

**Design specification for tables: a case study**

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## Design specifications for tables: a case-study

This article describes the editorial guidelines, typography, and layout developed for a book consisting almost entirely of tables, and explains why the particular design options were selected from a very wide range. The guiding principles were almost entirely ergonomic – the tables were laid out to make it as easy as possible for readers to scan the contents and to find those particular bits of data of interest to them. The design covers all the parts of statistical tables from table number and title, through headnotes, column headings and row headings (up to four levels in each) and footnote indicators, to source notes.

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Tables comprise densely packed information. Also, redundancy and context – two helpful features of running text – are lacking. So authors (and editors) need to put in extra efforts to make tabular information accessible to their readers. Editing complex tables also demands from editors a greater awareness of the impact of visual organization of tabular information on readers than that required while editing running text. In fact, Sears (1994) concludes her account of a meeting on designing tables with these words: ‘preparation of good tables is a survival skill needed by today’s researchers and their editors.’

Some information is already available on presenting tabular information. The recommendations cover three broad areas, namely, editorial, ergonomic, and typographic; and examples of each are, respectively, Finney (1986), Wright (1972) and Ehrenberg (1981), and Clark (1981). Hartley (1994) weaves all the strands together in a concise chapter on tables and graphs in his book *Designing instructional text*. MacKenzie (1994) is a case-study of re-designing the publications of the Australian Bureau of Statistics. A comprehensive review of literature is provided by Lefrere (1989) and a recent British Standard is BS 7581: 1992, *Guide to presentation of tables and graphs* (British Standards Institution, 1992). Though we should have liked to follow the standard, we found the advice was either too general (e.g. ‘Different levels of heading . . . should be shown by use of one or more of the following: different type styles, different type sizes, numbering, rules, indentation’) or not definitive (e.g. ‘Column headings should normally be ranged left or centred’) or lacking altogether (e.g. on the notation for missing data). Such established style manuals as Butcher’s *Copy-editing* (1992) and the *Chicago manual of style* (University of Chicago Press, 1982) are usually confined to giving authoritarian directions about the typographic treatment of different parts of a table. *Scientific style and format* (Council of Biology Editors, 1994) contains a fuller and more detailed treatment of the topic than many other comparable manuals, and explains the logic behind most of its recommendations.

I had occasion to survey as many of such recommendations as I could get hold of during the planning of the current and the next editions of TEDDY, a volume of statistical tables related to energy and environment, running to more than 300 tables, and published every other year by TERI (Tata Energy Research Institute), New Delhi. (TEDDY is short for TERI *Energy Data, Directory, and Yearbook*.) Before we began developing a prototype design, we identified a set of criteria that the proposed design was to meet. These criteria were based on the contents of the manuscript and on certain assumptions

about how TEDDY will be used by readers. The criteria are these:

- The volume should be easy to ‘browse’ – so, for example, the titles and numbers of the tables should stand out clearly.
- Anyone looking for a specific table number should be able to scan the printed volume easily to locate that particular table.
- All parts of the table should be legible.
- Each table should be as self-contained as possible, that is, readers should not be made to refer to other parts of the volume for explanation of abbreviations, uncommon symbols, etc.
- Within any table, the columns should be reasonably close so that readers can read horizontally in rows, as well as vertically in columns. In many publications, columns are separated by excessive space merely to make the table conform to a stipulated width corresponding to the width of the print area of a page or of a column. Yet, as Reynolds (1980: 92) puts it, ‘Columns should not be so far apart that there is a risk of error in reading across’.
- The sources of information should be detailed enough to permit readers to form some judgements about the source (whether it is recent, first-hand, etc.).
- The proposed design should accommodate up to four levels of headings, in both rows and columns.
- The design specifications should have a certain built-in flexibility to keep split tables (individual tables carried over from one page to the next) to the minimum. (In other words, the compositors could use their discretion and use a smaller type-size and closer line-spacing so long as these values are within the prescribed range.)

In the rest of this paper, I describe our attempts at designing tables to meet these criteria, explain the reasons for many of the design decisions, and briefly discuss how these decisions compare with the available recommendations and practices found in similar publications.

### Editorial guidelines

This section covers the editorial decisions concerning the arrangement of data, number of significant digits, abbreviations, and so on.

Tables can act as either storage bins, merely holding information, or as display cases, transmitting information. A conversion chart, listing inches in one column and centimetres in another, is a ‘look-up’ table and belongs to the first category, namely, storage bins. But consider a table showing the population of major cities of the world: it can be a simple look-up table if it is not to make any particular point other than stating the population. In such a case the cities are best ordered alphabetically, allowing a ‘random access’ search. However, if the cities are arranged in a descending order of their populations, the more populous ones will be noticed first. And if decadal changes instead of absolute numbers are the focus of interest, the ordering would again be different. In short, the compilers and editors were requested to take into account the main thrust of the table, if any, in deciding on the order in which the rows should be arranged. As the British Standard puts it, ‘The characteristic of a good table is that the main patterns and exceptions are self-evident’ (British Standards Institution, 1992: 6).

The second editorial guideline was to round off the data to just one place of decimal as far as possible, commensurate with the precision inherent in the data. For example, it is enough to express the estimations of coal reserves (given in million tonnes) to just one place of decimal or even in whole numbers only, whereas values of the maximum permissible concentration of phenolic substances in water meant for drinking are accurate to the nearest microgram, and must be expressed to three places of the decimal if given in milligrams.

The third guideline was to avoid abbreviations as much as possible and, if they had to be used (where space is at a premium, especially in column-headings), to explain them in the table itself instead of making the reader refer to a separate list of abbreviations. TEDDY draws upon many disciplines, ranging from economics to chemical engineering, and abbreviations that pose no difficulty to readers familiar with one field can mean nothing to those whose expertise lies elsewhere.

Another guideline recommended displaying two items of information prominently within a table title, namely, the unit of measurement (so long as it applied to the whole table), and the period to which the data related (World Bank, 1991: 17); thus, 'Total forest area (**in thousand square kilometres**): 1951/52 to 1985/86'. The units were set in bold and the years were always given at the end of the table title.

### Typography and layout

This section takes, in turn, each of the many components that make up a table, describes and explains its design, and compares the chosen design with that used in similar volumes of statistical tables.

The tables were set in 9-point type with 11-point interlinear space. Table titles were set in 11-point. However, to allow some flexibility in page make-up, the compositors were allowed to reduce the size of type by up to two points, and to reduce interlinear space if necessary to avoid splitting a table: thus, the permissible options ranged from 7/7 (7-point type with 7-point interlinear space) to 9/11.

We chose Monotype Plantin because of its large x-height and comparatively darker characters, and because it stands up well to the comparatively coarse resolution (600 dots per inch) of desktop laser printing (Luna, 1992: 100). Monotype Plantin (with 'Expert set') also has non-lining (old style) numerals, which make for a more open setting, and true small capitals, which are invaluable for setting acronyms (which the text of TEDDY had in plenty). McLean (1980: 73) also makes the point that non-lining numerals are more different from each other than lining numerals and therefore easier to distinguish. (These refinements, amongst others, were postponed till the next edition; the figures in this paper are based on specimen sheets prepared as part of the typographic specifications.)

### Table number

Table numbers were assigned by using 'point numbering' and consisted of a chapter number and the serial number of that table within the chapter; thus, Table 3.2 meant the second table in chapter 3.

To make the table number stand out prominently, it was put within a box and reversed out (that is, white type on a dark background). The size of the box was kept constant, chosen to accommodate three digits

(1 + 2) because the volume contained only eight chapters and no chapter contained more than 99 tables. An en-space separated the word ‘Table’ from its number, and an em-space separated the number-box from the title (figure 1).

The word ‘Table’ was set in upper and lower-case instead of in full capitals (TABLE) or in capital and small capitals (TABLE) because upper- and lower-case seemed more contemporary. Also, the slight spacing out of capitals or small capitals (thus: TABLE), a necessary typographic refinement, cannot be achieved easily in desktop publishing packages such as PageMaker.

### Table title

The title of the table was set out in ‘sentence style’; that is, only the first word was capitalized. It is well known that a profusion of capitals impairs legibility (Tinker, 1963) but the so-called ‘headline style’ (Capitalizing Every Word or Every Significant Word in the Title of a Table) also hinders comprehension in other subtle ways: to a practised reader, a capital letter usually signals the beginning of a sentence, and a full stop its end. But the headline style primes the reader for many false starts (it is like repeating ‘Ready’ and ‘On your marks’ to sprinters without firing the starting gun). As Lichty (1994: 98) puts it, ‘Don’t Capitalize Every Word Unless You Want To Cause Visual Hiccups’.

Some table titles ran to a second line: to make the table number stand out clearly, the second line was not run underneath the table number but was aligned vertically with the first letter of the table title (figure 2). Table titles were set unjustified, ranged left. In titles running to more than one line, we took care to break lines by sense: complete phrases were carried over to the second line. Also, the compositors were instructed to avoid starting the second line with articles, prepositions, and conjunctions (see the line break in figure 2).

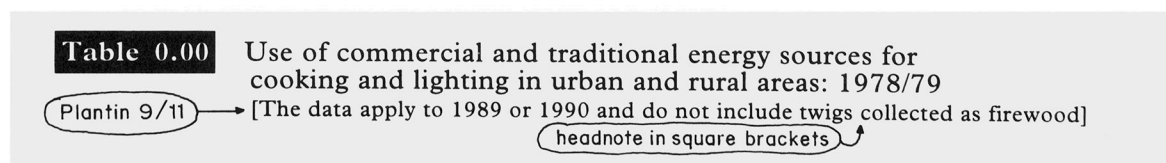
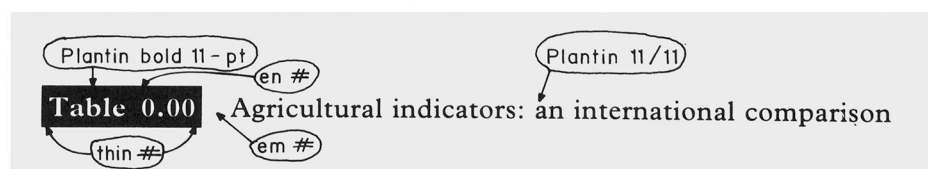
We also decided to use a second colour (Post Office red) for the table number box and the title of the table itself, in spite of the extra cost. The second colour made it easy to confine the reader’s attention to table titles while leafing through the volume (browsing). It also saved space and allowed us to do away with the customary horizontal rule above the body of the table: the title could be fairly close to the body because the change in colour was a strong enough demarcation.

### Head note

Any note that applied to the entire table was placed immediately after the table title and aligned with it vertically, enclosed in square brackets, and set in 9-point type (figure 2).

Figure 1. *right*  
The table number.

Figure 2. *below*  
Aligning table titles  
that run to more  
than one line.



**Columns**

*Column headings.* We decided to use italics for column headings not only to make them distinct but also because italics are compact. However, the heading of the left-most column (what some printers' manuals call the 'stub') was set in roman because, strictly speaking, it is not a column heading at all but a row heading, which sums up an attribute common to all the rows.

Column headings were set stacked and not 'hung' (figure 3), that is, all the column headings aligned at the bottom but extended upwards to reach varying levels depending upon how many lines they occupied. We preferred this arrangement because it brings the first line of data in each column closer to its heading; hung column headings leave a variable gap between the column heading and the data within that column.

The specifications for setting out multiple levels of headings in columns are set out in figure 4. Column headings of equal weight (all major headings, all subheadings, all minor headings, etc.) are not always of equal length – some will run to one line, some to two lines, and some will be even longer. In a stacked arrangement, when they are all aligned from the bottom, they cannot share a common starting point. In text settings, ranged-left headings are preferred to centred headings because, among other things, they all share a common starting point, namely, the left edge of the text area, which makes it easy to scan them. But in tabular setting, there has to be a trade-off, and we opted for bringing the first line of each column close to its head at the cost of achieving a common starting point, within each level, for all the column headings.

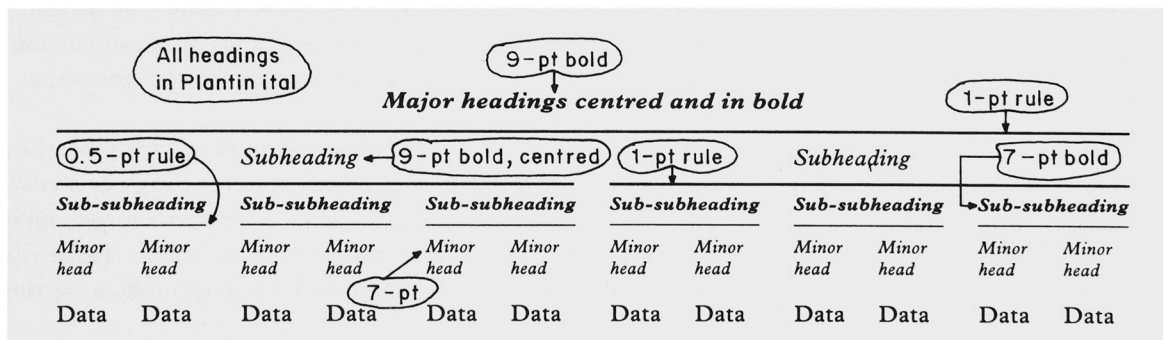
*Alignment of columns.* Aligning data in columns required some thought because several options are available: decimal, right, left, and centre. Our choice was dictated by what the data were about and how the entries (rows) within a column related to one another.

Figure 3. Stacked column headings.

Figure 4. Setting multiple levels of headings in column headings. All the column headings (except those of the left-most column) were set in italics, and in 9/11 unless specified otherwise.

**Table 0.00** Agricultural indicators: an international comparison

Country	<i>Economically active population in agriculture as % of total population</i>	<i>Arable land (million ha)</i>	<i>Per capita arable land (ha)</i>	<i>Fertilizer consumption (kg) per ha of arable land</i>
	Bangladesh	69	9.2	0.09
China	68	97.8	0.09	176.2
India	67	168.8	0.22	57.1
Pakistan	50	20.7	0.2	86.2



*Decimal alignment.* We decided to align the columns on the decimal point whenever they all shared the same unit of measurement. If some entries were whole numbers, a decimal point followed by one or more zeros as appropriate was added. This is by far the most common arrangement and requires little further elaboration.

*Right alignment.* In principle, the choice was similar to that for decimal alignment, the only difference being that all the entries comprised whole numbers only.

The choice of decimal- and right-aligned arrangement is obvious because it is the most common arrangement whenever a column of figures is totalled. Ehrenberg (1981) suggests that when entries are arranged thus, the larger numbers should be placed at the top. This will, of course, need to be reconciled with any other logic underlying the order in which the rows are arranged.

*Left alignment.* At times, the entries in a column do not share a common unit; each one refers to a different attribute of the column heading. Consider a table comparing, say, six countries on a number of counts, e.g. population, literacy, income, geographic area, length of coastline, and so on. We preferred a left-aligned arrangement in such cases. A decimal- or right-alignment can signal a numerical relationship among the entries where none exists in fact – hence our conscious decision to arrange such dissimilar entries left-aligned. This is the practice adopted by the Oxford University Press (Hart, 1983: 158). Not all publishers, however, choose to make such a distinction, and the World Bank is one of them (World Bank, 1991).

*Centred alignment.* Arranging the entries by centring them within a column is common enough. However, we could find no occasion where this arrangement would prove superior to others on grounds of either logic or usability. Some may prefer it on aesthetic considerations; indeed, when the entries in a column are not only disparate but also vary a great deal in their magnitude (and therefore in length), centring them does result in a more balanced-looking column. However, we decided to forgo this aesthetic refinement – the compositors were instructed to avoid the centred arrangement entirely, the only exception being the symbols for missing data (explained later in this article).

*Alignment between the body of the column and its head.* The choices here are less clear-cut. We decided to set the column headings (a) left-aligned if the column body was left-aligned and (b) right-aligned if the column body was right-aligned or aligned on the decimal point. The usual argument in favour of left-aligned text does not apply very strongly because most readers take in the entire heading at a glance; they do not read it line by line, and making each of these very short lines start from the same point offers little benefit. The British Standard (British Standards Institution, 1992: 8) allows column headings to be ranged right ‘if that [arrangement] aligns better with the column of data.’

*Totals and subtotals.* Published literature offers little guidance on setting out totals and subtotals within columns. Single or double rules are common, and can serve to distinguish between the two: subtotals can be set below a single rule and grand totals below a double rule. The word ‘Total’ can be distinguished typographically by setting it with an extra indent.

*Units in column headings.* If all the column headings had a common unit, it was given in the table title. If different column headings had different units, they formed a part of the column heading, placed (within round brackets) at the end of the heading, e.g. arable land (million ha), fertilizer consumption (kg/ha), etc.

*Intercolumn spacing.* Intercolumn spacing of 1 pica was specified and the space between the left-most column (the ‘reading column’) and rest of the columns was 2 picas so as to set it distinctly apart from the body of the table.

Each table was allowed to run to a variable width, commensurate with the fixed inter-column space mentioned earlier; no attempt was made to make every table conform to a fixed width dictated by the width of the print area. Because of this, many tables, especially those with fewer columns, remained well short of the full width of the print area. All the tables on a page were ranged left. Adding excessive space between columns forces readers to jump over chasms of space, thereby increasing the chances of a mismatch between the data and its intended row heading.

*Notation for missing values.* Often, some of the cells in a table cannot be filled because the requisite data are lacking, the particular column heading does not apply, or the values of the variable are too small to be measured, and so on. The notation to indicate why the data for a particular cell are missing is far from standard: n.a. (which can mean either ‘not applicable’ or ‘not available’), a dash, two or three dots, zeros, and blank spaces are some of the common devices. Different style manuals recommend different systems: the *World development report*, published by the Oxford University Press, New York, uses ‘.’ for ‘not available’ and an em-dash (—) for ‘not applicable’, whereas the World Bank style manual recommends an em-dash for ‘not available’, ‘n.a.’ for ‘not applicable’ and ‘.’ to indicate negligible amounts (World Bank, 1991). The University of Chicago Press (1982) recommends leaving the cell blank to indicate ‘not applicable’ and a dash or three or more dots to indicate ‘not available’. The British Standard (British Standards Institution, 1992) does not address the topic at all. We wanted to use a self-explanatory system that could signal the reason for the missing data as clearly and unambiguously as possible, and adopted the following symbols:

- a question mark in brackets [?] when the data were lacking,
- an em-dash (—) when the column heading did not apply,
- two points (..) when the values were negligible, and
- 0 or 0.0 or 0.00, etc. as appropriate, when the variable was measured and the value was found to be zero.

All the symbols except the zeros were centred on the column width.

## Rows

*Row headings.* The simplest way to set out multiple levels of headings is to use progressive indentation: the highest level (‘A’ level) is set flush left, the next level (‘B’ level) is indented 1 em, the third level (‘C’ level) is indented 2 ems, and so on. However, horizontal space is at a premium in the stub, just as vertical space is at a premium in column headings, and progressive indentation can take up a great deal of space. If any heading runs to more than one line, the next and the subsequent





headings in a two-column setting – the side heading aligns with the top line of the paragraph to which it relates.

### Bottom rule

Normally, tables are placed between two rules, one at the top and one at the bottom. Though we could dispense with the top rule because we set the title of the table in a different colour, we retained the bottom rule (1.5-point thick) to mark off the end of the main body of the table and to separate it from other adjuncts such as footnotes and source references.

### Footnotes

In tables, footnotes have a significance greater than their appearance may suggest, relegated as they are, by definition, to the ‘bottom of the heap’ and nearly always set in smaller type. Footnotes contain information that qualifies the data; they are meant to warn the reader against drawing erroneous conclusions based only on the value of the variable that appears in the table. For example, a footnote may call the reader’s attention to the fact that whereas the rest of the entries in a column are actual figures, the footnoted entry is only an estimate or a projection. Or it may inform the reader that, unlike the rest of the values, the value in that cell relates to a different year, sample, region, etc.

Different publications treat footnotes differently. Variety is found all the way from the characters used to ‘call out’ the footnotes – the traditional array of asterisks, section marks, obelisks, double obelisks, and pilcrow to superscript numerals (by themselves or ensconced within square or even curly brackets) – to whether they are run on or each begins a fresh line. The sequence of assigning the chosen symbols to consecutive footnotes usually follows the normal reading sequence, beginning from top left and working downwards in a series of horizontal sweeps. We decided against superscript numerals, however, not only because they do not stand out as clearly amongst the mass of numerals that form the body of nearly all the tables but also because it was potentially risky – there is always the chance of their being set inadvertently as normal numbers, an error less easy to catch in subsequent proofreading. The British Standard (British Standards Institution, 1992: 10) recommends that if numerals are used as footnote symbols, they should be *either* superscript *or* in parentheses (my emphasis). Using parentheses, however, may cause problems of alignment, particularly if all the values comprise whole numbers. We also ruled out the more traditional symbols (\* ¶ § †, etc.) because the system becomes cumbersome when footnotes are many. Also, they seemed faintly anachronistic. That left us with the alphabet, and we opted for the lower-case, set in bold italic – bold so as to make them stand out and italic because the right slant automatically provides a slight space between the referent and the footnote symbol.

At the foot, the symbols were reproduced to match exactly, that is, the letters were set as superscripts and not ‘in line’. A 2-unit space was inserted manually between the symbol and the text that followed it. Setting the footnote symbols in line may look tidy but the symbols are identification tags and tags in any matching pair must look identical (in-line figures are larger than superscripts).

Most of the footnotes were very short and giving each one a line to itself would have used up a great deal of space. Therefore, we set them run on but with 1 em-space between two consecutive footnotes (figure 6). A footnote ended in a full stop only when it was in the form of a sentence – we sacrificed consistency for the sake of observing this distinction. However, separating consecutive footnotes with em-spaces works well only when the footnotes are short. When the footnotes are long (more than 40 characters, as a rule of thumb), the length of the line becomes too long for comfortable reading because the measure is wide (the whole width of the type area) and the type-size is small (9-pt). For example, with a measure of 150 mm, a full line set in 9-point Monotype Plantin can run to 105 characters. In such situations, an alternative is to set the footnotes in two columns, starting each footnote on a fresh line. This at once makes the line-length more manageable, shortening it to less than 75 mm (after allowing for the intercolumnar space).

**Sources**

A volume such as TEDDY draws upon many sources, and listing them in the style of reference citations serves the same ends, namely, (1) to identify the source precisely; (2) to describe it in sufficient detail; and (3) to guide the readers adequately if they wish to obtain the document being cited. The heading was ‘Source’ or ‘Sources’ as appropriate, set in bold. If there was only one source, the citation was set on the same line, leaving an em-space after the word ‘Source’ (which was in bold-face). If sources were more than one, the word ‘Sources’ had a line to itself. The sources were numbered and, to make the numbers stand out clearly, they were ‘hung’ into the margin, that is, the numbers, which

Figure 6. Specimen table illustrating the typography and layout of its different parts.

**Table 0.00** Agricultural indicators: an international comparison  
 [This table is fictitious.]

Country	Economically active population in agriculture as % of total population	Arable land (million ha)	Per capita arable land (ha)	Fertilizer consumption (kg) per ha of arable land
Bangladesh <sup>a</sup>	69	9.2	0.09	67.3
China	68	97.8 <sup>b</sup>	0.09	176.2
India	67	168.8	0.22	57.1 <sup>c</sup>
Pakistan	50	20.7	0.2	86.2
Iran <sup>d</sup>	28	14.8	0.32	60.9
Republic of Korea	25	2.1	0.05	385.3
Brazil	24	76.8	0.55	42.5
Israel	4	0.4	0.10 <sup>e</sup>	223.6
Canada	3	46.0	1.8	47.4
UK	2	7.0	0.2	379.8

<sup>a</sup>Before partition    <sup>b</sup>Data from published sources    <sup>c</sup>Firsthand data    <sup>d</sup>Does not include land under perennial trees.    <sup>e</sup>As furnished by the Embassy of Israel

**Sources**

1 / <sup>1</sup>Current Energy Scene in India, May 1993, p. 108. Bombay: Centre for Monitoring Indian Economy.  
 2 / <sup>2</sup>Indian Petroleum and Natural Gas Statistics, various issues. New Delhi: Ministry of Petroleum and Natural Gas.

were followed with a slash, projected into the left margin whereas the citations themselves began at the normal left-hand edge of the type area (figure 6).

### Implementing the design and specifications

A brief account of how the design specifications were put into practice, from compiling data to printing out the final camera-ready pages, is given below to set the design into context.

The energy data systems group of the Tata Energy Research Institute (TERI), in co-operation with TERI's documentation and information centre, collects the data, compiles it into tables, and writes the accompanying text. The tables are created using a word-processing package such as WordPerfect or a spreadsheet such as Lotus. The text is invariably set in WordPerfect. Printouts of tables and text, along with the matching disk-files, are supplied to TERI's publications unit, which is responsible for copy-editing, designing and typesetting, and getting the volume printed. The publications unit uses PageMaker for nearly all of its publications and its compositors are trained in that package; they have had no previous experience in the more traditional methods of composing and typesetting.

To implement the design described in this paper, two sets of guidelines were prepared, one for the compilers of the tables and another for compositors and copy-editors. The set for compilers emphasized the editorial aspects, such as a considered choice in ordering the rows, rounding off the data as appropriate, choice of units, indication of the level of headings, correct choice of symbols for the missing data, and complete citations for sources. The only aspect of design that the compilers were asked to check was the alignment of data in columns (ranged left, aligned on the decimal, or ranged right) because, as described earlier, the choice was governed by the nature of the data.

Guidelines for use in the publications unit were more comprehensive and included a model marked-up table (figure 6). In addition, the printout of each table was marked up by a copy-editor to indicate line-breaks in case of long table-titles. First proofs were checked independently by both the energy data systems group (the authors) and the publications unit (editors). The second and subsequent proofs, if needed, were checked by the publications unit.

The 'authors' were requested to keep formatting to a minimum while preparing the disk-files, nor were any embedded codes used. The only formatting introduced at this stage was the use of bold and italics in citing the sources. In PageMaker, style-sheets were developed for table number, table title, headnote, column and row headings, and citations. The body of the table was worked upon individually, table by table.

### What next?

We in TERI, like others in many research organizations throughout the world, are called upon to produce high-quality documents without the benefit of formal training in typography. Personal computers have made the tools of professional designers available to all, but provide little instruction on how to use them effectively. I present this account

of what I learned from the published literature of the topic, and of how it was translated into specific and detailed decisions, to expose the design to scrutiny by professionals in information design and typography. But this is only half the story. What remains unproven is whether the design leads to reader-friendly tables: Does it mean fewer errors? Do readers find what they are looking for more quickly? Does using tables designed in this way mean less effort for readers? In short, how does our design score on usability? These are questions which we hope to address in the future.

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