Visual Presentations -2

The syntax of visual literacy

By Chuck Chakrapani

The visual syntax

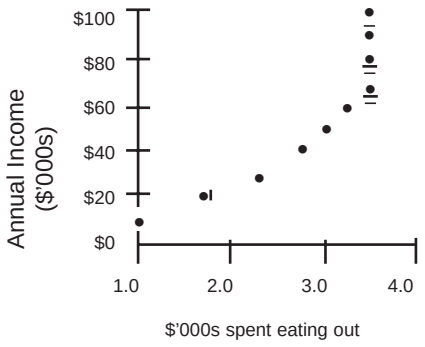
We all know that the statement 'The dog bit the man' is not the same as the statement 'The man bit the dog', although both are grammatically correct. Grammar decides whether a sentence is put together according to specific rules whereas syntax decides the meaning or lack thereof.

The same principle applies to graphic presentation as well. When we use standard graphic packages, the best we can hope for is that the grammar is correct i.e. the chart is put together according to specific rules. A computer program cannot decide whether the syntax of the graph - the meaning or the lack thereof - is met by the user. If we are not aware of the syntax, the graph could be conveying something we did not intend.

Often we use graphs correctly but not all the time. Most of us draw graphs correctly out of habit rather than out of knowledge. Yet errors in syntax occur often. Consider a situation in which we are working from a spreadsheet. Unless we are particularly aware of the syntax, we are likely not to think about the format of the data when we create charts. If the way the data are laid out in the spreadsheet does not correspond to the syntax of the graph, the program will still produce a graph. The graph so produced will fail to convey what we intend to convey (assuming we know what the graph is supposed to convey). If we are not clear what the graph is supposed to convey, we may end up with a graph that will convey nothing, or worse, will convey something that is not intended.

$ spent eating out	Annual Income
$1,000	$ 10,000
$1,800	$ 20,000
$2,400	$ 30,000
$2,800	$ 40,000
$3,000	$ 50,000
$3,100	$ 60,000
$3,200	$ 70,000
$3,300	$ 80,000
$3,400	$ 90,000
$3,500	$100,000

Chart A

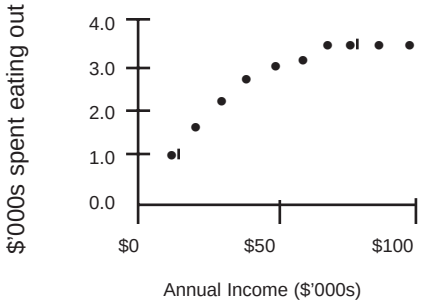


Cause and effect

Let us start with a very simple example. The table on the right shows data that relates income to the amount spent on meals outside the home. Chart A shows a possible graph produced from the above data. One can see from the graph that those who spend more on eating out tend to earn more. The relationship, however, is not obvious to the reader. If we look at Chart B, it is immediately clear that as a person's income increases, so does the amount he/she spends eating out. This increase in spending slows down after one's income reaches a certain level.

This leads us to the first principle of creating graphs. The horizontal line should always be in the direction of causality. In the above example, our assumption would be that increased income 'causes' increased spending - not that increased spending caus-

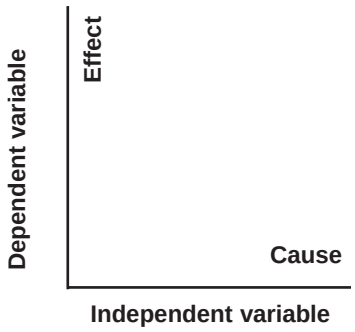
Chart B



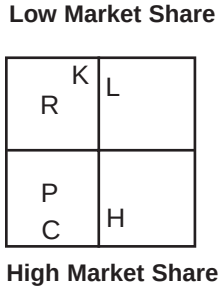
es increased income. The causal variable (i.e. the independent variable) should be on the horizontal (x) axis and the effect variable (i.e. the dependent variable) should be on the vertical (y). Why should this be so? Why is the above structure much easier to comprehend? So far I have not come across any research evidence to show that people have an innate tendency to comprehend better when the causal variable is on the x-axis and the effect variable is on the y-axis. (In fact economists reverse this structure and many people may have difficulty following even simple graphs produced by economists.) Conventional graphs are easier to comprehend because we have (subconsciously) trained ourselves to look for the causal variable on the x-axis and the effect variable on the y-axis. When this is reversed either we fail to comprehend the graph or misinterpret what it means.

(The words 'cause' and 'effect' are used here in a broad sense. 'Cause' is what the analyst believes to be the variable that has an 'effect' on a variable under consideration. If the analyst believes that 'as age increases strength decreases', age is assumed to be the 'cause' of the declining strength.)

The example discussed so far may be very obvious to many people. However, if the principle is not understood subtle mistakes in communication can occur. We may fail to communicate what we intend to communicate by not following the accepted syntax.



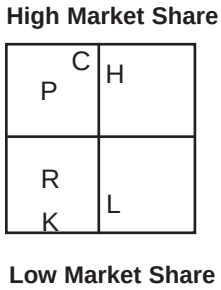
The two charts below contain exactly the same information: brands K, L and R have low market shares while brands P, H and C have high market shares. Yet most people will find the second chart easier to comprehend. Why?



Spatial meanings of a chart

Using 'causal' variables on the x-axis and 'effect' variables on the y-axis is so widely accepted that most people do this correctly, even without realizing that they are using this basic principle. What perhaps most people do not know is that different parts of the charts have specific meanings. The rules governing them are not explicit. When we violate the implied rules, we may still succeed in communicating through verbal explanations. However, in such cases, the chart that conforms to the implicit spatial meanings will leave the reader with a greater sense of comfort compared to another chart which does not.

For example, compare the two charts on the right. Both of them contain exactly the same information: brands C, P and H are high market share brands and brands R, L and K are low market share brands. However, research shows that most people would find the second graph easier to grasp because, in most people's minds, 'high' is associated with the top and 'low' is associated with the bottom of the chart.



There are other, less obvious, principles that govern the way we look at things. Horton (1991) summarizes the work of many researchers (Anheim 1974, Bertin 1983, Cooper 1978, Cornford

1981, Gombrich 1969, Whitney 1988, Winn 1990 & 1991) in this area. Briefly,

• ***Vertical positioning***. Higher vertical position strongly suggests priority in importance and sequence.

• ***Horizontal positioning***. Objects on the left are more important than objects on the right. (This may be reversed in cultures where reading is from right to left.) The meaning of horizontal positions is less strong compared to that of vertical positions. For instance, when we construct a bar chart it is more common to represent the strongest to the weakest brands we move from left to right. However, the effect of reversing the order is likely to be less serious compared to the effect of reversing the vertical positions.

• ***Diagonal positioning***. The diagonal positions also have their own meaning. Objects along a diagonal are perceived to be farther and later in time as we move along from the bottom left to the top right.

These relationships are illustrated in the charts on the right. These principles can be, and are often, violated without distorting the meaning of the graph. However, in such cases, many readers will find the meaning harder to graph. It is akin to using an unnecessarily complex sentence to express an idea when a simple sentence could have expressed the same idea easily and more effectively.

Using boxes

When we use a graph in a report should we use a box around the graph?

What are the implications of using a box as opposed to not using one?

When we use a box around a graph, we set it aside from the text. This implies that it is not an immediate part of the text, but can be seen or referred to at any time. A chart that is separated from the text by a box conveys to the reader:

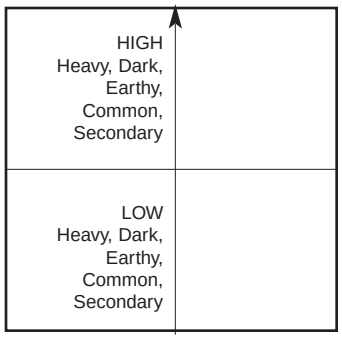
• what is in the box need not be looked at immediately;
• what is in the box is a reiteration of what is already explained in the text;
• what is in the box is a summary of the points discussed; or
• what is in the box is supplementary material.

(If what is in a box is text instead of a graph, it could mean the opposite i.e. what is enclosed in the box is a point that the writer wants to emphasize.)

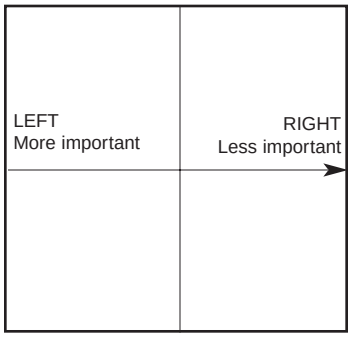
An example will make this point clear. Here are two versions of the same message. The only difference between the two versions is that in Version A, the chart is not boxed while in version B, it is.

What do positions in a chart mean?

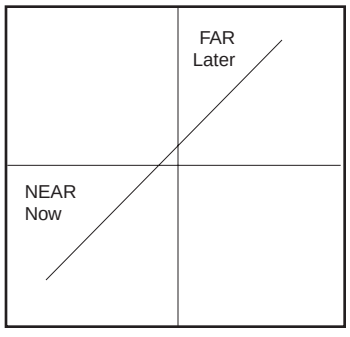
Vertical Positions



Horizontal Positions



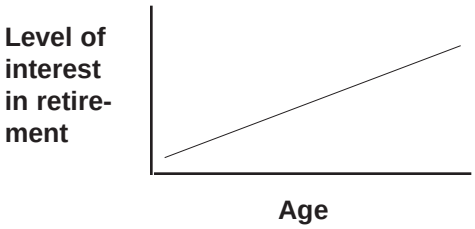
Diagonal Positions



Although both versions are identical, readers will tend to see the graph in Version A as an integral part of the text. Readers of Version B will pay varying degrees of attention to what is inside the box.

Version A

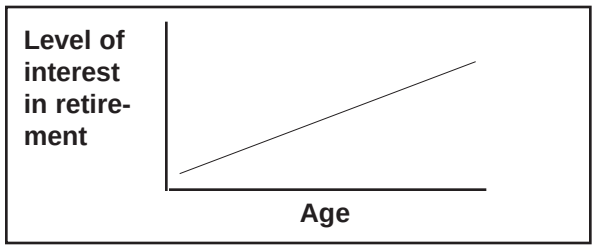
The most important finding to emerge from this study is that, as people get older, they tend to pay increasing attention to their retirement needs.



This would suggest that RRSP salespeople will have more success approaching older compared to younger people.

Version B

The most important finding to emerge from this study is that, as people get older, they tend to pay increasing attention to their retirement needs.



This would suggest that RRSP salespeople will have more success approaching older compared to younger people.

Errors beyond grammar and syntax

Even if we know the grammar and syntax of graphs we can err in other ways: The common errors are:

• Choosing an inappropriate chart (eg. pie instead of bar); and

• Choosing a style in which noise dominates the meaning.

We will discuss these and other errors in the next article.

Some basic principles of charts

• On a graph, the causal variable should be presented on the horizontal axis; the effect variable should be presented on the vertical axis.

• In visually representing objects, the following guidelines apply

  • Objects on top and those on the left are considered more important than those at the bottom and on the right.

  • Objects at the bottom left corner are nearer and closer in time than objects at the top right corner.

• Boxed items in a report are considered by readers as separate from the text. Items that are not boxed are considered to be an integral part of the text.

|Reference
Horton, William (1991) *Illustrating Computer Documentation.* New York: Wiley.

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