

# Enhancing the Appearance of Information Graphics

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*ABSTRACT- Informational tables are often an important part of technical papers. It is important that the data presented is quickly and easily understood. The primary purpose of tables is to give the reader a quick overview of the information presented in the research paper. Although the data is often painstakingly collected, most authors spend little time formatting the information for presentation. Many authors rely on the automated features provided by software to format the information and do little to embellish the final version of the table. This paper will focus on improving the readability and legibility of informational tables. Topics will include design and formatting considerations such as font specifications, contrast, spacing and alignment. Examples will demonstrate how applying standard design concepts to information graphics can enhance the overall effectiveness of the data.*

presenting visual information began appearing in the 18<sup>th</sup> century and the term “graphic designer” was finally coined in 1922 (4). At the start of the information age in the early 1980s, the need to mix text and visuals was in demand. Graphics were employed to help readers see the “big picture”. With the advent of desktop publishing, in the 80s and 90s, graphics became more economical and the use of information graphics escalated (5).

The purpose of technical papers, written by specialists for their peers, is to convey information (6). Research articles and conference papers are forums for presenting data, research results and industry trends. Information graphics can be considered the “pictures” of technical writing which clarify and support the text (7). Typically, technical papers use two types of graphic aids — tables and figures. The scope of this paper will cover guidelines for using tables in technical papers.

## I. INTRODUCTION

The term information graphics covers a variety of graphic formats —charts, graphs, diagrams, pictographs and tables. One only has to think of the works of Leonardo da Vinci, René Descartes and Sir Isaac Newton to realize that these visual formats have been around for a long time (1). An industrial draftsman, William Playfair, is credited with developing the graphic methods for charting facts and figures including the line graph, bar chart and pie chart that we use today (2). He is also credited with developing the journalistic form of “information graphics” (3). Artists who specialized in

## II. TABLES

Information graphics are a shorthand means of presenting information (8). If done well, the reader can quickly see and understand a trend, pattern or relationship among elements. Unlike charts, tables focus the reader’s attention on the data itself rather than on the representation of the data (9).

### Definition

By definition, a table is a matrix of information. Traditionally, tables are used to present a large amount of information in an orderly fashion. Tables allow the

reader to quickly focus on a specific item by scanning the matrix or to compare multiple items by scanning the rows or columns. For example, a table that compares the features of six CAD packages can be used in multiple ways. As shown in *Figure 1*, one reader can pick out the software package they are interested in and focus on the row, which highlights the included features. Another reader might select a particular feature they are interested in and scan the column, which shows which packages include that feature. Other readers might scan the entire table to compare the different packages.

### Appropriate Uses

Rabb states —“When graphs aren’t specific enough and verbal descriptions are too cumbersome, tables offer elegant solutions for showing exact numeric values (10).” The primary reason to use tables is to present information in a simple and visual format. Tables are used to substitute for a written description in order to break up the text and better organize information for the reader. There are a number of situations, which are appropriate for tables.

Whereas charts generally focus on a trend or comparison, tables are a way to organize data for the reader to peruse. They work for many situations because they can convey large amounts of quantitative data and can show several variables for a number of items (11).

Horton describes several situations, which are best handled by a table; 1) if there is a large amount of data to be displayed; 2) if the reader needs to see the exact

values of the statistics; 3) to show side-by-side comparisons; and 4) to simplify access to the information the user is targeting (12).

### Types of Tables

Horton describes three common types of tables—Look-up-a-value, Decision and Selection and Matrix. (13) A look-up table is designed to have the reader find a particular value at the intersection of a row and column. An example of a look-up table would be one that shows the data transfer rate for various web connections on the Internet. The user could easily find the particular rate of the target connection type.

A decision table provides the user with a variety of options. It assists the user in making a decision by showing the alternatives. The user can compare the various options and make a decision. For example, if the reader is trying to select the best file format to use for a web image, the table could guide them to make the proper choice. It’s like an if-then statement—if this is true, then do this.

A matrix table is used to show relationships between two items. The intersection of each row and column shows the relationship between the two categories. A mileage table would be a good example of a matrix table.

### III. LEGIBILITY AND READABILITY

Tufte states — “Excellence in statistical graphics consists of complex ideas communicated with clarity,

**CAD Software Comparison Table**

	<b>CompuCAD V2.0</b>	<b>Martin Show Designer 4</b>	<b>Stardraw 2D V3</b>	<b>WYSICAD V3</b>
Full CAD		√	√	√
Layers	√	√	√	√
2D Plans	√	√	√	√
3D Plans	√	√		√
Rendering	√	√		√

**Figure 1.**

precision, and efficiency (14).” A successful table makes it easy for the reader to 1) recognize the way the data is organized; 2) find the information; and 3) interpret the data (15). Visual cues are the tools that graphic designer’s use to improve the readability of a document. Something as subtle as bold text for the title, telling the reader to “start here”, or a line separating a heading from the data are devices to assist the reader in scanning the table. Both the legibility and readability of a table are controlled by the decisions of the designer.

Legibility is determined by the speed at which the actual words can be recognized or comprehended by the reader (16). Factors that affect legibility include the type of font, size, style and case of the text.

When selecting fonts to use in a table, select standard fonts, which are easy to read. Avoid fonts that are extremely narrow or wide. Use different font sizes or styles to emphasize key text elements. Also allow enough space around the text so that it stands out and be sure that if a screen is used, it is light enough not to interfere with legibility.

Readability refers to the relative ease with which the reader can read the material. Factors that affect the readability of tables include contrast, alignment and spacing. Visual cues have more to do with readability than legibility. The elements added to enhance the table make it better or worse.

#### IV. ENHANCING TABLES

Clarity is probably the most important consideration when laying out a table. A good layout makes it easy for the reader to scan the table and pick out the relevant data or grasp the relationship between items. In order to increase the clarity of the message and the readability of the table, consider the arrangement of elements and how they are structured. Gestalt psychology tells us that “...the way things look depends not just on the properties

of their elementary parts, but also, and more importantly, on their organization (17).”

#### Adding Contrast

Contrast is simply making elements stand out from one another by making them different. Consider contrast when creating headings, borders, dividers and backgrounds. *Figure 2* shows a table that has no contrast between elements. Headings and data are displayed with the same font size and style. Borders and dividers are all the same line weight and isolate the data. Tufte refers to this type of design as “information prison” (18). It is difficult to scan and compare the data. To improve the readability of the table as shown in *Figure 3*, the following steps were taken.

North Carolina vs. National SAT Scores				
NC	1998	1999	2000	2001
MATH	492	493	496	499
VERBAL	409	493	492	493
USA				
MATH	512	511	514	514
VERBAL	505	505	505	506

**Figure 2.**

North Carolina vs. National SAT Scores				
	1998	1999	2000	2001
<b>NC</b>				
Math	492	493	496	499
Verbal	409	493	492	493
<b>USA</b>				
Math	512	511	514	514
Verbal	505	505	505	506

**Figure 3.**

First, the headings were changed to make them stand out. The title was changed to a larger font and bolded. The column and row labels were also bolded. In addition, instead of using all upper case for all the

headings, some were changed to upper and lower case. The reader can quickly see the way the table is organized.

Second, the borders and dividers were simplified to call out related groups of information. After removing the grid structure, rules were added to emphasize particular divisions of information. Since the table focuses on comparing the data for a series of years, the vertical dividers were dropped to facilitate a comparison of data across the rows. A rule was used to emphasize the two major categories being compared. Third, a dark screen was added behind the title to set it off and allow the text to be reversed to white. This adds a contrasting background to set off the table from the rest of the page.

#### Aligning in a Meaningful Manner

A meaningful alignment of elements will lead to a good “continuation” of the data (19). Consider the alignment of headings and data values from both the readability and the organizational standpoint.

Bad continuation can result from something as simple as the justification of the text. For example, in *Figure 4*, the numbers in the columns do not align and the headings are center justified which makes it difficult to read. Another factor related to alignment, is how items are grouped or ordered. It is helpful to the reader

Web Connection Types and Rates		
Connection	Data Rate	Bandwidth
28.8 modem	3.6 KB	28.8 KB
T1	32-193 KB	256-1,544KB
14.4 modem	1.8 KB	14.4 KB
T3	5.5 MB	44 MB
56K modem	7 KB	56 KB
33.6 modem	4.2 KB	33.6 KB
Frame relay	7-64 KB	56-512 KB

**Figure 4.**

if the table elements are arranged in some meaningful manner to improve the effectiveness of the information (20). The redone table shown in *Figure 5* regroups items to add more structure to the table to assist the reader. Two subcategories have been added, repetitive data has been repositioned and the numbers have been organized from high to low.

Web Connection Types and Rates		
Connection	Data Rate	Bandwidth
<b>Home</b>		
56.0 modem	7.0 KB	56.0 KB
33.6 modem	4.2 KB	33.6 KB
28.8 modem	3.6 KB	28.8 KB
14.4 modem	1.8 KB	14.4 KB
<b>Corporate</b>		
T3	5.5 MB	44 MB
T1	32-193 KB	256-1,544 KB
Frame relay	7-64 KB	56-512 KB

**Figure 5.**

If column headings contain more than one line of text , align them along the bottom to avoid gaps between the headings and the data (21). Also, be aware that some fonts contain characters which are not uniform (the same width) and can lead to subtle misalignments of the data. If things don’t look quite right, try a different font.

Improper alignment, of design elements can also lead to difficulty reading down a column. *Figure 5* showed that the two data groups were separated by a space but since the reader would be comparing data in a vertical direction, the columns were screened in that direction to improve continuation. However, if the headings were centered and the background screened as in as in *Figure 6*, the layout would interfere when the reader scans down the column.

Web Connection Types and Rates		
Connection	Data Rate	Bandwidth
<b>Home</b>		
56K modem	7.0 KB	56.0 KB
33.6 modem	4.2 KB	33.6 KB
28.8 modem	3.6 KB	28.8 KB
14.4 modem	1.8 KB	14.4 KB
<b>Corporate</b>		
T3	5.5 MB	44 MB
T1	32-193 KB	256-1,544 KB
Frame relay	7-64 KB	56-512 KB

**Figure 6.**

### Creating Space

White space, or the blank areas around table items, also serves as a visual cue to the reader. More space between items tells the reader they are separate and less space say they are grouped or related in some way. Consider both horizontal and vertical spacing when laying out a table. Vertical spacing would include areas above and below headings, line and the space between data and rules. Horizontal spacing would primary be the space between columns of text and between text and grid lines.

Also, consider the proportion of white space to positive space. The data should not be so spaced out that it is difficult to follow or so cramped that it is trapped. Keep columns close together; don't spread them out more than is necessary. If it is necessary to spread out the columns in order to fit a particular area such as a page column, use a graphic devise such as a rule or screen to guide the reader's eye across the row (Figure 7).

Flash Raster File Formats		
File	PC	Mac
GIF Image	Yes	Yes
Photoshop	Yes	Yes
Windows Bitmap	Yes	No
Truevision Targa	Yes	Yes

**Figure 7.**

### Using Graphic Devices as Organizers

Tufte refers to graphic over-embellishment as "chartjunk" (22). For tables used in technical documents, the use of graphic devices should be limited to enhancing the data. Each element should serve a purpose such as organizing, clarifying or highlighting the information. Schriver asks the question — "Do the visual cues support the rhetorical goals for understanding and making use of the content? (23)"

Graphic devices include rules, borders, and screens. In general, use a limited number of graphic devices to organize the data. More specifically, keep line weights thin and screens light enough not to obscure the data. If spacing is tight, use thin rules between columns and rows. When using screens shade the rows or columns based on the way the data should be scanned.

## V. CONCLUSIONS

As the examples have illustrated, the proper use of visual cues and graphic devices can enhance the legibility and readability of table statistics. When creating a table, consider how the reader will scan the table and add visual cues to assist the user in finding and understanding the data.

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## TABLE DATA SOURCES

Table 1.

<http://www.stagetec.co.uk/CADCOMP.htm>

Table 2. and 3.

[http://www.wcpss.net/evaluationresearch/index\\_reports/2001/2000\\_2001\\_scholastic\\_assessment\\_test\\_results.pdf](http://www.wcpss.net/evaluationresearch/index_reports/2001/2000_2001_scholastic_assessment_test_results.pdf)

Table 4.,5. And 6.

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Table 7.

Mohler, James L. (2002). *Flash MX – graphics, animation & interactivity*, 177. United States: Thomson-Delmar Learning.