

Chart Tamer: Color Design by Function

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ChartTamer

Chart Tamer is an Excel plug-in created by BonaVista, which is now a part of XLcubed (<http://blog.xlcubed.com/excel-chart-tamer/>)

The product, which was developed in collaboration with Stephen Few, is designed to make it easy to create well-designed, effective charts and graphs in Excel. This is in strong contrast to the "eye candy" offered by Office 2007, or the plain ugly charts designed by earlier versions of Excel.

Stephen's presentation at this workshop is broadly about the design of Chart Tamer. This presentation is specifically about the design of the color palette.

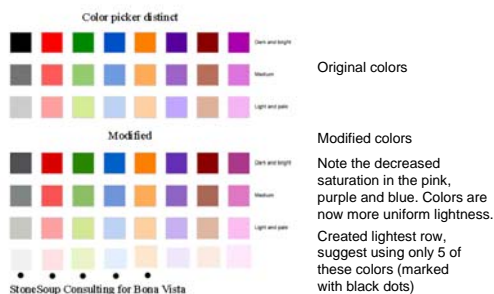
Starting point

Project: created distinct and ordered colors, based on an initial design by Stephen Few.
Note: The colors shown on the right may be slightly different than Stephen's original design, due to file transformations.

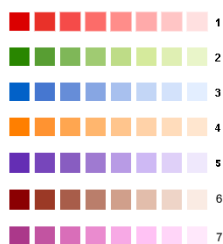
These colors are not bad, but could be improved by making the gradations more even, and also by reducing the saturation of some of the colors



Adjust the distinct colors first



Generate initial ramps

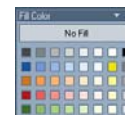


These are algorithmically interpolated in even steps from the lightest to the darkest value for each color in CIELAB space.

Unlike the original ramps, they do not hue shift. Hue shifting ramps, which are recommended by Cynthia Brewer for choropleth maps, often do not perform as well when data is spatially separated and some values may be missing

UI concerns

ChartTamer is an Excel plug-in that will have its own color palette with a custom layout.



Due to system limitations, however, any custom color palettes will also be displayed in the standard Excel palette, which is a 5x8 array, plus another two rows of 8 (not shown)

This constrains the design significantly.

Considerations

1. Total number of colors
2. Expressing ordered colors clearly
3. Making the pale colors recognizable by their relationship to other colors
4. Including black, white and sufficient gray colors

Eliminate pink, add very lights

The client decided the pink and purple were too similar, so we substituted a gold/yellow for the pink.

The client also decided it was very important to include 3 levels of light color for shading tables (rows 3-5). This would require a longer ramp than will fit in the layout, therefore, the ramps are no longer even steps in CIELAB.

Chart Fills
Chart Lines

This sample layout shows the maximum number of colors displayed in a standard Excel array

Focus on function

A key decision in the final design was to design for the most common functions, even if it meant limiting the number of different colors (hues) that could be used.

Another key decision was to try and combine all the colors into a single palette, rather than having one palette for distinct colors and one for ordered colors.

Even with a reduced set of colors, it was impossible to include as many steps in the ordered colors as originally intended. To accommodate all the functions, the lightness steps are uneven, which is contrary to usual practice.

Critical functions and their color characteristics

1. Lines (saturated, dark)
2. Text (as dark as lines, but less saturated (vivid))
3. Bars and areas (medium saturation and lightness)
4. Table shading, 3 levels (very light and desaturated (pastel))
5. Heat maps, hand generated (5-7 steps of ordered colors)

Testing

Colors can only be fully evaluated in context. The client proved me with an Excel spreadsheet with macros for setting its palette (see next slide).

The new colors would apply not only to the examples on that page, but to other examples throughout the workbook.

Change the values in the tables, press gray button

See results in palette and examples

Final version

Each set of colors is labeled by function. The **Dark fills and text** are less saturated versions of the corresponding **Lines** colors, and form the darkest colors in the ordered set (the **Lines** colors would be too vivid in large areas).

The darkest row of the **Medium to light fills** are the same as the **Bars** colors.

The lightest fills can be used as a background for black text. The Dark fills can be used as backgrounds for white text.

The gray fills are slightly tinted, to make them easier to distinguish. The **Borders** are a neutral gray scale.

Examples

Level	6,992.42	5,275.80	7,793.83	5,866.48	-9%	9.35
Level1	712.51	9,095.52	1,108.45	1,915.83	34%	13
Level2	8,081.38	1,019.09	9,666.11	1,235.67	30%	94
Level3	5,729.33	962.61	4,263.62	2,113.10	0%	6
Level4	5,729.33	962.62	2,476.27	1,946.87	-46%	7.12
Level5	2,541.69	8,560.99	2,029.56	3,452.53	2%	6.73

Row Label	Column1	Column2	Column3	Column4	Column5	Col
Level1	5,088.96	9,405.44	3,961.48	1,386.64	-3%	2.86
Level2	6,732.75	8,765.59	6,715.14	9,134.47	34%	6.89
Level3	4,525.09	8,096.79	4,131.84	1,509.62	30%	2.44
Level4	1,956.41	3,217.76	7,547.52	2,752.66	0%	4.1
Level5	4,217.16	2,475.08	6,232.12	2,519.00	-46%	6.81
Level6	8,485.22	9,738.02	5,946.02	5,506.87	2%	7.73

Row Label	Column1	Column2	Column3	Column4	Column5	Col
Level1	7,149.79	6,451.13	3,100.38	9,306.79	-9%	9.78
Level2	4,088.52	2,287.87	8,756.94	7,171.09	34%	1.94
Level3	4,547.76	725.05	6,759.55	5,470.65	30%	1.68
Level4	8,361.35	7,159.43	7,945.28	9,236.35	0%	1.51
Level5	498.89	1,287.03	3,147.86	1,817.46	-46%	3.88
Level6	8,618.52	8,115.14	2,060.66	1,956.24	2%	5.28

Row Label	Column1	Column2	Column3	Column4	Column5	Col
Level1	4,072.34	1,696.00	111.64	8,664.52	-9%	3.20
Level2	7,606.19	6,247.86	5,086.88	147.94	34%	2.66
Level3	7,183.09	390.47	6,147.63	5,698.62	30%	3.31
Level4	5,724.26	7,004.40	4,119.67	3,777.66	0%	5.9
Level5	343.05	6,993.07	9,209.34	5,519.07	-46%	6.11
Level6	1,038.34	4,446.38	3,877.88	2,760.44	2%	6.1

Row Label	Column1	Column2	Column3	Column4	Column5	Col
Level1	9,642.88	7,813.87	9,556.21	6,434.76	-9%	3.14
Level2	5,983.88	4,379.37	800.90	4,428.58	34%	7.50
Level3	3,510.87	1,745.48	3,306.11	8,845.07	30%	1.58
Level4	452.18	2,787.77	6,487.25	9,015.35	0%	6.21
Level5	3,390.58	2,865.70	5,929.59	289.78	-46%	6.21
Level6	1,000.92	2,590.27	8,099.59	8,246.72	2%	4.28

Column2	Column3	Column5	Column6	Row Label	Column1	Column2
7,085.80	-6%	6,065.04	2,609.62	Product 1	6,757.69	3,474.76
1,518.09	34%	9,814.23	2,039.69	Product 2	2,290.13	1,450.24
1,940.06	30%	2,002.20	897.32	Product 3	3,248.07	2,632.28
5,300.47	0%	7,392.03	9,456.99	Product 4	4,579.06	162.27
7,518.28	-46%	8,024.95	7,661.70	Product 5	7,079.26	9,643.52
3,424.78	2%	7,204.48	7,096.70	Product 6	6,372.46	9,226.47
9,833.33	9%	1,444.40	8,066.57	Product 7	9,865.42	778.31
2,297.59	50%	9,494.82	7,403.09	Product 8	7,675.79	1,818.04
5,540.89	26%	8,793.05	1,648.37	Product 9	8,532.44	4,618.62
5,428.11	-6%	4,398.39	8,195.98	Product 10	5,789.59	5,211.22
6,846.80	7%	7,988.77	2,393.62	Product 11	4,763.90	256.78
1,794.18	-33%	683.80	7,153.29	Product 12	8,623.60	7,603.49
1,152.99	-29%	8,066.17	4,170.41	Product 13	5,694.07	565.18
3,415.57	10%	4,688.03	6,147.71	Product 14	6,882.96	8,265.99
4,007.68	47%	6,514.37	5,993.21	Product 15	9,229.94	4,208.40
2,890.81	44%	7,045.20	8,756.07	Product 16	6,118.53	1,378.52
7,063.69	10%	817.16	9,325.02	Product 17	1,288.41	8,754.66
5,672.96	7%	6,990.88	2,470.66	Product 18	4,782.21	5,300.39

Column2	Column3	Column5	Column6	Row Label	Column1	Column2
8,021.34	-6%	3,247.65	9,948.43	Product 1	1,648.59	5,304.14
7,360.94	34%	3,783.61	9,375.28	Product 2	6,994.40	2,788.21
9,692.84	30%	6,156.95	6,438.78	Product 3	1,488.83	2,874.28
2,234.59	0%	1,497.06	3,976.11	Product 4	652.49	4,700.94
8,164.72	-46%	8,000.30	5,961.31	Product 5	2,246.42	5,527.93
5,349.99	2%	8,164.23	9,932.56	Product 6	1,695.95	1,403.28
1,107.88	9%	8,403.87	5,579.74	Product 7	5,321.64	1,663.51
8,449.09	50%	8,281.28	1,661.00	Product 8	1,411.05	7,336.66
1,240.82	28%	4,792.20	3,477.98	Product 9	926.99	6,903.63
1,196.48	-6%	5,896.52	4,900.94	Product 10	8,643.81	9,262.32
3,820.79	7%	4,683.41	5,713.13	Product 11	985.07	3,282.29
3,023.20	-33%	7,465.15	9,596.28	Product 12	1,302.47	2,787.02
7,093.12	-23%	1,284.06	8,618.58	Product 13	6,605.78	6,548.53
9,177.48	10%	3,492.81	1,137.37	Product 14	951.00	2,064.14

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