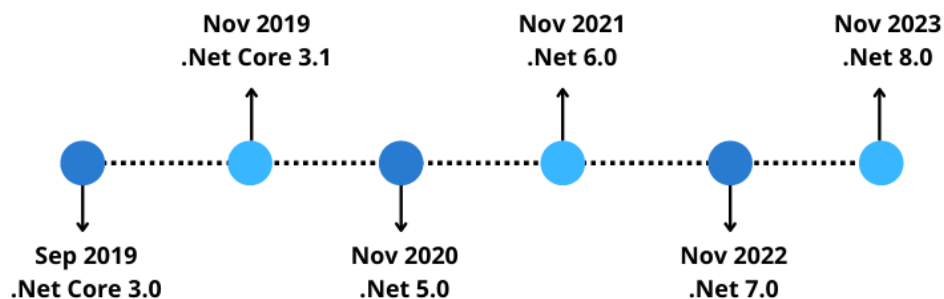


Figure 1. .Net Framework release chart

.Net Core MVC is an inbuilt template for developing web applications. According to the Microsoft doc, “ASP.NET Core MVC is a rich framework for building web apps and APIs using the Model-View-Controller design pattern.”

MVC is an architectural pattern to develop applications in which an application is divided into Model-View-Controller components. The Model represents the application's data layer and any business logic or operations performed by the application.

Views are the content that represents in the user interface. It uses the Razor view engine to embed .NET code in HTML.

Controllers are responsible for user interaction, processing with the model, and rendering the view. So basically, the Model works as the functions related to data; the View only displays information, and the Controller handles and responds to user input and interaction.

4.2.2 C#

C# is an object-oriented and component-oriented programming language developed by Microsoft and runs in the .Net framework. C# enables developers to build several types of secure and robust applications.

```
using System;

namespace HelloWorld
{
    class Program
    {
        static void Main(string[] args)
        {
            Console.WriteLine("Hello World!");
        }
    }
}
```

Figure 2. Hello World program in C# language

4.2.3 HTML/CSHTML/CSS

According to Mozilla, HTML (HyperText Markup Language) is the most basic building block of the Web. It is the markup language that is used to create a web page. The web browser does not know any server-side code but HTML, CSS & JavaScript.

CSS is a short form of Cascading Style Sheets. It is used to style or design the HTML page. It describes how HTML elements such as buttons, div, form, text box, and drop-down list are displayed. CSS is a simple mechanism for adding extra style to HTML blocks and elements.

Cshtml is a C# HTML file extension used to render the web page. It is also called razor view, used by the .Net framework to enable dynamic web pages. It is easy to use and maintain as it is supported by the server-side.

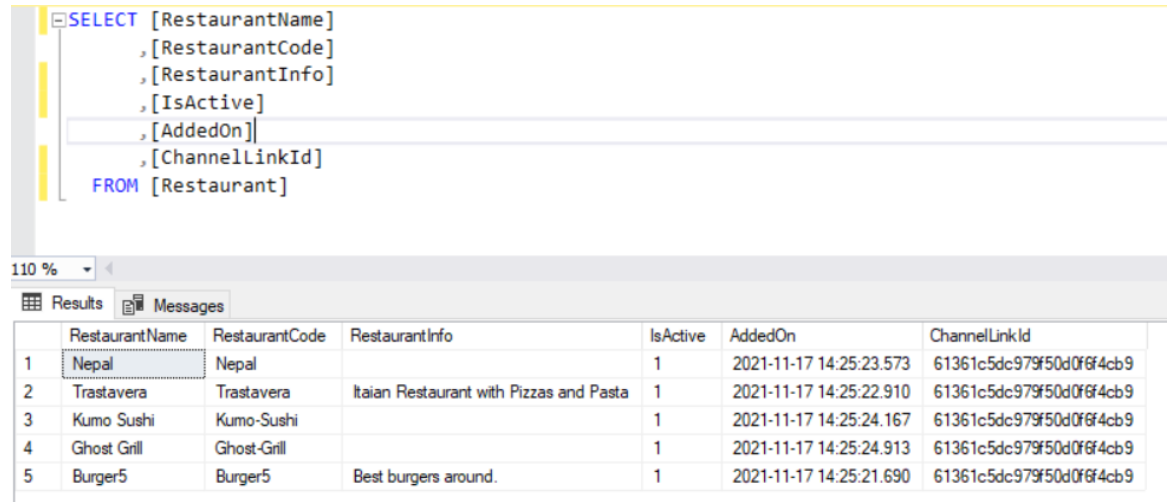
4.2.4 JavaScript/jQuery

JavaScript is one of the most used programming languages. It is lightweight and often regarded as the client-side programming language. So basically, it is created for web-centric applications and can communicate with the server-side.

jQuery is a JavaScript library developed for DOM manipulation. It uses JavaScript features but is easier and simpler to maintain with the features like event handling, Ajax, and CSS animation. Currently, most developers don't use jQuery as it was used 5-6 years ago due to the evolution of client-side frameworks like reactJs, vueJs and angularJs. However, in the Shadow Foods project, JavaScript and jQuery are used for DOM manipulations and other functions.

4.2.5 SQL

SQL is a domain-specific language used in programming and designed for managing data held in a relational database management system or for stream processing in a relational data stream management system. SQL is a query language that is used in relational databases.



The screenshot shows a SQL query editor with the following query:

```
SELECT [RestaurantName]
, [RestaurantCode]
, [RestaurantInfo]
, [IsActive]
, [AddedOn]
, [ChannelLinkId]
FROM [Restaurant]
```

Below the query, the results are displayed in a table with the following columns: RestaurantName, RestaurantCode, RestaurantInfo, IsActive, AddedOn, and ChannelLinkId. The table contains five rows of data.

	RestaurantName	RestaurantCode	RestaurantInfo	IsActive	AddedOn	ChannelLinkId
1	Nepal	Nepal		1	2021-11-17 14:25:23.573	61361c5dc979f50d0f6f4cb9
2	Trastavera	Trastavera	Itaian Restaurant with Pizzas and Pasta	1	2021-11-17 14:25:22.910	61361c5dc979f50d0f6f4cb9
3	Kumo Sushi	Kumo-Sushi		1	2021-11-17 14:25:24.167	61361c5dc979f50d0f6f4cb9
4	Ghost Grill	Ghost-Grill		1	2021-11-17 14:25:24.913	61361c5dc979f50d0f6f4cb9
5	Burger5	Burger5	Best burgers around.	1	2021-11-17 14:25:21.690	61361c5dc979f50d0f6f4cb9

Figure 3. SQL query example

4.2.6 API

An application programming interface, commonly known as API, is a connection between computers or between computer programs. It is a type of software interface that offers a service to other pieces of software.

In other words, API enables companies/developers to open their application's data and functionality to external third-party developers, business partners, or publicly. This allows services and products to communicate and leverage each other's data and functionality through a documented interface.

In Shadow Foods, there is the use of API in both ways. Shadow Foods has its API for the Menu mapping from Deliverect. It also uses Deliverect API for sending orders and Viva Wallet API for payment.

4.2.7 JSON

JSON stands for JavaScript Object Notation. JSON is a text format for storing and transporting data. JSON is "self-describing" and easy to understand.

We needed to understand JSON because the API endpoints from Viva Wallet and Deliverect respond in JSON format. The response is then parsed into the model objects that C# understands.

4.3 Third Party Services

Third-party services are companies or individual entity services used or embedded in other projects. Normally these service providers charge for their services but do not own or stake in the main product.

Shadow Foods also uses two main third-party services for different functionalities; Deliverect and Viva Wallet.

4.3.1 Deliverect

Deliverect simplifies the different online ordering business platforms by integrating the data like menu, orders, ingredients etc. They provide API services for those platforms from which any restaurant or platform can manage its system easily.

Shadow Foods uses Deliverect services like menu mapping and live order management. For example, Deliverect can get orders coming from apps like Foodora, Wolt or Shadow Foods, save the order to their system, and send the order to the restaurant systems like POS.

It integrates the different ordering channels and provides accounting, billing, and other services. In Shadow Foods, Deliverect is also used as the menu mapper.

That means Deliverect can call the API of Shadow Foods at any time to send all the menus of the restaurants at once or individual restaurants so that menu in all the channels would be the same.

4.3.2 Viva Wallet

Every online business needs a payment gateway to sell the product. Viva Wallet is the payment service provider for Shadow Foods.

Viva Wallet charges a small nominal fee per transaction to Shadow Foods. They provide a good dashboard for every transaction made through the application in their portal.

It provides an API key for the clients, which must be used in each API call made to the service.

4.4 System Architecture

The project is based on .Net Core MVC architecture alongside libraries and files that support the whole application. The project was created with an MVC pattern which can be seen inside the ShadowKitchenWebApp project.

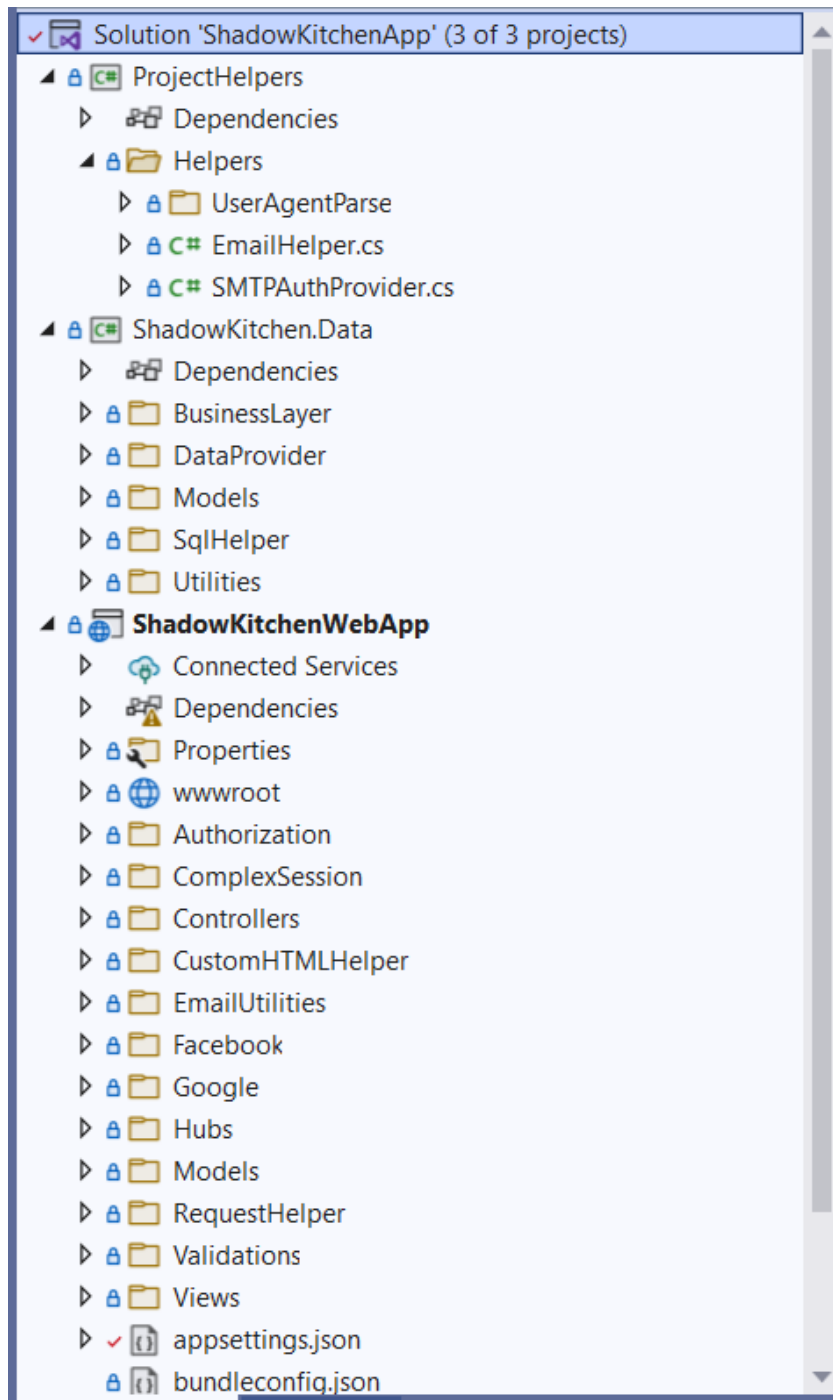


Figure 4. Shadow Foods project architecture model

Two class libraries, ProjectHelpers and ShadowKitchen.Data were added to the solution. ProjectHelpers contains a few helper classes used for the email system in the project.

ShadowKitchen.Data contains the files that are linked to the data layer. It contains models and methods to connect with the database and CRUD operations inside the SQLHelper folder. It also contains utility files, including methods like encryption-decryption, system messages, and Finnish time converting.

The main web application project, ShadowKitchenWebApp, contains the following main folders with different functionalities:

wwwroot: To save static files like images, JavaScript, CSS files etc.

Controllers: It contains the controller files.

Facebook & Google folder: It has Facebook and Google login methods.

Hubs: For signalr functionalities like live messaging.

Validations: For customized validation methods.

Views: All the user interface pages are inside the Views folder

appsettings.json: To save the application's configurations and important credentials like username, password, and database connection.

It is not the perfect architecture as it can be more simplified with folder and file management. But it still works fine as every folder contains its unique functional methods.

4.5 UI/UX Development

An interactive user interface with a good experience is always important in any web or mobile application. It should be visibly nice and easy to use the application's main functions. Shadow Foods also tried to implement the previous sentence.

The application has two sides based on UI development: Customer side UI and Admin side interface. Both UI uses razor page (cshtml) as the frontend framework.

Customer-side UI is for the normal users/customers who come to the application to order the food from different restaurants. They can see the restaurants, select, add the food to the cart, checkout and pay online. The main layout is self-designed, and it was fun to experiment with and used some references from other websites. Shadow Foods has orange and black colors used for the main theme.

Admin side portal is based on AdminLTE, free bootstrap admin templates in HTML. AdminLTE is an easy-to-use and customizable HTML template with CSS for the main design and JavaScript for a better user experience.

Also, for user events and DOM manipulation, jQuery is used alongside JavaScript on many pages in the app.

4.6 Backend Development

Back-end development includes all the server-side operations, methods, or functions required for the application to communicate with the database, another application, or user authentication. In Shadow Foods, C# is used as a server-side programming language within the .Net Framework.

```

public IActionResult Index()
{
    GetAutologinData();
    var data = HttpContext.Session.GetObjectFromJson<AfterUserLogin>("AfterUserLogin");
    if (HttpContext.Request.Cookies["CartItems"] != null)
    {
        ViewBag.CartItemCount = CountCartItems(HttpContext.Request.Cookies["CartItems"]);
    }
    if (data != null)
    {
        ViewBag.Profile = data;
    }
    RestaurantDataProvider objRestaurant = new RestaurantDataProvider();
    HomeViewModel list = objRestaurant.GetHomeData();
    ViewBag.Title = list.OfficeInfo.BrandName + " - " + list.OfficeInfo.TagLine;
    ViewBag.SliderCart = true;
    return View(list);
}

```

Figure 5. Controller method for the home page.

```

1 reference
public HomeViewModel GetHomeData()
{
    try
    {
        SQLHandler SQLH = new SQLHandler();
        DataSet ds = SQLH.ExecuteAsDataSet("[customer_GetHomeData]");
        HomeViewModel obj = new HomeViewModel();
        if (ds != null && ds.Tables != null && ds.Tables.Count > 0)
        {
            obj.RestaurantList = DataTableToListObject.DataTableToList<RestaurantModel>(ds.Tables[0]);
            obj.ItemList = DataTableToListObject.DataTableToList<ItemViewModel>(ds.Tables[1]);
            obj.OfficeInfo = DataTableToListObject.DataTableToList<OfficeMediaInfoModel>(ds.Tables[2])[0];
        }
        return obj;
    }
    catch (Exception)
    {
        throw;
    }
}

```

Figure 6. Fetching and binding into a model for the home page using stored procedure.

4.6.1 Database

The database is also an integral part of backend development. MsSql server is used as a database system in Shadow Foods. A stored procedure is used in all CRUD operations in the backend. ADO.Net connects the .net framework to the database. Let's see an example of a backend code to fetch home data.

```

2 references
public DataSet ExecuteAsDataSet(string StoredProcedureName)
{
    SqlConnection SQLConn = new SqlConnection(this._connectionString);
    try
    {
        SqlCommand SQLCmd = new SqlCommand();
        SqlDataAdapter SQLAdapter = new SqlDataAdapter();
        DataSet SQLds = new DataSet();
        SQLCmd.Connection = SQLConn;
        SQLCmd.CommandText = StoredProcedureName;
        SQLCmd.CommandType = CommandType.StoredProcedure;
        SQLAdapter.SelectCommand = SQLCmd;
        SQLConn.Open();
        SQLAdapter.Fill(SQLds);
        SQLConn.Close();
        return SQLds;
    }
    catch (Exception e)
    {
        throw e;
    }
    finally
    {
        SQLConn.Close();
    }
}

```

Figure 7. ADO .Net code for fetching data as a dataset from the database.

There are 34 tables and 99 stored procedures in the Shadow Foods database. Tables are to store the data, and stored procedures are to perform operations to insert, update or retrieve the data from the database.

The screenshot shows a SQL query window with the following query:

```
SELECT * FROM INFORMATION_SCHEMA.TABLES WHERE TABLE_TYPE='BASE TABLE'
order by TABLE_NAME
```

The results pane displays a table with the following data:

	TABLE_CATALOG	TABLE_SCHEMA	TABLE_NAME	TABLE_TYPE
11	ShadowKitchen	dbo	ItemAddOnMap	BASE TABLE
12	ShadowKitchen	dbo	ItemCategory	BASE TABLE
13	ShadowKitchen	dbo	Items	BASE TABLE
14	ShadowKitchen	dbo	ItemSubCategory	BASE TABLE
15	ShadowKitchen	dbo	ItemVsAllergen	BASE TABLE
16	ShadowKitchen	dbo	LoginLog	BASE TABLE
17	ShadowKitchen	dbo	OfficeMediaInfo	BASE TABLE
18	ShadowKitchen	dbo	OrderDetail	BASE TABLE
19	ShadowKitchen	dbo	OrderMaster	BASE TABLE
20	ShadowKitchen	dbo	OrderStatus	BASE TABLE
21	ShadowKitchen	dbo	PasswordRese...	BASE TABLE
22	ShadowKitchen	dbo	PickupLocation	BASE TABLE

The status bar at the bottom indicates: Query executed successfully. LAPTOP-NAT91D30 (13.0 SP1) sa (60) ShadowKitchen 00:00:00 34 rows

Figure 8. List of tables in the database.

The screenshot shows a SQL query window with the following query:

```
SELECT SPECIFIC_CATALOG, SPECIFIC_NAME as STORED_PROCEDURE, ROUTINE_TYPE
FROM INFORMATION_SCHEMA.ROUTINES WHERE ROUTINE_TYPE = 'PROCEDURE' order by SPECIFIC_NAME
```

The results pane displays a table with the following data:

	SPECIFIC_CATALOG	STORED_PROCEDURE	ROUTINE_TYPE
1	ShadowKitchen	admin_AddPickupLocation	PROCEDURE
2	ShadowKitchen	admin_ChangeOrderStatus	PROCEDURE
3	ShadowKitchen	admin_ChangeUserStatus	PROCEDURE
4	ShadowKitchen	admin_DeleteItem	PROCEDURE
5	ShadowKitchen	admin_EnableDisableItem	PROCEDURE
6	ShadowKitchen	admin_EnableDisablePage	PROCEDURE
7	ShadowKitchen	admin_GetActiveCategory	PROCEDURE
8	ShadowKitchen	admin_GetActivePickupLocation	PROCEDURE
9	ShadowKitchen	admin_GetActiveSubCategory	PROCEDURE
10	ShadowKitchen	admin_GetAllActiveRestaurants	PROCEDURE
11	ShadowKitchen	admin_GetAllCategory	PROCEDURE
12	ShadowKitchen	admin_GetAllChatMessage	PROCEDURE

The status bar at the bottom indicates: Query executed successfully. LAPTOP-NAT91D30 (13.0 SP1) sa (60) ShadowKitchen 00:00:00 99 rows

Figure 9. List of stored procedures in the database.


```

ALTER procedure [dbo].[customer_GetHomeData]
as
SELECT
    R.[RestaurantId]
    ,R.[RestaurantName]
    ,R.[RestaurantCode]
    ,X.Categories as RestaurantType
    ,R.[Image]
    ,R.ContactNumber
    ,R.RestaurantInfo
    ,R.[Address]
FROM [dbo].[Restaurant] R inner join (SELECT MenuId, Categories =
    STUFF((SELECT ', ' + CategoryName
        FROM [ItemCategory] b
        WHERE b.MenuId = a.MenuId
        FOR XML PATH('')), 1, 2, ''))
FROM [ItemCategory] a
GROUP BY MenuId) X on R.MenuId=X.MenuId where R.IsActive=1

SELECT
    I.ItemId,
    I.ItemName,
    I.ItemDescription,
    I.[Image],
    I.Price,
    C.CategoryName as Category,
    isnull(S.SubCategoryName, '') as SubCategory
from Items I inner join Restaurant R
on I.RestaurantId=R.RestaurantId
Inner join ItemCategory C on I.CategoryId=C.CategoryId
Left join ItemSubCategory S on I.SubCategoryId = S.SubCategoryId
where R.IsActive=1
and I.IsActive=1 and isnull(I.IsDeleted,0)=0
order by I.CategoryId asc

SELECT top 1 BrandName,TagLine ,ContactNumber FROM [dbo].[OfficeMediaInfo]

```

Figure 10. Stored procedure for fetching data for the home page.

4.7 Features

Shadow Foods includes the features like login, cart system, online payment, customer profile, order history etc. There's a different admin panel side as well in this application. Let's see the major functionalities of the application.

4.7.1 Login

There's a login page in Shadow Foods to authenticate the customers and restaurant users. There are three ways a customer can log in to order the food. They are Google, Facebook, and the normal email/password method. For the email and password login method, customers need to sign up in the application using their name, phone number, email, and password.

shadowfoods.com/Login

SHADOW KITCHEN

Sign in here

[Continue with Facebook](#)

[Continue with Google](#)

Or

Email
customer@test.com

Password
.....

[SIGN IN](#)

[Forgot your password?](#)

Don't have an account? [Sign up](#)

Figure 11. Shadow Foods login page.

4.7.2 Select Items/Cart system

You can see restaurants operating under the Shadow Kitchen on the home page. Customers can select a restaurant and add the items to the cart. They can also add items from another restaurant in the same cart.

While adding the items to the cart, customers can choose the quantity of that item and add any special note for that item. One can always edit the order on the checkout page before making the payment.

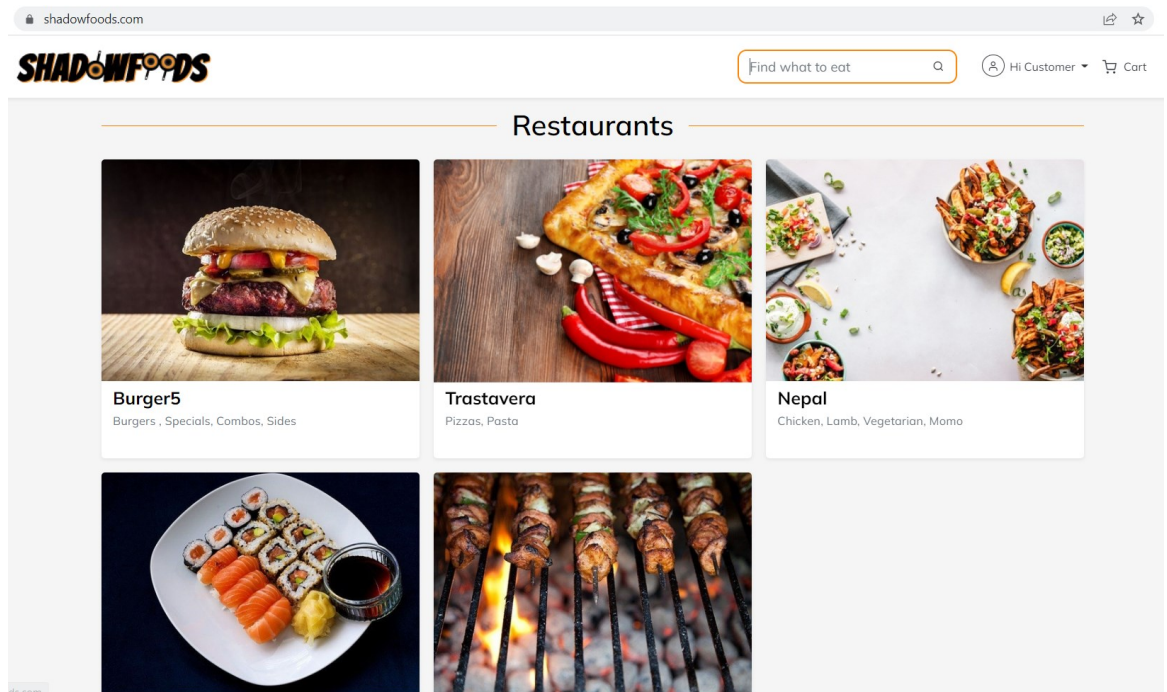


Figure 12. Shadow Foods home page.

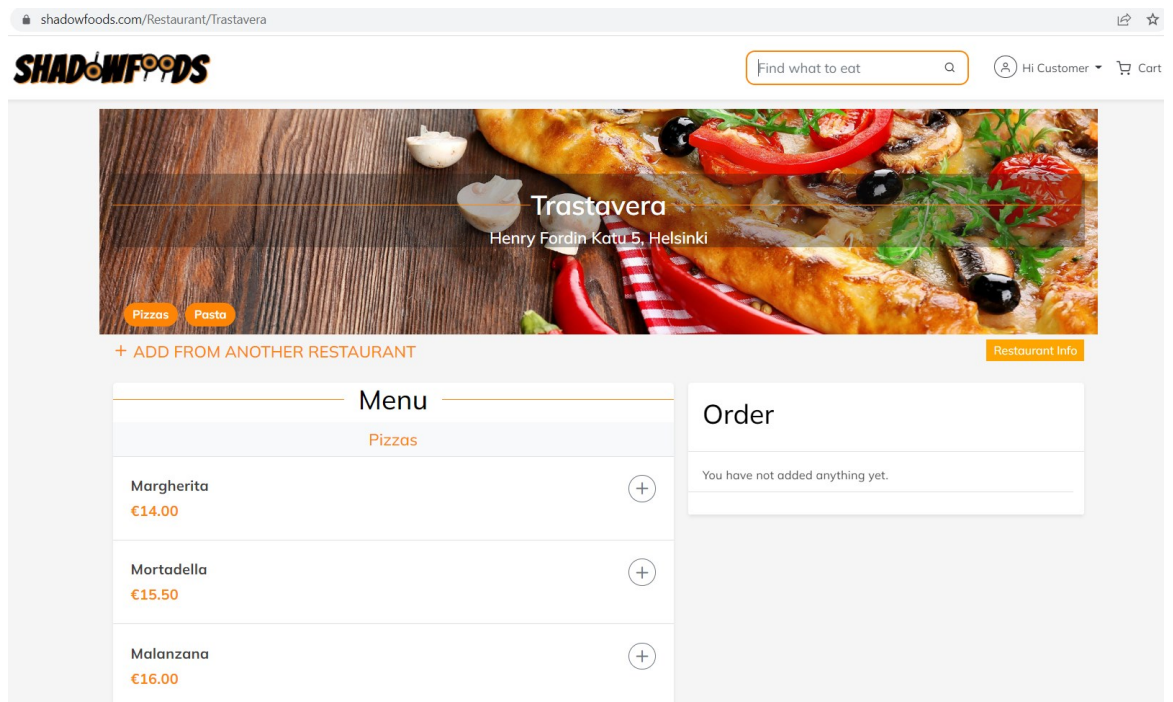


Figure 13. Shadow Foods restaurant menu page.

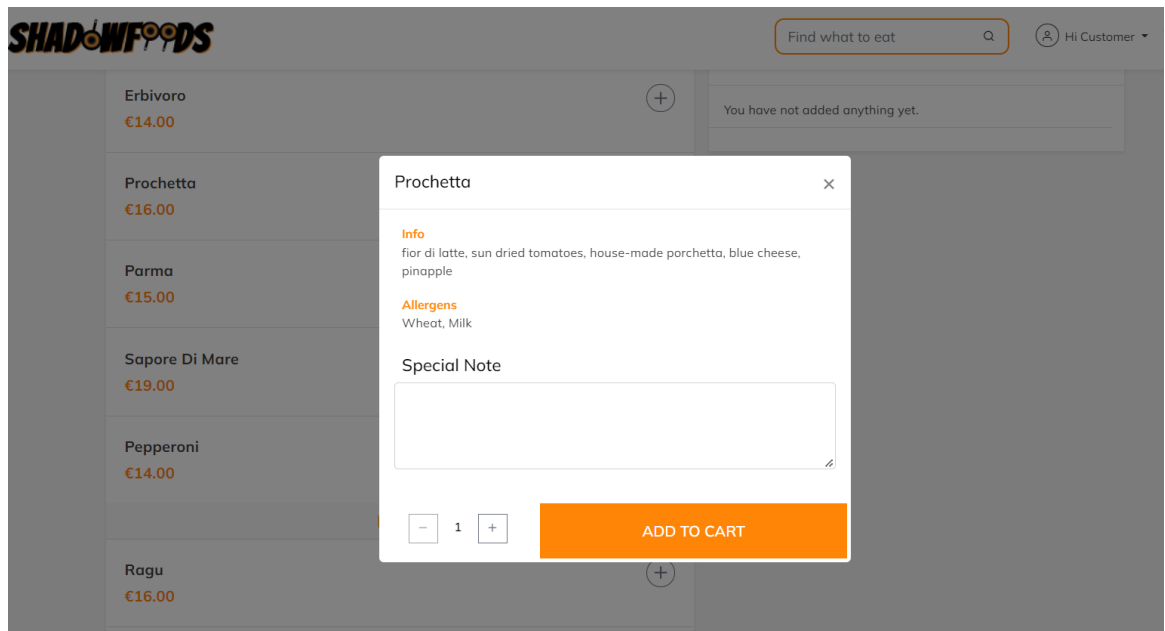


Figure 14. Shadow Foods add to cart pop-up model.

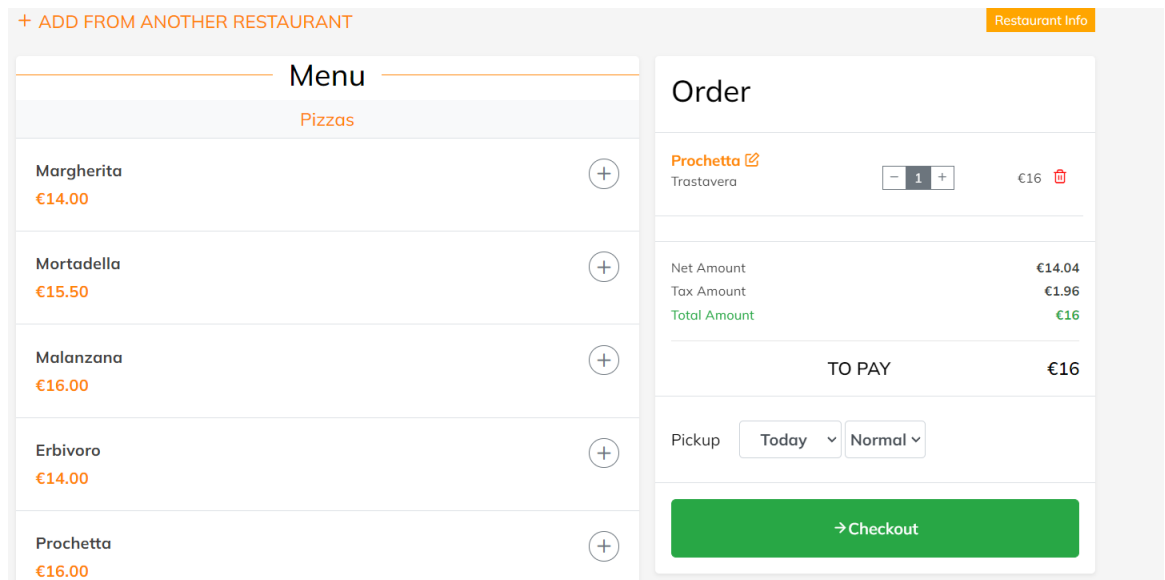


Figure 15. Shadow Foods after adding to cart page.

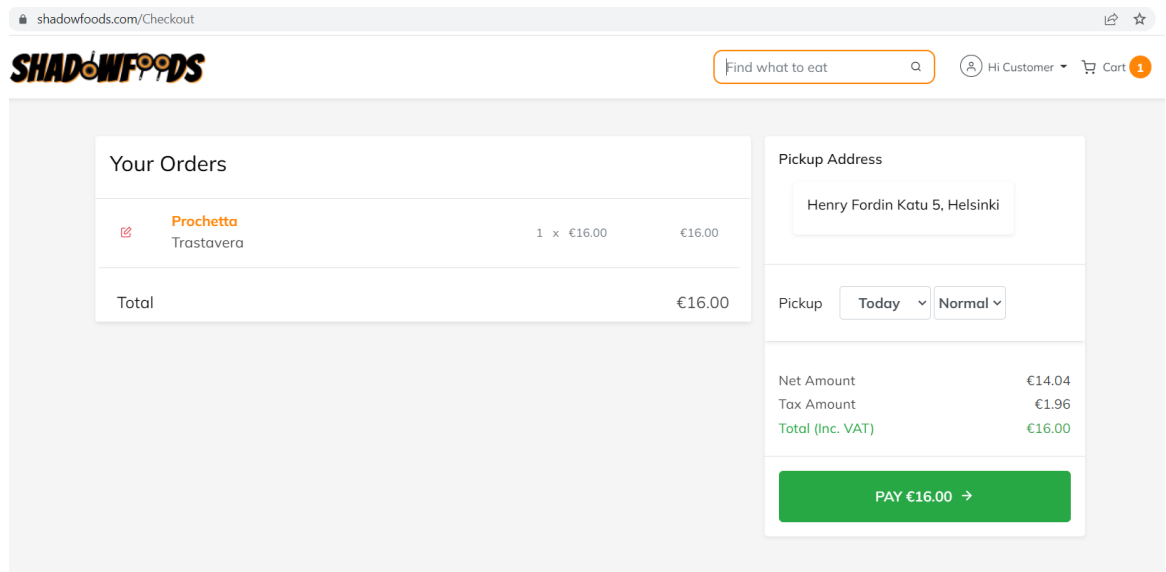


Figure 16. Shadow Foods checkout page.

4.7.3 Scheduling Order

This feature enables customers to schedule their order till the next day. Customers can choose the pickup time during the order and pick up at the scheduled time. Scheduling is spanned for 30 minutes intervals.

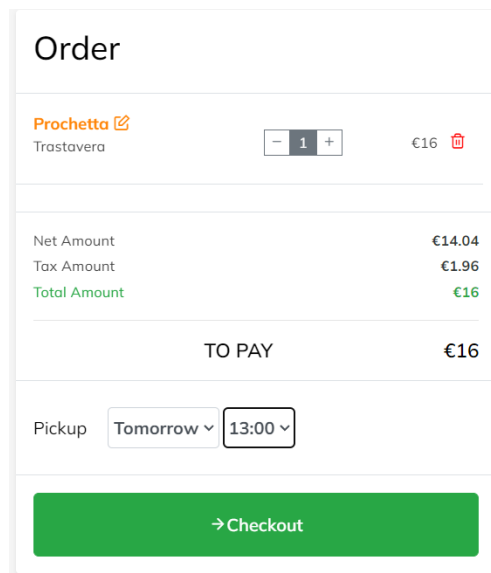


Figure 17. Shadow Foods pickup schedule.

4.7.4 Online Payment

After clicking the 'Pay' button on the checkout page, customers will be redirected to the Viva Payments page to make the payment through Google Pay or Debit/Credit cards. The customer is redirected to the confirmation page in Shadow Foods after making the payment.

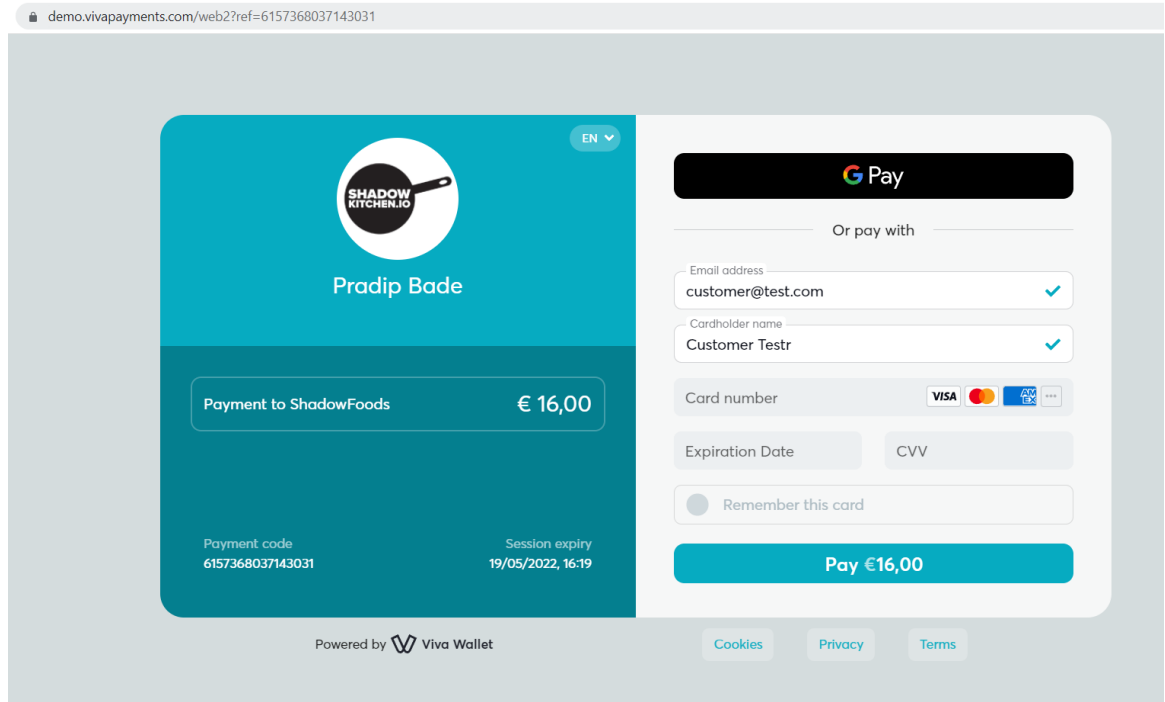


Figure 18. Viva Wallet order payment page.

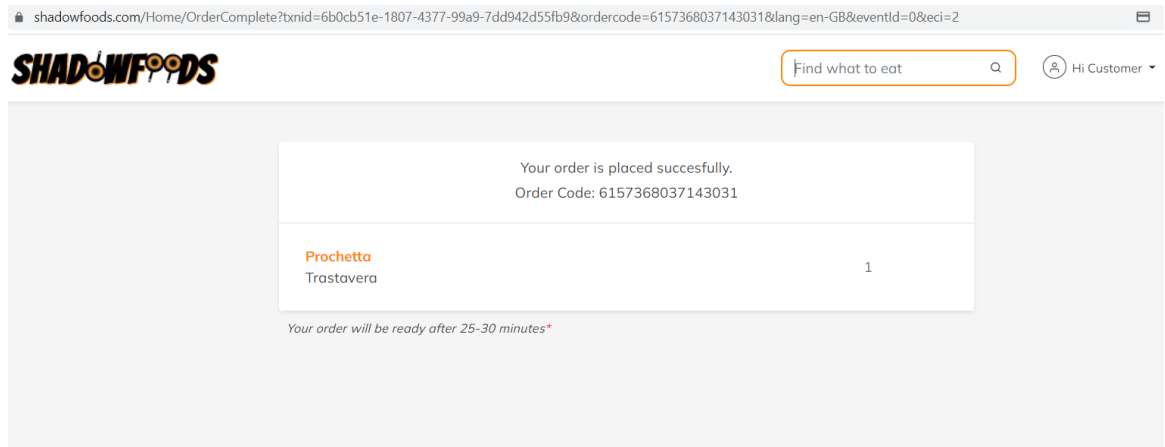


Figure 19. Shadow Foods order confirmation page.

4.7.5 Admin Dashboard

We can set up the necessary settings of the application from the admin dashboard. Admins can manage users and customers, update restaurants and menus, and update order status.

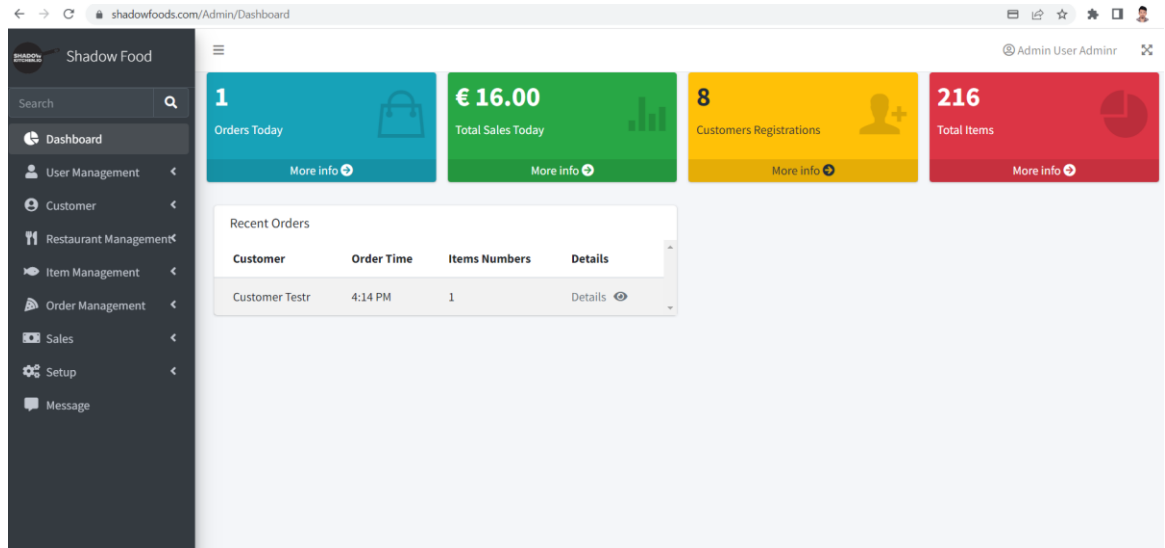


Figure 20. Shadow Foods admin dashboard page.

Admin portal includes the following:

Dashboard: Overview of the current statistics of different parameters like today's orders, recent orders, and total daily sales.

User Management: Create, Update, and Delete the admin or restaurant users. Only admin users can access it.

Customer Management: Here, admins can see the list of registered customers. Admins can block or delete the user.

Restaurant Management: Admin can add or update the restaurants, although it is done primarily by the menu mapping from Deliverect.

Item Management: This page is to add or update items from the restaurant. Items/Menu can be primarily updated from the Deliverect. Restaurant users can also update the menu for themselves from this page.

Order Management: It contains recent orders, all orders list and scheduled order list. The pickup admin can update the order status if the order is picked up.

Sales Report: This is just a simple report on the total sales that can be filtered based on pickup location and restaurant. The report can be exported to an excel sheet, pdf, or CSV file.

Setup: Setup includes pickup location, office info, and static page setup like 'About Us', 'Privacy Policy' or other pages.

Message: For the communication between pickup admin and restaurant users. Messaging system uses signalr technology to send live notifications.

4.7.6 Menu API

The initial plan was to manage everything related to the menu from the Shadow Foods app itself. As there were other platforms that the restaurants used, the idea of a common menu was initiated. It was later decided that the menu from the Deliverect system would be pushed to the different channels, including Shadow Foods.



Figure 21. Menu mapping architecture.

Deliverect has provided the example of the sample request that it would call when we push the menu. Whenever a Deliverect admin would push the menu, it would send the request to the provided webhook. The webhook is an API in the Shadow Foods system. There is an option to choose restaurants whose menu needs to be updated in the channels.

```
[Route("api/MapMenu")]
[HttpPost]
0 references
public void MapMenu([FromBody] List<MenuMapperModel> menulist)
{
    foreach (var item in menulist)
    {
        if (!string.IsNullOrEmpty(item.menuImageUrl))
        {
            item.menuImageUrl = SaveFileFromUrl(item.menuImageUrl, true);
        }
        foreach (var product in item.products)
        {
            if (!string.IsNullOrEmpty(product.Value.imageUrl))
            {
                product.Value.imageUrl = SaveFileFromUrl(product.Value.imageUrl, false);
            }
        }
        ApiDataProvider objApi = new ApiDataProvider();
        objApi.SaveMenuFromDeliverect(item);
    }
}
2 references
private string SaveFileFromUrl(string url, bool isrestaurant)
1 reference
private void SaveImage(string imageUrl, string filename)
1 reference
private void CompressImageNew(string filepath, string mediumpath, string smallpath)
```

Figure 22. Menu mapping API in Shadow Foods.

Even though Deliverect data will be used to publish the menu on all platforms, Shadow Foods can update the menu within itself.

4.8 Deployment

After developing some main features, the project was deployed to the web using Azure services. Deployment with Azure is easy with an in-built azure service in Visual Studio. It only needs to publish the project from the IDE by selecting Azure deployment.

Shadow Foods was published into the Azure App Service (Windows), which was done without hassle.

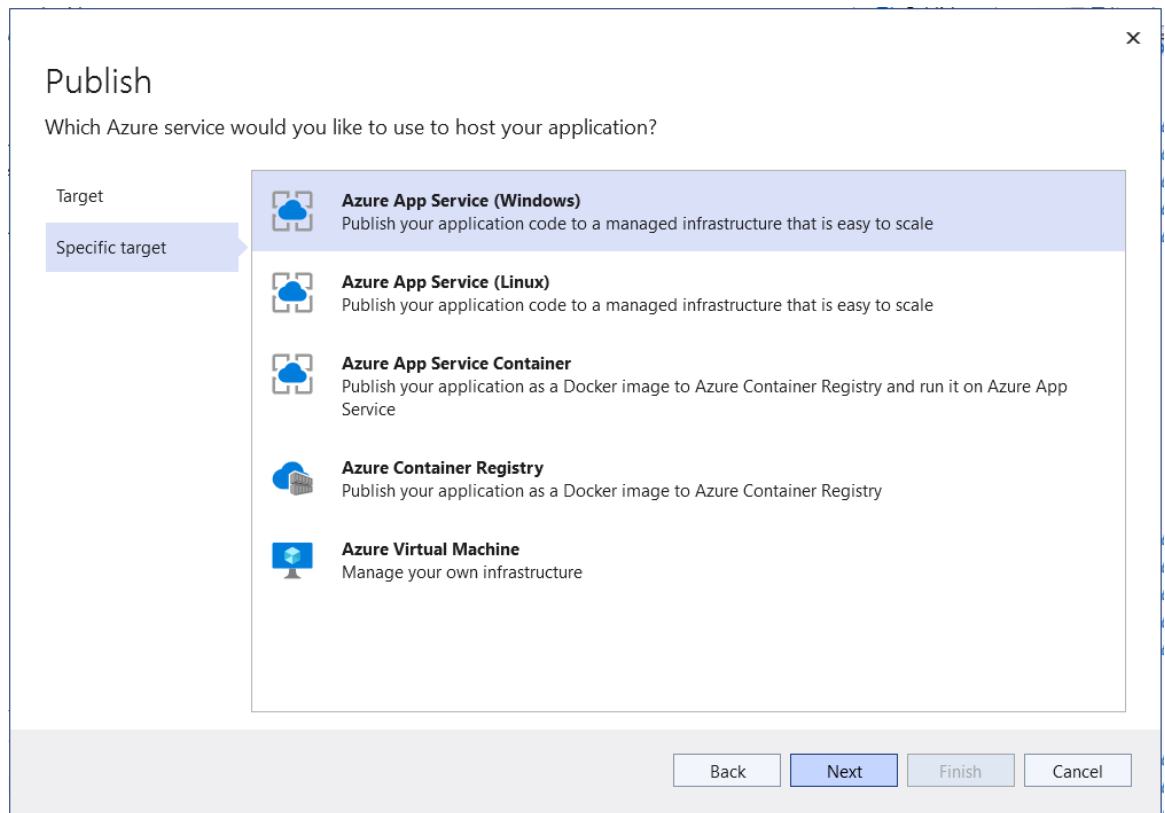


Figure 23. Deployment container in Visual Studio using Azure App Service.

4.9 Customer Ordering Flowchart

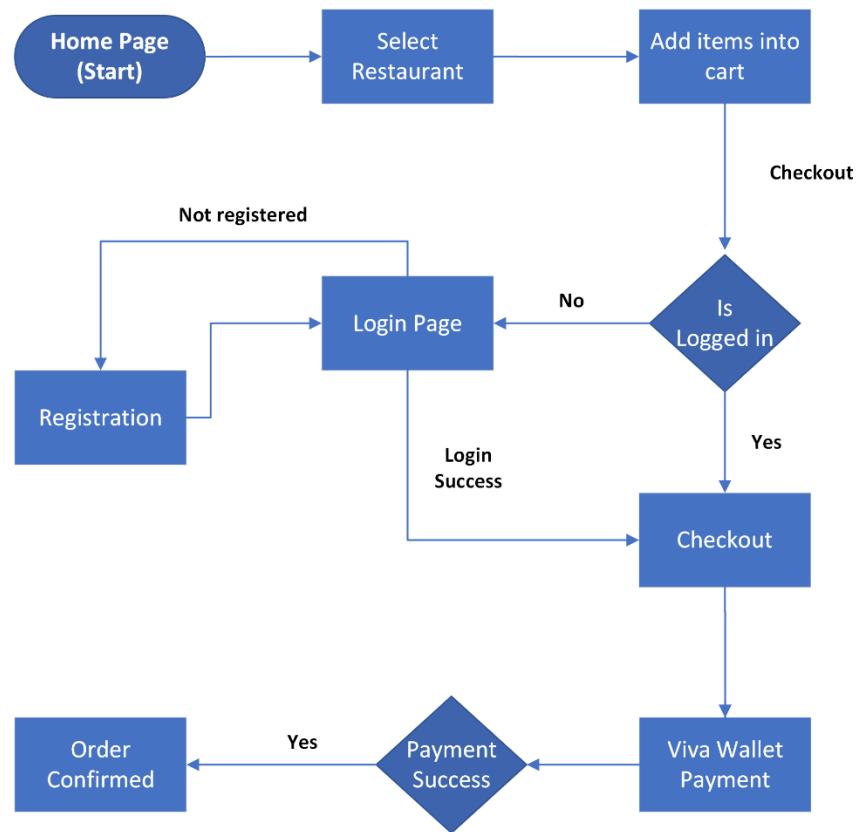


Figure 24. Shadow Foods ordering flowchart.

4.10 Future Update

Few things can be added or updated in Shadow Foods. One of the updates in the future can be developing API based backend and developing a mobile application of Shadow Foods. A mobile application would be more helpful for customers as they can get live notifications of order status.

The other updates can be:

- Customer review, rating or comment on restaurant and items.
- Delivery option.
- The concept of add-ons.

- Offers and today's special menu.
- More precise ready-to-be time.
- Bundling and minification.
- SEO optimization.

5 CONCLUSION

This thesis has covered the development and utility of an online food ordering application. It is a huge advantage to have an in-house e-commerce platform. Online business helps the business to reach the target group easily. It is cost-efficient in the long run and helps expand the business.

During the development, I faced many issues related to the system's development process or domain. There was a continuous change in how to achieve the target. Shadow Foods went from an independent application to part of an integrated system. But in the end, the changes make the whole system easier to understand and maintain in the future.

Overall, it was a wonderful experience and a fantastic opportunity to participate in this project. The initial objectives of the project were fulfilled. Surely there will be new updates to this application in the future, making the app more user-friendly and more business-driven. Working in Shadow Foods made me a better developer, and it has also improved my research skills. Not only did I enjoy doing full-stack development in this project, but I also appreciated that my ideas and thoughts were approved during the project life cycle.

REFERENCES

Webandcrafts Blog. (2021). The Impact of eCommerce on Society and Business: An Ultimate Guide. [online] Available at: <https://webandcrafts.com/blog/impact-of-ecommerce/>

[Accessed March 2022]

www.shadowkitchen.io. (n.d.). shadowkitchen.io - shadowkitchen Resources and Information. [online] Available at: <https://www.shadowkitchen.io/solutions>

[Accessed March 2022]

Lähdevuori, L. (n.d.). Tuleeko pilvikeittiöistä trendi myös Suomessa? – Hernesaarella aloittava Shadow Finland tavoittelee miljoonaluokan liikevaihtoa.

[online] Tärkeimmät talousuutiset | Kauppalehti. Available at:

<https://www.kauppalehti.fi/uutiset/tuleeko-pilvikeittioista-trendi-myos-suomessa-hernesaarella-aloittava-shadow-finland-tavoittelee-miljoonaluokan-liikevaihtoa/aa86e1ea-653b-46aa-999b-98471e1cd5f1>

[Accessed March 2022]

Statista. (n.d.). Online Food Delivery - Finland | Prévisions de marché Statista.

[online] Available at: <https://fr.statista.com/outlook/dmo/eservices/online-food-delivery/finland>

[Accessed March 2022]

Ec current. (2016). [online] Available at:

https://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf

[Accessed March 2022]

Wikipedia Contributors (2019). E-commerce. [online] Wikipedia. Available at:

<https://en.wikipedia.org/wiki/E-commerce>

[Accessed March 2022]

Statista (2022). Global Retail E-Commerce Market Size 2014-2021. [online] Statista. Available at: <https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/>

[Accessed April 2022]

Stax (n.d.). What Is A Payment Gateway And How Does It Work? [online] staxpayments.com. Available at: <https://staxpayments.com/blog/what-is-a-payment-gateway/>

[Accessed May 2022].

Sitar, D. (2021). What's A Payment Gateway And How Does It Work? [online] Forbes Advisor. Available at: <https://www.forbes.com/advisor/business/what-is-a-payment-gateway/>

[Accessed May 2022]

Wikipedia. (2020). Payment gateway. [online] Available at: https://en.wikipedia.org/wiki/Payment_gateway

[Accessed May 2022]

Viva Wallet. (2022). Viva Wallet About Us. [online] Available at: <https://www.vivawallet.com/en/about>

[Accessed May 2022]

Wikipedia Contributors (2019). Data integration. [online] Wikipedia. Available at: https://en.wikipedia.org/wiki/Data_integration

[Accessed May 2022]

ardalis (n.d.). Overview of ASP.NET Core MVC. [online] docs.microsoft.com. Available at: <https://docs.microsoft.com/en-us/aspnet/core/mvc/overview?view=aspnetcore-5.0>

[Accessed May 2022]

MDN Web Docs (2018). HTML: HyperText Markup Language. [online] MDN Web Docs. Available at: <https://developer.mozilla.org/en-US/docs/Web/HTML>
[Accessed May 2022]

Deliverect. (n.d.). Discover how our platform works. [online] Available at:
<https://www.deliverect.com/en-us/how-it-works>
[Accessed May 2022]