Visual Information Design

Line charts

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In this edition of our series "Visual Information Design – How to Create Meaningful Reports", which has appeared since January 2017, we would like to look at the representation of line charts. We will answer the following questions:

- When do line charts make sense?
- What do you need to pay attention to when using this type of chart?
- What requirements apply to alternative representations?

When do line charts make sense?

Line charts are used for viewing a progression over time.

Line charts are used to connect individual data points to each other. They help us recognise connections and trends.

Developments in time can be represented, for example. Here the x-axis represents the progression over time. The data on the y-axis depends on the requirements. For example, it may represent multiple quantities such as marketing costs, sales or earnings, or a quantity such as sales across multiple products.

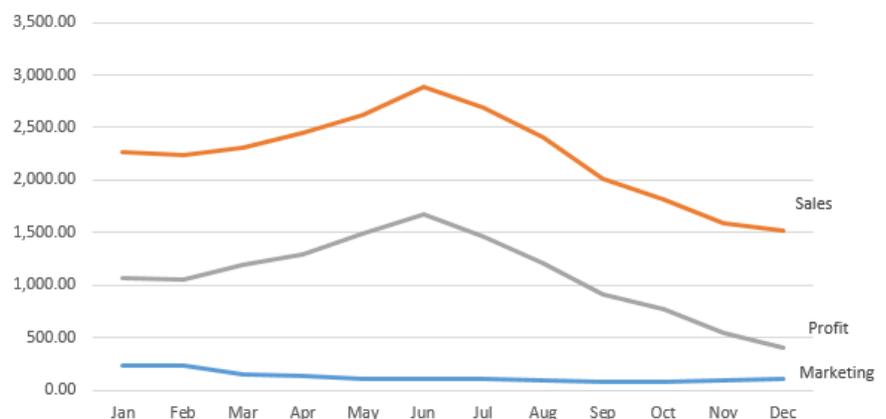Take the two following line charts as an example.

Fig. 1: Line chart for representing the month-by-month progression of sales, profit, and marketing, without key or title.
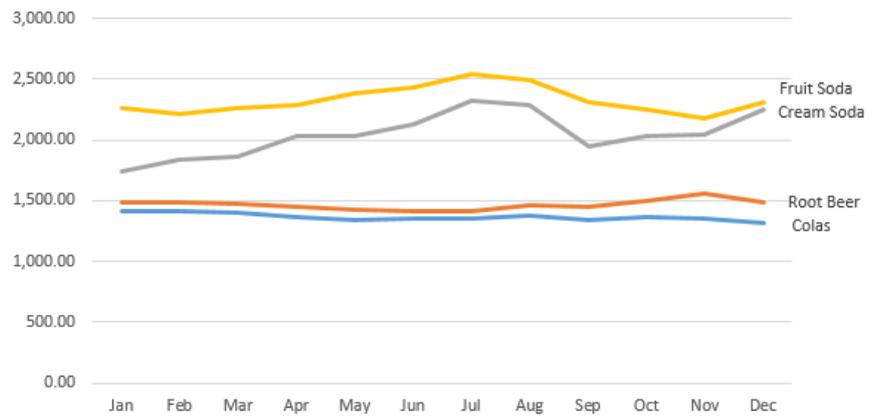
Fig. 2: Line chart for representing the month-by-month progression of a quantity of different product groups, without key or title.

The progression over time of the quantities, or of one quantity across different product groups, can be seen. This makes patterns, trends or any fluctuations easier to identify.

In both examples, we have deliberately kept the number of lines small and also avoided crossing lines.

But how should we deal with representations that contain multiple data series, which also cross each other? How can we represent our data in a meaningful way?

What should you take into consideration when using line charts? What requirements apply to alternative representations?

We recommend using at most five lines.

A representation with multiple lines can certainly lead to crossings. This could occur if sales of a particular product group in multiple markets are to be compared to each other over the course of a year, for example. The human eye detects one crossing immediately. In contrast, many crossings can be hard for the reader to understand. The more lines are represented in a line chart, the higher the probability that they will cross. Therefore, we recommend showing at most five lines in a chart; however, three to four is optimal.

When cases arise in which a chart contains multiple lines and multiple crossings occur, there are options for representing them in a clear and meaningful way: using the "brushing and linking" functions.

Brushing and linking can be used to represent the large number of lines and crossings in a perspicuous way.

Brushing makes it possible to bring individual lines to the foreground by clicking on them. The colours of the lines in the background are attenuated. The linking function can be used to select manually a particular timespan so that this selection or the point of view are transferred automatically to the other reports. This functionality is at its strongest while using dashboards. Since brushing and linking is an interactive functionality in tools, the effect of brushing can only be represented here with "dark" and "light" lines. For printouts this functionality does not help.
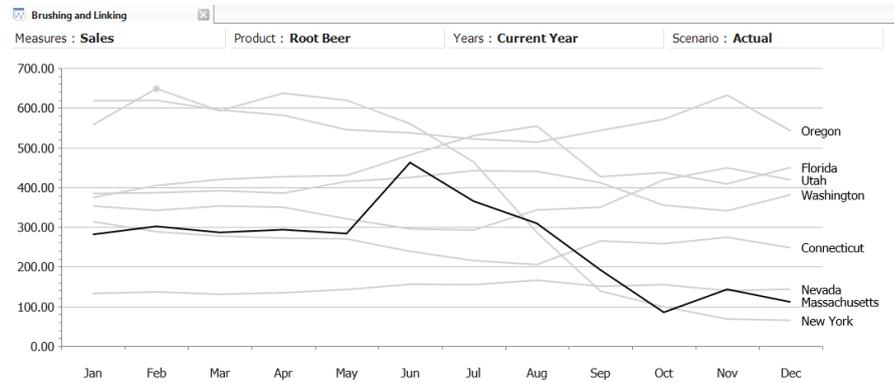
Fig. 3: Example of a representation of a line chart with brushing

If this function is not available to end users, they will need more colours in order to distinguish the individual lines from each other.

For example, if the user wishes to represent a key figure (sales) across multiple product groups and markets, many lines may well arise. These are also called "spaghetti diagrams", which is not a good representation of our data because trends cannot be identified.

A way of representing many lines of data on a chart is to use a small multiple, also known as a trellis chart.
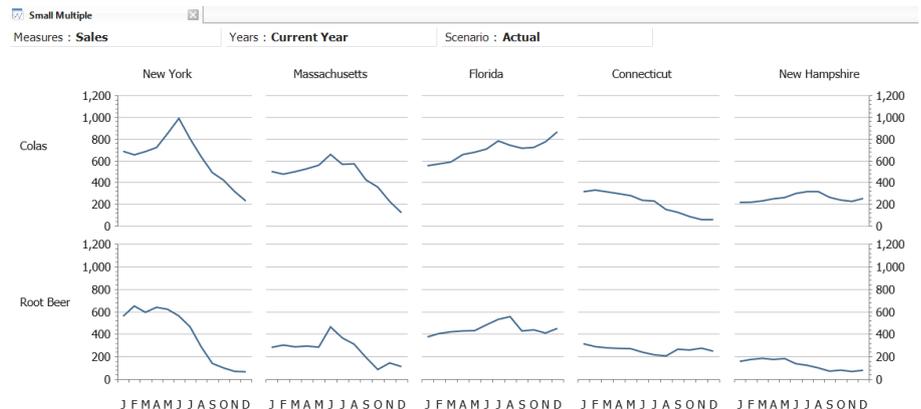

Fig. 4: Example of representing multiple lines as a small multiple

This representation allows each data series to be represented on their own chart. Furthermore, this requires no colour difference for differentiation. In this representation it is important that the axes are the same for all combinations. Conversely, that means that different kpi figures, such as sales and ROI as percentages, are inappropriate for comparison in the rows or columns. However, if you would like to compare a kpi figure across different products, markets or months and years, this representation is a possible alternative. Another possibility would be a planned value line vs. the actual value line for each combination.

Conclusion

Line charts are helpful for identifying patterns over time and also to identify trends. They could also be used to predict the future based on data from the past. This representation allows the values of different kpi figures to be compared to each other well. However, if the chart contains more than five lines, it is probable that there will also be more crossings, making the representation hard to understand. The brushing and linking functions interactively and small multiples can provide clarity in such cases. For printouts brushing and linking does not help.

For greater readability, you should use a title and format the axes accordingly as well.

You can find further helpful tips for representing information better in our Visual Information Design series.

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