TABULAR DATA: Finding the Best Format

By Tom Tullis and Stan Fleischman

It is often necessary for a technical communicator to present large amounts of tabular data containing many rows and columns on a Web site or in a report. We run into this situation all the time at Fidelity Investments. In the Human Interface Design department, we are often called upon to determine the optimal presentation scheme for tables of stocks or mutual funds and the many numbers and character strings associated with them (symbol, price, change in price, and so on).

You may have to produce tables of products with order numbers, color codes, and information on number in stock for each. No matter what information tables such as these contain, the communicator is faced with the same question: What is the best way to format such tables so that a reader is not overwhelmed with a dizzying array of figures?

Our Study

Factors

We conducted a study to try to answer this question. The study was targeted specifically to online documents; however, we believe that the results are equally relevant to printed documents.

We studied three factors in the design of these kinds of tables, as illustrated in Figure 1:

- Table Borders—Bars, Horizontal lines, Horizontal and Vertical lines, and No table borders
- Font Size—Large (HTML size = 2) and Small (HTML size = 1). Arial typeface was used for both.
- Spacing—Loose and Tight, in both horizontal and vertical dimensions.

The factorial combinations of these variables resulted in a total of 16 table designs. The following shows examples of our notation system:

- **BST** = **B**ars, **S**mall font, **T**ight spacing
- **HLL** = **H**orizontal lines, **L**arge font, **L**oose spacing
- **HVSL** = **H**orizontal and **V**ertical lines, **S**mall font, **L**oose spacing
- **NLT** = **N**o table borders, **L**arge font, **T**ight spacing

Procedure

Tables of hypothetical Fidelity mutual fund data were used in the study. Figures 2 and 3 show two of the tables studied. Eight pieces of data were shown for each mutual fund: name, fund number, symbol, NAV (Net Asset Value, or price), NAV change, change percent, offer price, and date.

The study was conducted online on

Figure 1. Table-design factors studied: four types of table borders, two font sizes, and two types of line spacing.

Figure 2. BLL (Bars, Large font, Loose spacing) condition studied. This format came out the best overall in our study.

Growth

Fund Name	Fund #	Symbol	NAV	NAV Change	NAV Change %	Offer Price	Date
Aggressive Growth	324	FDEGX	26.01	-0.53	-2.00	26.01	03/15/2001
Blue Chip Growth	312	FBGRX	43.69	-0.05	-0.11	43.69	03/15/2001
Capital Appreciation	307	FDCAX	20.16	-0.17	-0.84	20.16	03/15/2001
Contrafund	22	FCNTX	42.90	+0.16	+0.37	44.23	03/15/2001
Contrafund II	339	FCONX	10.30	-0.01	-0.10	10.62	03/15/2001
Disciplined Equity	315	FDEQX	22.56	+0.12	+0.53	22.56	03/15/2001
Dividend Growth	330	FDGFX	27.65	-0.06	-0.22	27.65	03/15/2001
Export and Multinational	332	FEXPX	15.56	-0.06	-0.38	15.56	03/15/2001
Fidelity Fifty	500	FFTYX	17.59	-0.37	-2.06	17.59	03/15/2001
Growth Company	25	FDGRX	53.90	-0.50	-0.92	53.90	03/15/2001
Independence	73	FDFFX	17.44	-0.24	-1.36	17.44	03/15/2001
Large Cap Stock	338	FLCSX	15.43	+0.03	+0.19	15.43	03/15/2001
Leveraged Company Stock	122	FLVCX	9.93	-0.10	-1.00	9.93	03/15/2001
Low-Priced Stock	316	FLPSX	23.93	-0.10	-0.42	24.67	03/15/2001
Magellan	21	FMAGX	105.76	+0.67	+0.64	109.03	03/15/2001

our intranet site; it was open to all Fidelity employees for about one month. A total of 1,474 employees participated. The incentive for participating was entry into a drawing for a gift check.

Two visual search tasks were presented to each participant for each data table (for example, "What is the NAV change for Magellan?"). The participant simply had to click on the value. The program automatically recorded the time it took participants to click, as well as the X and Y coordinates so that we could check for accuracy. Two different orders of presentation of the tables were used to balance practice effects.

After performing the two tasks for each table, participants were asked to give a rating of "Ease of Use" for that table format on a scale of 1 to 5.

Speed and accuracy data were calculated for each of the 16 tables. Times for clicks in incorrect locations were not included in the speed data. To get an overall performance measure, the time data and accuracy data were both transformed to z-scores, independently. These scores were then averaged for each table to arrive at an overall performance score. The subjective ratings of ease of use were similarly transformed to z-scores so that they could be compared to the overall performance scores. These performance and rating scores are plotted in Figure 4.

What We Discovered

We looked at how quickly and accurately users could find target pieces of information in each of the tables, as well as their subjective ratings of the usability of each design. Figure 4 shows these results for all sixteen table designs. Surprisingly, the results showed one clear winner overall—"BLL," illustrated in Figure 2. It got the best scores on both the performance and rating scales. This design uses alternating gray and white bars to designate the rows (much like the technique used to make old-fashioned line printer dumps digestible), a relatively large font, and loose spacing.

Figure 4 also shows a fairly clear loser—"HVST," illustrated in Figure 3. It got the worst subjective ratings and among the worst performance values. This design uses both horizontal and vertical lines to designate the rows and columns, a small font, and tight spacing. This combination of factors created a table that was both visually unappealing and difficult to use, perhaps because of the visual "noise" added by the lines. Other losers, as shown in Figure 4, were most of the tables that used no borders of any kind (those on the far right in Figure 4). The lack of borders apparently made it difficult to scan the tables.

Another interesting thing to note from the data in Figure 4 is that in some cases the performance and rating values were inconsistent with each other. (This is not uncommon in usability studies.) For example, "BLT" (Bars, Large font, Tight spacing) got good subjective ratings, but users had some difficulty using it, apparently because of the tight spacing.

Analyzing each factor independently showed that Bars were better than the other borders, Large fonts were better than Small, and Loose spacing was better than Tight. The differences were larger for the subjective ratings.

Conclusions

Some of the conclusions from this study seem fairly clear:

- When designing data tables, try to use alternating bars to distinguish the rows. In this study, we used light gray to alternate with white, but other light colors might work just as well. A darker color might provide too much contrast and be visually "jarring."
- If possible, use a larger font (in our study, Arial 12 point) and relatively loose line spacing. However, these factors may have to be traded off against the amount of scrolling required in a particularly long table. (In our study, none of the tables required scrolling.)
- Avoid the use of full horizontal and vertical lines in a table, particularly when using a smaller font and tight spacing.

Of course, this study isn't the last word in the design of tabular data—different types of data will require different solutions. But if you're new to this type of challenge, we hope you'll find this article useful as a place to start. ❶

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Figure 3. HVST (Horizontal and Vertical lines, Small font, Tight spacing) condition studied. This format came out among the worst of those studied.

Growth

Fund Name	Fund #	Symbol	NAV	NAV Change		NAV Change %	Offer Price	Date
Aggressive Growth	324	FDEGX	26.01	-0.53	↓	-2.00	26.01	03/15/2001
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Magellan	21	FMAGX	105.76	+0.67	↑	+0.64	109.03	03/15/2001
Mid-Cap Stock	337	FMCSX	23.35	0.00	—	0.00	23.35	03/15/2001
New Millennium	300	FMILX	26.02	-0.47	↓	-1.77	26.82	03/15/2001
OTC Portfolio	93	FOCPX	31.13	-0.64	↓	-2.01	31.13	03/15/2001
Small Cap Retirement	384	FSCRX	10.28	-0.07	↓	-0.68	10.28	03/15/2001
Small Cap Selector	336	FDSCX	14.04	-0.03	↓	-0.21	14.04	03/15/2001
Small Cap Stock	340	FSLCX	12.43	-0.01	↓	-0.08	12.43	03/15/2001

Figure 4. Average performance scores (higher numbers are better).