

DLMDSEBA01 Business Intelligence I

CASE STUDY

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# Sylt Fish Specialties

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## Introduction

Sylter Fischspezialitäten GmbH, an emerging fast-food chain in Germany with almost 400 locations, is known for its commitment to delivering fresh fish quickly. The company's business model emphasizes high standards and efficient processes to ensure the timely delivery of fresh fish. Specializing in a wide range of fish specialties and desserts, Sylter Fischspezialitäten GmbH prioritizes customer satisfaction and continuously seeks ways to enhance its business, increase productivity, and boost revenue.

Situated on the island of Sylt, the company has successfully positioned itself among the top five fast-food restaurants in the country, distinguishing itself by focusing on fresh fish delivery through efficient inland routes. Sylter Fischspezialitäten GmbH has a significant presence in the fast-food market, standing out from competitors that predominantly offer meat-based or processed food choices.

The company recently sought assistance from our specialized management consultancy, which focuses on Business Intelligence, to implement a Business Intelligence (BI) application. The goal is to monitor branch performance, identify factors affecting turnover, discover areas for improvement, and boost sales. By using BI analytics, the company can compare branches, benchmark performance, and make informed decisions. Sylter Fischspezialitäten GmbH's commitment to fresh fish and efficient logistics has positioned it as a major player in the German fast-food industry. Utilizing BI, the company aims to optimize operations and maintain its position as a top fast-food restaurant. This case study documents our collaboration on the design and development of the BI application.

## Objective

Sylter Fischspezialitäten GmbH's BI application project aims to build a prototype that comprehensively analyzes sales data. The goal is to enhance business expansion by understanding customer preferences and regional variations for increased sales and revenue. As an IT consultant specializing in Business Intelligence, the focus is on developing a BI application that swiftly addresses key questions, enables branch comparisons, and provides detailed reports to drive informed decision-making.

The BI application aims to identify operational systems, design an efficient data model, and develop benchmarks for comprehensive analysis. Successful completion of these tasks will empower Sylter Fischspezialitäten GmbH with a BI application for effective sales data analysis, trend identification, and data-driven decision-making, fostering improved operations, customer satisfaction, and increased sales. The designed BI application ensures accessibility for diverse users, including those in sales and controlling departments, offering swift and accurate data processing with daily report accessibility.

## Main Body

### Relevant Source Systems and Data Extraction

To build a BI application for the client, it is essential to identify the relevant operational systems that store the necessary data for analysis. After discussions with pertinent stakeholders and a thorough examination of the systems at Sylter Fischspezialitäten GmbH, the following operational systems had been identified:

- **Point of Sale(POS):** Utilized to record sales data, capturing details such as products sold and pricing.

- **Customer Relationship Management System(CRM):** This is employed to manage and track customer inquiries, issue resolutions, and customer satisfaction.
- **Inventory Management System:** This is employed to track and manage stock levels, recording information on product quantities, replenishment, and overall inventory status.
- **Logistics Management System:** This is utilized to oversee the transportation and distribution of goods, recording details on shipments, delivery routes, and overall logistics operations.
- **Financial Management System:** This is employed to oversee and manage financial transactions, tracking income, expenses, and overall financial health to support informed decision-making.
- **Human Resource Management System(HRMS):** This is implemented to streamline HR processes, including employee data management, payroll, attendance tracking, and performance evaluation, ensuring efficient workforce management and compliance.

#### **Exemplary extractions as flat files from the client's system include the following:**

After carefully reviewing the client's needs and taking into account the scale of their organization, it was decided to commence this project focusing exclusively on the Sales Data (POS). The goal is to deliver timely and effective results in meeting the client's requirements.

#### **Data Files Overview:**

- **Sales:** This file contains details about each sales transaction, including the date and time, items sold, price, and the name of the restaurant.
- **Product Master:** This file offers information on the available products, including the product name, type, description, and price.
- **Region Master:** This file offers information on the available restaurants, including the restaurant name and restaurant location.

The strategy involves daily extraction of the sales file, while the master files can be extracted either weekly or as needed, particularly when the master data has been updated in bulk.

The extracted data is loaded into the data warehouse, serving as a crucial element for data analysis and visualization, which constitutes the key aspect of this BI project.

#### **Data Modeling Overview**

Data modeling involves analyzing and defining various data types, along with their relationships, using text, symbols, and diagrams to visually represent data throughout its lifecycle in a business, aligning with the organization's data requirements(*What Is Data Modelling? | Microsoft Power BI*, n.d.).

Within the scope of the Clients' BI application, the data model will organize the data to streamline the analysis of sales data. After assessing the data and drawing from our past BI project expertise, it became evident that a star schema model is an ideal fit for this project.

The star schema denormalizes business data by organizing it into dimensions and facts. This structure allows users to analyze and manipulate the data flexibly, typically achieved by joining multiple fact tables and dimension tables(*What Is Star Schema?*, 2022).

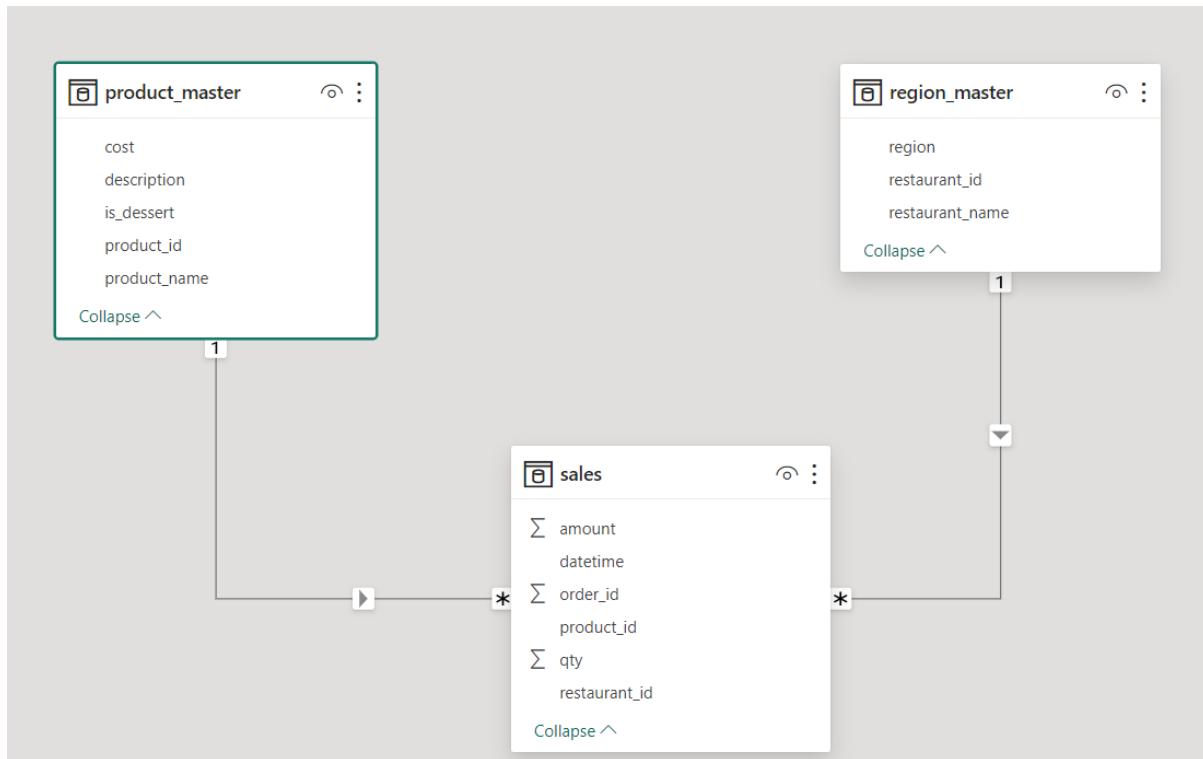


Figure: Star Schema

In the context of the Client's data, the star schema will position a central fact table containing key business metrics, such as sales transaction amounts and quantities. This fact table will establish connections with various dimension tables representing different aspects like region and product. This data structure enables us to help the client address critical business inquiries, such as "Is there a preference for salmon during the evening?", "What is the popularity of herring in Bad Honnef?", and "Between red berry compote and vanilla quark, which dessert is more favored?"

In the context of the data model, the relationship between the Sales table and the Product Master table is many-to-one. This implies that multiple sales entries in the Sales table can be associated with a single entry in the Product Master table, indicating that several sales transactions can involve the same product. Similarly, the relationship between the Sales table and the Region Master table is also many-to-one. This signifies that multiple sales entries in the Sales table can be linked to a single entry in the Region Master table, indicating that various sales transactions may occur in the same region.

*Note: I opted not to include a separate Time dimension table in my project because I found that by adding a very few datetime(sales feature)-related columns to the sales table during data manipulation, I could achieve the desired results. I initially created a time dimension table but later deemed it redundant for my specific approach to the project, leading to its removal. Thereby, this decision is also reflected in the absence of the Time dimension table in the schema.*

## Design Framework

The objective is to construct a data model that ensures both efficient and effective storage and retrieval of data. Additionally, the design should possess the flexibility to adapt to evolving business requirements in the future.

After a comprehensive examination of the client's diverse database systems across departments, it's evident that various systems are in use. Following discussions with

stakeholders, the decision is to centralize data from all departments into a Microsoft SQL Server-hosted data warehouse(specifically not a primary data warehouse, as the primary data warehouse for this project involving sales data will be established using Microsoft PowerBI).

Microsoft SQL Server, developed by Microsoft Corporation, is a relational database server facilitating data storage and retrieval through SQL. Its advantages include easy installation, improved performance, enhanced security, and excellent data restoration. Its uses range from database querying to supporting data processing, back-end storage, and ETL operations, making it valuable for various industries("MS SQL Server History and Advantages," 2014).

A data warehouse(DW or DWH) and also referred to as an enterprise data warehouse (EDW), serves as a crucial element in business intelligence, supporting reporting and data analysis. These warehouses act as centralized repositories, integrating data from various sources into one unified location. They store both current and historical data, providing a single source for generating analytical reports across the entire enterprise("Data Warehouse," 2023).

Currently, data migration from the POS system to MS SQL Server is carried out, with a planned strategy to migrate data from all other systems to ensure streamlined future projects. The current data model will encompass the following tables:

**Sales:** This table will store details related to sales, encompassing information such as the Date and time, Order ID, Product ID, Restaurant ID, Quantity of products sold, and the total sales amount(€).

order_id	datetime	product_id	restaurant_id	qty	amount
7	2020-01-03 15:16	18	97	3	50.1
7	2020-01-03 15:16	11	97	5	57
7	2020-01-03 15:16	26	97	2	23.8
7	2020-01-03 15:16	22	97	1	20.1
7	2020-01-03 15:16	16	97	1	21.8
7	2020-01-03 15:16	45	97	1	12.2
8	2020-01-04 22:51	45	30	2	24.4
8	2020-01-03 22:51	19	30	18	340.2
8	2020-01-04 22:51	32	30	5	134
9	2020-01-04 14:25	15	27	2	17.2

Figure: Sales Data

**Region Master:** This table will include details regarding the restaurant, containing attributes such as Restaurant ID, Restaurant Name, and Geographical location of the restaurant.

restaurant_id	restaurant_name	region
7	Eichenweg Stuttgart	South
8	Berliner Strasse Berlin	North East
9	Luisenplatz Potsdam	North East
10	Mozartweg Leipzig	East
11	Sonnenallee Berlin	North East
12	Tulpenweg Hamburg	North West
13	Am Kirchplatz Cologne	West
14	Friedrich-Ebert-Strasse Mannheim	South
15	Ahornstrasse Nuremberg	South East
16	Schillerplatz Stuttgart	South
17	Hirschweg Wiesbaden	South
18	Römerstrasse Mainz	South

Figure: Restaurant Data

**Product Master:** This table will encompass product details, with attributes including Product ID, Product Name, Dessert Indicator, Description, and Cost(€).

product_id	product_name	is_dessert	description	cost
1	Soused Herring	No	Traditional Soused Herring	8.5
2	Brathering	No	Marinated Brathering Fillets	7.8
3	Smoked Fish	No	Premium Smoked Fish Selection	12.3
4	Fish Sandwich	No	Classic Fish Sandwich with Fresh Catch	6.5
5	Saibling (Char)	No	Alpine Saibling - Delicate Char Flavor	14.75
6	Scholle Finkenwerder Art	No	North Sea Scholle Finkenwerder Style	18.2
7	Labskaus	No	Labskaus - Traditional Northern Dish	10.9
8	Smoked Salmon	No	Oak-Smoked Atlantic Salmon	22.5
9	Herring	No	Baltic Herring in Mustard Sauce	9.75
10	Trout	No	Freshwater Trout with Herb Infusion	15.6

Figure: Product Data

*Note: The generated data is for illustrative purposes and may not accurately represent real-world scenarios.*

## Implementation

Once the data model is designed, it needs to be put into action within the primary data warehouse (DWH) using suitable tools and technology.

Following an in-depth assessment of available business tools for ETL process, there were many tools available such as IBM DataStage ,Oracle Data Integrator, Fivetran, Hadoop, SAS Data Management and many more(*19 Best ETL Tools for 2023*, n.d.). After considering factors such as complexity and implementation time, Microsoft PowerBI emerged as the optimal choice for serving as the primary data warehouse for executing the ETL process for Sylter Fischspezialitäten GmbH.

*Note: PowerBI was selected, in part, due to specific accessibility restrictions, and it is worth mentioning that PowerBI is available for free use.*

Microsoft PowerBI is a comprehensive BI platform equipped with a powerful ETL tool, advanced data modeling capabilities, and sophisticated analytics tools. PowerBI stands out not only for its powerful data analytics capabilities but also for its swift implementation time. As a business intelligence tool, Power BI enables quick and efficient creation of visually appealing representations of analyzed data. Part of the Microsoft Power Platform, it facilitates

fast and seamless deployment, empowering teams with real-time data insights for swift decision-making. The platform's key features, including data visualization, connectivity options and real-time dashboards are complemented by its rapid implementation, making it an ideal choice for businesses aiming for timely and effective data analytics solutions (*What Are the Benefits of Power BI?*, n.d.).

To implement the data model using PowerBI, we install and configure PowerBI, connect the source systems and test the setup. Next, we establish the schema, define data sources, and specify transformations aligning with the data model. Finally, we use PowerBI to load and transform data from source systems, and thoroughly test the system to ensure accurate data loading and expected functionality.

### Extract, Transform, and Load (ETL)



Figure: ETL Process (informatica, n.d.)

Extract, Transform, and Load (ETL) is a crucial process in data management, consolidating diverse data into a data warehouse. By applying ETL, raw datasets undergo cleaning and organization, enhancing their usability for analytics. This process is crucial for businesses, enabling them to derive valuable insights, predict demand, and fulfill various essential business functions. ETL not only provides historical context by combining legacy and new data but also offers a consolidated view for in-depth analysis, ensuring accurate and reliable results. Automation of repetitive tasks further streamlines data processing, allowing to focus on innovation rather than mundane management tasks. The ETL process, executed in three steps—extraction, transformation, and loading—acts as a backbone for robust business intelligence and analytics (*What Is ETL?*, n.d.).

Utilizing MS SQL Server ensures a robust and secure data repository, while MS PowerBI offers efficient data visualization and analysis; these are few of the main reasons for choosing these tools for a comprehensive and reliable business intelligence solution for the Client.

#### The ETL process involves the following steps:

**Extract:** During this phase, data is extracted from one or more source systems. In our scenario, we will import Sales data from MS SQL Server into PowerBI, as illustrated in the following figures.

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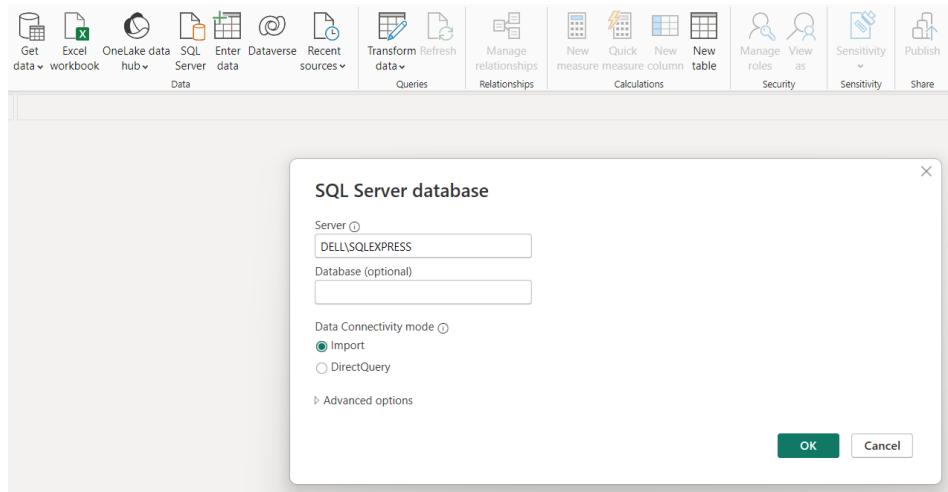


Figure: Extraction fig 1

	order_id	datetime	product_id	restaurant_id	qty	amount
1	2020-01-01 12:14	18	63	2	33.4	
2	2020-01-01 12:14	30	63	3	68.7	
3	2020-01-01 12:14	15	63	1	8.6	
4	2020-01-01 12:14	28	63	1	17.2	
5	2020-01-01 12:14	32	63	3	80.4	
6	2020-01-01 15:06	22	54	1	20.1	
7	2020-01-01 15:06	18	54	2	33.4	
8	2020-01-01 15:06	22	54	1	20.1	
9	2020-01-01 15:06	19	54	7	123.3	
10	2020-01-01 21:18	38	50	1	29.2	
11	2020-01-02 21:18	22	50	2	40.2	
12	2020-01-02 10:55	26	96	2	23.8	
13	2020-01-02 10:55	13	96	1	17.3	
14	2020-01-02 10:55	37	96	2	47.4	
15	2020-01-02 10:55	27	96	2	38.6	
16	2020-01-02 18:53	25	9	1	14.2	
17	2020-01-02 14:48	26	16	2	23.8	
18	2020-01-02 14:48	28	16	2	34.4	
19	2020-01-02 14:48	8	16	1	22.5	
20	2020-01-03 14:48	17	16	1	19.5	
21	2020-01-03 15:16	42	97	3	25.5	
22	2020-01-03 15:16	18	97	3	50.1	
23	2020-01-03 15:16	11	97	5	57	
24	2020-01-03 15:16	45	97	1	12.2	

Figure: Extraction fig 2

**Transform:** Once the data is extracted, it needs to be transformed into a format suitable for analysis. This involves activities like data cleansing, normalization, aggregation, and more to prepare the data for analysis. The images below offer a glimpse into few of the many transformation steps conducted using Power Query Editor in PowerBI, including the creation of measures using Data Analysis Expressions (DAX).

Figure: Transformation fig 1.1

Figure: Transformation fig 1.2

```

1 ProductRegionYearlyAverage =
2 CALCULATE(
3     AVERAGEX(
4         VALUES('Product Master'[name]),
5         CALCULATE(
6             SUM(Sales[amount])
7         )
8     ),
9     All(Sales[Year], Sales[restaurant_id])
10 )

```

Figure: Transformation fig 2

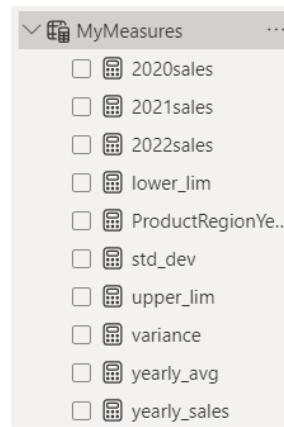


Figure: Transformation fig 3

**Load:** The final step involves loading the transformed data into the system, as illustrated in the following figures.

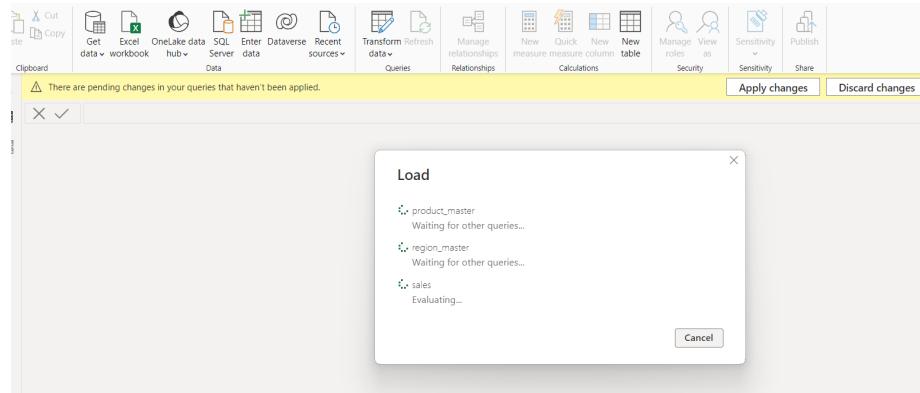


Figure: Loading fig 1

	order_id	datetime	product_id	restaurant_id	qty	amount
1	2020-01-01 12:14		18	63	2	33.4
1	2020-01-01 12:14		15	63	1	8.6
1	2020-01-01 12:14		28	63	1	17.2
1	2020-01-01 12:14		30	63	3	68.7
1	2020-01-01 12:14		32	63	3	80.4
2	2020-01-01 15:06		18	54	2	33.4
2	2020-01-01 15:06		22	54	1	20.1
2	2020-01-01 15:06		22	54	1	20.1
2	2020-01-01 15:06		19	54	7	132.3
3	2020-01-01 21:18		38	50	1	29.2
3	2020-01-02 21:18		22	50	2	40.2
4	2020-01-02 21:18		22	50	2	40.2

Figure: Loading fig 2

*Note: During the process in PowerBI, data can undergo transformation either before or after loading, but DAX measures are generated after the loading phase and are often utilized in the visualization process.*

After the successful loading of data into the platform, users can leverage BI tools for in-depth analysis. By exploring the analyses they can uncover valuable insights that inform and guide strategic business decisions.

## Analyses Overview

Business intelligence (BI) tools are essential for collecting, processing, and analyzing vast amounts of structured and unstructured data from diverse sources, including internal and external systems, documents, images, and social media posts. These tools enable users to present data through user-friendly formats such as reports, dashboards, charts, and graphs. BI tools offer a wide range of functions, including data mining, data visualization, performance management, analytics, reporting, text mining, and predictive analytics. The benefits of using BI tools are extensive, ranging from centralized data management, fostering self-sufficiency among non-technical users, making informed predictions based on historical data, generating automatic reports, to ultimately reducing business costs and increasing revenue (5 Business Intelligence Tools You Need to Know, 2023; Haije, 2022).

According to Coursera.org, the top five BI tools, including Microsoft Power BI, Tableau, QlikSense, Dundas BI, and Sisense, were selected based on common citations among various ranking websites(5 Business Intelligence Tools You Need to Know, 2023).

After thoroughly assessing the project requirements and engaging in discussions with key stakeholders at Sylter Fischspezialitäten GmbH, the decision to use PowerBI as the BI tool was finalized. The analyses necessary to fulfill the project requirements and beyond are as follows:

We've implemented several changes in our data analysis approach to streamline the analysis process. Notably, given the abundance of restaurants for Sylter Fischspezialitäten GmbH across Germany, we now utilize region as a metric, associating each restaurant with a specific region based on its geolocation. Additionally, we've categorized order times into defined schedules: Breakfast from 08:00 to 11:00, Lunch from 11:00 to 15:00, Evening Snack from 15:00 to 19:00, and Dinner from 19:00 to 22:00.

## 1. Product Performance: Regional Top 5 (Value & Consumption) and Total Sales Overview



### Top 5 Products per region (Value based)

This chart displays the highest-selling products considering their sales value. With the option to filter by region, the users can view the top-selling products in specific regions, multiple regions, or across all regions according to their preference.

The bar chart shows that Salmon stands out as the top-performing product overall in terms of sales value, followed closely by Halibut and Kingfish. Zander(Pike-perch) and Dover Sole, while not reaching the same level of popularity, still maintain a considerable presence.

Using this chart, the users can conduct profitability analysis by identifying the most lucrative products in each region, allowing them to focus efforts on items contributing significantly to overall revenue and profit margins. Additionally, they can manage costs by evaluating product costs and pricing strategies for high-selling items, ensuring optimal profitability and adjusting prices if necessary. Leveraging regional sales trends for top-selling products in financial forecasts and budgets enhances the precision of revenue projections. Moreover, they can adjust pricing models based on the popularity of products in different regions, maximizing revenue while remaining competitive.

### Top 5 Products per region (Consumption based)

This chart illustrates the leading products in terms of sales quantity. With a region filter, the users can observe the top-selling products in specific regions, multiple regions, or across all regions according to their preference.

From the chart, it's clear that Salmon is the most consumed product among the top five, while the next four products Pollock, Zander(Pike-perch), Eel and Grayling have very similar consumption levels, just below that of Salmon.

Using this chart, the users can analyze the best-selling products by quantity in each region to streamline inventory management, prevent stockouts for popular items, and utilize sales quantity data for efficient production planning, ensuring an adequate supply of top-selling products. They can perform menu optimization which allows them to tailor menus based on high-selling items by quantity, enhancing customer satisfaction and operational efficiency. They can streamline operations which involves aligning staffing levels and resources with the demand for high-quantity products in different regions. Additionally, users can identify the best-selling products in each region, enabling them to assess underperforming restaurants within those regions and strategically manage inventory to ensure an ample supply of the top-selling products, ultimately boosting sales for those establishments.

### Product Sales Performance Across Regions

This report displays the sales amount for each product in various regions, with the option to filter by year, consider multiple years, or view data for all years. It provides insights into the regional performance of each product.

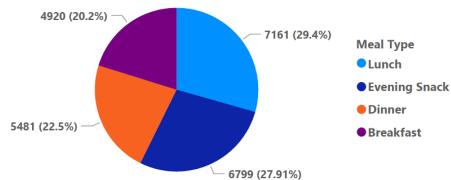
The report highlights significant variations in sales across regions, unveiling distinctive performance patterns for specific items. For instance, "Salmon" stands out with remarkable sales figures in regions like East, Northeast, and Southwest. Conversely, products like "Brathering" exhibit notable disparities, performing poorly across all the regions. Consistent high sales are observed for products like "Cod" and "Halibut" across diverse regions, suggesting a broad appeal. Moreover, items such as "Sole" showcase strong sales in specific regions, indicating localized preferences. This diverse sales landscape reflects the influence of regional tastes and preferences on product performance.

Product Sales Performance Across Region		Drill on Columns			
name	Region	ch (München)	Rheingoldstrasse BadHonnef	Römergasse Berlin	Römerplatz Berlin
Anchovy		51.60	25.80	68.80	8.60
Apple Pie		11.50			
Brathering					
Brill		50.80	203.20	127.00	25.40
Carp		59.50	309.40	142.80	47.60
Chocolate Mousse		63.00		136.50	10.50
Cod		132.30	1,058.40	226.80	132.30
Dover Sole		435.10	320.60	137.40	22.90
Eel		154.40	173.70	77.20	115.80
European Bass (Branzino)		52.80	475.20	52.80	
Fish Sandwich				19.50	
Flounder		103.80	138.40	103.80	51.90
Grayling		361.20	172.00	51.60	292.40
Grouper		71.10	47.40	260.70	71.10
Gurnard		107.20	321.60	26.80	53.60
Halibut		177.80	635.00	101.60	101.60
Herring				19.50	39.00
		165.75			

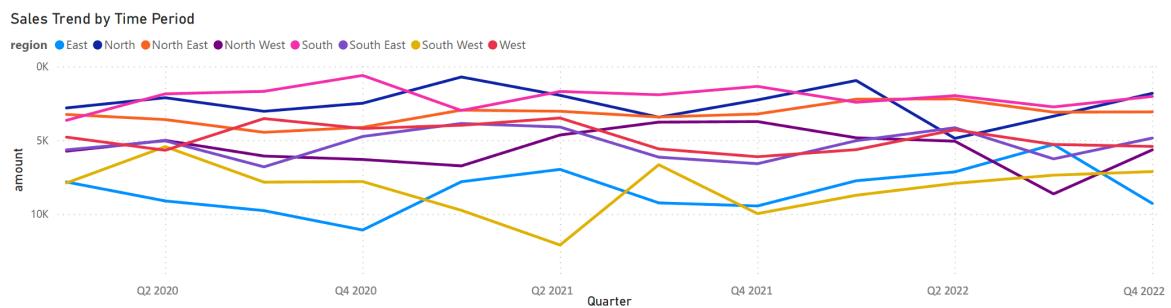
Furthermore, by utilizing the drill-down feature in the chart based on columns, we can assess the performance of a product in individual restaurants. For example, from the figure, it's evident that "Herring" has an average performance in Rheingoldstrasse BadHonnef.

The users can utilize this chart for sales forecasting, understanding the expected sales for each product in specific regions, thereby enhancing business planning. Additionally, they can optimize inventory by identifying and focusing on high-selling products, tailoring business strategies for different regions based on the performance of each product. Performance evaluation allows them to assess the success of products in specific regions and make informed decisions for improvement. This strategic focus enables users to direct attention and resources towards products with higher sales potential in targeted regions.

## 2. Meal Insights and Time Trends



Meal Type	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	1100	375	317	750	250	656	1027	445
<b>Dinner</b>	1218	389	544	634	263	707	1115	611
<b>Evening Snack</b>	1270	425	636	969	417	931	1259	892
<b>Lunch</b>	1624	355	462	987	399	897	1412	1025



### Impact of Time on Meal Types

The report illustrates the quantity of products sold in various regions for each meal schedule and the Pie chart visualizes the count of orders (each quantity considered as 1) sold in regions across different meal schedules. With the ability to filter by region, users can examine food schedule preferences for products in specific regions, multiple regions, or overall, based on their preferences.

From the chart, it's clear that Lunch is the most consumed meal type, followed by Evening Snack, Dinner, and then Breakfast, which is the least consumed meal type in terms of servings across the entire region. The regional analysis of meal consumption report highlights distinct patterns across breakfast, dinner, evening snack, and lunch categories. The East and

Southwest consistently exhibits a prominent position, leading in breakfast, lunch, evening snack, and dinner. Meanwhile, the North, Northeast and South region tends to consume fewer servings across these meal types.

Analyzing customer meal ordering time preferences helps identify trends, such as regions where certain meal schedules experience higher demand. This insight is valuable for adjusting inventory distribution, ensuring that products associated with popular meal schedules receive prioritized supply. This idea also explores how some items sell quickly, while others take more time, especially when considering various meal schedules.

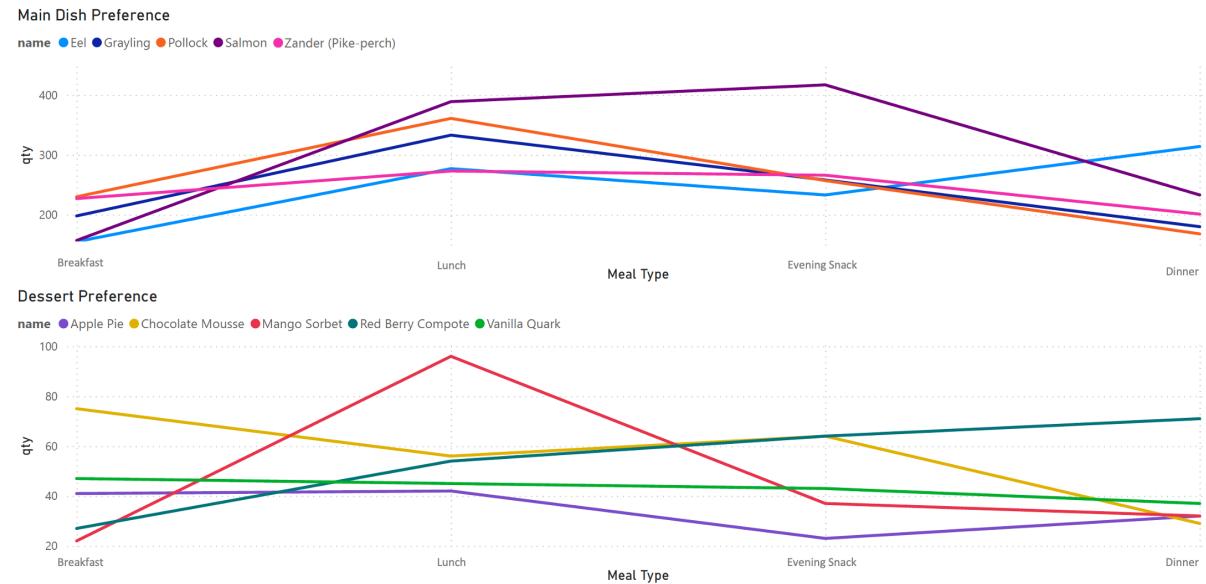
### Sales Trend by Time Period

This line chart illustrates the quarterly sales trend over time for different regions. Users can apply region filters to explore specific regions, multiple regions, or an overall view based on their preferences.

Throughout the analyzed timeframe, East and Southwest consistently demonstrate the lowest sales value generation. West, Southeast, and Northwest display average performance, marked by fluctuations in different quarters. On the other hand, North, South, and Northeast consistently generate relatively high sales value across all quarters. It's worth noting that North experienced a significant decline and subsequent rise between the 1st and 4th Quarters in the year 2022.

Such insights will aid management in recognizing seasonal sales trends and patterns, allowing for strategic adjustments in marketing and stock strategies. The users can utilize insights from regional sales trends for accurate revenue projections in financial forecasts and budgets, assess underperforming restaurants within specific regions, optimize the supply chain, streamline operations, evaluate market expansion strategies, and adapt quickly to changing market conditions based on observed trends.

### 3. Dish and Dessert Popularity Across Food Schedules



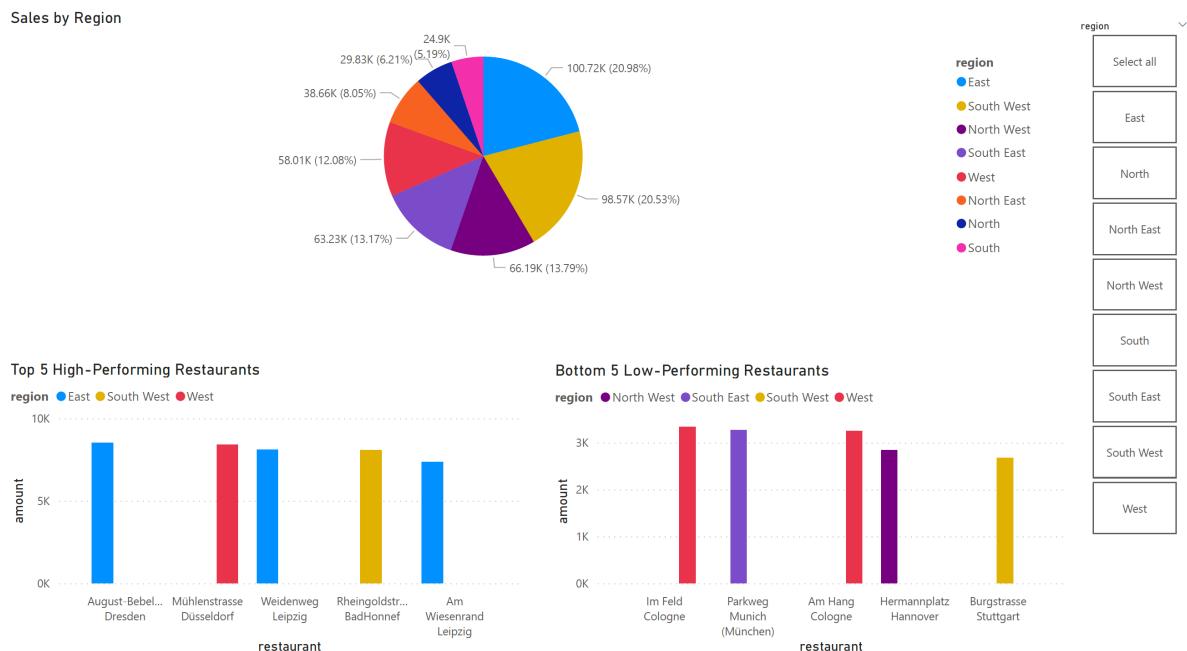
These visualizations reveal the popularity trends of top-selling dishes and desserts across different food schedules, such as Breakfast, Lunch, Evening Snack, and Dinner.

In Main dish preferences, Eel has the lowest sales during breakfast and the highest during dinner. Grayling, Pollock, and Zander perform well specifically during lunch. Salmon performs well across all meal schedules, especially during lunch and evening snack.

In Dessert preferences, Chocolate Mousse experiences high sales during breakfast but declines in other food schedules. Apple Pie performs relatively poorly compared to other top-selling desserts. Mango Sorbet excels during lunch. Red Berry Compote consistently increases its sales across all food schedules, peaking at dinner. Vanilla Quark maintains a steady performance throughout the day.

These charts assist management in identifying the most favored dishes and desserts for each schedule, enabling strategic adjustments in sales strategies. Users can understand the popularity trends of top-selling dishes and desserts across different food schedules, gain insights into customer preferences during specific food schedules, and identify patterns in the popularity of dishes and desserts, facilitating better inventory management.

#### 4. Comprehensive Sales Analysis: Regional Performance and Restaurant Rankings



#### Sales by Region

This Pie chart displays sales data categorized by region, allowing users to conduct a comprehensive performance assessment, evaluating the overall sales performance of different regions, aiding management in discerning regions with strong performance and those requiring improvement. Users can utilize region filters to examine specific regions, multiple regions, or an overall perspective. This filtering option will prove highly beneficial for comparing sales across different restaurants and regions. Additionally, clicking on a specific region in the chart allows for a detailed analysis of individual restaurant performance within that region.

The pie chart shows that East and Southwest regions contribute significantly to sales value, each generating over 20% of the overall sales. The Northwest, Southeast, West, and Northeast regions perform at an average level. However, the North and South regions are lagging, contributing just over 5% to the overall sales.

### Top 5 High-Performing Restaurants and Low-Performing Restaurants

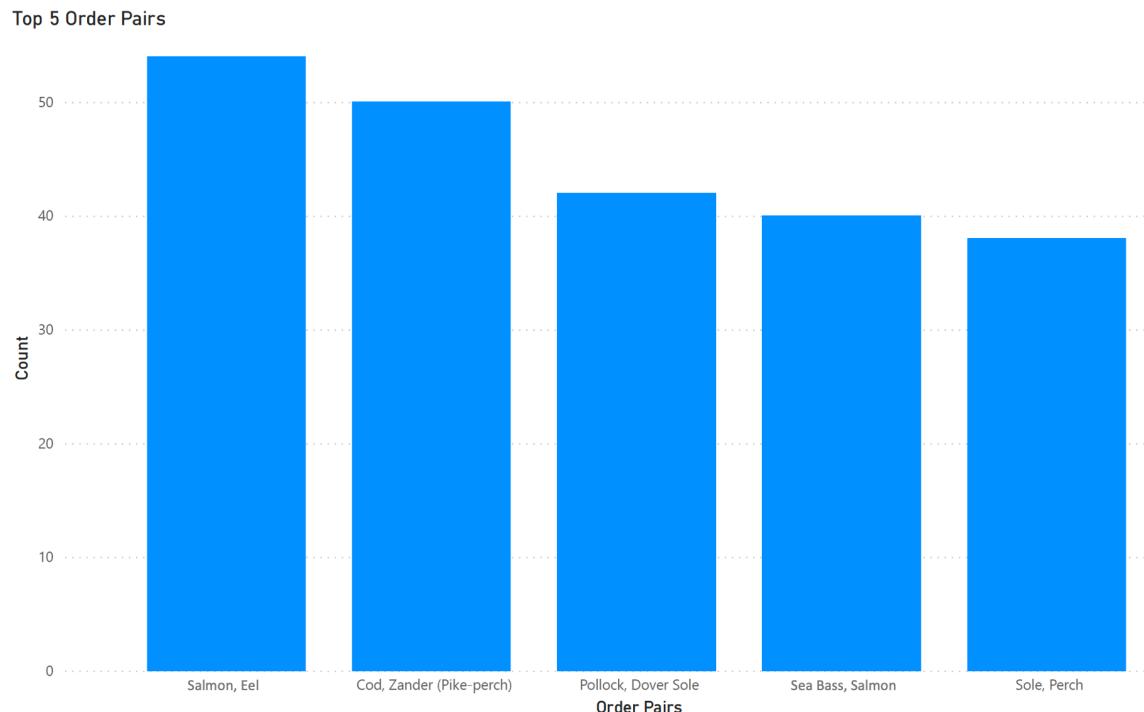
This chart highlights the top 5 high and low-performing restaurants based on sales across all regions. Users have the flexibility to explore specific regions, multiple regions, or gain an overall perspective using region filters.

The high-performing restaurants chart shows that the restaurant at August-Bebel-Strasse Dresden leads in performance, followed by Weidenweg Leipzig and Am Wiesenrand Leipzig in the 3rd and 5th positions, all from the East region. Mühlenstrasse Düsseldorf from the West holds the 2nd position, and Rheingoldstrasse BadHonnef from the Southwest secures the 4th place in terms of sales value generation.

The low-performing restaurants chart shows that Burgstrasse Stuttgart from the Southwest ranks as the lowest-performing restaurant, followed by Hermannplatz Hannover from the Northwest, Am Hang Cologne, and Im Feld Cologne from the West, and Parkweg Munich (München) from the Southeast in terms of sales value generation.

From these charts, users can quickly assess and compare the top 5 high and low-performing restaurants to understand their sales contributions and identify areas for improvement. They can identify regions that require targeted interventions or strategic adjustments based on the performance of high and low-performing restaurants. Users can tailor business strategies for different regions by leveraging insights from the top high and low-performing restaurants.

### 5. Top 5 Frequently Ordered Item Pair Analysis



This chart unveils the top 5 pairs of items most frequently ordered together across all regions.

The most common pair of orders includes Salmon and Eel, followed by Cod and Zander (Pike-perch), Pollock and Dover Sole, Sea Bass and Salmon, and Sole and Perch.

Utilizing this chart, users can gain valuable insights into customer preferences and behavior, allowing for strategic menu planning and optimization of offerings based on popular item pairs. Additionally, the information aids in efficient inventory management by ensuring sufficient stock of frequently paired items, reducing the risk of stockouts and minimizing waste. The data can be leveraged for targeted marketing promotions or bundled deals, driving sales and

customer engagement. Moreover, suggesting popular item pairs enhances the customer ordering experience, potentially increasing satisfaction and order value.

## 6. Sales boundary analysis

Product	Lower Limit	Upper Limit
Anchovy	1,473.65	2,774.75
Apple Pie	311.65	754.02
Brathering	86.61	438.59
Brill	4,549.37	4,780.90
Carp	3,854.42	4,166.18
Chocolate Mousse	560.97	1,056.03
Cod	4,992.20	6,940.00
Dover Sole	6,174.58	7,534.88
Eel	5,495.84	7,821.16
<b>European Bass (Branzino)</b>	<b>2,389.94</b>	<b>2,978.06</b>

This report delves into product sales performance by establishing lower and upper limits based on historical sales data. By employing a widely-used formula considering factors like mean, standard deviation, and confidence level, the analysis sets boundaries for individual data points.

Take the product "Anchovy" with a range of 1473.65 to 2774.75 as an example. This boundary supports various analyses, including forecasting. Actions can be tailored based on the product's actual performance concerning the boundary, whether it exceeded, stayed within, or fell below the limit.

Moreover, the insights derived from this approach enable quality control and outlier detection, optimizing inventory management, performance benchmarking, forecasting, risk mitigation, strategic pricing, market response analysis, operational efficiency, and continuous improvement initiatives in sales strategies and product management. The comprehensive assessment aids in strategic decision-making, adapting to changing market conditions, and fostering a data-driven approach for continuous improvement.

## 7. Time's Impact on Regional Food Schedule Preferences (Chi-Square Analysis) – Future Implementation

The following reports present the findings of a chi-square analysis investigating the impact of time on sales averages across four food schedules and eight regions.

## Sylt Fish Specialties - Case Study

### Overall

O Values:	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>20089.35</b>	<b>7057.35</b>	<b>5901.15</b>	<b>13157.4</b>	<b>4421.25</b>	<b>11747.1</b>	<b>19007.15</b>	<b>8509.7</b>
<b>Dinner</b>	<b>22421.45</b>	<b>7260.3</b>	<b>9810.5</b>	<b>11937.65</b>	<b>4610.7</b>	<b>12923.85</b>	<b>20480.55</b>	<b>10759.8</b>
<b>Evening Snack</b>	<b>23636.45</b>	<b>7871.55</b>	<b>11606.5</b>	<b>18714.85</b>	<b>7480.05</b>	<b>17554.65</b>	<b>23822.7</b>	<b>16428.1</b>
<b>Lunch</b>	<b>29495.4</b>	<b>6346.65</b>	<b>8259.4</b>	<b>18316.2</b>	<b>7334.55</b>	<b>16670.8</b>	<b>26309.5</b>	<b>18774.25</b>
	<b>95642.65</b>	<b>28535.85</b>	<b>35577.55</b>	<b>62126.1</b>	<b>23846.55</b>	<b>58896.4</b>	<b>89619.9</b>	<b>54471.85</b>
E Values:	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>19159.88</b>	<b>5716.52</b>	<b>7127.17</b>	<b>12445.58</b>	<b>4777.13</b>	<b>11798.59</b>	<b>17953.36</b>	<b>10912.22</b>
<b>Dinner</b>	<b>21358.35</b>	<b>6372.46</b>	<b>7944.97</b>	<b>13873.63</b>	<b>5325.27</b>	<b>13152.40</b>	<b>20013.39</b>	<b>12164.33</b>
<b>Evening Snack</b>	<b>27094.15</b>	<b>8083.78</b>	<b>10078.59</b>	<b>17599.41</b>	<b>6755.38</b>	<b>17260.94</b>	<b>25387.99</b>	<b>15431.07</b>
<b>Lunch</b>	<b>28030.27</b>	<b>8363.08</b>	<b>10426.82</b>	<b>18207.48</b>	<b>6988.78</b>	<b>17260.94</b>	<b>26265.16</b>	<b>15964.22</b>
$\Sigma(O-E)^2 / E$ :	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>45.09</b>	<b>314.49</b>	<b>210.90</b>	<b>40.71</b>	<b>26.51</b>	<b>0.22</b>	<b>61.85</b>	<b>528.96</b>
<b>Dinner</b>	<b>52.91</b>	<b>123.70</b>	<b>438.04</b>	<b>270.16</b>	<b>95.88</b>	<b>3.97</b>	<b>10.90</b>	<b>162.17</b>
<b>Evening Snack</b>	<b>441.26</b>	<b>5.57</b>	<b>231.63</b>	<b>70.70</b>	<b>77.74</b>	<b>5.00</b>	<b>96.51</b>	<b>64.42</b>
<b>Lunch</b>	<b>76.58</b>	<b>486.19</b>	<b>450.54</b>	<b>0.65</b>	<b>17.11</b>	<b>20.18</b>	<b>0.07</b>	<b>494.62</b>
	<b>615.85</b>	<b>929.95</b>	<b>1331.11</b>	<b>382.21</b>	<b>217.24</b>	<b>29.37</b>	<b>169.34</b>	<b>1250.17</b>
								<b>4925.25</b>

**Chi Square table Value for 21 Degrees of Freedom for 0.05 is 32.671**

**Null Hypothesis:** There is no impact of time with respect to regions.  
**Alternative Hypothesis:** The time factor has influence on the region.

**Calculated value is greater than table value (4925.25 > 32.671) so we reject the Null hypothesis.**

### Yearly:

Yearly Average	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>6986.43</b>	<b>2322.45</b>	<b>1397.03</b>	<b>4355.94</b>	<b>1473.75</b>	<b>3919.70</b>	<b>6336.77</b>	<b>2836.57</b>
<b>Dinner</b>	<b>7473.93</b>	<b>2420.10</b>	<b>3270.17</b>	<b>3079.22</b>	<b>1539.90</b>	<b>3207.95</b>	<b>6262.85</b>	<b>1500.60</b>
<b>Evening Snack</b>	<b>7878.82</b>	<b>1623.85</b>	<b>3865.83</b>	<b>6236.28</b>	<b>2493.35</b>	<b>5851.55</b>	<b>7940.00</b>	<b>5476.03</b>
<b>Lunch</b>	<b>9831.00</b>	<b>2115.55</b>	<b>2753.13</b>	<b>6105.40</b>	<b>2444.85</b>	<b>5556.93</b>	<b>8760.83</b>	<b>6256.08</b>
	<b>31880.88</b>	<b>9511.95</b>	<b>11859.88</b>	<b>20708.70</b>	<b>7948.85</b>	<b>19632.13</b>	<b>29873.30</b>	<b>18157.28</b>
								<b>149572.28</b>
E Values:	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>6386.63</b>	<b>1905.51</b>	<b>2375.72</b>	<b>4148.53</b>	<b>1592.38</b>	<b>3932.86</b>	<b>5984.45</b>	<b>3637.41</b>
<b>Dinner</b>	<b>7119.45</b>	<b>2124.15</b>	<b>2648.32</b>	<b>4624.54</b>	<b>1775.09</b>	<b>4384.13</b>	<b>6671.13</b>	<b>4054.78</b>
<b>Evening Snack</b>	<b>9031.38</b>	<b>2694.59</b>	<b>3359.53</b>	<b>5866.47</b>	<b>2251.79</b>	<b>5733.65</b>	<b>8462.66</b>	<b>5143.69</b>
<b>Lunch</b>	<b>9343.42</b>	<b>2787.69</b>	<b>3475.61</b>	<b>6069.16</b>	<b>2329.59</b>	<b>5753.65</b>	<b>8755.05</b>	<b>5321.41</b>
								<b>1641.75</b>
$\Sigma(O-E)^2 / E$ :	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>15.03</b>	<b>104.83</b>	<b>70.30</b>	<b>13.57</b>	<b>8.84</b>	<b>0.07</b>	<b>20.62</b>	<b>176.32</b>
<b>Dinner</b>	<b>17.64</b>	<b>41.23</b>	<b>146.01</b>	<b>90.05</b>	<b>31.96</b>	<b>1.32</b>	<b>3.63</b>	<b>54.06</b>
<b>Evening Snack</b>	<b>147.09</b>	<b>1.86</b>	<b>77.21</b>	<b>23.57</b>	<b>25.91</b>	<b>1.67</b>	<b>32.17</b>	<b>21.47</b>
<b>Lunch</b>	<b>25.53</b>	<b>162.06</b>	<b>150.18</b>	<b>0.22</b>	<b>5.70</b>	<b>6.73</b>	<b>0.02</b>	<b>164.87</b>
	<b>205.28</b>	<b>309.98</b>	<b>443.70</b>	<b>127.40</b>	<b>72.41</b>	<b>9.79</b>	<b>56.45</b>	<b>416.72</b>
								<b>1641.75</b>

**Chi Square table Value for 21 Degrees of Freedom for 0.05 is 32.671**

**Null Hypothesis:** There is no impact of time with respect to regions.  
**Alternative Hypothesis:** The time factor has influence on the region.

**Calculated value is greater than table value (1641.75 > 32.671) so we reject the Null hypothesis.**

### Monthly:

Monthly Average	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>558.04</b>	<b>196.04</b>	<b>163.92</b>	<b>365.49</b>	<b>122.81</b>	<b>376.31</b>	<b>527.98</b>	<b>236.28</b>
<b>Dinner</b>	<b>622.82</b>	<b>201.68</b>	<b>272.51</b>	<b>331.60</b>	<b>128.08</b>	<b>359.00</b>	<b>568.90</b>	<b>298.88</b>
<b>Evening Snack</b>	<b>656.57</b>	<b>218.65</b>	<b>322.40</b>	<b>519.86</b>	<b>207.78</b>	<b>487.63</b>	<b>661.74</b>	<b>456.34</b>
<b>Lunch</b>	<b>919.32</b>	<b>176.30</b>	<b>229.43</b>	<b>508.78</b>	<b>203.74</b>	<b>463.08</b>	<b>730.82</b>	<b>521.51</b>
	<b>2656.74</b>	<b>792.66</b>	<b>988.27</b>	<b>1725.73</b>	<b>662.40</b>	<b>1636.01</b>	<b>2489.44</b>	<b>1513.11</b>
E Values:	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>532.22</b>	<b>158.79</b>	<b>197.98</b>	<b>345.71</b>	<b>132.70</b>	<b>327.74</b>	<b>498.70</b>	<b>303.12</b>
<b>Dinner</b>	<b>593.29</b>	<b>177.01</b>	<b>220.69</b>	<b>385.38</b>	<b>147.92</b>	<b>365.34</b>	<b>555.93</b>	<b>337.90</b>
<b>Evening Snack</b>	<b>752.62</b>	<b>224.55</b>	<b>279.96</b>	<b>488.87</b>	<b>187.65</b>	<b>479.47</b>	<b>705.22</b>	<b>428.64</b>
<b>Lunch</b>	<b>778.62</b>	<b>232.31</b>	<b>289.63</b>	<b>505.76</b>	<b>194.13</b>	<b>479.47</b>	<b>729.59</b>	<b>443.45</b>
$\Sigma(O-E)^2 / E$ :	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>1.25</b>	<b>8.74</b>	<b>5.86</b>	<b>1.13</b>	<b>0.74</b>	<b>0.01</b>	<b>1.72</b>	<b>14.69</b>
<b>Dinner</b>	<b>1.47</b>	<b>3.44</b>	<b>12.17</b>	<b>7.50</b>	<b>2.66</b>	<b>0.11</b>	<b>0.30</b>	<b>4.50</b>
<b>Evening Snack</b>	<b>12.26</b>	<b>0.15</b>	<b>6.43</b>	<b>1.96</b>	<b>2.16</b>	<b>0.14</b>	<b>2.68</b>	<b>1.79</b>
<b>Lunch</b>	<b>2.13</b>	<b>13.51</b>	<b>12.51</b>	<b>0.02</b>	<b>0.48</b>	<b>0.56</b>	<b>0.00</b>	<b>13.74</b>
	<b>17.11</b>	<b>25.83</b>	<b>36.98</b>	<b>1.22</b>	<b>4.70</b>	<b>0.82</b>	<b>34.73</b>	<b>136.81</b>

**Chi Square table Value for 21 Degrees of Freedom for 0.05 is 32.671**

**Null Hypothesis:** There is no impact of time with respect to regions.  
**Alternative Hypothesis:** The time factor has influence on the region.

**Calculated value is greater than table value (136.81 > 32.671) so we reject the Null hypothesis.**

### Weekly:

Weekly Average	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>128.78</b>	<b>45.24</b>	<b>37.83</b>	<b>84.34</b>	<b>28.34</b>	<b>75.30</b>	<b>121.84</b>	<b>54.55</b>
<b>Dinner</b>	<b>143.73</b>	<b>46.54</b>	<b>62.89</b>	<b>29.56</b>	<b>131.29</b>	<b>68.97</b>	<b>642.34</b>	
<b>Evening Snack</b>	<b>151.52</b>	<b>50.46</b>	<b>74.40</b>	<b>118.97</b>	<b>47.95</b>	<b>112.53</b>	<b>152.71</b>	<b>105.31</b>
<b>Lunch</b>	<b>189.07</b>	<b>40.68</b>	<b>52.94</b>	<b>117.41</b>	<b>47.02</b>	<b>106.86</b>	<b>168.65</b>	<b>120.35</b>
	<b>613.09</b>	<b>182.92</b>	<b>228.06</b>	<b>398.24</b>	<b>152.86</b>	<b>377.54</b>	<b>574.49</b>	<b>349.18</b>
E Values:	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>122.82</b>	<b>36.64</b>	<b>45.69</b>	<b>79.78</b>	<b>30.62</b>	<b>115.09</b>	<b>69.95</b>	
<b>Dinner</b>	<b>136.91</b>	<b>40.85</b>	<b>50.93</b>	<b>88.93</b>	<b>34.14</b>	<b>84.31</b>	<b>128.29</b>	<b>77.98</b>
<b>Evening Snack</b>	<b>173.68</b>	<b>51.82</b>	<b>64.61</b>	<b>112.82</b>	<b>43.30</b>	<b>110.65</b>	<b>162.74</b>	<b>98.92</b>
<b>Lunch</b>	<b>179.68</b>	<b>53.61</b>	<b>66.84</b>	<b>116.71</b>	<b>44.80</b>	<b>110.65</b>	<b>168.37</b>	<b>102.33</b>
$\Sigma(O-E)^2 / E$ :	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>0.29</b>	<b>2.02</b>	<b>1.35</b>	<b>0.26</b>	<b>0.17</b>	<b>0.00</b>	<b>0.40</b>	<b>3.39</b>
<b>Dinner</b>	<b>0.34</b>	<b>0.79</b>	<b>2.81</b>	<b>1.73</b>	<b>0.61</b>	<b>0.03</b>	<b>0.07</b>	<b>1.04</b>
<b>Evening Snack</b>	<b>2.83</b>	<b>0.04</b>	<b>1.48</b>	<b>0.45</b>	<b>0.50</b>	<b>0.03</b>	<b>0.62</b>	<b>0.41</b>
<b>Lunch</b>	<b>0.49</b>	<b>3.12</b>	<b>2.89</b>	<b>0.00</b>	<b>0.11</b>	<b>0.13</b>	<b>0.00</b>	<b>3.17</b>
	<b>3.95</b>	<b>5.96</b>	<b>8.53</b>	<b>2.45</b>	<b>1.39</b>	<b>0.19</b>	<b>1.09</b>	<b>8.01</b>
								<b>31.57</b>

**Chi Square table Value for 21 Degrees of Freedom for 0.05 is 32.671**

**Null Hypothesis:** There is no impact of time with respect to regions.  
**Alternative Hypothesis:** The time factor has influence on the region.

**Calculated value is less than table value (31.57 < 32.671) so we accept the Null hypothesis.**

Yearly Average	East	North	North East	North West	South	South East	South West	West
<b>Breakfast</b>	<b>18.35</b>	<b>6.45</b>	<b>5.39</b>	<b>12.02</b>	<b>4.04</b>	<b>10.73</b>	<b>17.36</b>	<b>7.77</b>
<b>Dinner</b>	<b>20.48</b>	<b>6.63</b>	<b>8.96</b>	<b>10.90</b>	<b>4.21</b>	<b>11.80</b>	<b>18.70</b>	<b>9.83</b>
<b>Evening Snack</b>	<b>21.59</b>	<b>7.19</b>	<b>10.60</b>	<b>17.09</b>	<b>6.83</b>	<b>16.03</b>	<b>21.76</b>	<b>15.00</b>
<b>Lunch</b>	<b>26.94</b>	<b>5.80</b>	<b>7.54</b>	<b>16.73</b> </td				

These reports explore how time influences average sales across four food schedules, presenting variations in overall, yearly, monthly, weekly, and daily averages. The results reveal significant impacts on regional sales trends, with the null hypothesis being rejected for overall, yearly, and monthly analyses. However, for weekly and daily averages, the null hypothesis is accepted, indicating no significant impact of time on these shorter timeframes. Analysts can extract seasonal insights from the data, identifying when specific products or food schedules experience heightened or decreased demand for informed seasonal marketing strategies. The reports also allow examination of sales patterns during festive periods, aiding in planning promotions for maximum revenue. Delving into customer behavior patterns aids in tailoring marketing efforts, while insights from the data support strategic operational adjustments and localized strategies tailored to specific regions or time periods.

Chi-Square Analysis is one of the analysis that is scheduled for a later stage during the upcoming phase of the project, taking into account the performance and feedback from users regarding the current analyses.

*Note: It is important to highlight that a date filter will also be implemented for all the pertinent charts, allowing users such as those in sales or controlling to explore various timeframes, including the previous day, week, month, quarter, year, and custom ranges. This feature ensures that users can delve into the details of the charts for a more granular analysis tailored to their specific needs.*

## Rationale for Project Decisions and Procedures

The subsequent explanations outline the justification behind the decisions and procedures implemented in the project:

- Product, region, date and time were selected as the dimensions for the data model as they are crucial for analyzing sales data.
- MS SQL Server and Power BI were selected as the main tools because of their synergy in facilitating a robust data repository and real-time data analytics.
- The designed data model prioritizes scalability, flexibility, simplicity, and user-friendliness for seamless analysis and adaptation to new dimensions and measures.
- Selected analyses offer a comprehensive perspective on product, meal schedules, and regional performance, supporting informed decision-making and strategic planning.
- The Documented results ensures easy sharing and understanding, encompassing detailed explanations of analyses, visualizations, and insights.
- The project was completed promptly by prioritizing critical tasks, adhering to deadlines, and involving end-users from the beginning to ensure the project requirements were met.

## Conclusion

Sylter Fischspezialitäten GmbH's BI application project focuses on enhancing business expansion through comprehensive sales data analysis and informed decision-making. The designed BI application ensures accessibility and swift processing, promoting improved operations, customer satisfaction, and increased sales for the company.

## Strategic Recommendations and Insights:

- Recognizing Salmon's dominance in both sales value and consumption, strategically position and promote Salmon-related products to optimize revenue. Leverage its consistent popularity across all meal schedules for diverse culinary creations and promotions, ensuring maximum sales and heightened customer satisfaction.

- Leverage the popularity of Red Berry Compote, especially during dinner hours, and the consistent appeal of Vanilla Quark throughout the day. Explore opportunities to enhance the visibility of these desserts, potentially offering special promotions during peak hours or adjusting their placement on the menu to maximize sales.
- Identify strategies to enhance the performance of Herring at Rheingoldstrasse Badhonnef, where it currently shows average sales. Consider local preferences, promotional activities, or menu adjustments to boost Herring's appeal and sales in this specific location.
- Lunch is the most consumed meal; East and Southwest show consistent meal preferences. Tailor regional menus and inventory management based on peak meal schedules.
- East and Southwest regions significantly contribute to sales value. Target strategies to improve sales in lagging North and South regions; explore opportunities for regional promotions.
- East region dominates high-performing restaurants. Implement successful strategies from high-performing East restaurants in other regions.
- Salmon and Eel are frequently ordered together. Create bundled promotions or menu deals featuring Salmon and Eel to capitalize on popular item pairs.
- Leverage the BI application to systematically compare sales performance among different branches. Identify high-performing branches to extract valuable insights and implement learnings across the entire network.
- Sales Boundary Analysis establishes upper and lower limits for product sales. Utilize boundary insights for strategic decision-making, pricing adjustments, and forecasting, ensuring products stay within profitable performance ranges.

Implementing these strategic recommendations and insights will not only enhance sales performance but also position the company for a competitive edge in the market. By leveraging the popularity of key products, optimizing menu offerings, and tailoring strategies to regional preferences, Sylter Fischspezialitäten GmbH can drive revenue growth and improve overall business success.

## References

- 5 Business Intelligence Tools You Need to Know. (2023, November 29). Coursera.  
<https://www.coursera.org/articles/bi-tools>
- 19 Best ETL Tools for 2023. (n.d.). Retrieved December 8, 2023, from  
<https://blog.hubspot.com/website/etl-tools>
- Data warehouse. (2023). In Wikipedia.  
[https://en.wikipedia.org/w/index.php?title=Data\\_warehouse&oldid=1186295996](https://en.wikipedia.org/w/index.php?title=Data_warehouse&oldid=1186295996)
- Haije, E. G. (2022, April 6). Top 15 Business Intelligence Tools (BI Tools). Mopinion.  
<https://mopinion.com/business-intelligence-bi-tools-overview/>
- informatica. (n.d.). What is ETL? Informatica. Retrieved December 7, 2023, from  
<https://www.informatica.com/resources/articles/what-is-etl.html>
- MS SQL Server History and Advantages. (2014, September 23). ByteScout.  
<https://bytescout.com/blog/2014/09/ms-sql-server-history-and-advantages.html>
- What are the benefits of Power BI ? - Gestisoft. (n.d.). Retrieved December 7, 2023, from  
<https://www.gestisoft.com/blog/what-are-the-benefits-of-power-bi>

*What is Data Modelling? | Microsoft Power BI.* (n.d.). Retrieved December 7, 2023, from <https://powerbi.microsoft.com/en-ie/what-is-data-modeling/>

*What is ETL? - Extract Transform Load Explained - AWS.* (n.d.). Amazon Web Services, Inc. Retrieved December 7, 2023, from <https://aws.amazon.com/what-is/etl/>

*What is Star Schema?* (2022, April 21). Databricks.  
<https://www.databricks.com/glossary/star-schema>