Misleading graphics

Looking at the flurry of examples of poorly presented data we can try to paraphrase the well-known sentence about the gradation of lies. There are ordinary lies, damned lies, statistics and the highest degree of all are the infographics.

Today we will talk about three types of charts and diagrams. Ones that tell us nothing, ones that mislead and ones that were prepared by a government ministry.

Let us start by contemplating this chart. It shows the average wages of men and women in different provinces. What can we read from it?

Which province has the highest wages?

Or maybe in which province there is the greatest wage gap between men and women?

Or maybe in which province women make the least money?

You won’t be able to read a lot from it without using a protractor. The only thing that could be done to make the chart more complicated would be to put these circles in motion.

Charts which have little to tell most often include pie charts and three-dimensional diagrams.

For example, this diagram shows the employment rate among students and graduates.

The employment rate for graduates is easy to read because the diagram contains numbers. But what is the employment rate for students?

Third dimension effectively prevents making an even approximate guess about the height of the pink stripe.

Another circle of info-hell are the misleading diagrams. What happens when we combine a pie chart with a 3D diagram?

This diagram shows the number of winners of a certain contest divided into different fields. Try to guess, do more winners come from bio-info or bio-techno?

On pie charts, sizes are shown using various angles. But when we show a chart from a side angle, the angles change. On a vertical plane the angles are flattened and turned horizontally they expand.

Fake depth is never a good prescription for a great diagram but in the case of pie charts it turns into pure poison.

You should also be suspicious about diagrams that have a moving axis for some unknown reason. Similarly, watch out for bar graphs in which the bars do not start at zero. This graph illustrates both problems.

Looking at it, let’s try to estimate, how much has the number of collaborating universities gone up between the year 2006 and 2011.

The graph suggests a fairly large increase, perhaps even doubling of the original number. But when we look at the numbers it turns out the increase is just by 15%.

What’s wrong with that diagram? It shows an increase in the average wage nationwide and an average teacher’s salary. But is this comparison reliable?

The absence of an axis looks suspicious. It is impossible to add it to the diagram because an axis where the number 2780 stands below 2318 does not exist.

While disinformation on diagrams and charts shown so far can merely make people smile sometimes serious distortions are seen on diagrams which portray important information.

This diagram shows the returns generated by ZUS [Social Security] and OFE [Private Pension Funds]. Without dwelling into what the returns mean in the case of ZUS, let’s look at how the data is being shown.

Or more precisely, let’s look at the units on the axes.

Looking at the diagram we get the impression that returns at ZUS were greater.

It is not easy to see that the right side of the chart, the OFE side, shows returns in the teens [in percentages] while on the left chart these kinds of returns are uncommon.

Different scales on both axes prevent reliable comparisons

Sometimes the trap is very subtle.

Looking at the chart which shows the level of subsidies for the purchase of textbooks let’s try to figure out if more or less textbooks were sold in 2012 than in 2010.

On this chart it is very difficult to notice that the amount of subsidies grows by about 11% a year while during the same period textbook prices were going up faster, at around 15% a year. The message arising from these numbers does not match the infographics.

A separate circle of hell is reserved for diagrams with a flexible axis. Looking at that diagram we get the impression that R&D spending is growing at an increasing rate. This optimistic conclusion will be shattered if you notice that the last bar shows a collective forecast for a four-year period. After splitting the figure of PLN 4.862bn into a four-year period it turns out that the average projected R&D spending will be less than in 2012.

We admit, however, that this diagram has a decidedly different undertone.

When reading charts and graphs, just as when driving a car, we should apply the principle of limited confidence.