DECISION-MAKING DASHBOARD DESIGN REPORT

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Student ID: 2092654

CONTENTS

DASHBOARD OVERVIEW

Design Objective

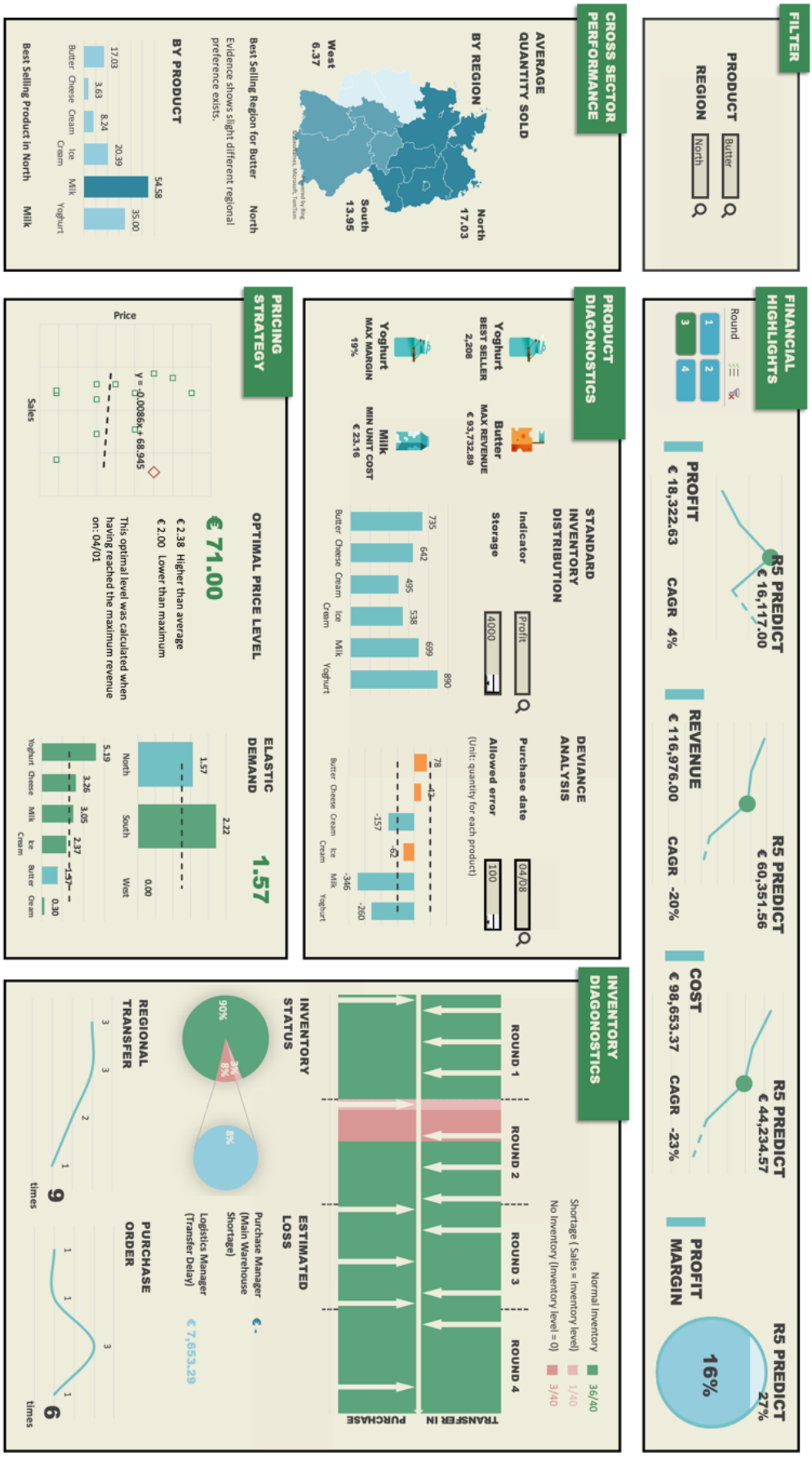
Our client is ERP Dairy, a dairy manufacturing company based in Germany. This dynamic and interactive dashboard is used to help four managerial roles at ERP Dairy to evaluate past performance as well as make insightful and sensible future decisions.

This dashboard contains six sections in total, each of which includes several KPIs targeting different roles, which will be described individually in this report.

Element Summary

Section	Title	Number of KPI
1	Filter	0
2	Financial Highlights	4
3	Cross-Sector Performance	2
4	Product Diagnostics	3
5	Pricing Strategy	2
6	Inventory Diagnostics	3
Total	**6**	**14**

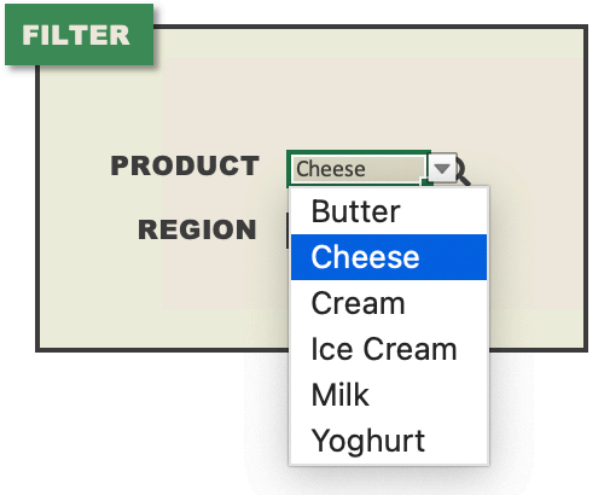
Work Product



DASHBOARD USER GUIDELINE

Section 1: Filter

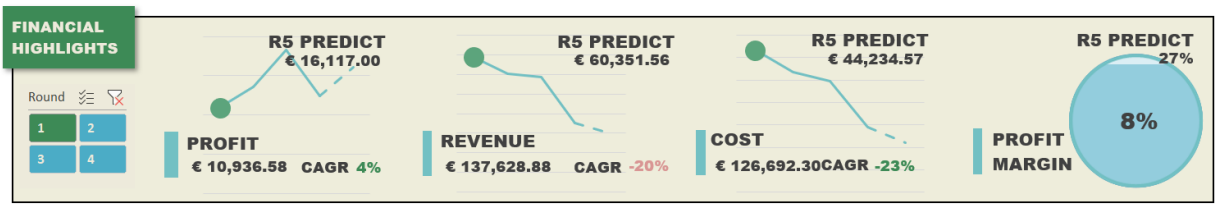
Introduction: This section does not include any KPI directly, but a filter linked with other sections (Specifically section 3, 5, 6), to help the dashboard users access individual performance by selecting different regions and products.



Workings Explanation: This section uses data validation and only allow list values as product and regions. Then, 3*6 = 18 entries could be created as filters, each of the individual performance in section 3, 5, 6 will be shown when specific values selected.

Section 2: Financial Highlights

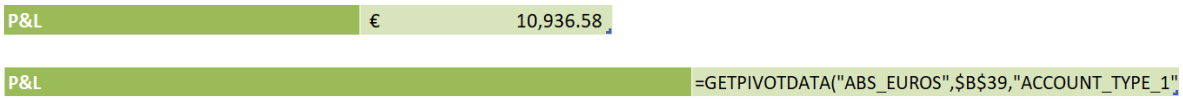
KPI Measure	Dimension	Category	Managerial Role
Profit	Round	Descriptive; Predictive	CEO
Revenue			
Cost			
Profit margin			



Introduction: The prior target for the company is to increase revenue, decrease cost and therefore increase profitability. This section is mainly targeting the CEO to evaluate the company's performance at a broad aspect and thus anticipate into the future. It subtracts several key financial performance indicators from the financial statement and based on which, calculates the CAGR[1] and profit margin. This section also gives a predictive figure for the next round. Dashboard users can filter by round using the slicers on the left-hand side and clear up all the filters to get an added-up value.

Workings Explanation: All KPI in section 2 use very similar techniques. Taking profit for example: there are four dimensions of profit: specific figure (which will be refreshed by using the slicer by simulation round), CAGR, trendline and the predict in round 5.

The profit figure was directly taken from the pivot table. To keep it refreshing dynamically, here a GETPIVOTDATA () function was used.



In the trendline, the solid line shows the data of all rounds, the green point is one figure in a specific round and the dash line shows how the profit trend would go in the next round. Some tricks were used here. Data were separated into three series using IF () function.

[1] $CAGR\ (Compounded\ Average\ Growth\ Rate) = \left(\frac{Figure\ in\ round\ 4}{Figure\ in\ round\ 1}\right)^{\frac{1}{number\ of\ rounds-1}} - 1$

P&L	€ 18,322.63

Round	Series 1 (All rounds figure)	Series 2 (Specif figure filtered by slicer)	Series 3 (Forecasted value)	Round-on-Round Growth Rate
1	€ 10,936.58	#N/A	#N/A	#N/A
2	€ 13,629.87	#N/A	#N/A	25%
3	€ 18,322.63	€ 18,322.63	#N/A	34%
4	€ 12,423.97	#N/A	€ 12,423.97	-32%
5	#N/A	#N/A	€ 16,117.00	#N/A

Series 1 (All rounds figure)	Series 2 (Specif figure filtered by slicer)
=GETPIVOTDATA("ABS_EUROS",$B$4,"SIM_ROUND",B65,"ACCOUNT_TYPE_1","P&L")	=IF(Table14[[#All],[Column2]]=[@[Series 1 (All rounds figure)]], [@[Series 1 (All rounds figure)]], NA())
=GETPIVOTDATA("ABS_EUROS",$B$4,"SIM_ROUND",B66,"ACCOUNT_TYPE_1","P&L")	=IF(Table14[[#All],[Column2]]=[@[Series 1 (All rounds figure)]], [@[Series 1 (All rounds figure)]], NA())
=GETPIVOTDATA("ABS_EUROS",$B$4,"SIM_ROUND",B67,"ACCOUNT_TYPE_1","P&L")	=IF(Table14[[#All],[Column2]]=[@[Series 1 (All rounds figure)]], [@[Series 1 (All rounds figure)]], NA())
=GETPIVOTDATA("ABS_EUROS",$B$4,"SIM_ROUND",B68,"ACCOUNT_TYPE_1","P&L")	=IF(Table14[[#All],[Column2]]=[@[Series 1 (All rounds figure)]], [@[Series 1 (All rounds figure)]], NA())
=NA()	=NA()

The prediction was calculated using three different methods: Compounded by CAGR, average round-on-round growth rate and linear regression. RSME of each method was calculated and a combination of VLOOKUP () and MIN () function was used to help find out which method could bring the smallest RMSE. However, linear regression could bring the least sum of squared errors among the three in general.

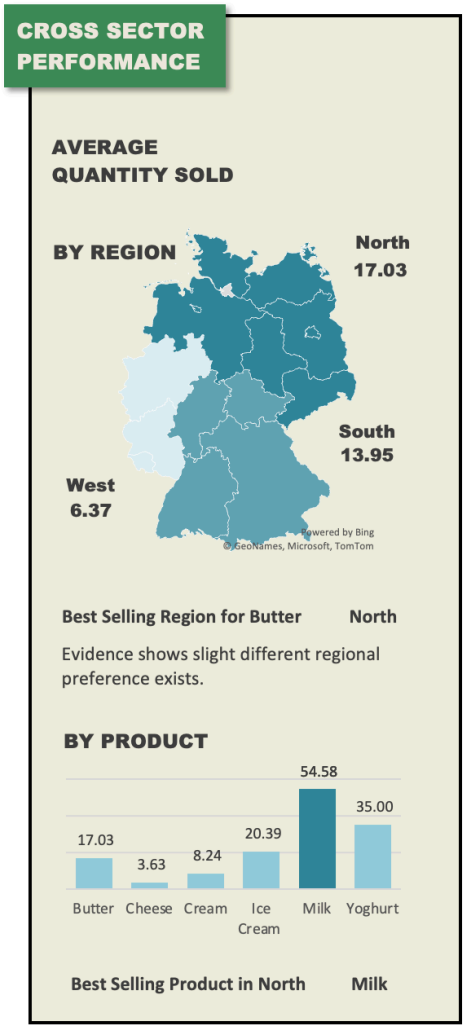
Method	Input Value	Predicted Value	RMSE
AGR	9%	€ 13,536.46	€ 4,893.40
CAGR	4%	€ 12,963.43	€ 4,709.99
LF	#N/A	€ 16,117.00	€ 2,568.17

Round	Real Value	Squared Error (AGR)	Squared Error (CAGR)	Squared Error(LF)
1	€ 10,936.58	#N/A	#N/A	€ 2,305,669.14
2	€ 13,629.87	€ 2,937,756.43	€ 4,921,349.71	€ 67,264.50
3	€ 18,322.63	€ 12,056,807.41	€ 16,817,675.10	€ 16,294,309.10
4	€ 12,423.97	€ 56,841,581.13	€ 44,812,969.40	€ 7,714,684.01

Section 3: Cross-Sector Performance

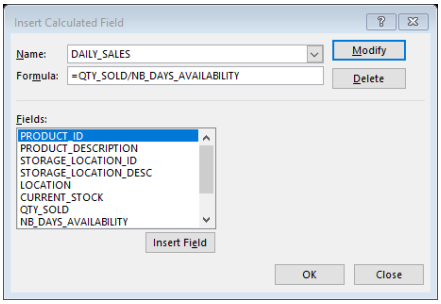
KPI Measure	Dimension	Category	Managerial Role
Average Sold Quantity	Region Product	Descriptive	Logistics Manager

Introduction: This section is linked with the filter in section 1. It described the average daily sold quantity cross product and region. Firstly, the map summarises the average daily sales of each product in different three regions. It also lists the best-selling region and whether different market's preference worth being noticed (in terms of standard deviation). With this, the logistic manager may increase distribution more to those regions with high average daily sales and vice versa. If no evidence showing significantly different market's preference, then that product in different markets might have a similar preference (e.g. cream), logistics manager may distribute the same amount to those regions without considering too much on how to split. Secondly, the column chart describes that of different product in one specific region and highlighted the best-seller in one specific region.



Workings Explanation:

In obtaining the average daily quantity sold. "DAILY_SALES" was calculated as a new field (shown in the screenshot on the right).



Then, using GETPIVOTDATA (), one product's regional performances can be filtered by Section 1. STDEVP () function is used to calculate the standard deviation and mean value of the average daily sold quantity of one specific product.

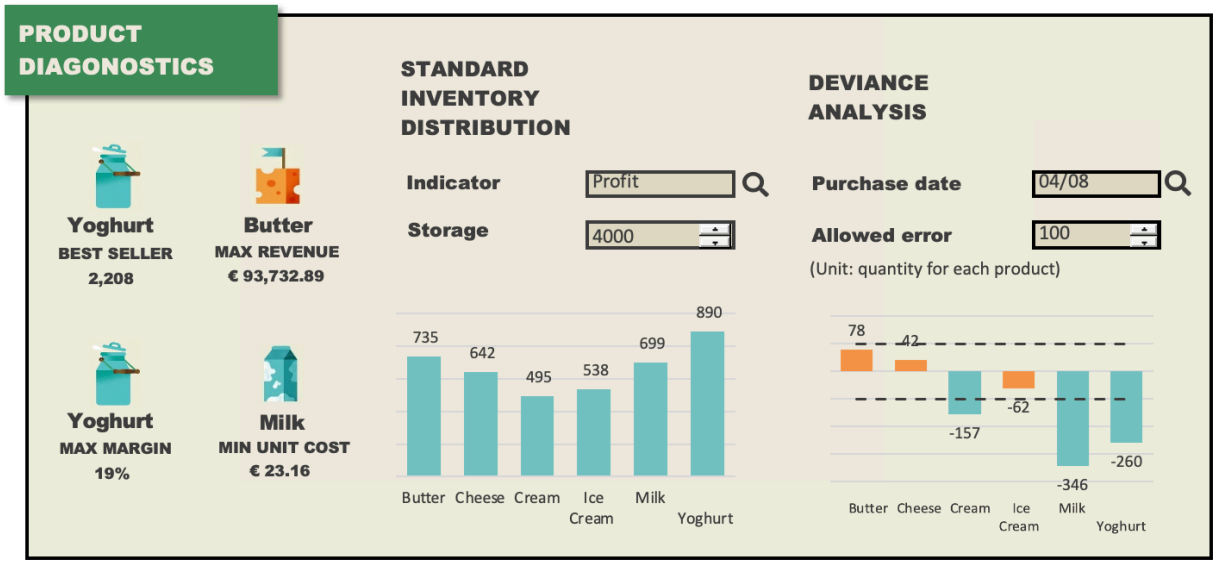
Product	Standard Deviation	Mean
Milk	=STDEVP($G$5:$G$7)	=AVERAGE($G$5:$G$7)
Yoghurt	=STDEVP($H$5:$H$7)	=AVERAGE($H$5:$H$7)
Cheese	=STDEVP($D$5:$D$7)	=AVERAGE($D$5:$D$7)
Ice Cream	=STDEVP($F$5:$F$7)	=AVERAGE($F$5:$F$7)
Butter	=STDEVP($C$5:$C$7)	=AVERAGE($C$5:$C$7)
Cream	=STDEVP($E$5:$E$7)	=AVERAGE($E$5:$E$7)

The alert of difference consumption preference among regions uses an IF () function and follows the thresholds below:

Standard Deviation	Regional preference
>20	Significantly different
4-20	Slightly different
<4	No difference

Section 4: Product Diagnostics

KPI Measure	Dimension	Category	Managerial Role
Star product	Product	Descriptive	Purchase Manager
Inventory distribution		Prescriptive	
Purchase decision evaluation		Descriptive	CEO, Purchase Manager



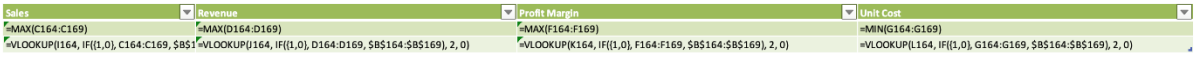
Introduction: This section contains three KPIs. First, it lists four star products. Secondly, to help the purchase manager to split the stock capacity among different products, a column chart standardizes the target the purchase manager should have set, by splitting the whole inventory level (4,000 units with additional charges for extra) among six products. This could have been done in terms of revenue, profit or quantity sold, depending on the manager's strategy. Lastly, this section includes a column chart for the purchase manager as well as the CEO to evaluate how the manager has done so far compared to the standard inventory distribution. Past performance of purchase is calculated. In doing so, a comparison between the manager's decision and the optimal level can be drawn to evaluate the manager's preciseness in capturing the market's demand. Negative and positive differences were shown on different sides of

the x-axis. Any difference that exceeds the pre-set allowed error (in setting the target) will be highlighted as orange.

Workings Explanation:

A combination of MAX (), MIN () and VLOOKUP () function were also used to help find out which product has the maximum or minimum value. Here an IF ({1,0}, Range 1, Range 2) function was used to lookup reversely.

Sales	Revenue	Profit Margin	Unit Cost
2,208	€ 93,732.89	19%	€ 23.16
Yoghurt	Butter	Yoghurt	Milk



Sales	Revenue	Profit Margin	Unit Cost
=MAX(C164:C169)	=MAX(D164:D169)	=MAX(F164:F169)	=MIN(G164:G169)
=VLOOKUP(I164, IF({1,0}, C164:C169, $B$1	=VLOOKUP(J164, IF({1,0}, D164:D169, $B$164:$B$169), 2, 0)	=VLOOKUP(K164, IF({1,0}, F164:F169, $B$164:$B$169), 2, 0)	=VLOOKUP(L164, IF({1,0}, G164:G169, $B$164:$B$169), 2, 0)

Individual revenue, profit and quantity sold of each product are calculated as fractions. For example, butter has a revenue of € 93732.89, making up 21% of the total revenue. The standard inventory distribution is obtained by multiplying 21% by stock capacity (4, 000 by default). Here this dashboard adds a spinner to adjust to capacity with an additional charge of € 300 in exchange for 1, 000 units capacity.

Past purchase performances are calculated using quantity sold and entire stock level. To determine when a purchase occurred, IF () function is used. If the entire stock level went up, there should be a purchase order[2]. For example, on 01/01, the stock level of butter was 0, at 01/02, it went up to 600. However, no sales were made on 01/01, a real purchase of 600 plus the stock level on 01/01 (0), we can determine that the purchase manager has set a target of 600. Since the game used a pull strategy, an important assumption made that products arrived on the first day after purchase orders have been created. Lastly, the difference between the target and optimal level was calculated as the manager's decision-making deviation. Data validation was used here to check the date when the manager has set a target.

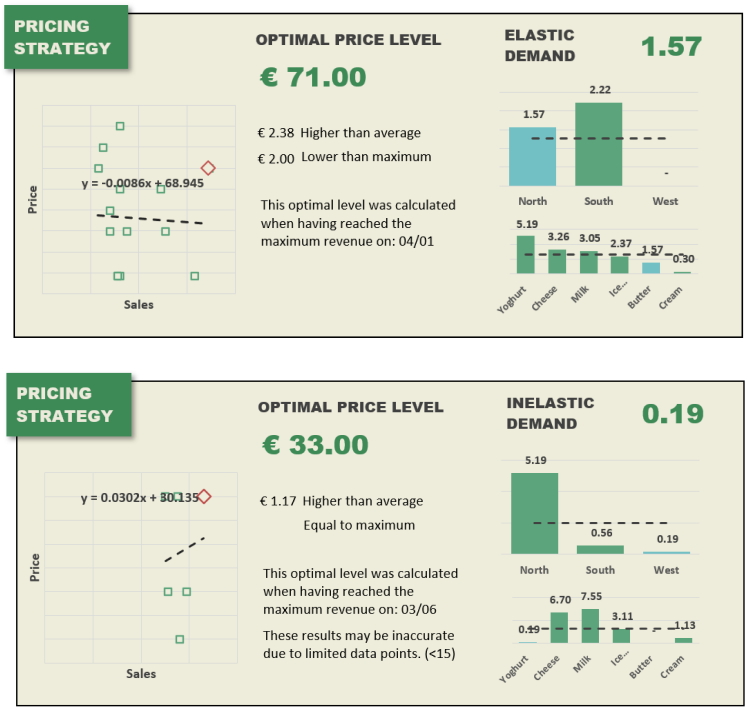
[2] To determine how many products have been bought:

$Real\ Purchase$ = Stock level on 2^{nd} day – Stock level on 1^{st} day + Sales on 1^{st} day

$Target$ = Real Purchase + Stock level on 1^{st} day

Section 5: Pricing Strategy

KPI Measure	Dimension	Category	Managerial Role
Optimal price level	Product/Region	Prescriptive	Pricing Manager
Price Elasticity of Demand		Descriptive	



Filtered by Butter/North (Above) and Yoghurt/West (Below)

Introduction: This section contains two KPIs. Firstly, it calculates the price elasticity of demand by different regions and products. Dashboard user can filter individual performance using section 1 and compare it in the column chart, with the same product in different regions and different products in one region. For products with high elasticity (>1), the price should be increased carefully since those markets are very sensitive to price change. Secondly, this section gives an optimal price level. This optimal was obtained when the revenue reached the highest among all these points. Alerts of impreciseness will be provided when selecting those products/regions whose number of data points is less than 15.

Workings Explanation:

This section used sales and daily average price. Firstly, these data have been cleaned. Zero values (when no sales occur) were filled with NA () function (It is important to

remove all these zeros, otherwise, excel will automatically take zero values into the regression). And when sales equal to stock level, these data points were supposed to be outliers. This was because the sold quantity cannot truly reflect the market's real demand, where stock level can be the limiting factor. Using IF () and VLOOKUP () functions, the date of inventory shortage can be determined, and NA () can be used to cover these values with #N/A. Then, a scatter was plotted using those cleaned data.

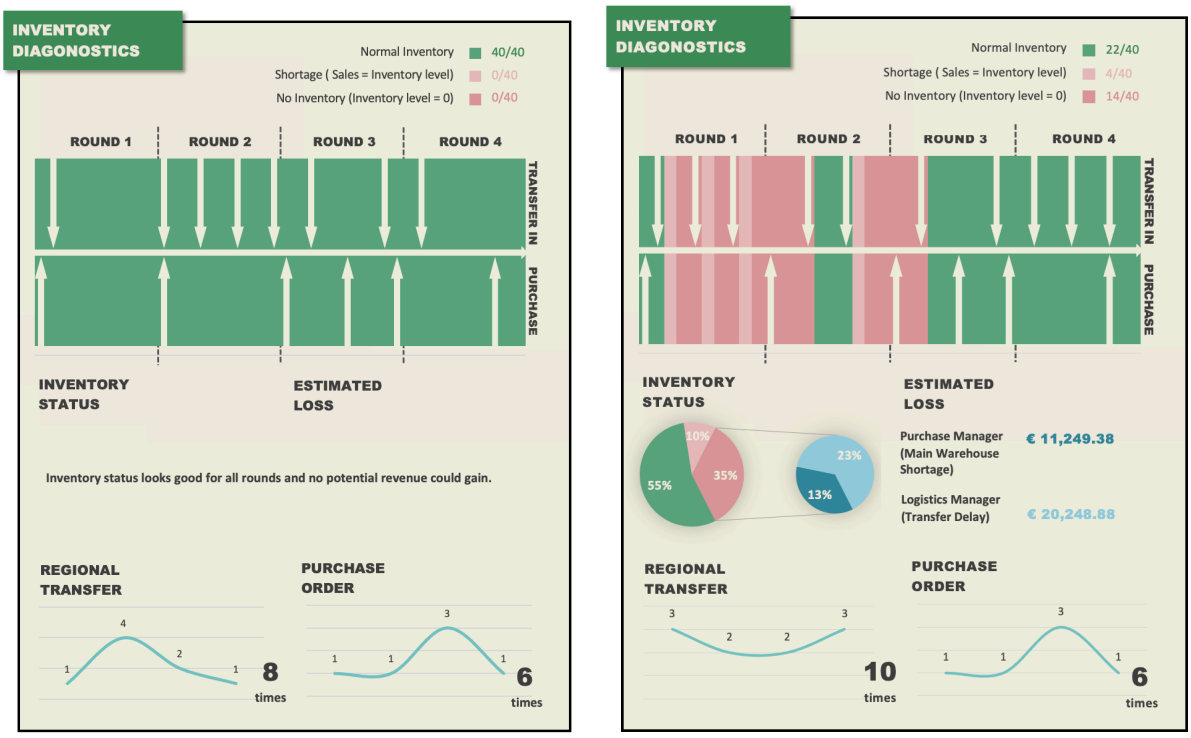
Using MAX () and VLOOKUP () functions, the date which brought the maximum revenue can be determined. Thus, the corresponding price was taken as the optimal price level. Moreover, the average and maximum price of a specific region/product are calculated using AVERAGE () and MAX () functions. Those difference were calculated and shown on the dashboard. Text alters works using IF () functions. For example, if the optimal price was higher than the average price, the dashboard will show a “Higher than average”.

Price elasticity of demand was calculated using the mid-point method[3]. Two extreme points with the highest and lowest price are found using MAX (), MIN () and VLOOKUP () functions. Since one price might have many different sales, here another table was used for calculating the average for all the corresponding prices.

Section 6: Inventory Diagnostics

KPI Measure	Dimension	Category	Managerial Role
Inventory status	Product/Region	Descriptive	CEO, Purchase Manager, Logistics Manager
Estimated loss			CEO
Regional Transfer			Logistics Manager
Purchase			Purchase Manager

[3] $PED\ (Price\ Elasticity\ of\ Demand) = \frac{Change\ of\ Sales}{Change\ of\ Quantity} * \frac{Sum\ of\ Quantity}{Sum\ of\ Price}$



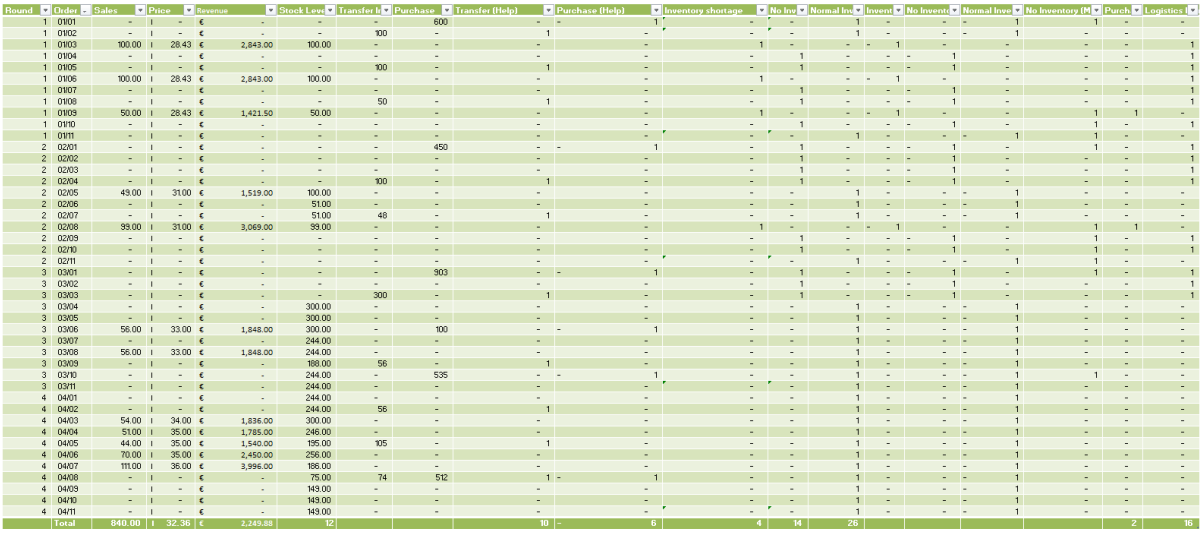
Filtered by Cheese/North (Left) and Yoghurt/North (Right)

Introduction: This section is also connected with section 1. It contains three KPIs. Inventory is a very important factor. If supply cannot meet the market demand, losses will incur. It is good for both purchase and logistics managers to identify which product/region has the worst inventory status and increase supply frequency and target correspondingly. Also, it could be useful to the CEO to evaluate and improve coordination efficiency. Firstly, a graph with time series is given, it illustrates how inventory status changed over time and with purchase orders been and regional transfer been made. Secondly, inventory status is calculated out of 40 and summarised as percentages. Since no inventory could mean potential losses, another pie chart is created to show how much loss should the purchase manager and logistic manager be responsible respectively. Thirdly, it gives a figure of how many times in total have purchase orders and regional transfer been made, which are also shown in the line chart with simulation round.

Workings Explanation:

Here a table was created for each Product/Region. A mixture of VLOOKUP () and IF () functions are used to create dummy variables. For example, if stock level = 0, then

“no inventory” will be labelled as 1, otherwise 0. The sum of dummies directly represents the total number of times.



Round	Order	Sales	Price	Revenue	Stock Leve	Transfer I	Purchase	Transfer (Help)	Purchase (Help)	Inventory shortage	No Inv	Normal Inv	Invent	No Invent	Normal Inve	No Inventory (M	Purch	Logistics I
1	01/01	-	-	€ -	-	-	600	-	1	-	-	1	-	-	1	1	-	-
1	01/02	-	-	€ -	-	100	-	1	-	-	-	1	-	-	1	-	-	-
1	01/03	100.00	28.43	€ 2,843.00	100.00	-	-	-	-	1	-	-	1	-	-	-	-	1
1	01/04	-	-	€ -	-	-	-	-	-	-	1	-	-	1	-	-	-	1
1	01/05	-	-	€ -	-	100	-	1	-	-	1	-	-	1	-	-	-	1
1	01/06	100.00	28.43	€ 2,843.00	100.00	-	-	-	-	1	-	-	1	-	-	-	-	1
1	01/07	-	-	€ -	-	-	-	-	-	-	1	-	-	1	-	-	-	1
1	01/08	-	-	€ -	-	50	-	1	-	-	1	-	-	1	-	-	-	1
1	01/09	50.00	28.43	€ 1,421.50	50.00	-	-	-	-	1	-	-	1	-	-	1	1	-
1	01/10	-	-	€ -	-	-	-	-	-	-	1	-	-	1	-	1	-	1
1	01/11	-	-	€ -	-	-	-	-	-	-	-	1	-	-	1	1	-	-
2	02/01	-	-	€ -	-	-	450	-	1	-	1	-	-	1	-	1	-	1
2	02/02	-	-	€ -	-	-	-	-	-	-	1	-	-	1	-	-	-	1
2	02/03	-	-	€ -	-	-	-	-	-	-	1	-	-	1	-	-	-	1
2	02/04	-	-	€ -	-	100	-	1	-	-	1	-	-	1	-	-	-	1
2	02/05	49.00	31.00	€ 1,519.00	100.00	-	-	-	-	-	-	1	-	-	1	-	-	-
2	02/06	-	-	€ -	51.00	-	-	-	-	-	-	1	-	-	1	-	-	-
2	02/07	-	-	€ -	51.00	48	-	1	-	-	-	1	-	-	1	-	-	-
2	02/08	99.00	31.00	€ 3,069.00	99.00	-	-	-	-	1	-	-	-	1	-	-	1	-
2	02/09	-	-	€ -	-	-	-	-	-	-	1	-	-	1	-	1	-	1
2	02/10	-	-	€ -	-	-	-	-	-	-	1	-	-	1	-	1	-	1
2	02/11	-	-	€ -	-	-	-	-	-	-	-	1	-	-	1	1	-	-
3	03/01	-	-	€ -	-	-	903	-	1	-	1	-	-	1	-	1	-	1
3	03/02	-	-	€ -	-	-	-	-	-	-	1	-	-	1	-	-	-	1
3	03/03	-	-	€ -	-	300	-	1	-	-	1	-	-	1	-	-	-	1
3	03/04	-	-	€ -	300.00	-	-	-	-	-	-	1	-	-	1	-	-	-
3	03/05	-	-	€ -	300.00	-	-	-	-	-	-	1	-	-	1	-	-	-
3	03/06	56.00	33.00	€ 1,848.00	300.00	-	100	-	1	-	-	1	-	-	1	-	-	-
3	03/07	-	-	€ -	244.00	-	-	-	-	-	-	1	-	-	1	-	-	-
3	03/08	56.00	33.00	€ 1,848.00	244.00	-	-	-	-	-	-	1	-	-	1	-	-	-
3	03/09	-	-	€ -	188.00	56	-	1	-	-	-	1	-	-	1	-	-	-
3	03/10	-	-	€ -	244.00	-	535	-	1	-	-	1	-	-	1	1	-	-
3	03/11	-	-	€ -	244.00	-	-	-	-	-	-	1	-	-	1	-	-	-
4	04/01	-	-	€ -	244.00	-	-	-	-	-	-	1	-	-	1	-	-	-
4	04/02	-	-	€ -	244.00	56	-	1	-	-	-	1	-	-	1	-	-	-
4	04/03	54.00	34.00	€ 1,836.00	300.00	-	-	-	-	-	-	1	-	-	1	-	-	-
4	04/04	51.00	35.00	€ 1,785.00	246.00	-	-	-	-	-	-	1	-	-	1	-	-	-
4	04/05	44.00	35.00	€ 1,540.00	195.00	105	-	1	-	-	-	1	-	-	1	-	-	-
4	04/06	70.00	35.00	€ 2,450.00	256.00	-	-	-	-	-	-	1	-	-	1	-	-	-
4	04/07	111.00	36.00	€ 3,996.00	186.00	-	-	-	-	-	-	1	-	-	1	-	-	-
4	04/08	-	-	€ -	75.00	74	512	1	1	-	-	1	-	-	1	-	-	-
4	04/09	-	-	€ -	149.00	-	-	-	-	-	-	1	-	-	1	-	-	-
4	04/10	-	-	€ -	149.00	-	-	-	-	-	-	1	-	-	1	-	-	-
4	04/11	-	-	€ -	149.00	-	-	-	-	-	-	1	-	-	1	-	-	-
	Total	840.00	32.36	€ 2,243.88	12			10	6	4	14	28					2	16

The estimated loss was calculated by multiplying the number of unavailable days with the average daily revenue. And it splits this figure between the purchase manager and logistics manager. It is the purchase manager’s responsibility if the main warehouse has no inventory (nothing could be transferred by the logistics manager). Otherwise, it should be the logistics manager be responsible for the transfer delay.

Role	Perventage	Estimated loss breakdown
Total	1	=Table2[[#Totals],[Revenue]]*Table2[[#Totals],[No Inventory]]
=IF(X54=0, "", "Purchase Manager")	=IFERROR(Table2[[#Totals],[Purchase Manager]]/SUM(Table2[[#Totals],[Purchase Manager]:[Logistics Manager]]),"")	=IF($X$54=0, "", W55*$X$54)
=IF(X54=0, "", "Logistics Manager")	=IFERROR(Table2[[#Totals],[Logistics Manager]]/SUM(Table2[[#Totals],[Purchase Manager]:[Logistics Manager]]), "")	=IF($X$54=0, "", W56*$X$54)

DASHBOARD EVALUATION

Overall evaluation

For this dashboard, most of the figures and calculations were done outside the pivot table. This was to ensure comparison across different pivot tables (cannot be done directly in one since they are connected to different data sources) can be made and come up with a more sensible and insightful interpretation. Although the data could only be refreshed with the existing data, manual adjustments might be needed if the dataset extends for more rounds, which could be a limitation.

Moreover, the linkage among each section is weak. In later refinement, sections could be linked more closely. For example, how logistics manager going to split across regions and how purchase manager utilise the capacity could be linked more quantitatively.

Concerning techniques applied, since most of the values are linked with the text box, conditional formatting is in limited usage.

Evaluations and further developments by section

Section	Evaluations and further developments
1	This section does allow other sections to be filtered by product and region. However, it does not allow users to check for an added-up figure for multiple choices and only linked with section 3, 5 and 6. In later refinement, this could be added. Also, more filter types could be added such as round number.
2	More financial analysis can be added to this section (e.g. cost breakdown) and also allow users to check for figures other than rounds, but also across different products and regions.

3	It could be more precise and provide more quantitative suggestions. For example, how many products exactly needs to be distributed to each of the three regions.
4	This section has specified the detailed level in real number, which is so far so useful. For refinement, more connections could be made between different sections.
5	For some of the products and regions, existing data points are very limited. As a result, the r-squared for most of the region/product is rounded to zero. If more data is available in the later rounds, the goodness-of-fit could be improved. Also, more explanatory variables (taking milk for example, the sales of yoghurt might have influenced its sales given that they are substitutes) could be added. This will lead us to a multivariate linear regression. This part listed the demand function on the top-right corner. When enough data points obtained to run regression between price and sales, the optimal price level can be obtained by taking the first derivative of the revenue function at zero.
6	Given that the whole game used pull strategy, here this dashboard assumes that there was only one day delay in orders being made and the arrival of products. Sometimes it may take longer so it might be good to male this delivery day as an adjustable input number to see how things change. Here in this section, it only allows checking individual performance. Summary of the entire span of products and regions could be added.

PRIORITIZED PRODUCT BACKLOG

Managerial Role	Requirement	Priority	Workload	Sprint	Status
Purchase Manager	Make decisions on how to split stock capacity among products.	Must	Large	1	Prototype completed but to be refined
Logistics Manger	Make decisions on how to split a given number of products in the main warehouse into different regions.	Must	Small		
CEO	Evaluate the company's performance in terms of financial indicators.	Must	Small		
Pricing Manager	Find the optimal price level of each product in each region.	Must	Medium		
Logistics Manger	Decide on frequency of regional transfer needs to be made.	Must	Large	2	

Purchase Manager	Decide on frequency of purchase order needs to be made.	Must	Large	
Logistics Manger	Evaluate past regional transfer performance.	Should	Large	3
Purchase Manager	Justify if it is worth paying an additional charge in exchange for extra stock capacity.	Should	Large	
Purchase Manager	Evaluate past purchase performances.	Could	Large	4

CEO	Evaluate managers' decision usefulness, coordination and efficiency.	Should	Large		
Pricing Manager	Compare markets' sensitivity towards price changes.	Should	Medium		
Pricing Manager	Evaluate past pricing strategy.	Could	Large	5	To be started