University of South Australia

Constructing graphs tables and diagrams

In some academic writing you may need to show the results of measurements and calculations or to describe equipment or processes. Sometimes the best way to communicate such information is through the use of tables, graphs and diagrams.

Graphs or tables?

Graphs present numbers in a visual way. If there is a clear mathematical relationship between two quantities, for example if one is directly proportional to the other, the results are better presented as a graph. If there is no such relationship, a table may be a better way to go.

Tables

A table contains rows and columns of figures, each row and column being made up of sets of results grouped according to particular aspects. In Tables 1 and 2, the aspects are years and lease locations. Give some thought to the order of your rows and columns.

For example, in Table 1, the columns are arranged year by year. This has a logic that is easily followed. The rows, however, have the saw-log leases arranged in alphabetical order which does not show any trends in the production figures.

Even if there is not a mathematical relationship between the quantities, there may be some general trend. Ordering the rows from say the biggest to the smallest numbers will be more helpful than a random order. In Table 2, the saw-log leases have been arranged with the highest production lease at the top and the lowest production lease in the bottom row.

You need to make choices about the number of significant figures you will include in your results. Table 1 shows the production rates measured to two decimal figures whereas Table 2 has these results rounded off to the nearest whole number. You will need to decide what (if any) rounding off is appropriate.

Table 2 also gives average production rates for each year and for each lease. You will need to decide if information like this is of interest to the reader and whether to include it.

When you use a table, give it a title and a number, and label the rows and columns with the quantity being shown and the units they are measured in.

Table 1:
Yearly Prod'n (in'000 tons) of saw-logs from 7 forest leases

Lease	*Year*				
	1990	*1991*	*1992*	*1993*	*1994*
Cedar Junction	137.63	129.17	149.38	117.21	183.40
Dead Dog Hill	29.70	30.79	33.53	27.41	34.64
Heartbreak Hill	16.54	19.38	19.88	16.59	21.62
Millstream	142.63	137.60	171.79	162.40	194.26
Paradise	206.48	274.56	275.98	213.78	303.35
Queen's Ridge	47.32	51.83	53.73	49.10	60.23
Rapid Falls	63.54	77.82	81.76	54.20	89.49

(Adapted from Lindsay, 1995)

Table 2:
Yearly prod'n (in '000 tons) of saw-logs from 7 forest leases

Lease	*Year*					
	1990	*1991*	*1992*	*1993*	*1994*	*Av.*
Paradise	206	275	276	214	303	255
Millstream	143	138	172	162	194	162
Cedar Junction	138	129	149	117	183	143
Rapid Falls	64	78	82	54	89	73
Queen's Ridge	47	52	54	49	60	52
Dog Head Hill	30	31	34	27	35	31
Heartbreak Hill	17	19	20	17	22	19
Average	92	103	112	91	127	105

(Adapted from Lindsay, 1995)

Graphs

Where there is a clear mathematical relationship between two quantities, it may be best to construct a graph. Graphs present two sets of information using a horizontal and a vertical axis. You use the horizontal axis for what is called the 'independent variable', i.e., the quantity whose values are unchangeable. In Figure 1 the independent variable is the year, in Figure 2 it is the introductory courses.

Use the vertical axis for the quantity which depends on the values of the other quantity. In Figure 1, the value of the taxonomic extinction depends on which year it was, so *Taxonomic Extinction* goes on the vertical axis.

When you have decided which quantity to put on which axis, you need to work out a suitable scale. The scale should be such that the results are spread enough to be easily legible. Label the axes with the quantity (e.g. Taxonomic Extinction) and the units (e.g. %) and give the graph a title and a figure number.

Two or more sets of data can be plotted on the one graph, but they need to be clearly distinguished from each other by the colour or the symbols used to plot the points.

Line graphs

If the results are continuous, i.e., if the quantities vary continuously from one measured point to another, use a line graph with the points connected. An example of this is shown in Figure 1. The value of taxonomic extinction varies continuously over time and so would have different (but unmeasured) values between the values recorded.

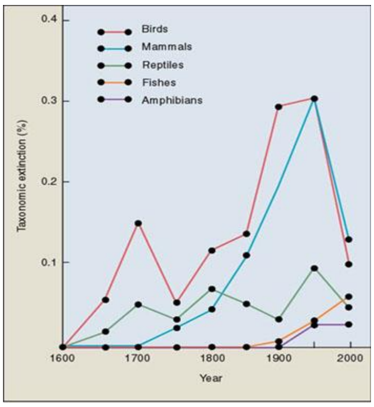

Figure 1: Trends in species loss (Johnson, 2003)

Bar graphs

If the data is made up of discrete clumps, use a bar graph. For example, in Figure 2 the number of students enrolling in different courses are separate groups and so it makes sense to show them separately.

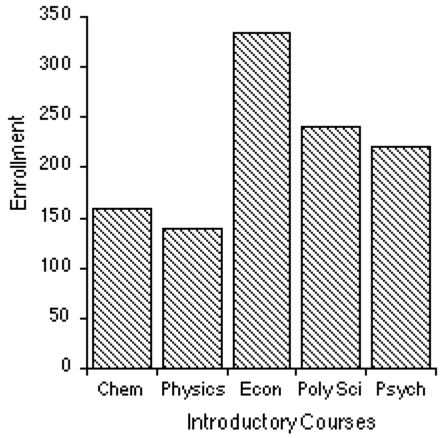

Figure 2: Enrolment in Introductory Courses at Union University (Syracuse University, 2002)

Pie charts

The relative sizes of groups making up a whole population can be best shown with a pie chart. Here the whole circle or 'pie' represents the total group. The various 'slices' show the relative proportions of the sub-groups.

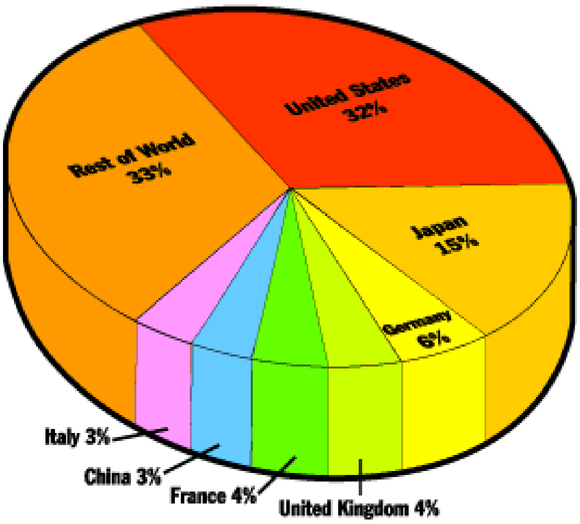

Figure 3: Gross Domestic Product by Country (Devitt, 2002)

University of South Australia

Diagrams

A diagram can sometimes explain an object, a process or even a set of related concepts more clearly and easily than can a long wordy explanation.

Don't include a diagram simply for decoration or to fill an empty space. Only use it if it does provide valuable information in a visual way. Keep a diagram to the simplest form that will show the necessary information. Include essential detail but leave out anything not absolutely necessary.

Figure 4 summarises a process for the development of a certain type of software. The reader can readily see the process at a glance.

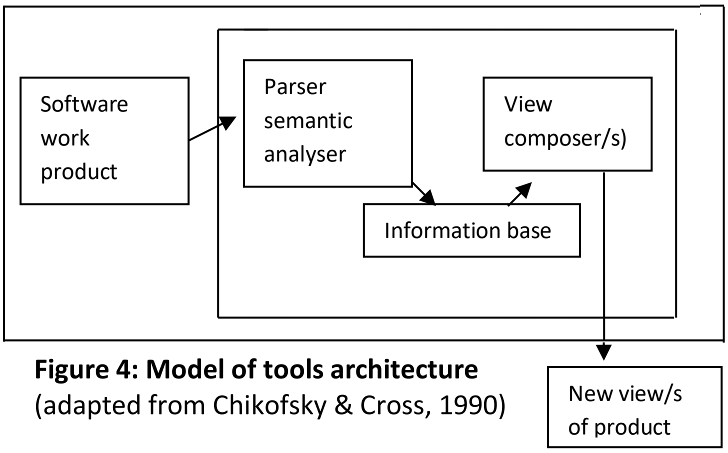

Figure 4: Model of tools architecture
(adapted from Chikofsky & Cross, 1990)

If you include a diagram, give it a figure number and a title and clearly label all relevant parts.

In summary

Tables, graphs and diagrams can convey complex information in a readily-accessible way. They should relate to what you have written and you should refer to them explicitly in your writing. For example, you could say *The data in Figure 2 suggests that…* or *These results have been summarised in Table 1* or *This process is represented diagrammatically in Figure 3.*

To be reader-friendly, locate tables, graphs and diagrams as close as possible to where you write about them.

References

Chikofsky, E., & Cross, J. (1990). Reverse engineering and design recovery: a taxonomy. *IEEE,* 7 (1), 13–17.

Devitt, T. (2002). *Global warming: Beyond a reasonable doubt:* The why files? University of Wisconsin. http://whyfiles.org/158glowarm_evid/

Johnson, G. (2003). *Conversation biology.* The McGraw-Hill Companies. http://www.mhhe.com/biosci/genbio/tlw3/enhancement_chapters/conservation.html

Lindsay**,** D. (1995),. *A guide to scientific writing* (2nd edn). Longman.

Syracuse University. (2002). *Self-instructional mathematical tutorials.* Syracuse University. http://cstl.syr.edu/fipse/TabBar/RevBar/REVBAR.HTM