

# Case Study: Multidimensional Analysis using Microsoft Excel

## 1 Create a Pivot Table and navigate

### BUSINESS CASE

Robert Jones is a manager of several sales organizations at Global Bike Inc. and his responsibilities are monitoring and managing sales activities. He has a number of OLTP systems to assist with the recording of day-to-day transactions. At the end of each month, he is provided with a report which displays each sale. The format of the report is illustrated below. Although this report provides a lot of information, the information is not in a format that can easily assist in the type of decisions you are required to make. Robert has decided to examine the PivotTables as means of producing more useful reports.

The sales data is delivered by the IT Department in the following format (click to enlarge):

YEAR	MONTH	DAY	Customer	CustomerDescr	City	Salesorg	Country	OrderNumbr	Orderitem	Product	ProductDesc	Product C	Division	SalesC	UnitOf	Revenue	Currency	Discount	CostOfGoods	Revenue	USD	Discount	USD	Cogm	USD
2007	1	1	5000	Beantown Bikes	Boston	UE00	US	100001	10	DXTR2000	Deluxe Touri	TOU	BI	2	ST	6000	USD	300	2800	6000	6000	300	2800	2800	
2007	1	1	5000	Beantown Bikes	Boston	UE00	US	100001	20	PRTR2000	Professional	TOU	BI	5	ST	16000	USD	800	7500	16000	16000	800	7500	7500	
2007	1	1	5000	Beantown Bikes	Boston	UE00	US	100001	30	ORMN1000	Men's Off R	ORB	BI	1	ST	2400	USD	120	1200	2400	2400	120	1200	1200	
2007	1	1	5000	Beantown Bikes	Boston	UE00	US	100001	40	ORHT1000	Men's Off R	ORB	BI	1	ST	1600	USD	80	900	1600	1600	80	900	900	
2007	1	1	5000	Beantown Bikes	Boston	UE00	US	100001	50	DXRD1000	Deluxe Road	ROB	BI	7	ST	11900	USD	595	7000	11900	11900	595	7000	7000	
2007	1	1	5000	Beantown Bikes	Boston	UE00	US	100001	60	DXRD2000	Deluxe Road	ROB	BI	2	ST	3300	USD	165	1900	3300	3300	165	1900	1900	
2007	1	1	5000	Beantown Bikes	Boston	UE00	US	100001	70	PRRD1000	Professional	ROB	BI	2	ST	8000	USD	400	4400	8000	8000	400	4400	4400	
2007	1	1	5000	Beantown Bikes	Boston	UE00	US	100001	80	OHMT1000	Off Road Hel	ACC	AS	1	ST	50	USD	2,5	25	50	50	2,5	25	25	
2007	1	1	5000	Beantown Bikes	Boston	UE00	US	100001	90	CAGE1000	Water Bottle	ACC	AS	1	ST	18	USD	0,9	9	18	18	0,9	9	9	
2007	1	1	5000	Beantown Bikes	Boston	UE00	US	100001	100	RKIT1000	Repair Kit	ACC	AS	1	ST	32	USD	1,6	16	32	32	1,6	16	16	
2007	1	1	5000	Beantown Bikes	Boston	UE00	US	100001	110	PUMP1000	Air Pump	ACC	AS	13	ST	364	USD	18,2	182	364	364	18,2	182	182	
2007	1	1	5000	Beantown Bikes	Boston	UE00	US	100001	120	FAID1000	First Aid Kit	ACC	AS	7	ST	280	USD	14	140	280	280	14	140	140	
2007	1	1	15000	Bavaria Bikes	München	DS00	DE	100002	10	DXTR1000	Deluxe Touri	TOU	BI	2	ST	4901,6	EUR	245,08	3770,2	6600	6600	330	2800	2800	
2007	1	1	15000	Bavaria Bikes	München	DS00	DE	100002	20	DXTR2000	Deluxe Touri	TOU	BI	1	ST	2450,8	EUR	122,54	1885,1	3300	3300	165	1400	1400	
2007	1	1	15000	Bavaria Bikes	München	DS00	DE	100002	30	PRTR2000	Professional	TOU	BI	3	ST	7842,54	EUR	392,13	6059,25	10559,98	10559,98	528	4500	4500	
2007	1	1	15000	Bavaria Bikes	München	DS00	DE	100002	40	PRTR3000	Professional	TOU	BI	2	ST	5228,36	EUR	261,42	4039,5	7039,99	7039,99	352	3000	3000	

### TASK

The purpose of this exercise is to create a PivotTable in Microsoft Excel in order to analyze the data using the multi-dimensional reporting. A number of multi-dimensional navigational techniques will be introduced. Moreover, some special techniques for presenting key figures will be shown.

#### 1.1 Open the Excel file

Open **Excel 2010** and the file [SalesdataPivotV01.xlsx](#).

#### 1.2 Create Pivot Table

Start with a high level overview and create a pivot table, which shows the revenue in Germany and the US throughout the years.

Sum of Revenue USD		Column Labels		
Row Labels	DE	US	Grand Total	
2007	\$30.951.628	\$29.764.202	\$60.715.830	
2008	\$31.445.647	\$27.998.418	\$59.444.065	
2009	\$31.765.085	\$20.845.731	\$52.610.816	
2010	\$34.191.745	\$21.662.670	\$55.854.415	
2011	\$35.146.741	\$21.479.002	\$56.625.743	
<b>Grand Total</b>	<b>\$163.500.846</b>	<b>\$121.750.023</b>	<b>\$285.250.869</b>	

#### 1.3 Rotate

Rotate the view by swapping the axes.

Sum of Revenue USD	Column Labels	2007	2008	2009	2010	2011	Grand Total
DE		\$30.951.628	\$31.445.647	\$31.765.085	\$34.191.745	\$35.146.741	\$163.500.846
US		\$29.764.202	\$27.998.418	\$20.845.731	\$21.662.670	\$21.479.002	\$121.750.023
<b>Grand Total</b>		<b>\$60.715.830</b>	<b>\$59.444.065</b>	<b>\$52.610.816</b>	<b>\$55.854.415</b>	<b>\$56.625.743</b>	<b>\$285.250.869</b>

You can observe a different behavior of two countries: whereas Germany shows a continuous increase in revenue, there is a sharp decline in the US in 2009. Try now to identify reasons for this behaviour in the data! Do this by slicing the data (see the next step).

## 1.4 Slice

We analyze the data from Germany first and, therefore, do a slice on country. Switch the Key figure to *Revenue* in local currency.

Sum of Revenue	Column Labels	2007	2008	2009	2010	2011	Grand Total
DE		22.986.729 €	23.353.620 €	23.590.854 €	25.393.053 €	26.102.295 €	121.426.551 €
<b>Grand Total</b>		<b>22.986.729 €</b>	<b>23.353.620 €</b>	<b>23.590.854 €</b>	<b>25.393.053 €</b>	<b>26.102.295 €</b>	<b>121.426.551 €</b>

## 1.5 Drill down to Sales Organization and Customer

As next, drill down to the sales organization. There is no dependency visible: both sales organizations behave similarly.

Country	DE						
Sum of Revenue	Column Labels	2007	2008	2009	2010	2011	Grand Total
DN00		12.424.033 €	12.559.465 €	12.718.046 €	13.653.991 €	13.753.719 €	65.109.253 €
DS00		10.562.696 €	10.794.156 €	10.872.808 €	11.739.062 €	12.348.576 €	56.317.298 €
<b>Grand Total</b>		<b>22.986.729 €</b>	<b>23.353.620 €</b>	<b>23.590.854 €</b>	<b>25.393.053 €</b>	<b>26.102.295 €</b>	<b>121.426.551 €</b>

From sales organization, drill down to customer. Everything looks fine!

Country	DE						
Sum of Revenue	Column Labels	2007	2008	2009	2010	2011	Grand Total
DN00		12.424.033 €	12.559.465 €	12.718.046 €	13.653.991 €	13.753.719 €	65.109.253 €
Alster Cycling		1.603.491 €	1.639.129 €	1.677.483 €	1.760.869 €	1.874.391 €	8.554.183 €
Capital Bikes		2.591.710 €	2.792.880 €	2.814.687 €	2.958.624 €	2.906.314 €	14.964.105 €
Cruiser Bikes		1.708.372 €	1.684.626 €	1.560.919 €	1.751.832 €	1.861.652 €	8.567.401 €
Drahtesel		1.404.113 €	1.288.207 €	1.524.278 €	1.357.803 €	1.429.301 €	7.003.722 €
Fahrpott		1.240.863 €	1.305.697 €	1.200.590 €	1.538.322 €	1.477.796 €	6.763.268 €

## 1.6 Rotation

Check the dependency on the product category and product by rotating the cube.

Country	DE						
<b>Sum of Revenue</b>	<b>Column Labels</b>						
<b>Row Labels</b>	2007	2008	2009	2010	2011	Grand Total	
ACC	190.214,31 €	194.456,55 €	189.237,23 €	202.478,85 €	204.206,90 €	980.593,84 €	
EBI				1.503.480,00 €	1.484.411,00 €	2.987.891,00 €	
E-Bike Tailwind				1.503.480,00 €	1.484.411,00 €	2.987.891,00 €	
ORB	7.022.849,23 €	7.257.383,28 €	7.274.412,22 €	7.712.756,46 €	7.529.578,22 €	36.796.979,41 €	
Men's Off Road Bike Fully	2.788.030,08 €	2.535.323,70 €	2.779.382,40 €	2.968.689,60 €	2.971.596,60 €	14.043.022,38 €	
Men's Off Road Bike Hard Tail (Shimano)	1.112.333,59 €	1.333.333,50 €	1.136.530,40 €	1.295.726,40 €	1.213.887,50 €	6.091.811,39 €	
Men's Off Road Bike Hard Tail (SRAM)	2.001.246,39 €	1.979.106,48 €	2.060.294,40 €	2.216.087,72 €	2.069.510,04 €	10.326.245,03 €	
Women's Off Road Bike Fully	1.121.239,17 €	1.409.619,60 €	1.298.205,02 €	1.232.252,74 €	1.274.584,08 €	6.335.900,61 €	
ROB	6.826.215,08 €	6.754.271,11 €	6.954.173,72 €	6.772.955,09 €	7.355.858,41 €	34.663.473,41 €	
TOU	8.882.504,30 €	9.094.026,60 €	9.113.443,50 €	9.147.821,55 €	9.468.673,58 €	45.706.469,53 €	
TRE	64.946,20 €	53.482,52 €	59.587,15 €	53.561,29 €	59.567,11 €	291.144,27 €	
<b>Grand Total</b>	<b>22.986.729,12 €</b>	<b>23.353.620,06 €</b>	<b>23.590.853,82 €</b>	<b>25.393.053,24 €</b>	<b>26.102.295,22 €</b>	<b>121.426.551,46 €</b>	

We observe the introduction of a new product in 2010: the new *E-bike Tailwind*. Now analyze the new market in more details!

### 1.7 Show percentage values

Compare the new E-bike with other bikes. Filter the last two years an all bikes (filter on *Division!*). Instead of showing the revenue in absolute numbers, show values as % of *Column Total*. Sort the data by revenue. We recognize that the new product already contributes more than 5% to the total revenue!

Country	DE		
Division	BI		
<b>Sum of Revenue</b>	<b>Column Labels</b>		
<b>Row Labels</b>	2010	2011	Grand Total
Professional Road Bike (Shimano)	11,50%	12,68%	12,10%
Men's Off Road Bike Fully	11,78%	11,47%	11,63%
Professional Touring Bike (silver)	9,34%	10,24%	9,80%
Deluxe Touring Bike (silver)	9,38%	8,89%	9,13%
Men's Off Road Bike Hard Tail (SRAM)	8,80%	7,99%	8,39%
Deluxe Road Bike (Shimano)	7,92%	8,44%	8,18%
E-Bike Tailwind	5,97%	5,73%	5,85%
Men's Off Road Bike Hard Tail (Shimano)	5,14%	4,69%	4,91%
Women's Off Road Bike Fully	4,89%	4,92%	4,90%
Professional Touring Bike (black)	4,66%	4,78%	4,72%
Professional Touring Bike (red)	4,64%	4,45%	4,54%
Deluxe Touring Bike (red)	4,15%	4,14%	4,14%
Deluxe Touring Bike (black)	4,14%	4,07%	4,10%
Professional Road Bike (Campagnolo)	2,59%	2,68%	2,64%
Professional Road Bike (SRAM)	2,56%	2,31%	2,43%
Deluxe Road Bike (SRAM)	2,31%	2,29%	2,30%
City Bike Max	0,19%	0,19%	0,19%
Fixed Gear Bike Plus	0,02%	0,04%	0,03%
<b>Grand Total</b>	<b>100,00%</b>	<b>100,00%</b>	<b>100,00%</b>

### 1.8 Drill-through

To finish the analysis of Germany find out, when the new E-bike was sold for the first time. For this have a look at all order items sorted by date.

YEAR	MONTH	DAY	Customer	CustomerDescr
2010	2	1	23000	Red Light Bikes
2010	2	1	20000	Neckarrad
2010	2	4	23000	Red Light Bikes
2010	2	4	20000	Neckarrad
2010	2	4	16000	Capital Bikes

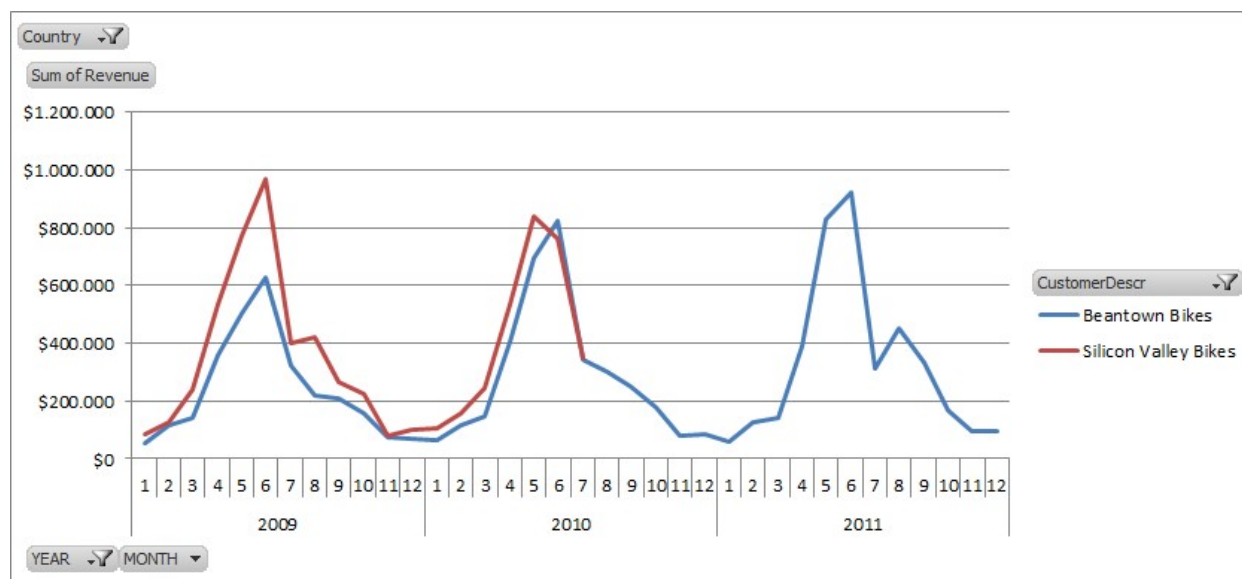
## 1.9 Analyzing the US Data

In the following, we analyze the situation in the US. Remember that we observed a **sharp revenue decline between 2008 and 2009** and we want to find out reasons for this. Therefore change country to US (1) and remove all other filters. Since revenue is in local currency, change the format to \$. In order to obtain Customer and City in two separate columns (2) you have to switch to the *Classic PivotTable layout* (cf. *PivotTable Options*). We observe that a very important customer is lost between 2010 and 2011 (3).

Country		US						
Sum of Revenue		YEAR						
CustomerDescr	City	2007	2008	2009	2010	2011	Grand Total	
Beantown Bikes	Boston	\$4.265.437	\$4.141.214	\$2.853.740	\$3.486.673	\$3.922.744	\$18.669.809	
Big Apple Bikes	New York City	\$2.512.306	\$2.515.725	\$1.701.089	\$1.864.509	\$2.371.440	\$10.965.070	
DC Bikes	Washington DC	\$2.022.173	\$1.930.335	\$1.389.631	\$1.480.469	\$1.813.882	\$8.636.490	
Furniture City Bikes	Grand Rapids	\$942.490	\$894.097	\$579.003	\$670.377	\$742.830	\$3.828.798	
Motown Bikes	De	\$2.204.387	\$1.722.545	\$1.459.930	\$1.615.603	\$1.789.923	\$8.792.389	
Northwest Bikes	Se	\$1.979.204	\$1.863.327	\$1.388.454	\$1.499.900	\$1.843.000	\$8.573.885	
Peachtree Bikes	Atlanta	\$2.084.956	\$1.880.627	\$1.405.432	\$1.359.690	\$1.746.020	\$8.476.725	
Philly Bikes	Philadelphia	\$2.038.263	\$1.861.628	\$1.304.664	\$1.507.449	\$1.798.689	\$8.510.693	
Rocky Mountain Bikes	Denver	\$2.409.330	\$2.470.058	\$1.712.070	\$2.056.063	\$2.165.340	\$10.812.862	
Silicon Valley Bikes	Palo Alto	\$5.504.421	\$5.062.581	\$4.216.176	\$2.989.108	\$1.455.973	\$17.772.286	
SoCal Bikes	Irvine	\$1.778.550	\$1.830.065	\$1.455.127	\$1.622.934	\$1.745.973	\$8.178.555	
Windy City Bikes	Chicago	\$2.022.685	\$1.826.213	\$1.380.414	\$1.509.892	\$1.745.973	\$8.532.463	
<b>Grand Total</b>		<b>\$29.764.202</b>	<b>\$27.998.418</b>	<b>\$20.845.731</b>	<b>\$21.662.670</b>	<b>\$21.479.002</b>	<b>\$121.750.023</b>	

## 1.10 Insert a Chart

We want to explore this in more detail and use a chart to visualize the data. Filter Silicon Valley Bikes and Beantown Bikes Boston and the years 2009 to 2011 (dice operator). Drill down to calendar month and insert a line chart



We observe that revenue of *Silicon Valley Bikes* is zero from August 2010 on. We have to ask the responsible sales person what was

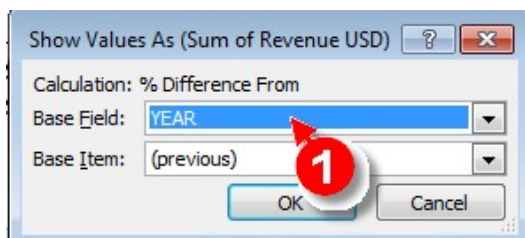
going on here.

## 1.11 Conditional Formatting

In order to detect other effects we remove the filter on the calendar year, **exclude** this customer from the subsequent steps....



... and look at the monthly values compared to the previous year.



This shows a decline in September 2008 (Lehman crisis) which is partially recovered in the following years.

Country	US				
Customer	(Multiple Items)				
Sum of Revenue Column Labels					
Row Labels	2007	2008	2009	2010	2011 €
1		-5,38%	-45,92%	-0,43%	35,76%
2		-0,24%	-37,63%	11,93%	6,59%
3		3,33%	-29,42%	2,18%	15,26%
4		-4,53%	-24,37%	3,87%	10,10%
5		1,43%	-30,84%	13,30%	14,97%
6		3,34%	-30,61%	10,78%	16,10%
7		-3,44%	-31,00%	16,23%	2,41%
8		-5,94%	-34,72%	19,71%	30,96%
9		-26,90%	1,96%	4,73%	21,51%
10		-33,79%		34,39%	7,41%
11		-35,81%		27,08%	15,97%
12		-37,13%	-1,24%	39,11%	24,34%

## CALCULATED KEY FIGURES

So far Robert restricted his investigation to the key figure revenue and found three different incidents which influenced our revenue, being a new innovation in Germany (E-Bike) and Lehman crisis and loss of the biggest customer in the US.

However the original data includes discount and cost of goods manufactured as well. So Robert extends his analysis on **net sales** and **contribution margin**.

**NOTE**

The key figures can be calculated as follows

Net sales = Revenue - Discount

Contribution Margin = Net Sales - Cost of Goods Manufactured

Contribution Margin Ratio = Contribution Margin / Revenue

**TASK**

Now techniques for calculating new key figures based on existing key figures will be shown.

**1.12 Calculate Contribution Margin**

Explore which product made in 2011 the most *Contribution Margin in USD*...

YEAR	2011	
Row Labels	Sum of Contribution Margin USD	Sum of Contribution Margin USD
PRRD1000	\$3.539.785	
ORMN1000	\$3.209.675	
PRTR2000	\$3.242.067	
DXTR2000	\$2.867.288	
DXRD1000	\$2.203.481	
ORHT2000	\$2.205.006	
ORHT1000	\$1.338.220	
PRTR1000	\$1.537.638	
ORWN1000	\$1.422.158	
PRTR3000	\$1.402.108	

**1.13 Calculate Contribution Margin Ratio**

... and the most *Contribution Margin Ratio*

YEAR	2011	
Row Labels	Sum of Contribution Margin USD	Sum of Contribution Margin Ratio
FXGR1000	\$10.792	56,1%
DXTR3000	\$1.285.822	55,4%
DXTR2000	\$2.867.288	55,4%
DXTR1000	\$1.332.920	55,4%
PRTR2000	\$3.242.067	55,4%
PRTR3000	\$1.402.108	55,3%
PRTR1000	\$1.537.638	55,2%
CITY1000	\$56.004	55,2%
PRTR1000	\$1.537.638	55,2%

**2 Develop your Skills****TASK**

Now it is time you practice some of the skills we have just covered.

### **2.1 Flops**

What product sold the least number of units?

### **2.2 Top Seller**

What product category provided the most revenue in 2011?

### **2.3 Sales by Product Category**

What percentage did the off-road bikes contribute to the overall bicycle sales quantity?

In which three cities was this percentage significantly above the average?

### **2.4 Seasonal Behaviour**

Bicycles and accessories are more likely to be bought in spring and summer as in fall and winter time. Find which product is an exception to this rule.

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