

Say it with Charts



Covers
New Technologies
and the Internet

*The Executive's
Guide to Visual
Communication*

GENE ZELAZNY

FOURTH EDITION



**SAY IT WITH
CHARTS**

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SAY IT WITH CHARTS

**THE EXECUTIVE'S GUIDE
TO VISUAL COMMUNICATION**

Fourth Edition

GENE ZELAZNY

McGraw-Hill

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To Ken Haemer

If we define originality as “undiscovered plagiarism,” then this book is original. Much of the credit for the ideas presented in this book belongs to the late Kenneth W. Haemer (formerly Manager, Presentation Research, AT&T). Over the years Ken was both mentor and friend. Thank you, Ken. I miss you.

If Ken made me think, then McKinsey & Company, Inc., provided me with a home to apply and advance my ideas. And so, let me also thank the hundreds of professional consultants I work with at McKinsey. It's a privilege and a pleasure.

Last, many, many thanks to all of you who have assisted in making this book a reality.

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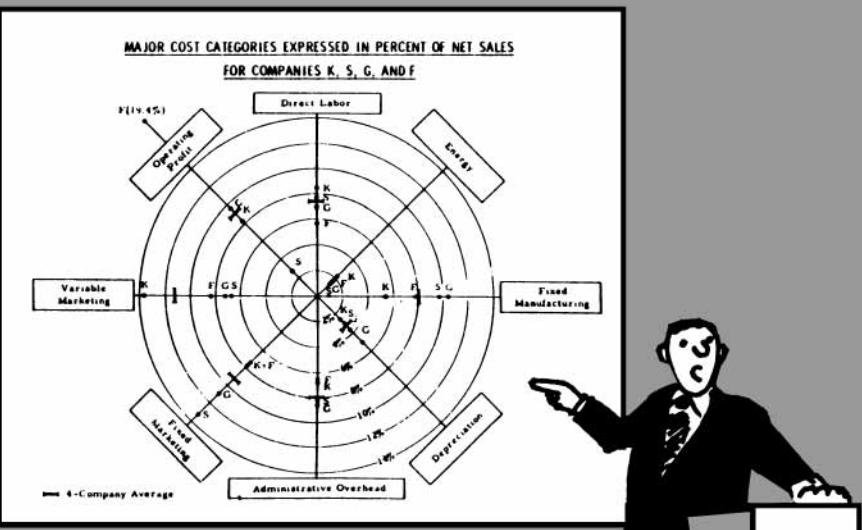
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**SAY IT WITH
CHARTS**



jeannot Z.

“What do you mean, what does it mean?”

SAY IT WITH CHARTS

It's 9:00 a.m. on the third Tuesday of the month, time for the monthly meeting of the Steering Committee. To set the rest of the day's proceedings in perspective, the committee chairman has asked a bright, fast-rising manager—let's call him Frank—to prepare a brief presentation on the state of the industry in which we compete and our company's performance as a stepping-stone for new investment opportunities.

Intent on doing a good job, Frank has done much research, worked on his story line, and prepared a series of visual aids to help him say it with charts. Like most of us, Frank realizes that charts are an important form of language. They're important because, when well conceived and designed, they help us communicate more quickly and more clearly than we would if we left the data in tabular form.

When charts *aren't* well conceived or designed, as we're about to see in Frank's examples, they serve more to confuse than to clarify. Let's sit with the audience and listen to Frank's presentation as we comment, quietly, on the effectiveness of his visuals.

Frank begins: Good morning ladies and gentlemen. My purpose is to present a brief overview of our industry and our company's performance. My objective is to gain your support for expanding into developing countries. I've designed a few visual aids to better place my findings in perspective.

First, let me point out that we compete in a healthy industry. As you can clearly see from this exhibit, for the 11 measures of performance shown across the top and the three types of companies within the industry listed down the side, performance is excellent.

And there you sit in the audience, wondering whether your eyesight is failing, as you try in vain to read the numbers.

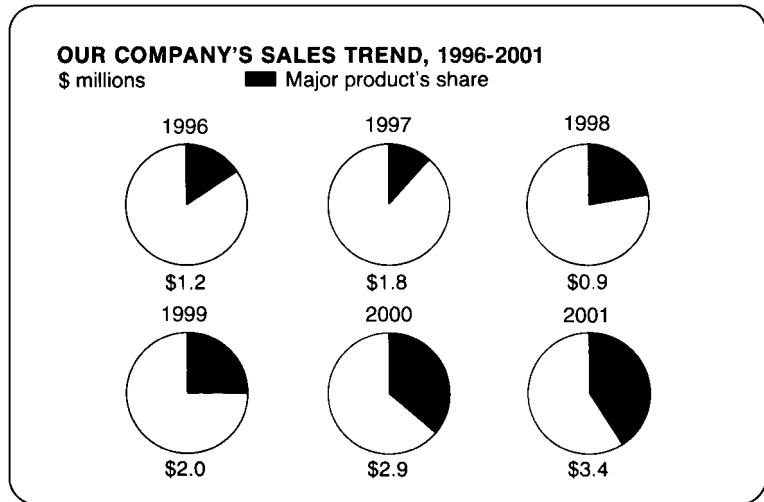
Frank continues: Within the industry, our performance has been outstanding. For instance, our sales have grown, considerably since 1996, in spite of the decline in 1998, which, as you know, was the result of the strike.

"Oops," you whisper, "did I just miss something? I could swear I heard Frank say that sales have grown considerably, but what I see is a series of pie charts that show our major product's share increasing. Oh! Wait a minute. I see! He's referring to the figures underneath each pie. . . ."

► 1

SUMMARY OF THE INDUSTRY'S CONTRIBUTION INCREASED PRODUCTIVITY IN THE STANDING IMPROVEMENT PROGRAM											
Performance Measure	By Product Type	By District Office			By District Office			By District Office			Total
		Market Share	Market Share	Market Share	Market Share	Market Share	Market Share	Market Share	Market Share	Market Share	
Manufacturers - Region A											
Atlanta	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 10,000
Boston	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	140,000
Bridgewater	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	60,000
Hartford	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	40,000
Newark	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	110,000
New York	80,000	81,000	82,000	83,000	84,000	85,000	86,000	87,000	88,000	89,000	880,000
Providence	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	30,000
Riverside	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000
Total	\$144,000	\$145,000	\$146,000	\$147,000	\$148,000	\$149,000	\$150,000	\$151,000	\$152,000	\$153,000	\$1,530,000
Manufacturers - Region B											
Baltimore	\$11,000	\$11,000	\$11,000	\$11,000	\$11,000	\$11,000	\$11,000	\$11,000	\$11,000	\$11,000	\$110,000
Boston	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
Cambridge	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000
Cleveland	13,000	13,000	13,000	13,000	13,000	13,000	13,000	13,000	13,000	13,000	130,000
Edmonton	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	20,000
Hartford	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	40,000
Harrisburg	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000
Houston	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	140,000
Montgomery	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000
Pittsburgh	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000
Total	\$113,000	\$114,000	\$115,000	\$116,000	\$117,000	\$118,000	\$119,000	\$120,000	\$121,000	\$122,000	\$1,220,000
Manufacturers - Region C											
Calgary	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 50,000
Edmonton	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000
Edmonton	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000
Hartford	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000
Houston	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000
Montgomery	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000
Pittsburgh	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000
Total	\$6,000	\$6,000	\$6,000	\$6,000	\$6,000	\$6,000	\$6,000	\$6,000	\$6,000	\$6,000	\$60,000

► 2



Frank goes on: Compared with our four major competitors, we rank first in return on investment with 14 percent. . . .

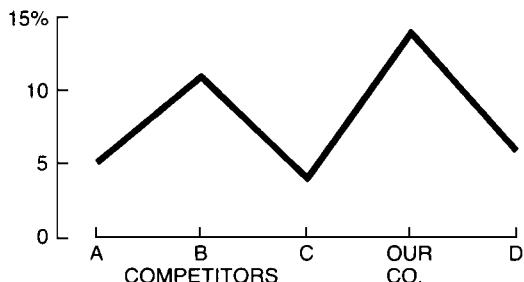
"What ranks first? Who ranks first?" you say. "From the visual, I thought the point was that ROI has been fluctuating."

. . . and our market share has increased since 1996 along with that of one competitor, while the other three lost share.

You sigh in frustration "Has someone spiked my orange juice? Why do I feel that my eyes and ears aren't talking to one another, that I'm receiving mixed signals? Is it perhaps that the visuals I see are not supporting the messages I hear?"

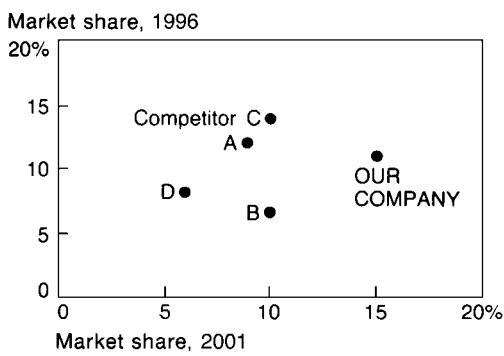
► 3

COMPARISON OF 2001 RETURN ON INVESTMENT, BY COMPANY



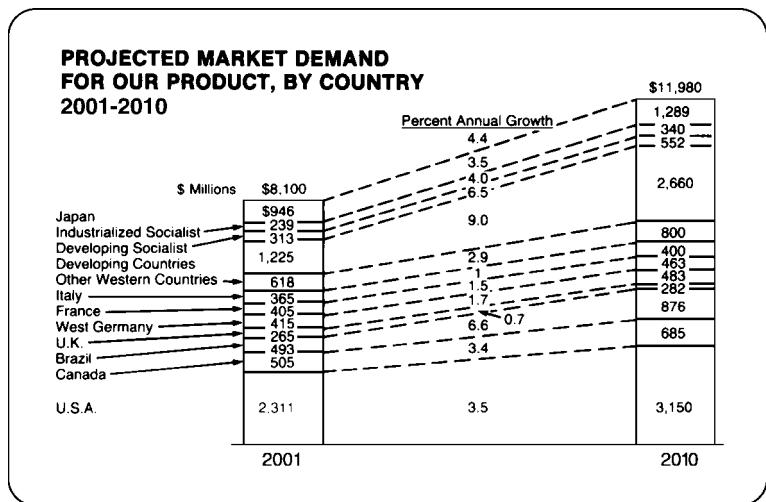
► 4

**MARKET SHARE TRENDS, BY COMPANY
1996-2001**



Frank proceeds: Given these sales, ROI, and market-share trends, we recommend expanding the selling effort for our major product into developing countries. We believe these markets hold considerable potential. Since you may not understand this visual, let me explain it. What I've done is shown the total size of the market worldwide in 2001 and projected it to 2010. On the basis of a lot of research, we forecast that the market will increase from \$8 billion to over \$11 billion. Then I divided the totals by the 11 countries that make up the market and showed the size of each. Then I calculated the average annual compound

► 5



growth rate for each country and listed it in the center. As you can see from these figures, the developing countries are projected to show the fastest growth.

Now I feel your nudge and hear your aside: "Isn't it remarkable how these visual aids designed to aid speakers require so much speaker aid to be understood. I always thought that a picture was worth 1,000 words, not that it required them."

Frank: If we are to move ahead, however, we need first to persuade top management that the political and social climate in these developing countries will not interfere with our plans. A recent poll of 16 top management members reveals they are almost evenly split for and against investing in these countries.

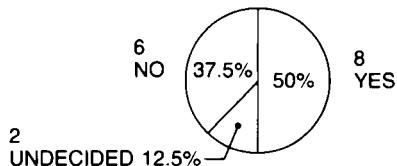
By now, your social unrest is hard to contain, and the pie chart conjures visions of dessert at lunch.

► 6

RESULTS OF RECENT OPINION POLL OF 16 TOP MANAGEMENT EXECUTIVES

"Should the political and social climate of developing countries influence our decision to expand into this market?"

PERCENTAGE OF TOTAL: 100% = 16



Source: Recent opinion poll of 16 top management executives.

Frank's intention was right: he meant to use charts to support his presentation. His execution was not good: he developed a series of charts that were illegible or unintelligible and that detracted from his presentation. Let's review his charts and see why they don't work.

Visual number ► 1 is illegible. Like all illegible visuals, it suffers from the APK—anxious parade of knowledge—syndrome. This is usually the case when the presenter is more concerned with what's been put *into* the chart than in what the audience gets *out* of it.

What Frank didn't realize is that a chart used in a visual presentation must be at least twice as simple and four times as bold as one used in a report. It's the same as the distinction between a billboard that must be read and understood in the time you drive past it and a magazine advertisement that you can study in detail.

At the other extreme is the last chart, number ► **6**, which is so simple that it is not needed; the message could have been expressed with words alone. In addition to overly simple charts, there are other situations when you're better off without a chart:

1. Sometimes the chart denotes a sense of accuracy that may be misleading, as is the case with projections or ranges that may be tenuous.
2. Sometimes there are sets of data that the audience or reader has become comfortable with, such as the company's profit and loss statement, and changing the form to a chart could be confusing.
3. Certain individuals may be unaccustomed to, or resistant to, or skeptical about the use of charts.

With charts, a good rule is "fewer is better." Producing charts is time-consuming and expensive. Also, the more charts we use, the less people remember. Use one chart in a report or presentation, and it will receive 100 percent of the audience's attention; use 100, and none will be memorable.

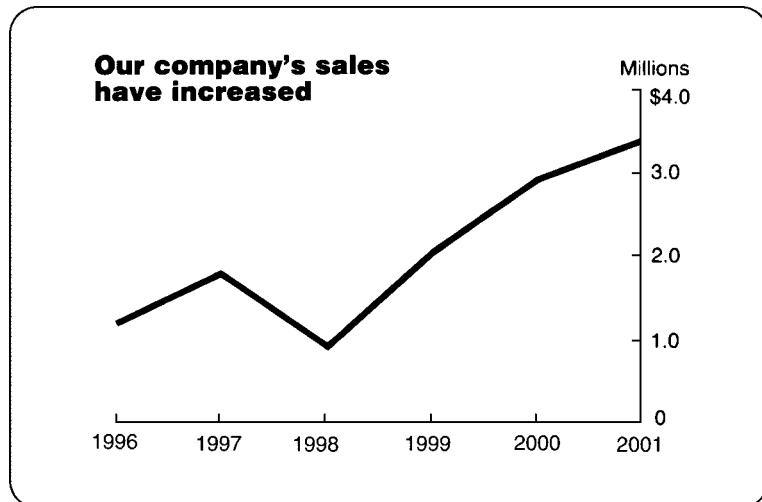
Chart 5, the one describing the world market, is what I call a "charttable"; it can't make up its mind whether to be a chart or a table and decides to be both. The hope is that if the chart doesn't work, the information may. In most cases, neither does. Undoubtedly, this chart helped Frank figure out the important relationships—in this case, the comparison of projected growth rates by country. However, Frank did not translate the data from the form that helped him analyze the problem to a simpler chart that emphasized the results of his analyses.

The remaining three charts, ► **2, 3, and 4**, suffer from what is probably the major problem facing most of us when we translate data into chart form: the wrong form for the message. In Chart 2, pie charts were chosen where a line chart is called for; in Chart 3, a line chart was used where a bar chart would be better; in 4, we see a dot chart instead of column charts.

Sales have increased from \$1.2 million in 1996 to \$3.4 million in 2001 despite the decline in 1998 caused by the strike.

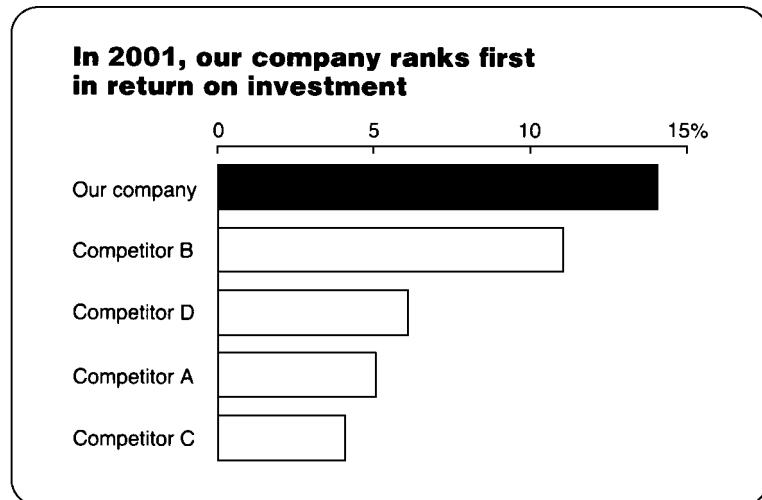
Here is what these three charts should have looked like to support the spoken message more quickly and clearly.

► 2



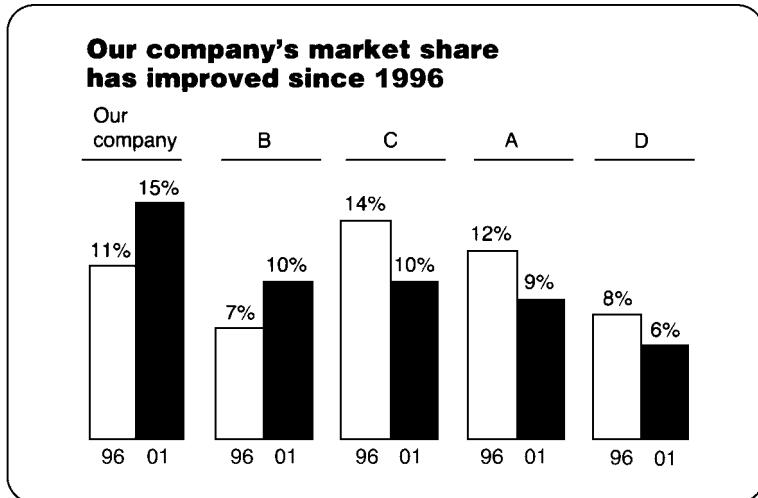
Compared with our four major competitors, we rank first with a 14 percent return on investment in 2001.

► 3



Our market share has increased 4 percentage points from 11 percent in 1996 to 15 percent today. Of our four competitors, B also improved, while C, A, and D lost share.

► 4



Now these charts work. In each case, the chart form supports the message expressed in the title, and the title reinforces the point the chart demonstrates. In all cases, the message comes across faster and better than it would if the data were left in table form.

And there you have the purpose of this book. Its goal is to help you say it with charts by choosing and using charts that will work for you and your audience no matter where the charts are used—be it in business presentations or reports, in your management information system, in computer graphics software packages, in annual reports, or in magazines or newspaper articles.

In the next portion of this section, we'll work our way through the process that moves us from data to chart. In Section II, we'll examine a portfolio of finished charts that you can refer to for ideas the next time the need arises.

In Section III, we'll show how to convey your message using concept visuals, and visual metaphors.

In Section IV, we'll demonstrate how to design charts for on-screen presentations.

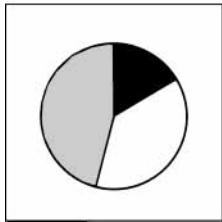
As I said before, charts *are* an important form of language. But as is true of any language we want to become proficient in, it takes time and patience to learn the vocabulary, and practice until the skill becomes second nature. Since no one learns by reading, only by doing, I've incorporated work projects so you can practice as you read. So take pencil in hand, and let's move on to the process of choosing charts.

Section 1

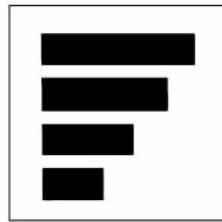
CHOOSING CHARTS

No matter how many business graphics we see in various kinds of communications—including tables, organization charts, flow diagrams, matrixes, maps—when it comes to quantitative charts, there are only five basic chart forms to choose from. As shown here in simple terms, these are:

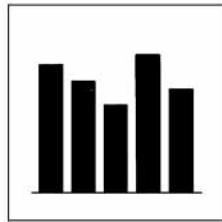
The pie chart



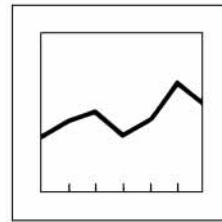
The bar chart



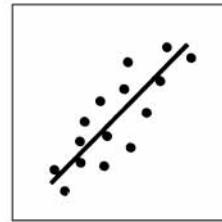
The column chart



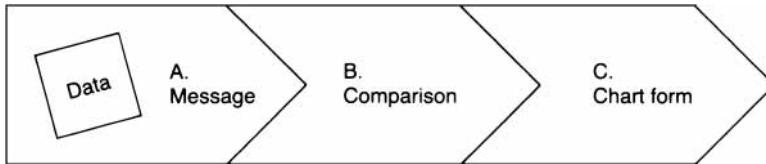
The line chart



The dot chart



Now we know where we're going; the question is, how do we get there? With the following diagram, let me summarize the process that moves us from the data we start with to the specific chart we end with.



Step A:

DETERMINE YOUR MESSAGE

(from data to message).

The key to choosing the appropriate chart form is for *you*, as the designer, to be clear, first and foremost, about the specific point you want to make.

Step B:

IDENTIFY THE COMPARISON

(from message to comparison).

The message you've determined will always imply one of five basic kinds of comparison: component, item, time series, frequency distribution, or correlation.

Step C:

SELECT THE CHART FORM

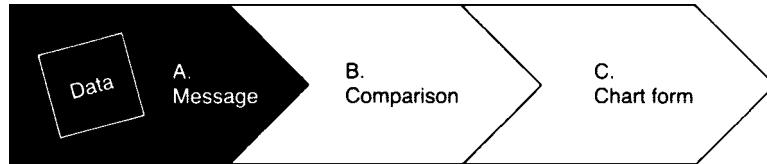
(from comparison to chart).

Each comparison will lead, in turn, to one of the five chart forms.

Let's discuss each step in detail.

A. DETERMINE YOUR MESSAGE

(from data to message)



Choosing a chart form without a message in mind is like trying to color coordinate your wardrobe while blindfolded.

Choosing the correct chart form depends completely on *your* being clear about what *your* message is. It is not the data—be they dollars, percentages, liters, yen, etc.—that determine the chart. It is not the measure—be it profits, return on investment, compensation, etc.—that determines the chart. Rather, it is *your* message, what *you* want to show, the specific point *you* want to make.

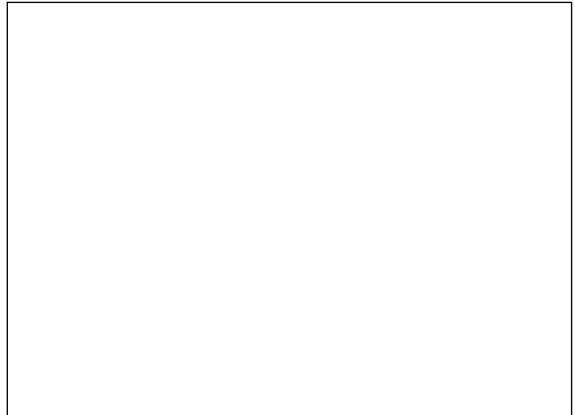
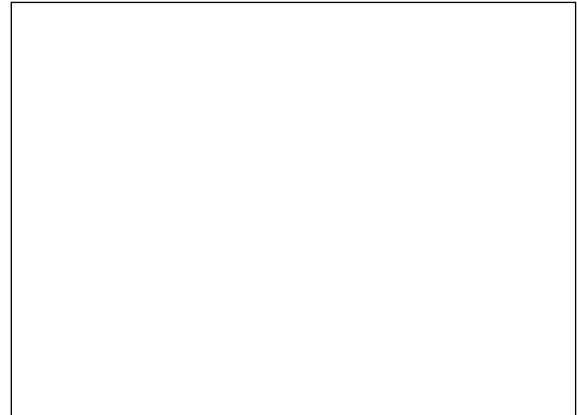
To stress the importance of this first step, sketch as many charts as you can think of in the empty boxes on the next two pages using the data (percentage of sales by region for each company) shown in the upper right-hand box. Don't worry about accuracy—your goal is to draw as many charts as you can before turning to page 14.

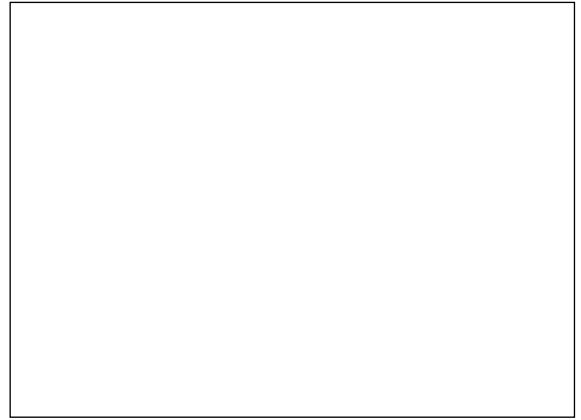
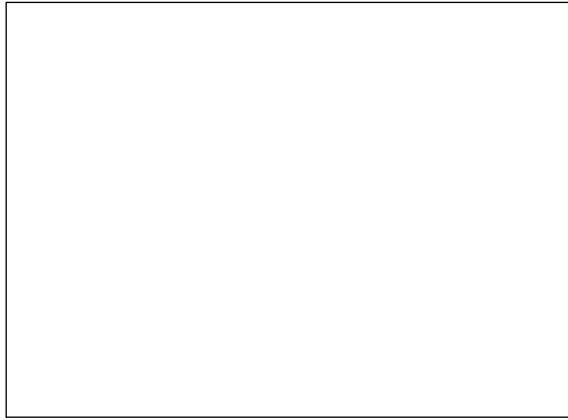
PROJECT

Sketch as many charts as you can think of using these data: the more the better.

Percentage of January Sales by Region

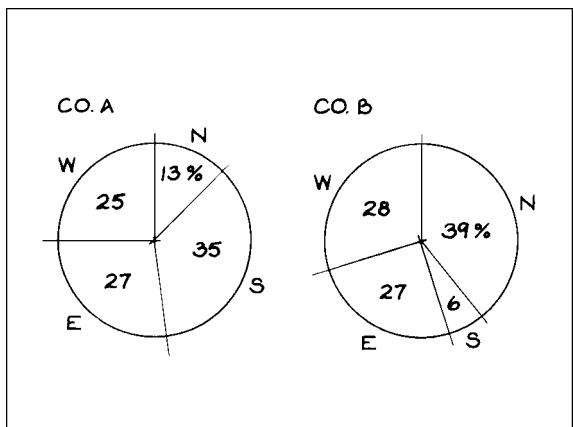
	Co. A	Co. B
North	13%	39%
South	35	6
East	27	27
West	25	28



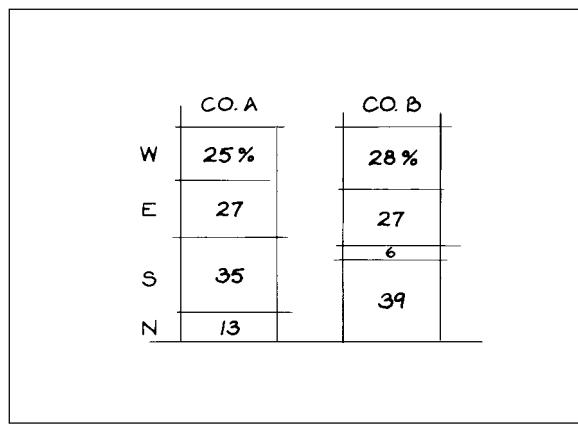


WHICH CHART WOULD YOU CHOOSE?

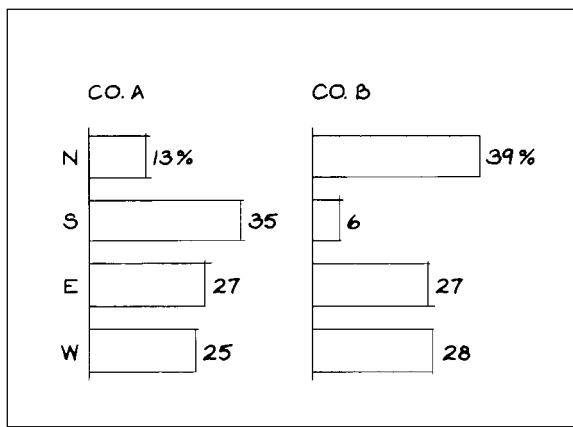
► 1



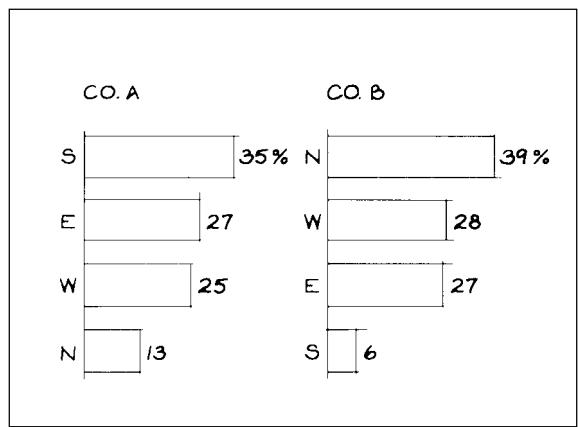
► 2



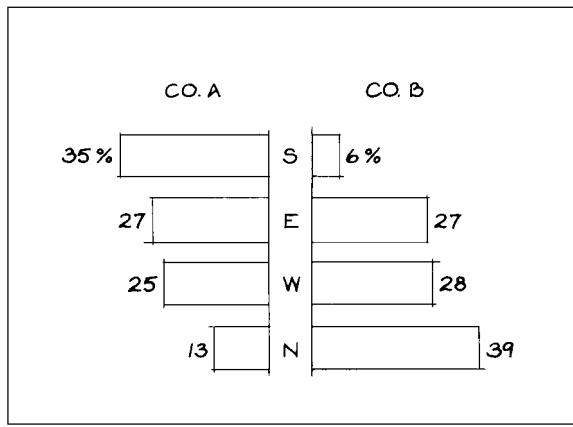
► 3



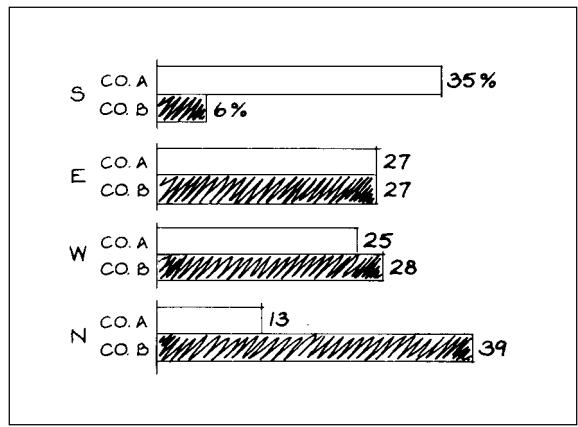
► 4



► 5



► 6



The charts shown on the facing page may be among those you sketched. All the better if you thought of others. But a question remains.

WHICH CHART WOULD YOU CHOOSE?

It all depends! It all depends on the specific point *you* want to make—*your* message. Each chart shown, simply as a function of the way it's organized, is best equipped to emphasize a particular message.

For instance, showing the data as a couple of pie charts or 100 percent columns, you would be emphasizing that:

► 1 ► 2 The mix of sales is different for Companies A and B.

Or you may have shown the data as two sets of bar charts, sequencing the bars in the order the data were presented in the table. Now the chart is stressing the message that:

► 3 The percentage of sales for both Companies A and B varies by region.

On the other hand, you could have ranked the percentage of sales for each company in descending (or ascending) order, now stressing the point that:

► 4 Company A is highest in the South; Company B is highest in the North. Or, Company A is lowest in the North; Company B is lowest in the South.

By structuring the bars in a mirror image around the regions, we now demonstrate that:

► 5 Company A's share of sales is highest in the South where Company B's is the weakest.

By grouping the bars against a common base, we now compare the gaps by region, showing that:

► 6 In the South, Company A leads B by a wide margin; in the East and West, the two are competitive; in the North, A lags B.

Now, it's possible—even probable—that in the early stages of deciding what your message should be, you may need to sketch a number of charts that look at the data from various points of view. A more efficient approach is to highlight the aspect of the data that seems most important and settle on the message that brings out that aspect.

For example, looking at this simplified table, there are three possible aspects of the data that could be highlighted and turned into messages.

Your attention might focus on the overall sales trend from January through May; how the dollar value of sales has changed over time. In that case, your message would be that "Sales have risen steadily since January."

Sales by Product, \$000				
	Product			
	A	B	C	Total
Jan.	88	26	7	121
Feb.	94	30	8	132
Mar.	103	36	8	147
Apr.	113	39	7	159
May	122	40	13	175

On the other hand, you might want to focus on a single point in time. Reading the figures across for May, for example, you might take note of the ranking of sales for Products A, B, and C. In that case, your message could be: "In May, sales of Product A exceeded those of B and C by a wide margin."

Sales by Product, \$000				
	Product			
	A	B	C	Total
Jan.	88	26	7	121
Feb.	94	30	8	132
Mar.	103	36	8	147
Apr.	113	39	7	159
May	122	40	13	175

Looking at the same May data from yet another perspective, you might focus on the percentage of total sales accounted for by each product. Then your message might be: "In May, Product A accounted for the largest share of total company sales."

Sales by Product, \$000				
	Product			
	A	B	C	Total
Jan.	88	26	7	121
Feb.	94	30	8	132
Mar.	103	36	8	147
Apr.	113	39	7	159
May	122	40	13	175

70% 23% 7% 100%

Note that for these last two examples, we used nearly the same aspect of the data to come up with different messages. The decision to emphasize ranking or share is up to you, and that decision will give you your message.

Suppose you have other data from the same company.

This table shows the distribution of sales by size of sale at one point in time, May. Here your message might be: "In May, most sales were in the \$1,000 to \$2,000 range."

Number of Sales by Size of Sale, May

Size of sale	Number of sales
<\$1,000	15
1,000-1,999	30
2,000-2,999	12
3,000-3,999	8
4,000 +	5

This last set of data shows the relationship of the salesperson's experience to the sales he or she generates. Noting that salesperson P, with only two years' experience, generates \$23,000 in sales, while salesperson Q, with more than twice the experience, generates only one-quarter the volume would indicate the message that: "There is no relationship between sales and experience."

Relationship of Salesperson's Experience to Sales

Sales-person	Years of experience	Amount of sales
P	2	\$23,000
Q	5	6,000
R	7	17,000
S	15	9,000
T	22	12,000

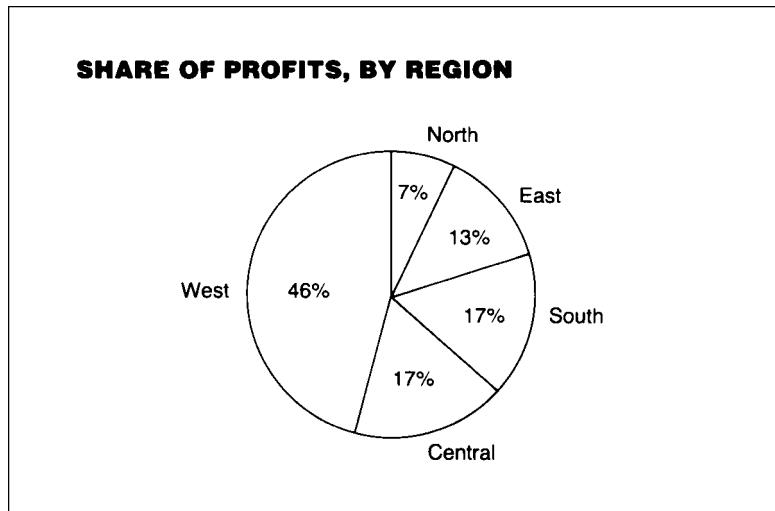
As we've seen, this first step, determining your message, must be completed before you can select the appropriate chart form. Having spent all that time and energy doing so, you may as well make the most of the effort and *let the message become the title of the chart*. Let me elaborate.

For many of the charts we see, the title is little more than a cryptic heading, such as:

COMPANY SALES TREND
PRODUCTIVITY BY REGION
PERCENTAGE OF ASSETS BY DIVISION
DISTRIBUTION OF EMPLOYEES BY AGE
RELATIONSHIP OF COMPENSATION
TO PROFITABILITY

These titles describe the subject of the chart, but they don't say what's important about it. What about sales performance? What about the distribution of employees? What about the relationship between compensation and profitability? Don't keep it a secret; let your message head the chart. In so doing, you reduce the risk that the reader will misunderstand, and you make sure he or she **focuses on the aspect of the data you want to emphasize.**

Let's look at a couple of examples that demonstrate the difference and establish the advantage of message titles over the topic titles just shown.



Here, the title states the topic of the chart, leaving you to determine the significance of what the chart shows. Studying the chart, most readers would probably focus on the West, believing the message to be emphasized is that the **"West accounts for almost half of profits."**

However, that may not be the point that the designer wants you to focus on. He or she may wish to stress that the **"North generates the smallest share of profits."** In short, with the topic title, you run the risk of being misunderstood. Substituting the message title, **"North generates the smallest share of profits"** reduces that risk by focusing the reader's attention on the aspect of the data we want to stress.

In this second example, the title merely identifies what the trend line stands for—NUMBER OF CONTRACTS—and serves to distinguish the topic of this line chart from that of other line charts we might see in a report or presentation. However, studying the trend, here are four possible aspects we may want to stress.

Message 1

The number of contracts has increased

Message 2

The number of contracts has been fluctuating

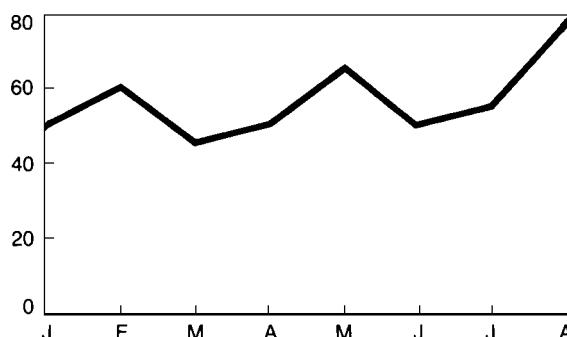
Message 3

In August, the number of contracts reached its highest point

Message 4

The number of contracts declined in two of the eight months

NUMBER OF CONTRACTS
January-August



To assist readers, let's select **the one message** we wish to emphasize to head the chart.

A message title is similar to a headline in your newspaper or magazine; it is brief and to the point and summarizes what you're about to read. For the cryptic headings we showed before, here's what the message titles might look like:

Topic title: COMPANY SALES TREND
Message title: **Company sales have doubled**

Topic title: PRODUCTIVITY BY REGION
Message title: **Region C ranks fourth in productivity**

Topic title: PERCENTAGE OF ASSETS BY DIVISION
Message title: **Division B accounts for 30% of the assets**

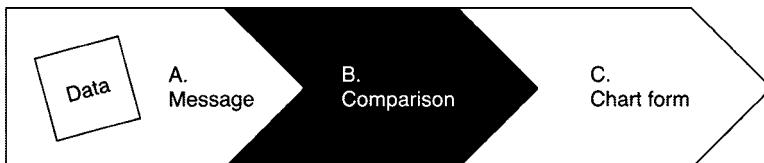
Topic title: DISTRIBUTION OF EMPLOYEES BY AGE
Message title: **Most employees are between 35 and 45 years old**

Topic title: RELATIONSHIP OF COMPENSATION TO PROFITABILITY
Message title: **There is no relationship between compensation and profitability**

Once you've determined *your* message, you'll find the process becomes very specific. So let's move on to the second step, identifying the kind of comparison implied in your message.

B. IDENTIFY THE COMPARISON

(from message to comparison)



If the first step is the message we start with and the third step is the chart we end with, this step is the link between the two.

What's important to recognize here is that any message—that is, any point from the data you wish to emphasize—will always lead to one of five basic kinds of comparison, which I've chosen to call *component*, *item*, *time series*, *frequency distribution*, and *correlation*.

Let's see examples of messages that imply each one of these comparisons. At the same time, let me define the comparisons and give you clues—trigger words—for recognizing them in messages you derive from the data.

1. COMPONENT COMPARISON

In a component comparison, we are interested primarily in showing the *size* of each part *as a percentage* of the total. For example:

- ¶ In May, Product A accounted for the largest *share of total* company sales.
- ¶ Client *share of market* in 2001 is less than 10 percent of the industry.
- ¶ Two sources contributed almost *half of total corporate funds*.

Any time your message contains words such as *share*, *percentage of total*, *accounted for X percent*, you can be sure you're dealing with a component comparison.

2. ITEM COMPARISON

In an item comparison, we want to compare how things *rank*: are they about *the same*, or is one *more* or *less* than the others? For example:

- ¶ In May, sales of *Product A* exceeded those of *Products B and C*.
- ¶ Client's return on sales *ranks* fourth.
- ¶ Turnover rates in the six departments are *about equal*.

Words indicating *large than*, *smaller than*, or *equal* are clues to an item comparison.

3. TIME SERIES COMPARISON

This comparison is the one we're most familiar with. We're not interested in the size of each part in a total or how they're ranked, but in how they *change over time*, whether the trend over weeks, months, quarters, years is *increasing*, *decreasing*, *fluctuating*, or *remaining constant*. For example:

- ¶ Sales *have risen* steadily since January.
- ¶ Return on investment *has decreased* sharply over the past five years.
- ¶ Interest rates *have fluctuated* over the past seven quarters.

Clues to look for in your message are words like *change*, *grow*, *rise*, *decline*, *increase*, *decrease*, *fluctuate*.

4. FREQUENCY DISTRIBUTION COMPARISON

This kind of comparison shows *how many items fall into a series of progressive numerical ranges*. For instance, we use a frequency distribution to show how many employees earn less than, say, \$30,000, how many earn between \$30,000 and \$60,000, etc.; or how much of the population is under 10 years old, how many people are between 10 and 20, between 20 and 30, etc. Typical messages might be:

- ¶ In May, *most sales* were in the \$1,000 to \$2,000 range.
- ¶ The *majority of shipments* are delivered in *five to six days*.
- ¶ The *age distribution* of company employees differs sharply from that of our competitor.

Terms to look for that suggest this kind of comparison are *x to y range, concentration*, as well as the words *frequency* and *distribution* themselves.

5. CORRELATION COMPARISON

A correlation comparison shows *whether the relationship between two variables follows*—or fails to follow—the pattern you would normally expect. For example, you would normally expect profits to increase as sales increase; you would normally expect sales to increase as the size of the discount offered increases.

Whenever your message includes words like *related to, increases with, decreases with, changes with, varies with*, or the converse such as *doesn't increase with*, it's an instant clue that you're showing a correlation comparison. For example:

- ¶ Sales performance in May shows *no relationship between* sales and the salesperson's experience.
- ¶ Chief executive officer compensation *does not vary with* size of company.
- ¶ Size of policy *increases with* policyholder income.

There you have them, the five kinds of comparison implied in any of the messages you'll be deriving from tabular data. Stated simply:

Component: Percentage of a total.

Item: Ranking of items.

Time Series: Changes over time.

Frequency Distribution: Items within ranges.

Correlation: Relationship between variables.

With this in mind an pencil in hand, study the following 12 typical messages derived from tabular data and identify the kind of comparison implied by each message. Look for the clues—the trigger words—in each, and, if necessary, look back to the definition and the examples we've just discussed. Check your answers with those shown upside down at the bottom of the page.

Typical Messages

Comparison?

1. Sales are forecast to increase over the next 10 years
2. The largest number of employees earns between \$30,000 and \$35,000
3. Higher price of gasoline brands does not indicate better performance
4. In September, the turnover rates for the six divisions were about the same
5. The sales manager spends only 15% of his time in the field
6. Size of merit increases is not related to tenure
7. Last year, most turnover was in the 30 to 35 age group
8. Region C ranks last in productivity
9. Our company's earnings per share is declining
10. The largest share of total funds is allocated for manufacturing
11. There is a relationship between profitability and compensation
12. In August, two plants outproduced the other six by a wide margin

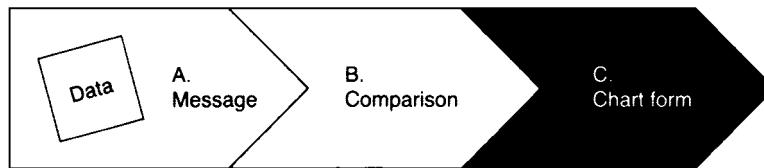
ANSWERS

-
- | | | | |
|----------------|---------------------------|---------------------------|----------|
| 1. Time Series | 2. Frequency Distribution | 3. Correlation | 4. Item |
| 5. Component | 6. Correlation | 7. Frequency Distribution | 8. Item |
| 9. Component | 10. Component | 11. Correlation | 12. Item |

Having moved from the data to your message and from your message to a comparison, we're now ready to proceed with the final step—from the comparison to the chart form most appropriate for your message.

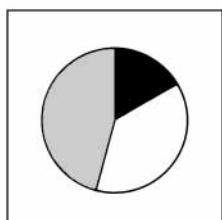
C. SELECT THE CHART FORM

(from comparison to chart)

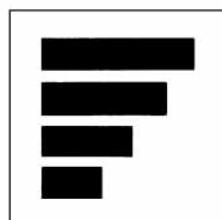


Now you have seen that, no matter what your message is, it will always imply one of the five kinds of comparison. It should come as no surprise that, no matter what the comparison is, it will always lead to one of the five basic chart forms: the pie chart, the bar chart, the column chart, the line chart, and the dot chart.

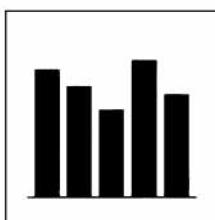
The pie chart



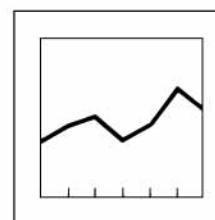
The bar chart



The column chart



The line chart



The dot chart



I've observed that the *pie chart* is the most popular. It shouldn't be; it's the least practical and should account for little more than 5 percent of the charts used in a presentation or report.

On the other hand, the *bar chart* is the least appreciated. It should receive much more attention; it's the most versatile and should account for as much as 25 percent of all charts used.

I consider the *column chart* to be "good old reliable" and the *line chart* to be the workhorse; these two should account for half of all charts used.

While possibly intimidating at first glance, the *dot chart* has its place 10 percent of the time.

That accounts for 90 percent. The remainder is likely to be these chart forms used in combination—say, a line chart with a column chart or a pie chart with a bar chart.

Let's recognize that each chart form, simply as a function of the way it's designed, is best equipped to illustrate one of the five comparisons.

This matrix illustrates the primary choices. Down the side are the five basic chart forms. Across the top are the five kinds of comparison we've just discussed. For time series, frequency distributions, and correlations, you have two choices of chart forms. Deciding which to use is a function of the amount of data you're plotting. For a time series or frequency distribution, use the column chart when you have few (say, six or seven) data points; use the line chart when you have many. For a correlation comparison, use the bar chart to show few data, the dot chart when you have many.

Let's work our way through the matrix and see why each chart form is recommended to show each comparison. In the process, we'll discuss how to make the most of the chart forms and present variations for each that provide additional information.

BASIC CHART FORMS

	COMPONENT	ITEM	TIME SERIES	FREQUENCY	CORRELATION
PIE					
BAR					
COLUMN					
LINE					
DOT					

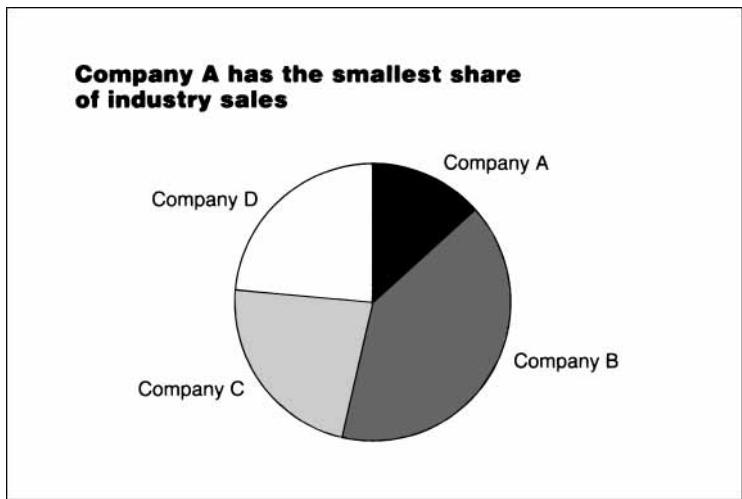
As we proceed, keep in mind that choosing, and especially using, charts is not an exact science. And so you'll note a liberal sprinkling of qualifiers, such as, generally, occasionally, most of the time, some of the time, etc., all of which imply that your judgment must play a role in deciding how best to design the charts. The options presented in the matrix, along with the suggestions for making the most of charts, are guidelines. More often than not, however, you'll find these guidelines will serve you well.

Before turning the page for a specific discussion of each comparison and its recommended chart form, I suggest that you pause for a while and skip to the second section where I present a portfolio of all these charts at work. Browse through this shopping list of charts to gain an appreciation of how effective charts can be when they are well conceived and designed.

1. COMPONENT COMPARISON

A component comparison can best be demonstrated using a pie chart. Because a circle gives such a clear impression of being a total, a pie chart is ideally suited for the one—and only—purpose it serves: showing the size of each part as a percentage of some whole, such as companies that make up an industry.

THE PIE CHART



To make the most of pie charts, you should generally use not more than six components. If you have more than six, select the five components most important to your message and group the remainder into an “others” category.

Because the eye is accustomed to measuring in a clockwise motion, position the most important segment against the 12 o'clock line and, to add emphasis, use the most contrasting color (e.g., yellow against a black

background), or the most intense shading pattern if producing the chart in black and white. If no one segment is more important than the others, consider arranging the components from the largest to the smallest or vice versa and use either the same color or no shading for all segments.

In general, pie charts are the least practical of the five chart forms. They are also the most misused and, worse, the most abused.

For example, on the next page are several pseudo pie charts I've discovered over the years in various presentations, newspapers, magazines, and annual reports. Now I'll grant you each is imaginative and resourceful, even attractive, although example D is a bit macabre. They are also examples of form becoming more important than content and, as a result, they fail to present accurate visual relationships.

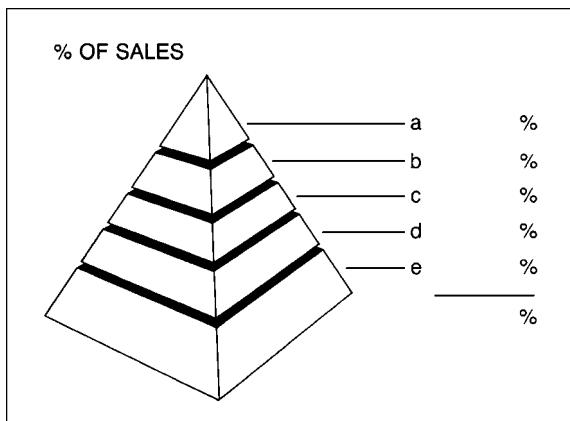
Let me stress that the primary purpose of any chart is to demonstrate relationships more quickly and more clearly than is possible using a tabular form. Whenever the form becomes more important than the content—that is, whenever the design of the chart interferes with a clear grasp of the relationship—it does a disservice to the audience or readers who may be basing decisions on the strength of what they see.

Let's have fun and do an exercise that tests the usefulness of these examples as visual *aids*. To get the most from the following work project, promise that *you will not think*; record your first visual impression. For each example, starting at the top and moving down or around, quickly fill in the percentage of the total corresponding to each component. Then add the totals. Most important, you CAN'T GO BACK, you CAN'T ERASE, and fortunately you CAN'T CHANGE YOUR MIND, since you cannot think.

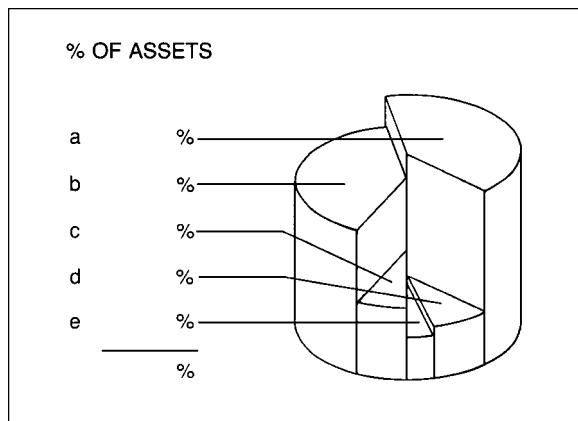
GO!

For each of these six charts, fill in the percentage you feel each segment represents and add them up.

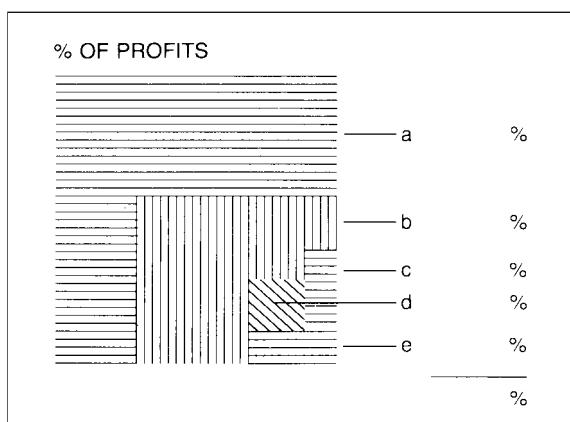
► A



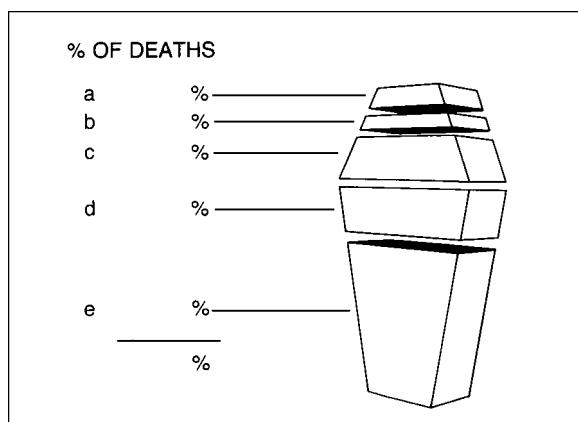
► B



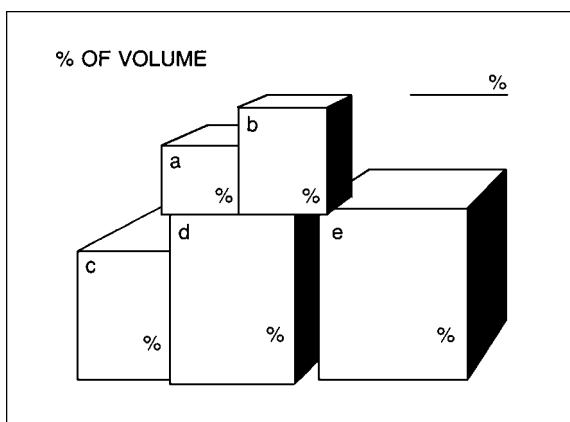
► C



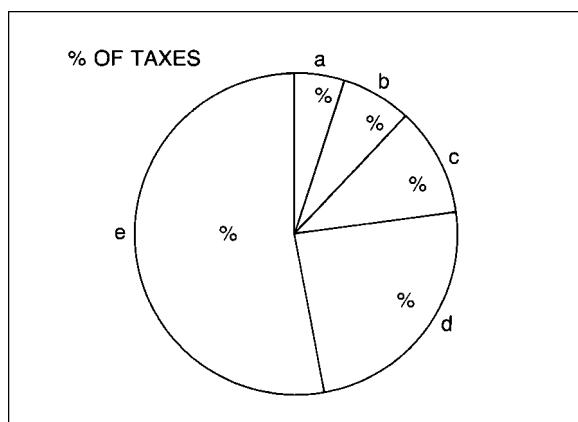
► D



► E



► F



Now compare all your guesses with the actual data that accompanied each example:

	A Percent cent of sales	B Percent of assets	C Percent of profits	D Percent of deaths	E Percent of volume	F Percent of taxes
a.	5%	37%	58%	7%	7%	5%
b.	7	31	32	6	15	7
c.	11	10	3	17	18	11
d.	24	14	4	16	25	24
e.	53	8	3	54	35	53
	100%	100%	100%	100%	100%	100%

If your results were radically different from these numbers—at least for Charts A through E—then it's clear that the charts are not doing the job they were intended to do, which is to give you an *accurate* impression of the relationships. I've tested these with many colleagues. Chances are your results were similar to theirs. In few cases did the data add to exactly 100 percent. Instead, the components added to less than 100 percent as often as they did to well over 100 percent. In the most extreme cases, the data added up to only 45 percent at the lower end and to 280 percent at the high end. Even when people arrived at the same total, their proportions were not necessarily similar.

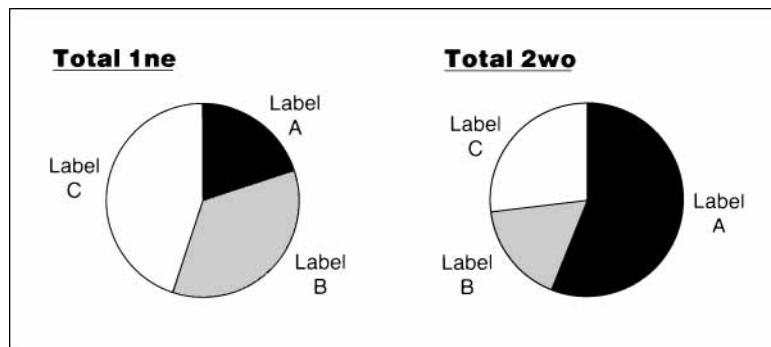
On the other hand, almost everyone was accurate in estimating the percentages in Example F, *Percent of Taxes*, presented as a conventional pie chart. Here, people could more readily *see* that segment *a* is somewhere around 5 percent and that *d* is about 25 percent, while *e* is a bit more than 50 percent. In truth, Example F is based on the same data as Example A. I just changed the titles to see what would happen. Compare the percentage values you filled in for A with those you wrote for F and note how the difference in chart form threw you off.

There's a clear lesson to be learned from this exercise: If your objective is to communicate accurate relationships,

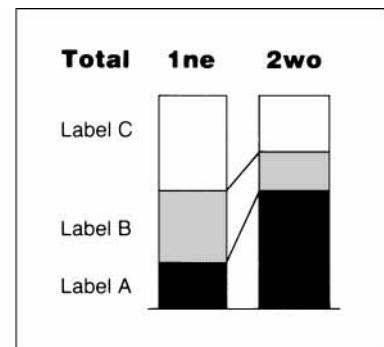
overcome the urge to be creative and instead rely on conventional pie charts. Use your creativity to make the charts attractive with handsome layouts, readable type, and constructive use of color or shadings.

A pie chart serves the purpose of showing the components of a single total better than a 100 percent bar or 100 percent column chart. However, as soon as you need to compare the components of more than one total, don't think, don't hesitate. Switch to either

Poor



Preferred



100 percent bars or 100 percent columns. This example shows why.

Notice how the labels must be repeated for each of the two pie charts shown. Of course, we could use a legend. However, this forces the reader to look back and forth between the legend and the components to be clear about which belongs to which. Also, although shadings—or colors—help the viewer to distinguish the three components, the eyes must travel back and forth, from pie to pie, to grasp the relationships.

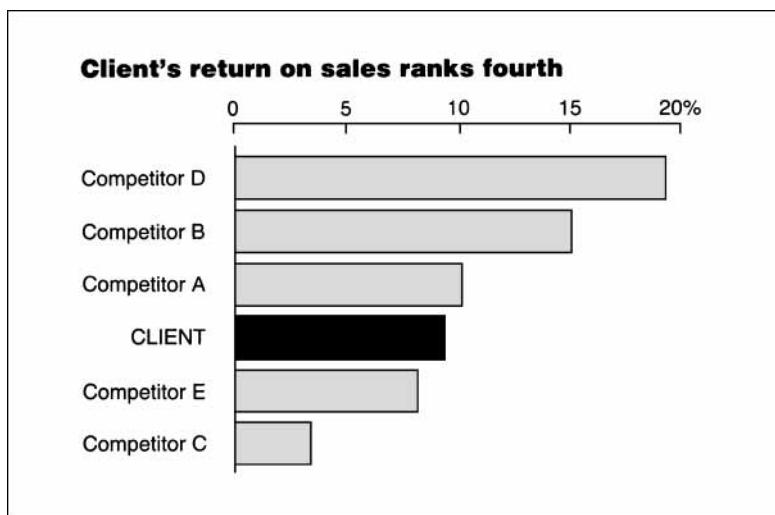
By using two 100 percent columns instead, we reduce the problems. Now the labeling is less redundant, and the relationships between corresponding segments, here reinforced with connecting lines, are more quickly apparent.

2. ITEM COMPARISON

An item comparison can best be demonstrated by a bar chart.

The vertical dimension is not a scale; all it is used for is labeling the measured items—such as countries, industries, companies, salespeople's names. This being the case, you can arrange the bars in any sequence that suits the ranking you want to stress. For example, in a chart that compares the return on sales for a client company with that of its five competitors at one point in time, the bars can be sequenced by company name in alphabetical order, or by date of entry into the industry, or by size of sales, or by the magnitude of the return from either low to high or, as in this example, from high to low (from best to worst).

THE BAR CHART

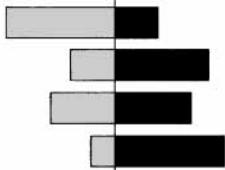
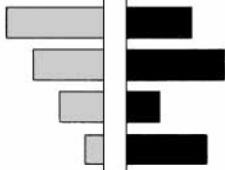
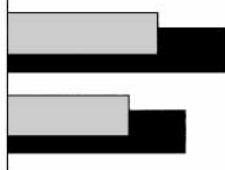
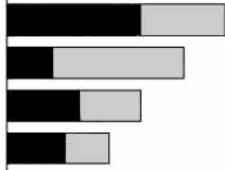


In preparing bar charts, make certain that the space separating the bars is smaller than the width of the bars. Use the most contrasting color or shading to emphasize the important item, thereby reinforcing the message title.

To identify the values, use either a scale at the top (sometimes at the bottom) or numbers at the ends of the bars, not both. Use the scale if all you want is a fast study of the relationships; use the numbers if they are important to your message. At times, it's a good idea to use the scale and *the one number* that needs emphasis. Using both scale and numbers, however, is redundant and adds clutter to the bar chart, as it does, for that matter, to the column chart and the line chart.

When showing numbers, round out the figures and omit decimals whenever they have little effect on your message; a figure such as 12 percent is more easily retained than 12.3 percent or 12.347 percent.

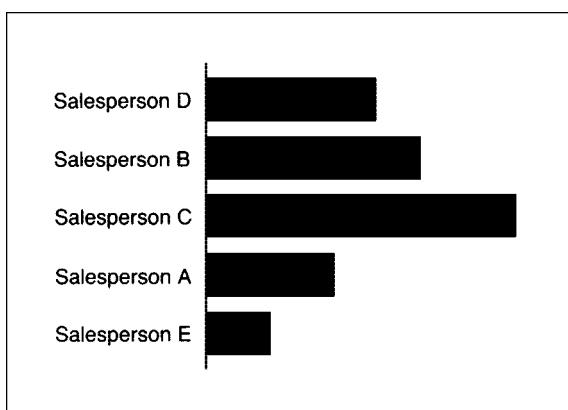
To demonstrate the versatility of the bar chart, here are six variations of the chart form, each providing additional information. Examples of the application of these variations are illustrated in the second portion of this section. You may want to glance at them now. Certainly you will want to incorporate them into your vocabulary of charts at work.

 <p>A deviation bar chart distinguishes the profit winners from the losers</p>	 <p>A sliding bar chart shows the different mix of two components, e.g., percentage of imports versus percentage of exports</p>
 <p>A range bar chart shows the spread between low and high amounts, e.g., range of discounts</p>	 <p>The paired bar chart shows the correlation between two items, e.g., growth of market versus share of market</p>
 <p>A grouped bar chart compares various aspects of the same item, e.g., with and without discount</p>	 <p>The subdivided bar chart shows the components that make up the total</p>

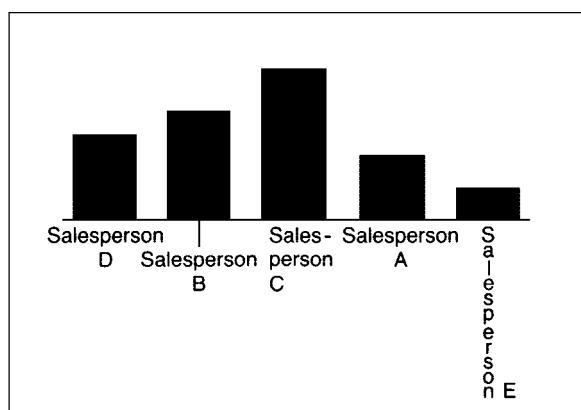
At times, you may want to use the column chart instead of the bar chart—vertical bars instead of horizontal bars—to show an item comparison. There's really nothing violently wrong with doing so. However, 9 times out of 10, you're better off with the bar chart for two reasons. First, by reserving bar charts for showing an item comparison, we reduce the possibility of confusion with a time series comparison, for which column charts are more appropriate. To reinforce this distinction, therefore, let's avoid using the bar chart for showing changes over time; in Western culture, we're accustomed to thinking of time moving from left to right, not top to bottom.

The second reason is a practical one. Generally, items have lengthy labels—territories such as Northeast, Southwest; industries such as agriculture, manufacturing; salespeople's names—all requiring space. Notice from the two examples shown that you have all the space you need to the left of the bars to label the various items, whereas, with the column chart, you may have to go through contortions since columns are usually narrow. Here you have to squeeze the label to the point of illegibility, or hyphenate the word, or write it in an awkward manner.

Preferred



Poor



3. TIME SERIES COMPARISON

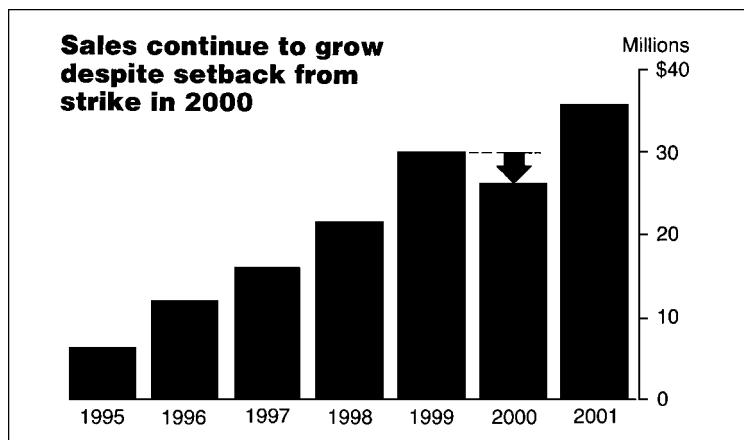
Whereas a component comparison and an item comparison show relationships at one point in time, the time series comparison shows changes over time.

A time series comparison can best be demonstrated with either a column chart or a line chart. Deciding on which to use is simple. If you have only a few points in time to plot (say, up to seven or eight) use the column chart; if, on the other hand, you have to show a trend over 20 years by quarters, you're much better off with the line chart.

In choosing between a column and a line chart, you can also be guided by the nature of the data. A column chart emphasizes levels or magnitudes and is more suitable for data on activities that occur within a set period of time, suggesting a fresh start for each period. Production data fit into this category. A line chart emphasizes movement and angles of change and is therefore the best form for showing data that have a "carry-over" from one time to the next. A good example here is inventory data.

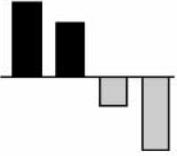
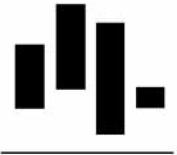
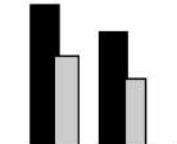
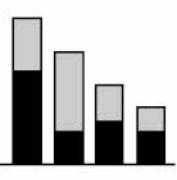
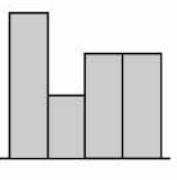
Beyond these distinctions, each chart form has its own characteristics and variations, so let's study them separately.

THE COLUMN CHART

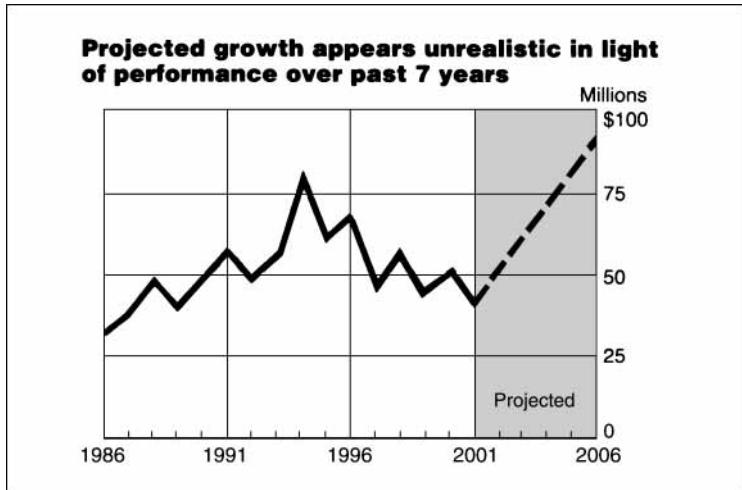


The suggestions for making the most of bar charts also apply to column charts: make the space between the columns smaller than the width of the columns; and use color or shading to emphasize one point in time more than others or to distinguish, say, historical from projected data.

As with the bar chart, there are several variations of the column chart that make it a resourceful and valuable tool; these variations are shown at work in Section 2.

	<p><i>The deviation column chart</i> distinguishes, say, the profit-making years from the losing ones.</p>
	<p><i>The range column chart</i> shows the spread between low and high amounts, like the barometric performance of the stock market.</p>
	<p><i>The grouped column chart</i>, with columns either butting against one another or overlapping, compares two items at each point in time and shows how the relationships change over time, e.g., dollars with inflation and discounted for inflation.</p>
	<p><i>A subdivided column chart</i> shows how the components contributing to the total vary over time, e.g., salary plus fringe benefits adding to total compensation.</p>
	<p><i>A step-column chart</i> leaves no space between the columns and is best used to show data that change abruptly at irregular intervals, such as personnel ceilings or capacity utilization.</p>

THE LINE CHART

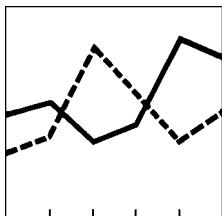


Without doubt, the line chart is the most often used of the five charts, and well it should be since it is the easiest to draw, the most compact, and the clearest for discerning whether the trend is increasing, decreasing, fluctuating, or remaining constant.

When preparing a line chart, make sure the trend line is bolder than the baseline and that the baseline, in turn, is a little bit heavier than the vertical and horizontal scale lines that shape the reference grid.

Think of grid rulings as you would the umpire at a sporting event; they're there for reference purposes, not to dominate the main attraction—in this case, the trend line(s). In other words, you may use vertical grid lines to distinguish the historic from the projected, or to emphasize quarterly periods, or to separate five-year increments. Similarly, a few horizontal scale lines will make it easier for the reader to discern relative values. In short, use your judgment to choose between too many and none at all.

The line chart has only two variations, far fewer than the bar chart or the column chart, but important enough to deserve more discussion.

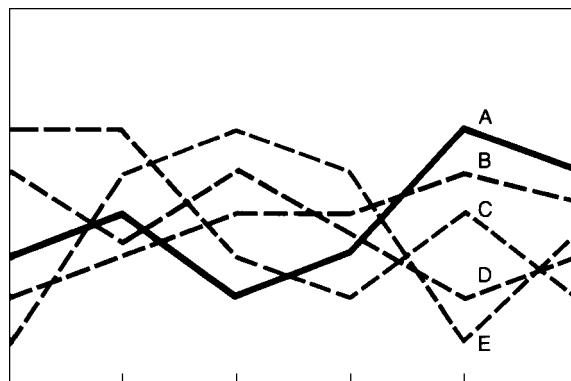


The grouped line chart compares the performance of two or more items. To distinguish, say, your company's trend from those of your competitors, use the most contrasting color or the boldest solid line for your company and less intense colors or thinner or patterned lines (long dashes, short dashes) for the others.

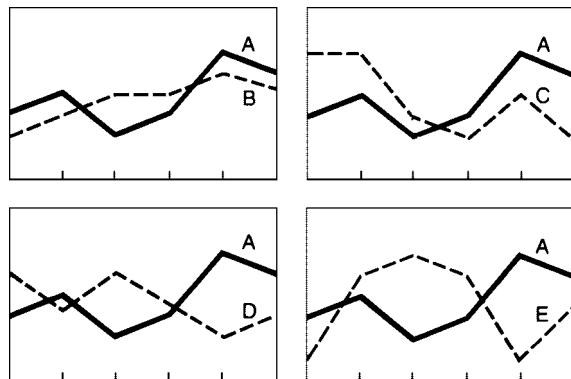
The challenge is deciding how many trend lines we can show simultaneously before the chart looks more like spaghetti than trends. Let's be realistic, a line chart with eight trend lines isn't necessarily twice as useful as one with four lines; twice as confusing, maybe, but not twice as useful.

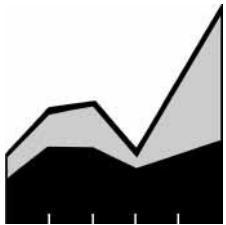
A technique for untangling the mess is to pair your trend with that of each competitor on a set of smaller charts, as you see. Granted, this creates more charts, but simpler comparisons per chart.

The Spaghetti Chart



Untangling the Mess



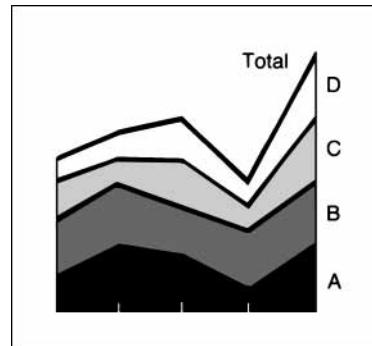


By coloring or shading the surface between the trend line and the baseline, we create the *surface chart*. By subdividing the surface into the components that make up the totals at each point in time, we create the *subdivided surface chart*. Here too, as with the subdivided bar and column charts, limit the number of layers to five or fewer. If there are more than five segments, plot only the four important ones and group the remaining into an “others” category.

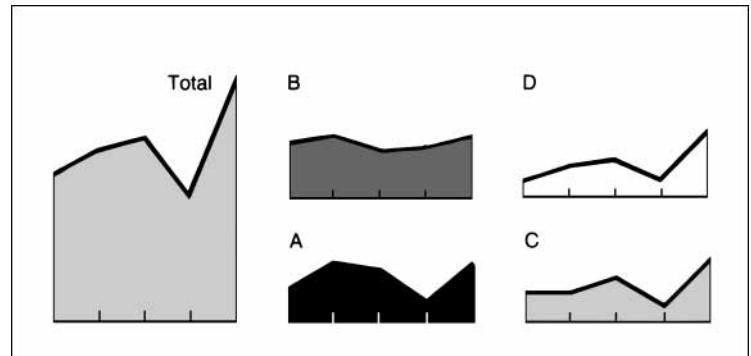
For all subdivided charts, place the most important segment against the baseline, since this is the only segment that is measured against a straight line. All other segments are at the mercy of the ups and downs of that segment.

As with the spaghetti chart we just discussed, the technique for making sense of the sea of layers is to separate the components and show each on its own base, reducing the subdivided chart to simpler surface charts.

From Subdivided Line Chart



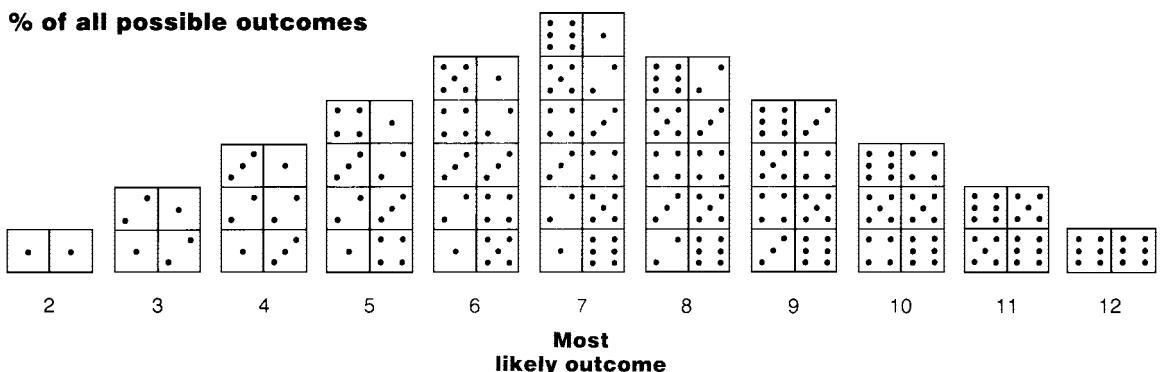
To Simpler Surface Charts



4. FREQUENCY DISTRIBUTION COMPARISON

A frequency distribution comparison shows how many items (frequency) fall into a series of progressive numerical ranges (distribution).

There are two major applications for this kind of comparison. The first is generalizing likely events on the basis of a sample of observations. Here, the frequency distribution is used to predict risk, probability, or chance. One use might be to show that there is a 25 percent chance that shipments will be delivered in five days or less; another might be to describe (un)certainty, such as the odds of rolling a losing seven, as a percentage of all possible outcomes, when shooting craps. (Save your money, the odds are one in six.)



The “bell-shaped” curves and frequency polygons that are associated with this application are governed by mathematical rules. Do yourself a favor and rely on the assistance of a statistician to design them. Since these “curves” are used primarily for analytical purposes, they are not our concern in this book.

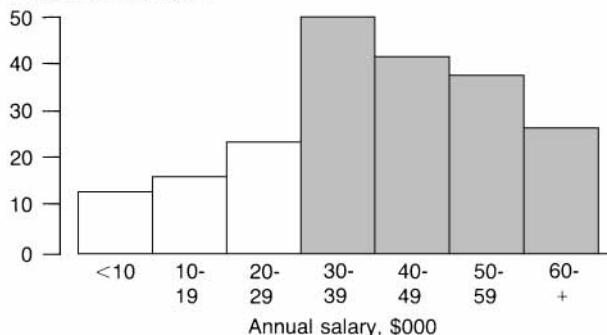
The second application, often seen in business presentations and reports, is summarizing vast amounts of data to demonstrate some meaningful relationship (e.g., 25 percent of the shipments are delivered in five to six days). This application is particularly useful for demographic information such as the number of employees by salary ranges, or the distribution of U.S. families by income levels, or the voting pattern by age group. As you would expect, this use of frequency distribution gains in popularity each time the national census is taken and every four years along with presidential elections.

In this role, the frequency distribution can best be shown by either a *step-column chart* (*histogram*) or a *line chart* (*histograph*). Column charts are better when only a few ranges are used—say, five or seven—and line charts are better when there are many.

THE COLUMN CHART (HISTOGRAM)

75% of our employees earn more than \$30,000

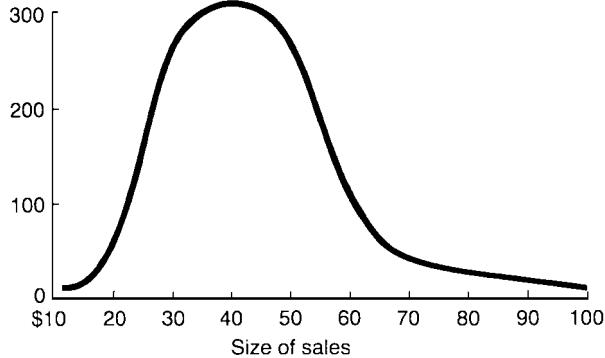
Number of employees



THE LINE CHART (HISTOGRAPH)

Most sales are between \$30-\$50

Number of sales

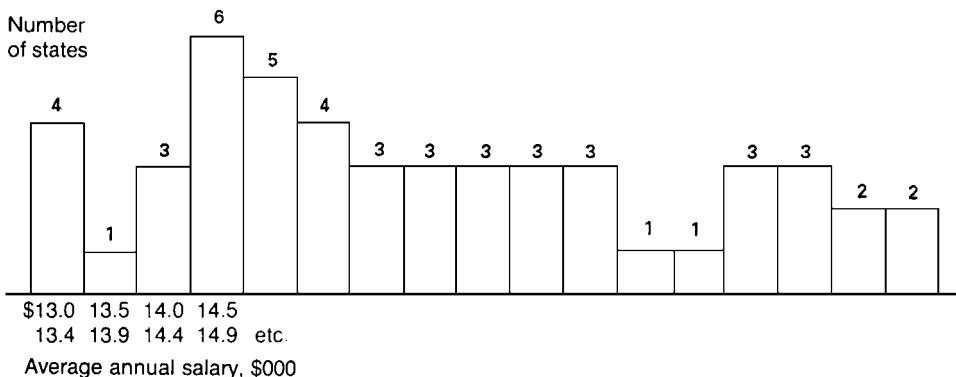


These charts have two scales: the vertical one (frequency) is for the number (sometimes percentage) of items or occurrences; the horizontal one (distribution) is for the ranges. The distribution scale requires special attention.

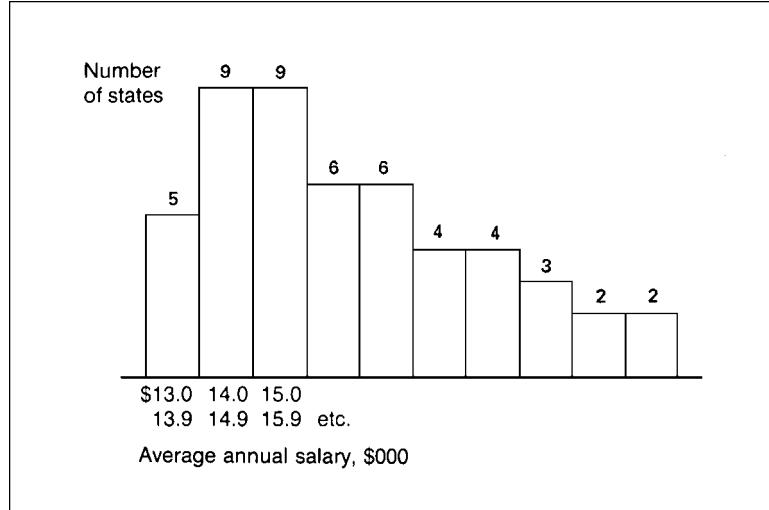
Size of the Ranges. The size of the ranges—and therefore the number of groups—is important in bringing out the pattern of the distribution. Too few groups hide the pattern; too many groups break it up. As a general rule, use no fewer than 5 groups and no more than 20.

Within these extremes, however, you’re looking for the number of groups that will demonstrate your intended message. For instance, if we wanted to bring out the pattern of a distribution of average annual salaries paid to public school teachers in the 50 states:

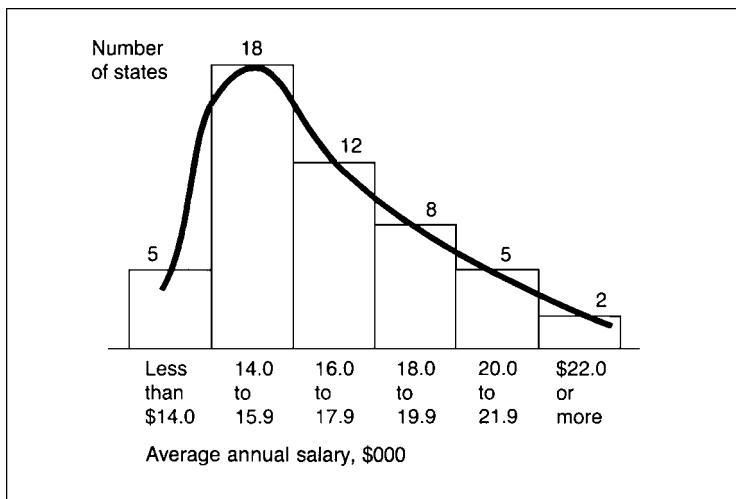
Grouping the ranges by \$500 increments reveals no discernible pattern.



Grouping the ranges by \$1,000 increments begins to suggest a pattern.



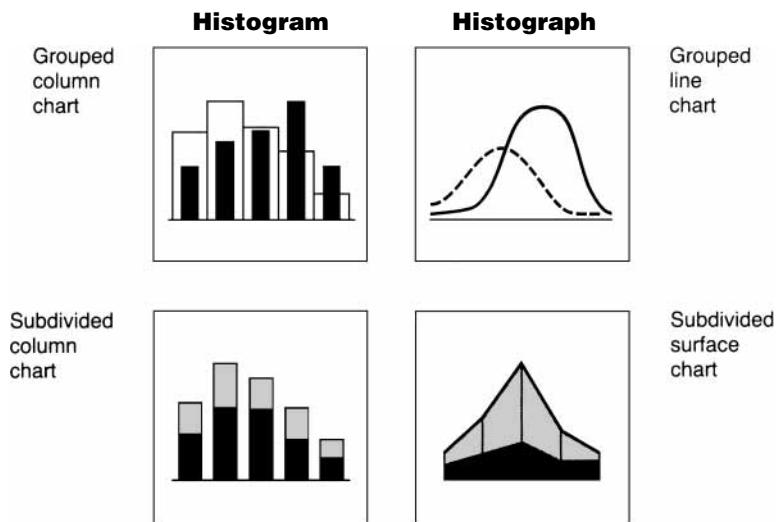
But it isn't until we group the ranges by \$2,000 increments that we clearly see the bell-shaped curve usually associated with a frequency distribution. In this example, the curve is skewed to the left—that is, to the lower side of the distribution—indicating a possible message that almost half of the states (23 states out of 50) paid their teachers less than \$16,000 in the year.



Size of the Groups. It is best to use groups of equal size. If one grouping represented a \$5 range and the next, \$20, the shape of the distribution would be distorted. Among the exceptions are cases where the data are not recorded in equal steps (e.g., educational levels) or where unequal steps make better sense, such as personal income tax brackets. Because the range of incomes is so great, and because there are so many people near the lower end and so few near the upper end, equal intervals won't work; \$1,000 intervals would result in a chart several yards wide, \$40,000 intervals would put virtually everyone in the first interval. The chart would be more informative if smaller intervals were shown at the lower end and larger ranges at the upper end.

Clear Labeling. The size of the groups should be explained clearly. "Overlapping" labels, such as 0–10, 10–20, 20–30, do not tell which groups include the repeated figure. For continuous data, such as dollar sales, the preferred method is less than \$10.00, \$10.00–19.99, \$20.00–29.99, etc. For discrete data, such as number of cars manufactured, the preferred method is less than 10, 10–19, 20–29, etc.

Both the histogram and the histograph can be grouped to show, for instance, the distribution for one year against another, or to compare your employees' age distribution with that of a competitor or perhaps an industry average. Also, when absolute numbers are used, they can be subdivided to show how the components add to their total.¹

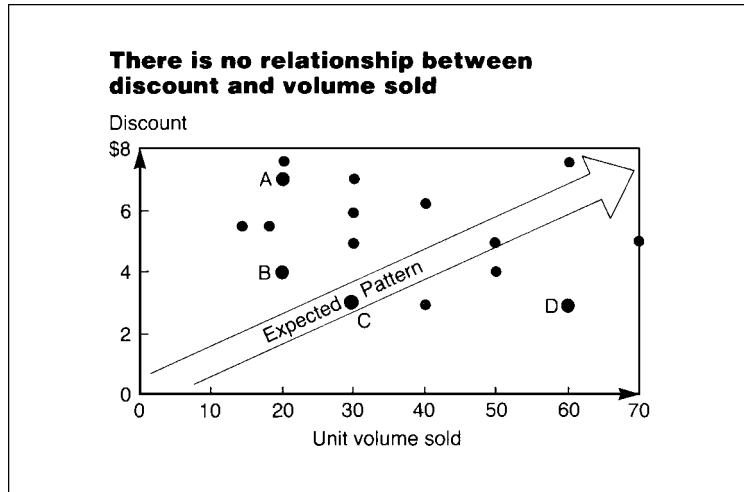


¹ *Caution:* It is misleading to subdivide a frequency distribution when the frequency is expressed in percentage terms. For example, if 60 percent of women earn between, say, \$5 and \$10 an hour, and 50 percent of men earn the same, it cannot be said that combined, 110 percent of the people earn between \$5 and \$10 an hour.

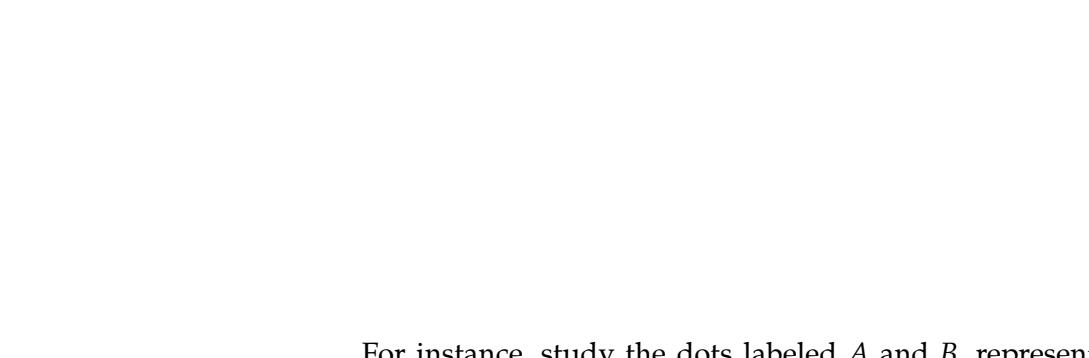
5. CORRELATION COMPARISON

A correlation comparison shows whether the relationship between two variables follows—or fails to follow—the pattern you would normally expect. For example, you would normally expect that a salesperson with more experience would generate more sales than one with less experience; you would normally expect that employees with more education would receive higher starting salaries. Such comparisons are best shown by a dot chart, sometimes called a scatter diagram, or by a paired bar chart. Let's look at each in turn.

THE DOT CHART



Here we show 16 transactions in terms of the size of the discount offered and the number of units sold. Normally, you would expect that the larger the discount, the greater the incentive to purchase more units. As the dot chart reveals in this case, there is no such correlation.



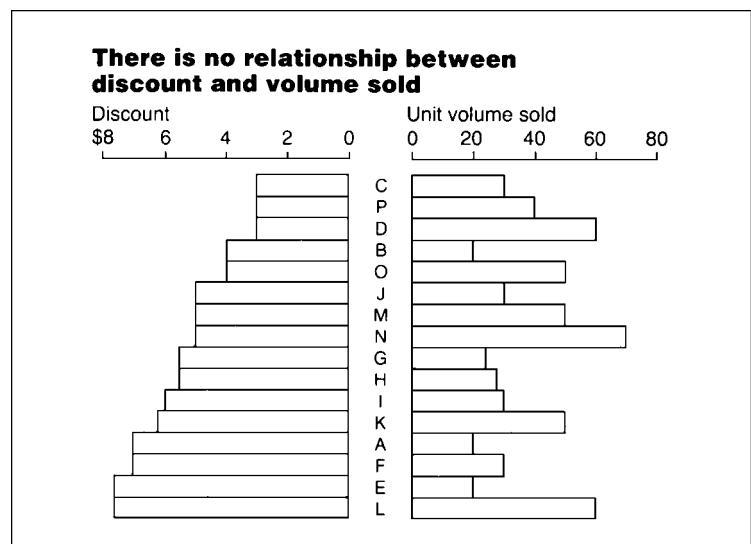
For instance, study the dots labeled *A* and *B*, representing the transactions of two salespeople. Both sold 20 units (horizontal scale). However, *A* offered a \$7 discount, while *B* gave only \$4 (vertical scale). On the other hand, salespeople *C* and *D* offered the same \$3 discount, and yet *C* sold 30 units while *D* sold twice as many. Obviously, the size of the discount offered has little or no effect on the volume bought.

Had there been a correlation, then the dots would have clustered around a diagonal line moving from the lower left of the chart to the upper right, represented here by a faint background arrow. It's often a good idea to include this arrow to reinforce the expected pattern. Of course, at times, the arrow might point down to show, for example, that volume increases as price decreases. Also, let's not confuse this arrow with the mathematically computed "line of best fit" which is a curve fitted through the dots that emphasizes the pattern of the plotted values.

These dot charts are being used increasingly in presentations, reports, and some business magazines. If you plan to use them, be patient with your audience or reader and explain how to read the chart before revealing the message.

Aside from appearing confusing, the problem with these charts is identifying the dots. Including each salesperson's name next to his or her dot not only adds to the confusion but can create a severe case of myopia. An option is to use a legend with each dot identified by a letter or number corresponding to the full name shown somewhere else on the chart. A better option is to use the paired bar chart.

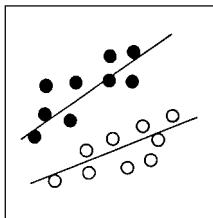
THE BAR CHART



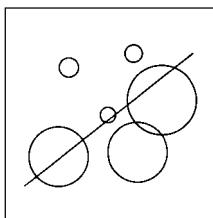
You'll notice that now there is space to label each set of plotted values between the sets of bars. In a paired bar chart, we usually rank the independent variable on the left, in either a low-to-high or high-to-low sequence. When the relationship between the expected pattern and the actual one is consistent, the dependent variable bars on the right will form a mirror image of those on the left. In other words, low discounts will mirror low volume and high discounts will be paired with high volume. When the relationship is not as expected, the two sets of bars will deviate from one another, as they do in this example.

This paired bar chart option will work only when there are relatively few sets of data to plot. Beyond 15 or so, you're better off with the more compact scatter diagram and forgetting about trying to label each dot.

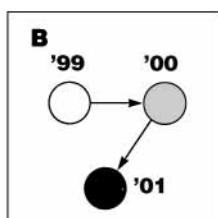
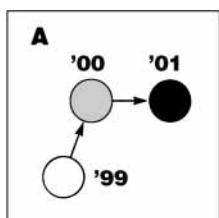
While there are no variations for the paired bar chart, there are several worth mentioning for the dot chart.



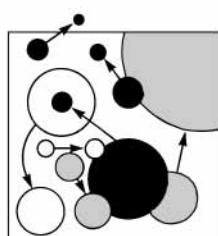
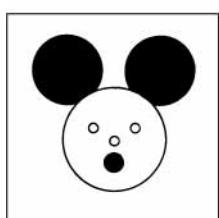
The *grouped dot chart* shows the correlation of two items or of one item at different times. Although solid and open dots are used here, other suitable symbols, such as squares, triangles, or stars, can also be used.



A third variable is introduced in the *bubble chart* with dots of different sizes. For instance, where the two scales might represent sales and profits, the size of the dot might indicate the relative size of assets for each company in an industry.



The *time dot chart* shows the change over time of the correlation. Avoid the tendency to show all such movements on one grid; instead, place each on its own chart.



All of the above.

A word of caution: Please keep dot charts simple lest they become a tribute to Mickey Mouse or Star Wars.

There you have them, the five basic kinds of comparisons implied by the messages derived from the analysis of any data, and the chart forms most appropriate for demonstrating them.

To make sure you can apply the process in actual practice, test yourself with the two work projects that follow. Afterwards, review the shopping list of charts at work in Section 2 and refer to it whenever the need arises.

WORK PROJECT A

Let's go back to the project we did at the end of Step B—identifying the comparison—and advance it to choosing the appropriate chart form for each of the 12 messages.

On the next pages are the 12 messages along with the kind of comparison you identified. Select the appropriate chart by referring to the matrix and sketch the chart you would use to support the respective messages.

KINDS OF COMPARISON					
	COMPONENT	ITEM	TIME SERIES	FREQUENCY	CORRELATION
BASIC CHART FORMS	PIE				
	BAR				
	COLUMN				
	LINE				
DOT					

As you sketch your charts, bear in mind the two important observations we've made.

1. It's not the data or the measures that indicate which chart to use; it's what *you say* about it. For instance, you'll note that for Examples 4, 6, and 7, we want to show tenure measures, and yet, for each case, we have a different comparison implied, which leads to a different chart form. So focus your attention on the trigger words, the clues in your messages. In the solutions that follow the project, these words are underlined.
2. Even without data, as we're doing here, you're able to decide which chart to use with the technique one of my colleagues called "visualizing the message, not the mess."

The simplest test of whether a chart works is asking yourself about the finished chart: "Do I *see* what the message title *says*?" In other words, do the chart and the title work together; does the chart support the title; and does the title reinforce the chart? So, if I *say* in my title that "sales have increased significantly," I want to *see* a trend moving up at a sharp angle. If not, if the trend parallels the baseline, it's an instant clue the chart needs more thinking.

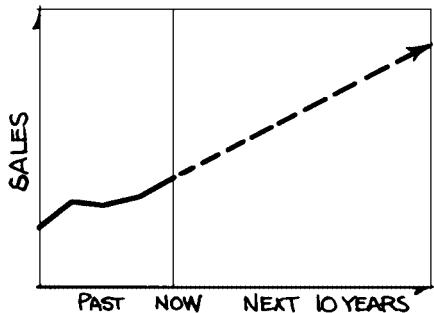
My solutions follow the messages. Don't worry if you've chosen a column chart and I show a line chart for time series comparisons or frequency distributions, or if you used the dot chart and I used a paired bar chart for correlations. In my solutions, the selection was arbitrary.

<p>1. Sales are forecast to increase over the next 10 years Time Series</p>	<p>2. The largest number of employees earns between \$30,000 and \$35,000 Frequency Distribution</p>
<p>3. Higher price of gasoline brands does not indicate better performance Correlation</p>	<p>4. In September, the turnover rates for the six divisions were about the same Item</p>
<p>5. The sales manager spends only 15% of his time in the field Component</p>	<p>6. Size of merit increases is not related to tenure Correlation</p>

<p>7. Last year, most turnover was in the 30 to 35 age group</p> <p>Frequency Distribution</p>	<p>8. Region C ranks last in productivity</p> <p>Item</p>
<p>9. Our company's earnings per share is declining</p> <p>Time Series</p>	<p>10. The largest share of total funds is allocated to manufacturing</p> <p>Component</p>
<p>11. There is a relationship between profitability and compensation</p> <p>Correlation</p>	<p>12. In August, two plants outproduced the other six by a wide margin</p> <p>Item</p>

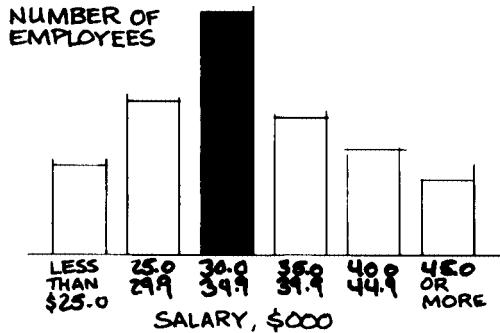
1. Sales are forecast to increase over the next 10 years

Time Series



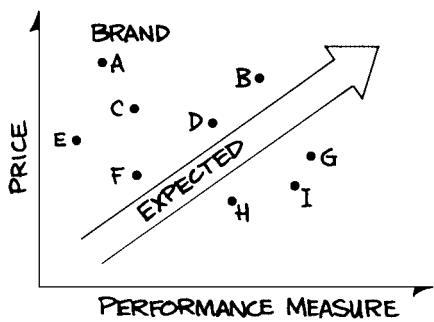
2. The largest number of employees earns between \$30,000 and \$35,000

Frequency Distribution



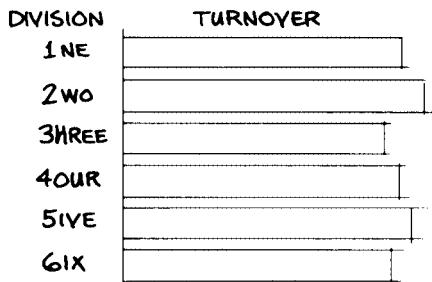
3. Higher price of gasoline brands does not indicate better performance

Correlation



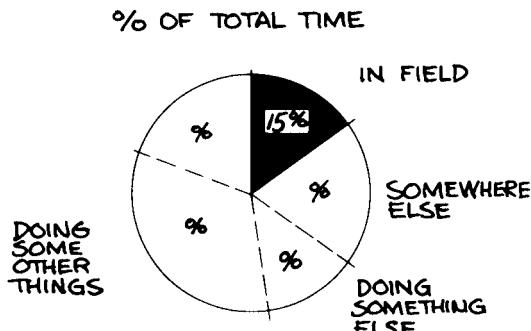
4. In September, the turnover rates for the six divisions were about the same

Item



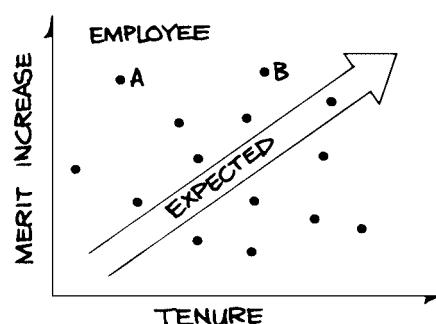
5. The sales manager spends only 15% of his time in the field

Component



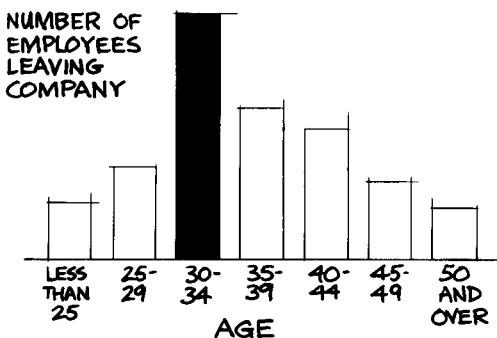
6. Size of merit increases is not related to tenure

Correlation



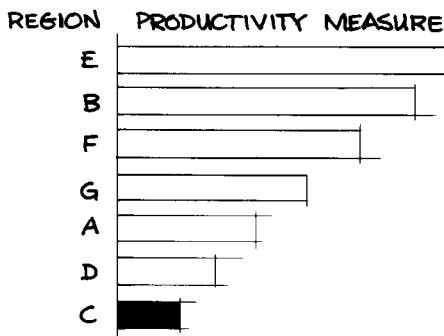
7. Last year, most turnover was in the 30 to 35 age group

Frequency Distribution



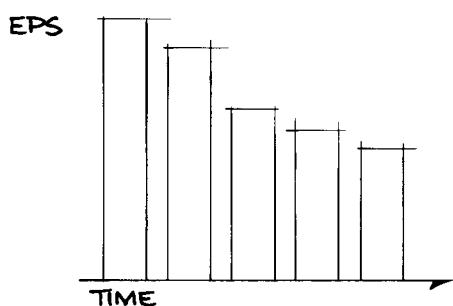
8. Region C ranks last in productivity

Item



9. Our company's earnings per share is declining

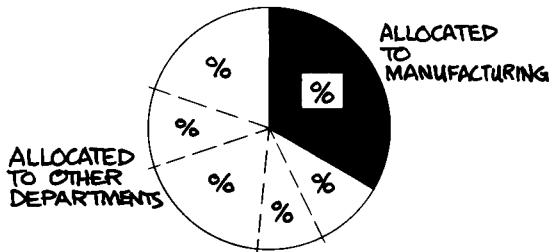
Time Series



10. The largest share of total funds is allocated to manufacturing

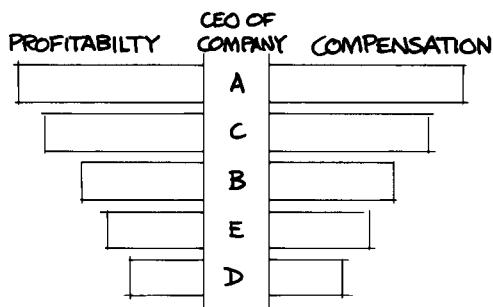
Component

% OF TOTAL FUNDS



11. There is a relationship between profitability and compensation

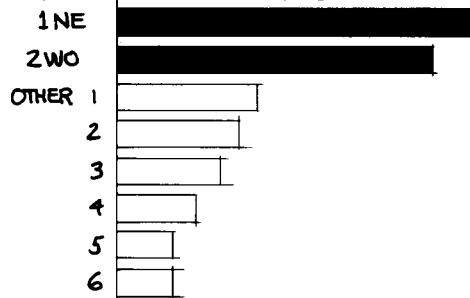
Correlation



12. In August, two plants outproduced the other six by a wide margin

Item

PLANT PRODUCTION



WORK PROJECT B

Now, of course, in the business world we would go through the process *with* data, so let's apply the method to one last project using tabular information.

On the following pages, you'll find several sets of data drawn from an analysis of the imagin-a-toy industry. This industry manufactures mythical toys, including Slithy Toves, Gimbling Wabes, Mimsy Borogoves, Outgrabe Mome Raths, and the ever-popular Frumious Bandersnatch. The industry is made up of six competitors; ours is the Kryalot Company.

On the basis of the instructions given and the data presented, sketch the appropriate charts in the space provided.

In every instance, be sure to identify the kind of comparison the message implies and refer to the matrix to select the appropriate chart form. Also, write the message title you would use to reinforce the point each chart makes about our company.

		KINDS OF COMPARISON				
		COMPONENT	ITEM	TIME SERIES	FREQUENCY	CORRELATION
BASIC CHART FORMS	PIE					
	BAR					
	COLUMN					
	LINE					
	DOT					

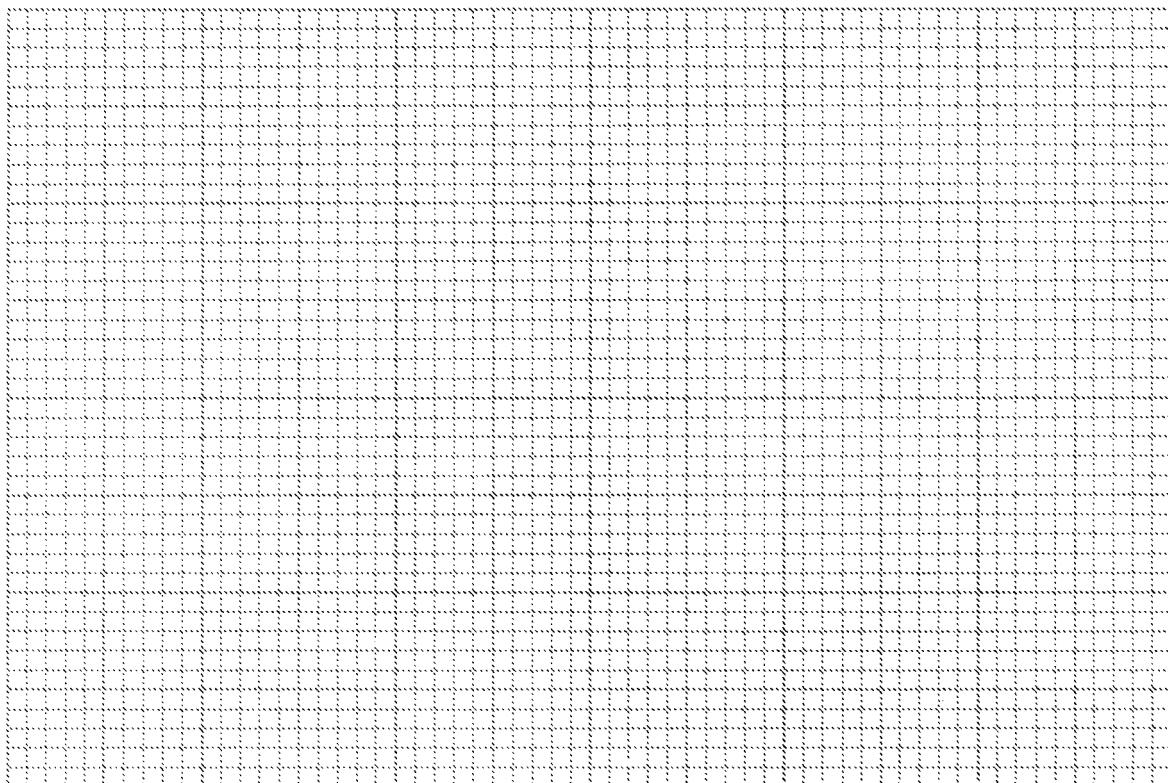
The solution for each problem is presented on the back.

Exhibit 1

On the basis of the following data, sketch a chart to demonstrate Kryalot's share of imagin-a-toy industry sales in 2001 compared with that of our competitors'.

Share of Industry Sales by Company, 2001

Kryalot	19.3%
Competitor A	10.1%
Competitor B	16.6%
Competitor C	12.4%
Competitor D	31.8%
Competitor E	9.8%
	<hr/>
	100.0%



SOLUTION

For Exhibit 1, the phrase “share of 2001 industry sales” serves as the clue to a component comparison—the size of the parts as a percentage of the total—and calls for a pie chart since we’re speaking about a single total.

Here, the components have been arranged clockwise, proceeding from the company with the largest share to the company with the smallest, thereby positioning Kryalot as having the second-largest share. To emphasize Kryalot’s share, we used the shading for that segment.

Exhibit 1

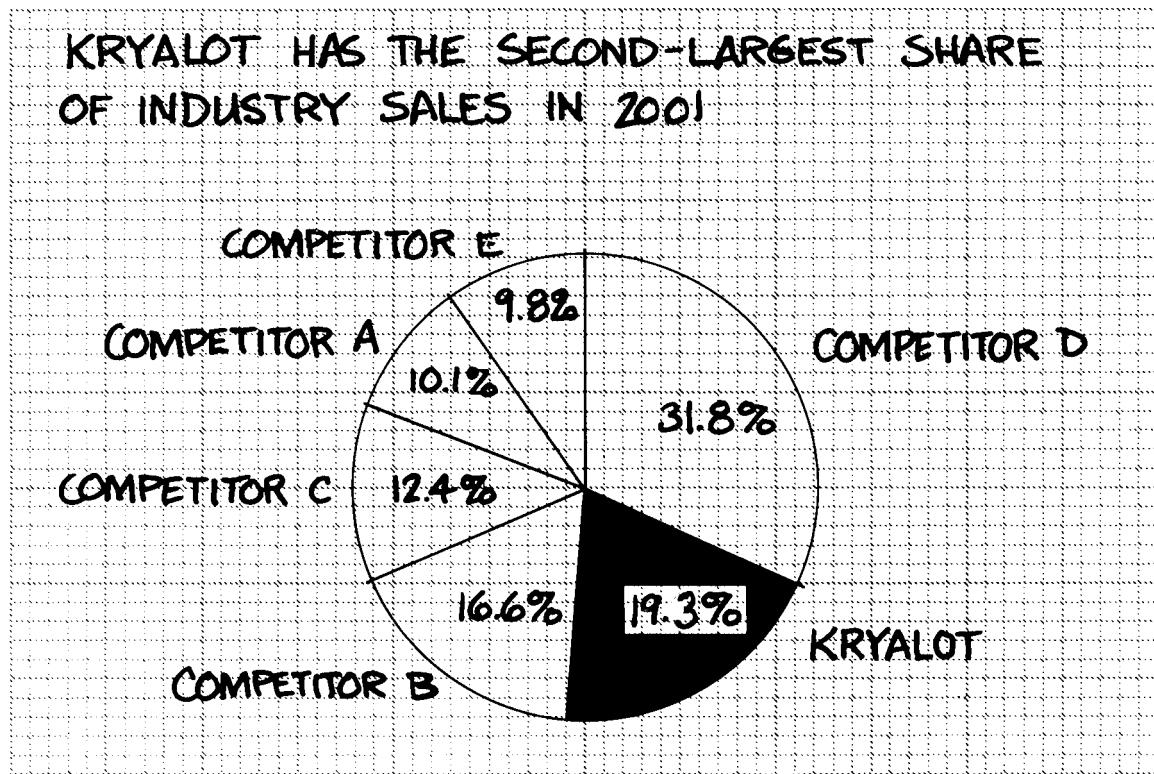
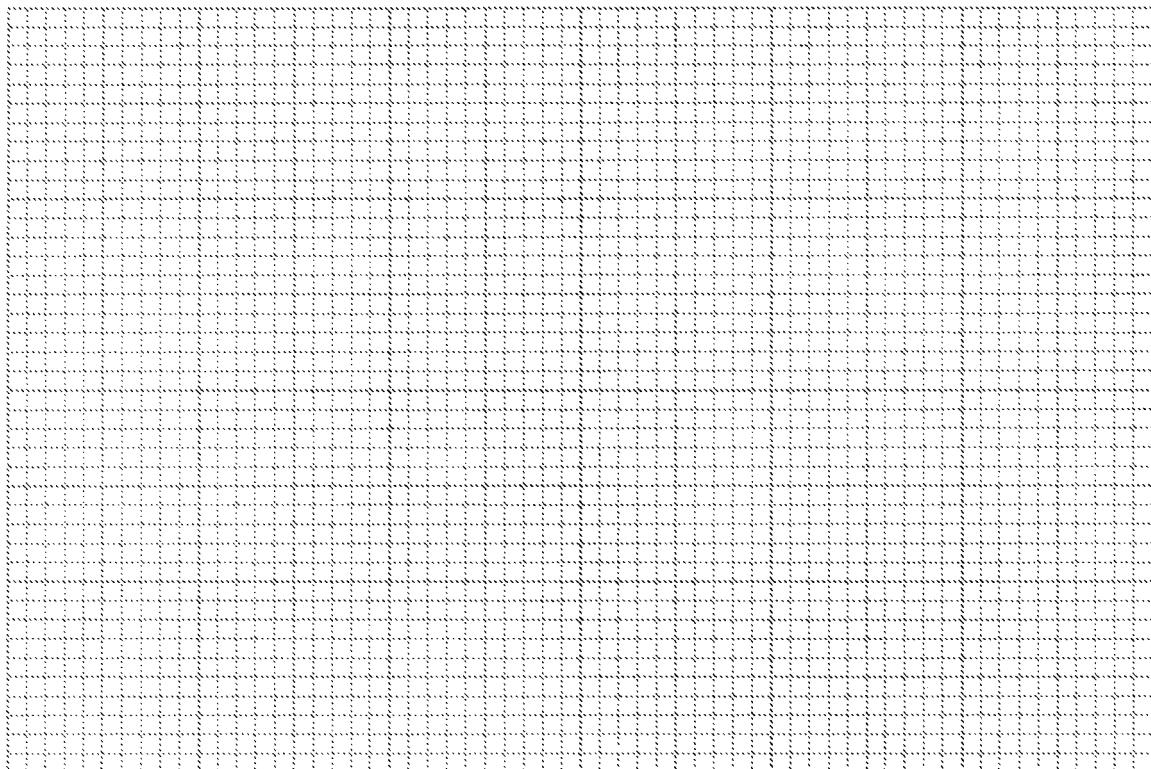


Exhibit 2

Sketch a chart that demonstrates how Kryalot's return on assets ranks in the industry in 2001.

Return on Assets, 2001

Kryalot	8.3%
Competitor A	9.8%
Competitor B	15.9%
Competitor C	22.4%
Competitor D	14.7%
Competitor E	19.1%



SOLUTION

In Exhibit 2, the word “rank” is the trigger that implies an item comparison. Here, we want to know which competitor has the highest return on assets and which has the lowest. In this case, Kryalot has the lowest. Notice how the bar chart effectively demonstrates the point by positioning Kryalot at the bottom of the list and emphasizing it once more with the darkest shading.

Exhibit 2

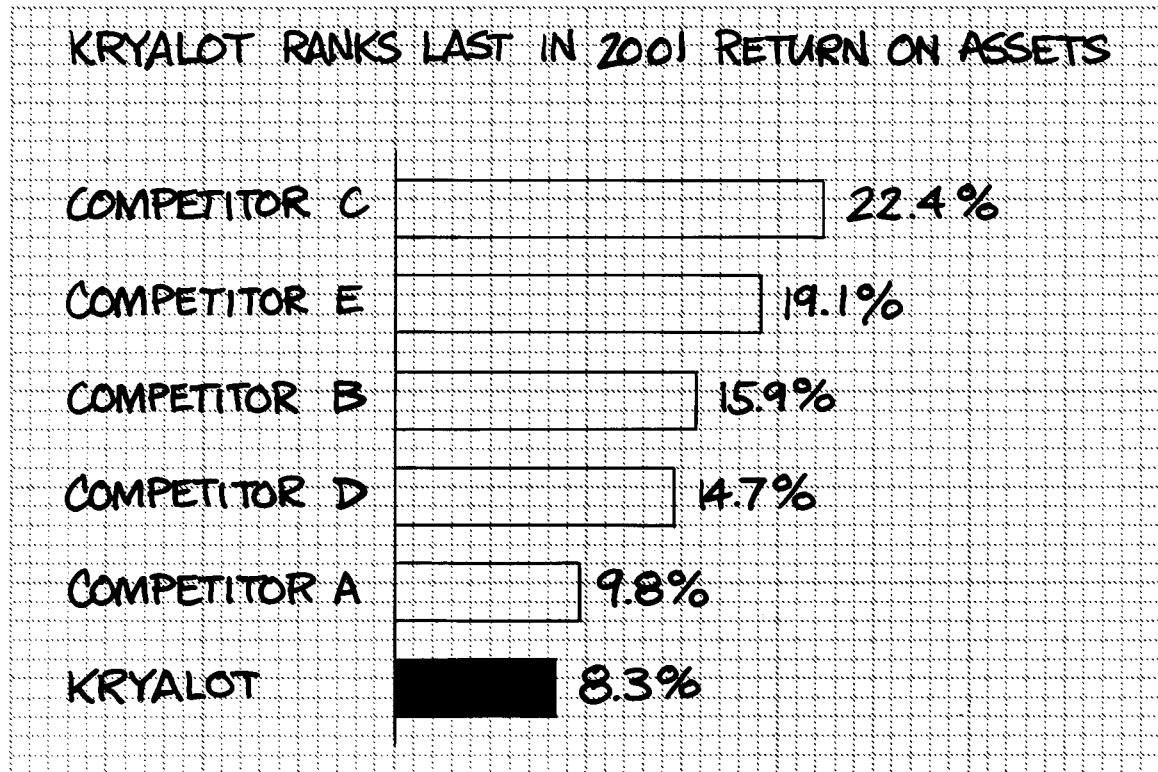


Exhibit 3

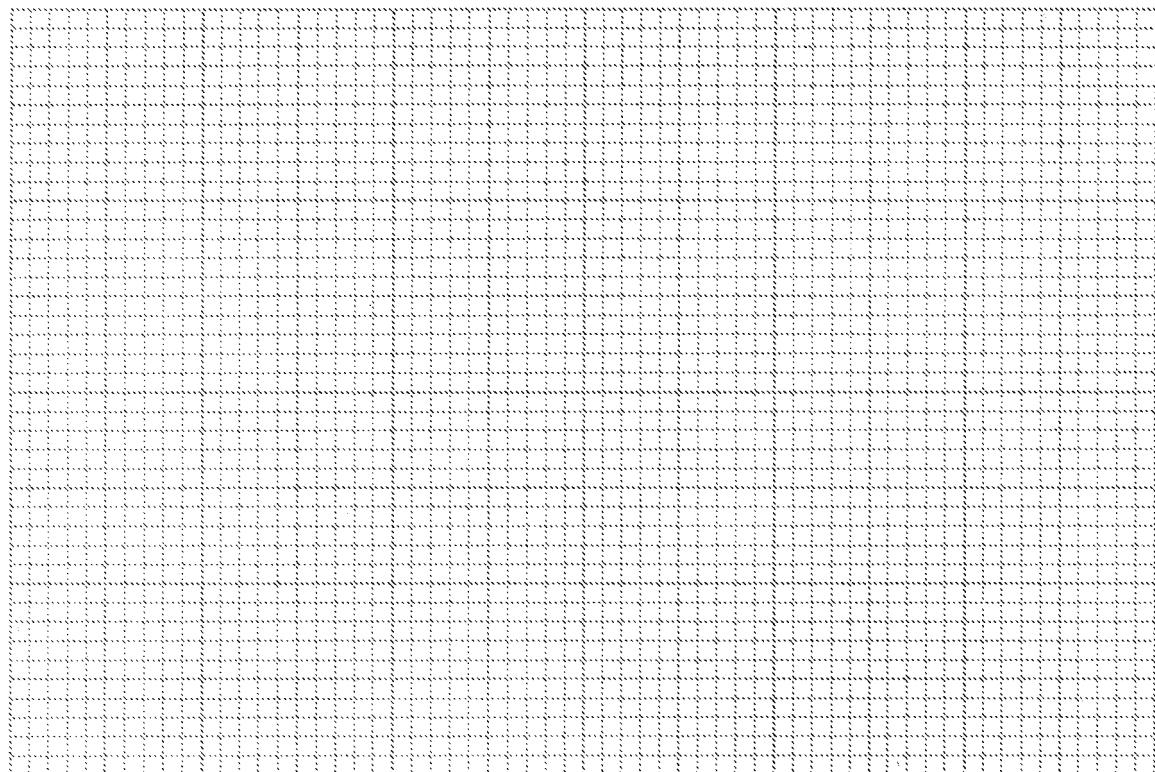
Sketch a chart that demonstrates whether a relationship exists between share of sales and return on assets in the imagin-a-toy industry in 2001.

Share of Industry Sales, 2001

Kryalot	19.3%
Competitor A	10.1%
Competitor B	16.6%
Competitor C	12.4%
Competitor D	31.8%
Competitor E	9.8%

Return on Assets, 2001

Kryalot	8.3%
Competitor A	9.8%
Competitor B	15.9%
Competitor C	22.4%
Competitor D	14.7%
Competitor E	19.1%



SOLUTION

We would normally expect a relationship between share of sales and return on assets; that is, the greater the share, the higher the return. Here, the data indicate this is not so. For instance, although Kryalot has the second-largest share, it has a return much lower than that of, say, Competitor C, which ranks fourth in its share of market.

Although the dot chart would be equally appropriate, the paired bar chart allows us to label each set of paired bars more effectively.

Exhibit 3

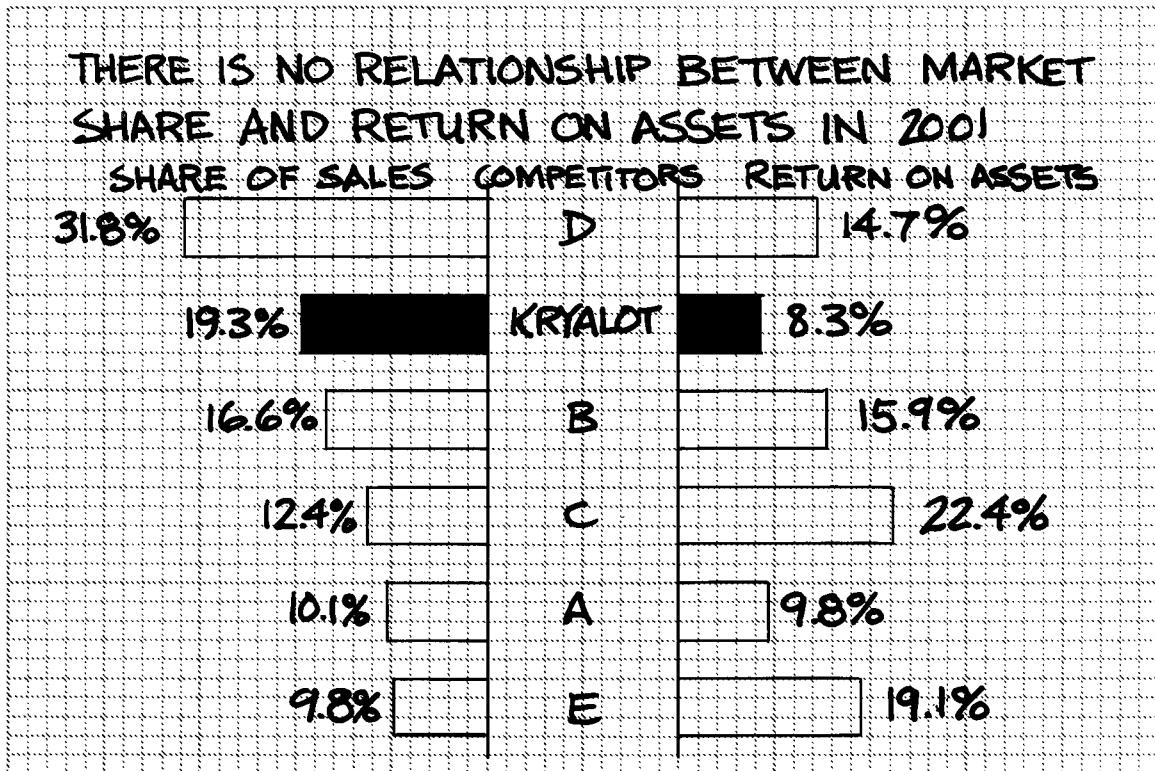


Exhibit 4

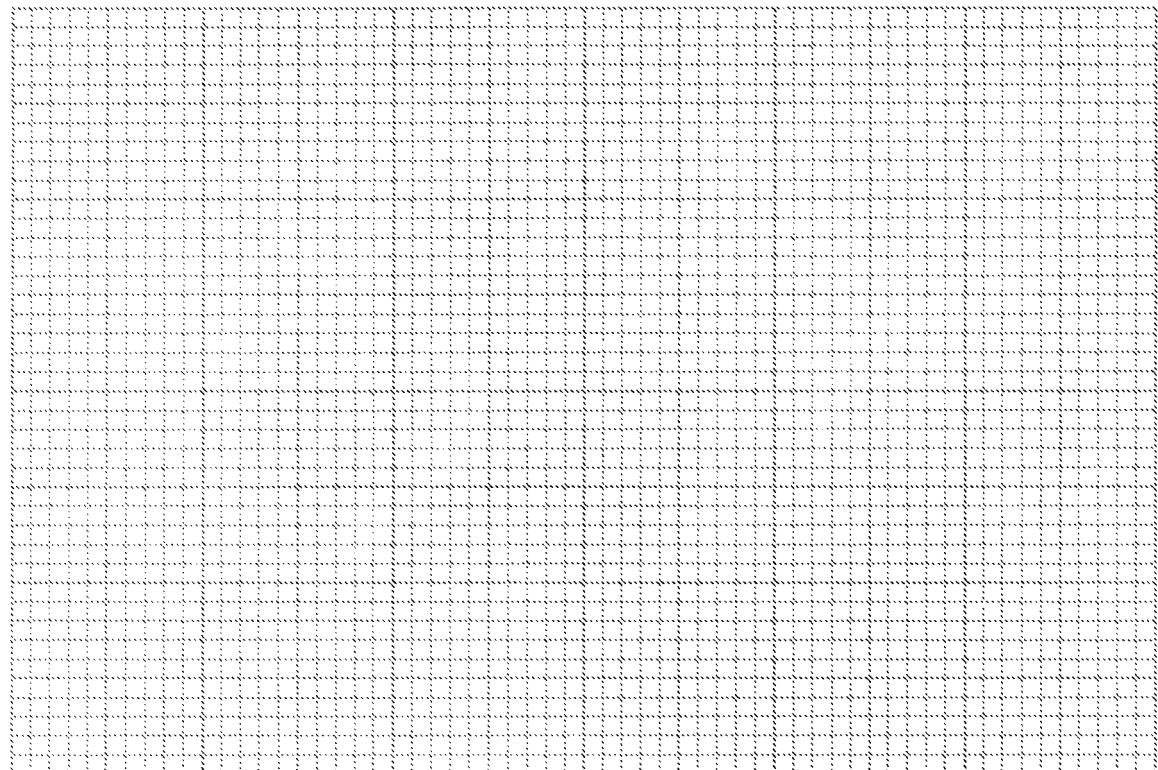
Sketch a chart that demonstrates the trends, for Kryalot's sales and earnings between 1997 and 2001, using 1997 as the base year and showing succeeding years as a percentage of the base year.

Kryalot Net Sales

	\$ Millions	1993 = 100
1997	\$387	100
1998	420	109
1999	477	123
2000	513	133
2001	530	137

Kryalot Earnings

	\$ Millions	1993 = 100
1997	\$24	100
1998	39	162
1999	35	146
2000	45	188
2001	29	121



SOLUTION

Exhibit 4 calls for demonstrating changes over time—a time series comparison—and the line chart serves the purpose well.

We translated the absolute data into percentages of a base value—in this case 1993 figures—to provide a common, and clearer, basis for comparison of disparate figures: \$530 million as compared to \$29 million.

This is an excellent example of the value charts have over tabular data. The chart clearly demonstrates the erratic pattern of earnings, which might not have been as obvious had the data been left in tabular form.

Exhibit 4

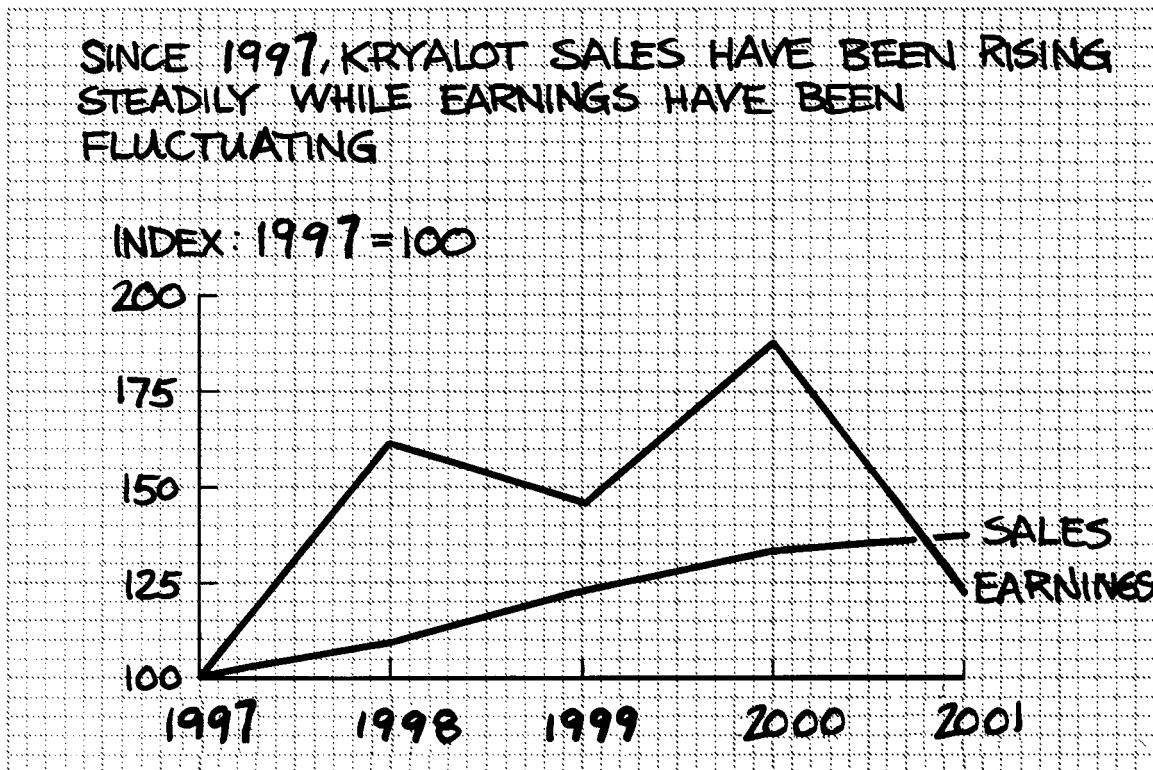
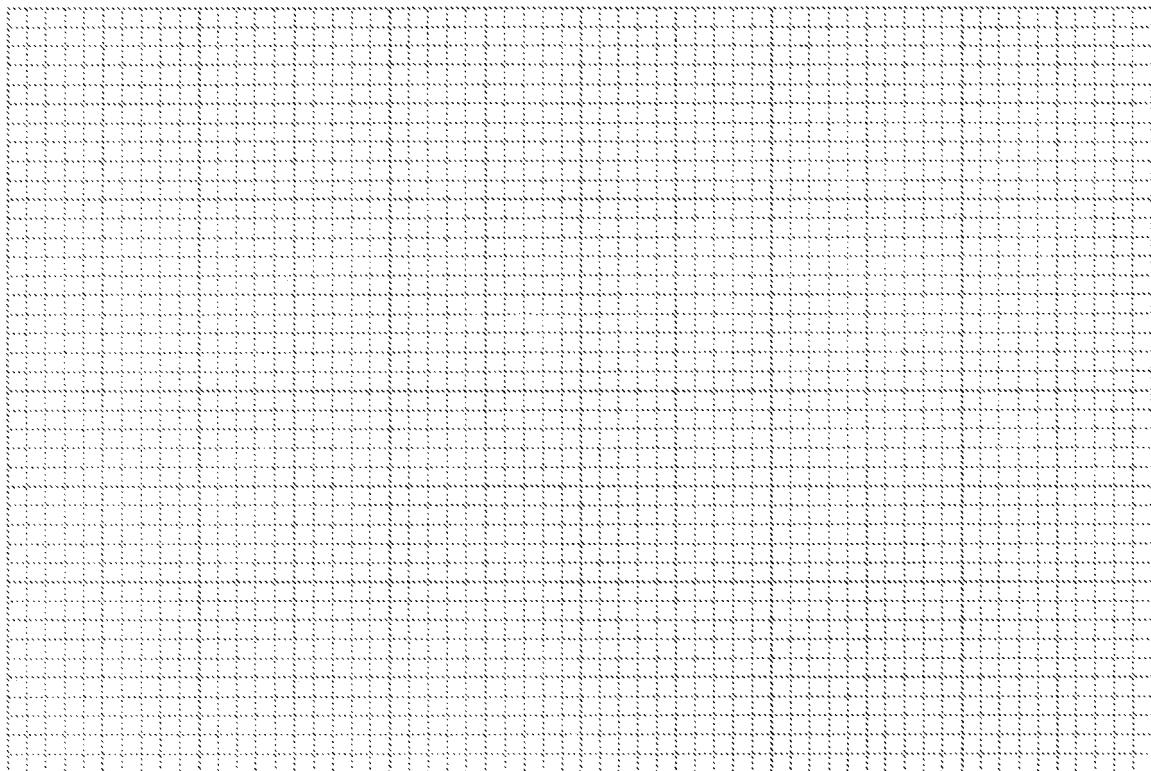


Exhibit 5

Sketch a chart demonstrating that in 2001 most of our sales, unlike those of Competitor D, are for the less expensive models for Frumious Bandersnatches.

Number of Units Sold, 000.

Size of Sales	Kryalot	Competitor D
Less than \$5.00	320	280
\$ 5.00–\$ 9.99	770	340
\$10.00–\$14.99	410	615
\$15.00–\$19.99	260	890
\$20.00 or more	105	550



SOLUTION

Exhibit 5 calls for a frequency distribution comparison, that is, the number of units that are sold in particular price ranges. In this case, we displayed the column chart for Kryalot against the stepped column chart for Competitor D. Two superimposed lines could also have been shown but, with so few data points, the columns are preferable.

Exhibit 5

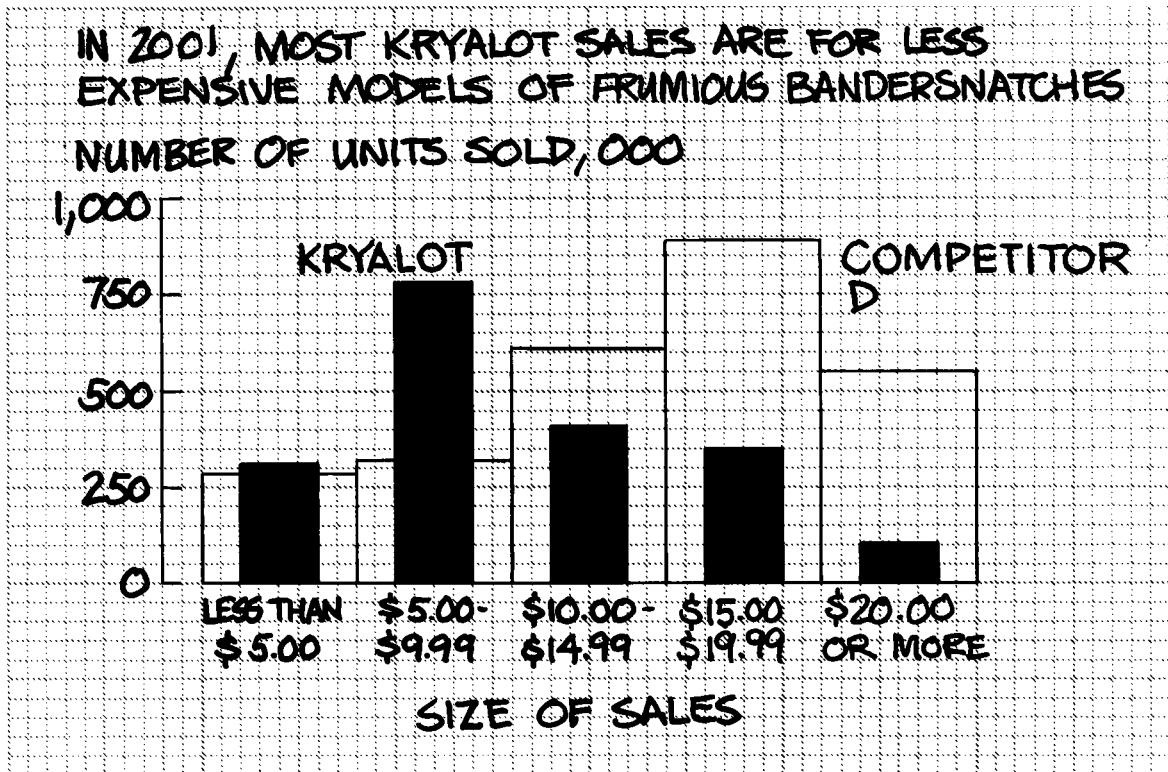
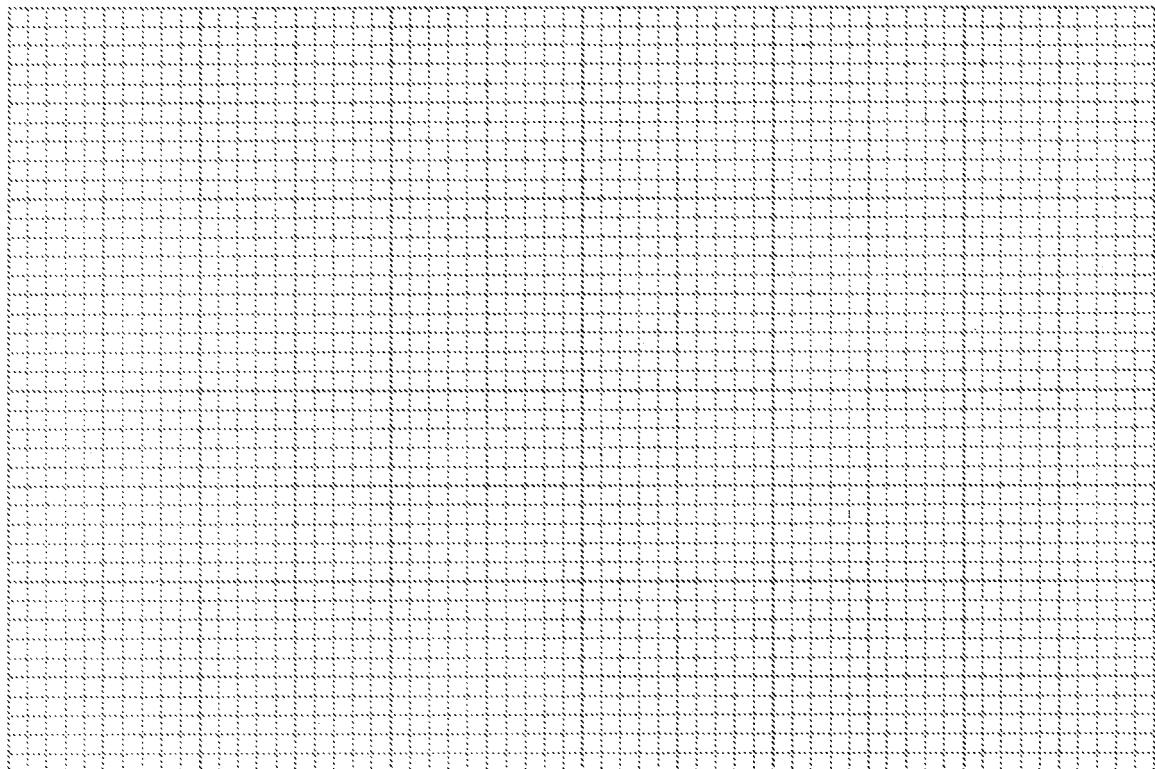


Exhibit 6

Sketch a chart that demonstrates how our product sales mix differs from that of Competitor D's in 2001.

Percentage of Total Sales by Product, 2001

Products	Kryalot	Competitor D
Slithy Toves	15.0%	25.3%
Gimbling Wabes	8.4%	21.3%
Mimsy Borogoves	20.6%	19.9%
Outgrabe Mome Raths	16.2%	18.6%
Frumious Bandersnatches	39.8%	14.9%
	100.0%	100.0%



SOLUTION

In this last exhibit, we're back where we started with a component comparison—that is, showing percentage of total sales. As the matrix indicates, we could use pie charts. However, since we're dealing with more than one total, one for Kryalot *and* one for Competitor D, we're better off with 100 percent columns. This avoids the redundant labels that would have to be used with two pies, eliminates the need for a legend, and gives us a chart that more quickly demonstrates the relationships between the segments.

Exhibit 6

IN 2001, KRYALOT'S PRODUCT MIX DIFFERS FROM THAT OF COMPETITOR D'S		
	KRYALOT	COMPETITOR D
GIMBLING WABES	100%	100%
SLITHY TOVES	8.4%	21.3%
OUTGRABE MOME RATHS	15.0%	25.3%
MIMSY BOROGOVES	16.2%	18.6%
FRUMIOUS BANDERSNATCHES	20.6%	19.9%
	39.8%	14.9%

Let me summarize the major messages presented thus far.

- ¶ Charts are an important form of language. When well conceived and designed, they help you communicate more quickly and more clearly than you can with the data in tabular form.
- ¶ It's neither the data nor the measures that indicate what form of chart to use; it's *your* message, what *you* want to show, the specific point *you* want to make.
- ¶ Fewer is better. Use charts only when they will clearly help to get your message across.
- ¶ Charts are visual *aids*; they are not a substitute for writing or saying what you mean. Help them help you get your message across, and they'll serve you well.

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Section 2

USING CHARTS

Following is a portfolio of 80 charts at work. The charts are organized around the five basic kinds of comparison: component, item, time series, frequency distribution, and correlation. The time series section is further subdivided into a segment each for column charts, line charts, and combinations of column and line charts. Within each section, the charts are presented in increasing order of complexity ranging from, say, one pie per chart to multiple pies.

Note: All charts in this book are derived from fictitious data. They are for illustrative purposes only and must not be used as source material for content.

MESSAGE TITLES

To reinforce Step 1 in the process of choosing charts, *message titles* are included for all the examples. In actual practice, you might want to delete them from the charts. For example, when producing onscreen visuals where space is limited, you might decide to include the message title only in your written script and not show it on the visual. However, omitting the title does not mean omitting the step of making certain, first and foremost, that *you* are clear about *your* message, what *you* want to show, the specific point *you* want to make, since this will determine the chart form to use.

DUAL COMPARISONS

For some of the examples, you will note that the charts look suspiciously as if they should belong in another segment. This was done because, at times, the *message* you have determined, based upon your analysis of the data, will imply a *dual comparison*, e.g., item and component or time series and item. In these cases, you must determine which comparison is primary and which is secondary. Consider, for example, the following message which contains both a time series and an item comparison: "Sales are forecast to increase over the next 10 years, but profits may not keep pace." The first part of the message is a time series comparison. But with the statement, "but profits may not keep pace," we add a second, item, comparison. In other words, we are interested not only in the chronological change in sales (time series) but also in the performance of sales (item number 1) compared with profits (item number 2). However, the primary emphasis remains on changes over time,

and we would therefore use the basic chart form most appropriate to a time series comparison. In this case, the best choice would be a line chart with a separate line for each of the two items. In the portfolio, these dual comparison charts have been included in the section on the comparison I judged to be primary.

SCALES

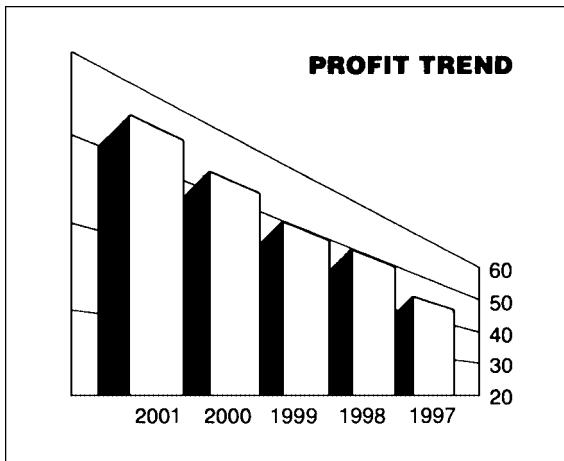
Scale values have been omitted since the nature and magnitude of the data being plotted (e.g., sales dollars in thousands) is not important for our purposes in this portfolio. Naturally, scale values are used in practice, but omitting them should not obscure the relationship each chart illustrates. In fact, it is a good test of your own charts to see whether messages come across clearly without showing the scales.

This does not mean that scaling considerations are unimportant to the design of charts.¹ On the contrary, the wrong scale can lead to producing a chart that is misleading or worse, dishonest. Here is an extreme example of each.

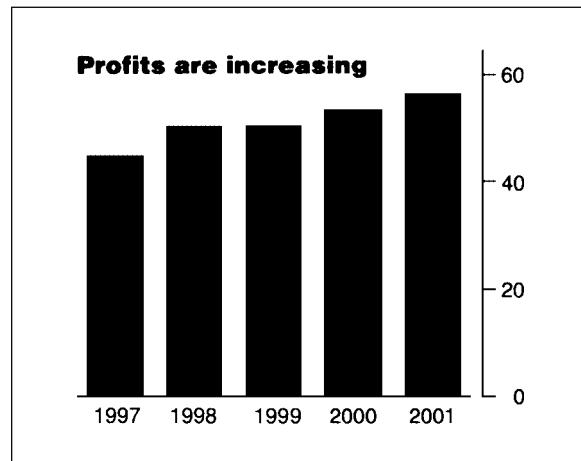
¹ For a more thorough presentation of the misuse and abuse of scales, refer to my article, "Grappling with Graphics," *Management Review*, October 1975. The selected examples presented in this section are reprinted, with the permission of the publisher, from MANAGEMENT REVIEW, October 1975 © 1975 by AMACOM, a division of American Management Associations, New York. All rights reserved.

EXAMPLE ► 1

Misleading



Accurate

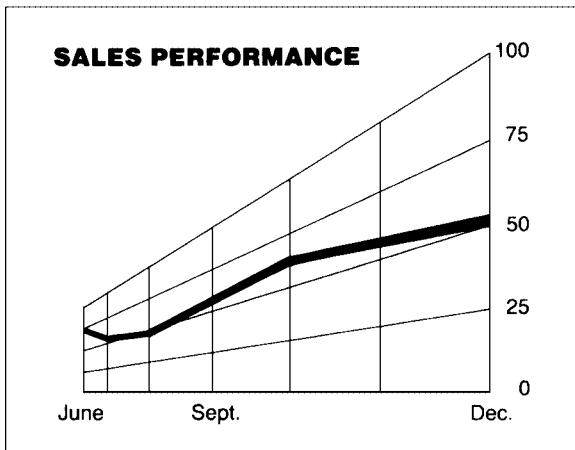


In Example 1, the chart at the left shows a picture of the trend in profits for the past five years. Our quick impression is that profits are declining. However, on closer inspection we notice four scaling problems: (1) the years are shown in reverse, moving from the most recent year at the left to earlier years at the right (a carry-over from annual reports, in which the most recent annual data are placed at the left to attract more immediate attention); (2) the bottom 20 units of profits are lopped off; (3) the columns are in three dimensions, so it's hard to know whether to measure their height from the front or the rear; (4) the scale lines are drawn in perspective. Together they create an unfortunately misleading picture of declining performance. Pity the shareholders.

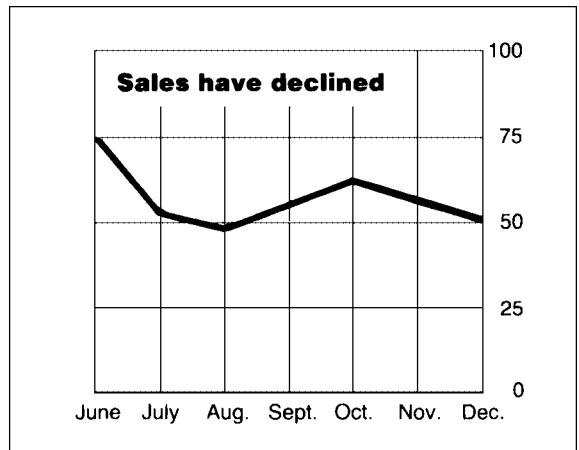
In the chart at the right, we see more quickly and clearly that profits are increasing.

EXAMPLE ▶ 2

Dishonest



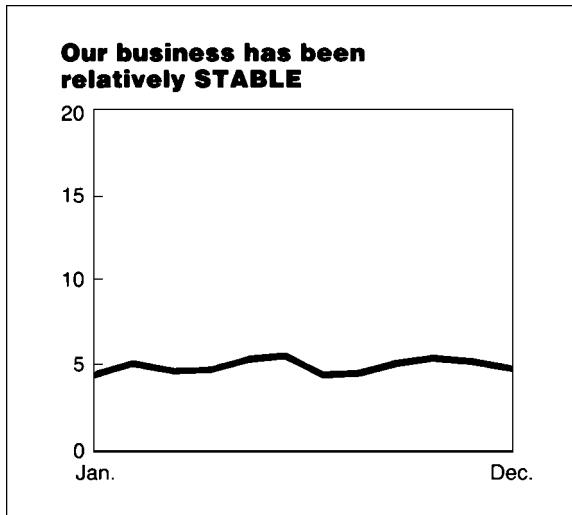
Accurate



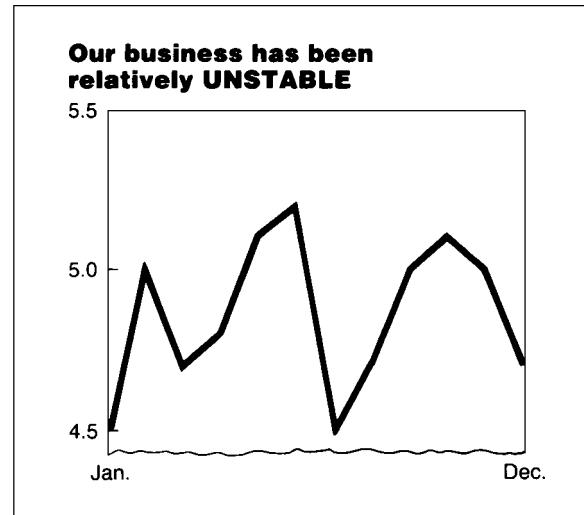
In the second example, foreshortening the scale lines in the chart on the left produces the impression that sales are increasing. Not true, as we can see from the chart on the right.

The point is this: a chart is a picture of relationships, and only the picture counts. Everything else—titles, labels, scale values—merely identifies and explains. The most important feature of the picture is the *impression* you receive. Scaling has an important controlling effect on that impression. Here is a demonstration of how easily and how substantially the scale can shape your impression of the message. Which would you choose, A or B?

► A



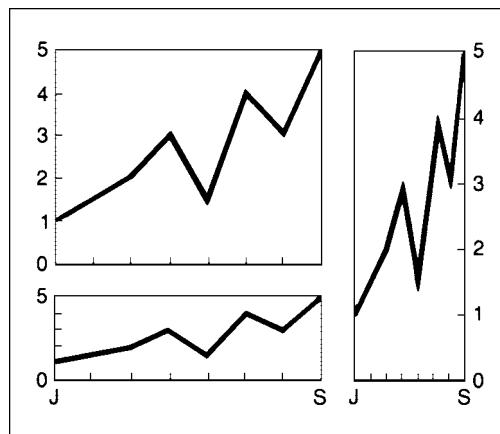
► B



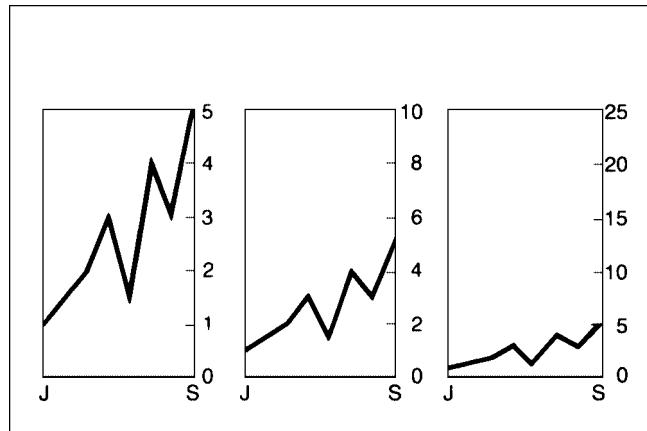
It would be easy to opt for the answer, "Something in between," and yet that, too, may be inappropriate. The decision rests on *your professional understanding of the significance of the changes*. And so, a \$1,000 change in a multimillion contract may be insignificant while a one-cent change in the price of a floor tile may be. You would therefore select a scale to reflect your understanding of the importance of the changes; perhaps the picture at the left would be appropriate for contracts, the one at the right for floor tiles.

To provide an accurate impression of your understanding of the changes, construct your charts with a respect for the factors that influence the picture:

The shape of the chart, from short and wide to tall and narrow

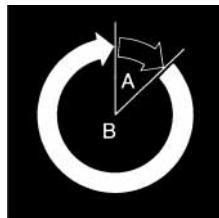


The scale range, say, 0 to 5, 0 to 10, or 0 to 25



These and other important scaling considerations are discussed in the commentary that accompanies each chart in the portfolio.

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COMPONENT COMPARISON

Shows the size of each part as a percentage of the total

COMPONENT COMPARISON

Chart 1 illustrates the simplest—and only truly appropriate—use of the pie chart: to compare a few components. Four shadings are used to distinguish the companies, with the darkest shading reserved for Company A to emphasize the aspect of the data mentioned in the title.

► 1

Company A has the smallest share of industry sales

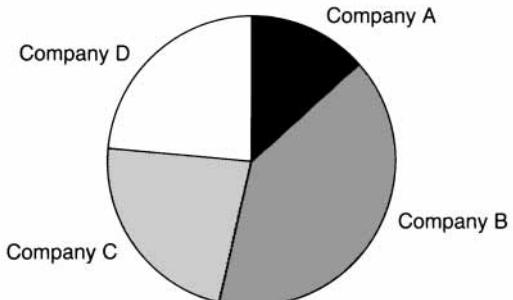
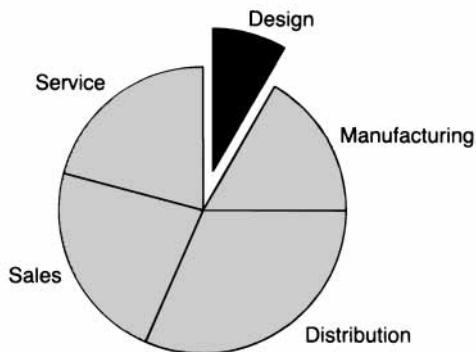


Chart 2 illustrates two methods of focusing attention on a component: (1) using darker shading; and (2) separating the segment from the remainder of the pie. In this example, the components are arranged according to the natural flow of activities.

► 2

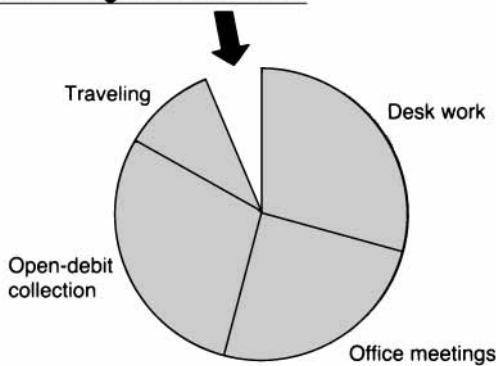
Product design accounts for less than 10% of total cost



Because the eye tends to complete the circumference of a circle, omitting a segment draws attention to the missing component, as Chart 3 shows. In this case, the lack of effort in recruiting new business is implied by the omission of the segment. The arrow further draws your attention to the sector.

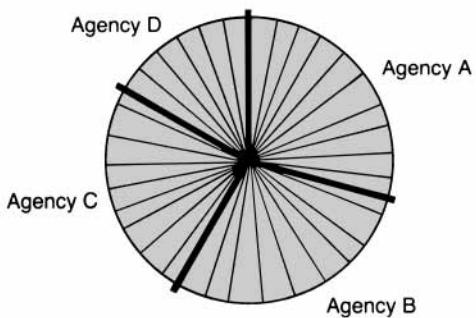
► 3

Agent's daily responsibilities leave little time for recruiting new business



► 4

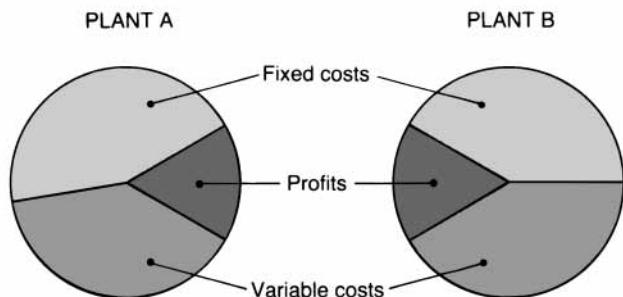
**Four major agencies splintered
into many small businesses**



Although Chart 4 violates the guideline against using more than six components in a pie chart, it is used in this case to emphasize the message that there are many agency businesses. Note that it is virtually impossible to measure the relative size of each component; if you must do so, you are better off presenting the data in tabular form or as a bar chart (see Charts 12 and 13).

► 5

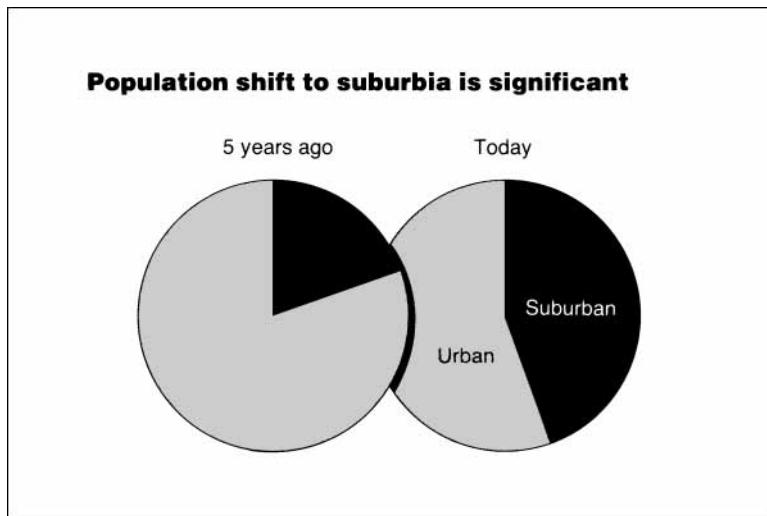
**Both plants have similar
cost structures**



Arranging the components within each pie in a mirror image, as is done in Chart 5, permits the use of only one set of labels. This makes it unnecessary to repeat the labels for each pie or to use a legend that forces you to look back and forth from the legend to the respective component. In the process, we disregard two guidelines: (1) starting at the 12 o'clock baseline; and (2) arranging the components in the same order.

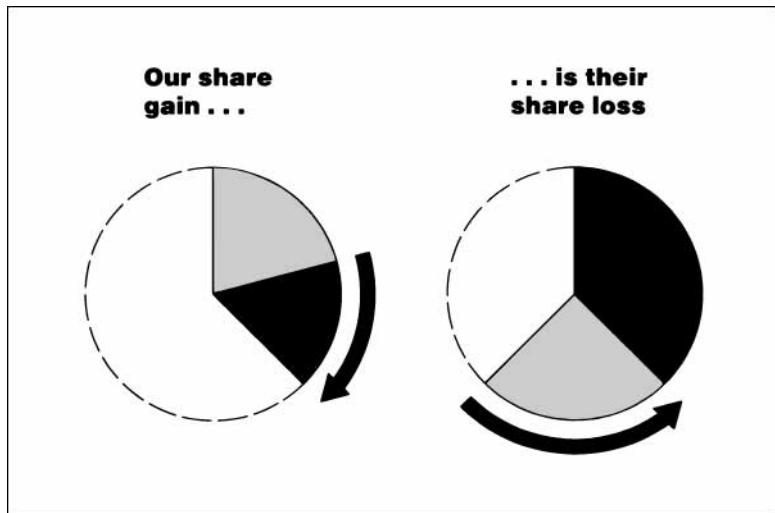
Chart 6 compares components within separate pies. When using this technique, keep things simple—no more than three components, no more than two pies. Beyond two pies, it is better to switch to 100 percent columns (see Chart 40).

► 6

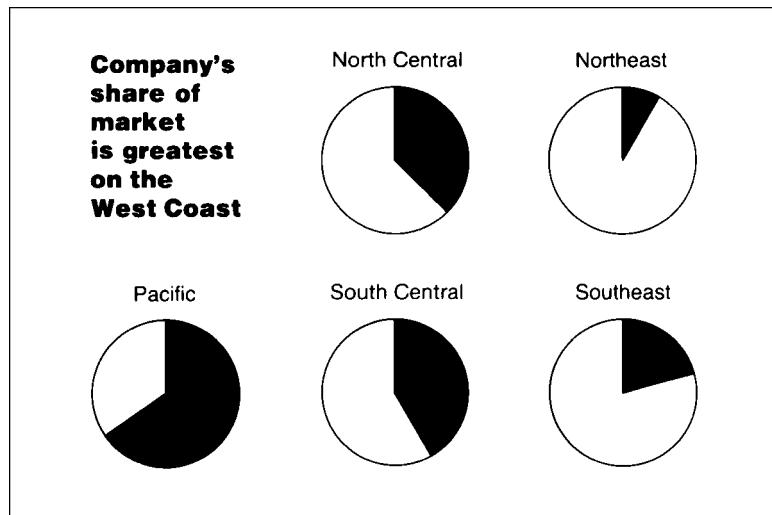


I hesitate to include Chart 7, since it will work only with two components, and even then the shading may be confusing. On the other hand, when kept simple, as we see here, it can be memorable. If in doubt, do not hesitate and use the more conventional two sets of 100 percent columns.

► 7



► 8



By using a separate pie for each region, as in Chart 8, we see: first, the company's share in each region; and second, the variation from region to region. Although 100 percent bars (see Chart 21) could be used, positioning the pies to simulate the natural geographic location makes this presentation more effective.

► 9

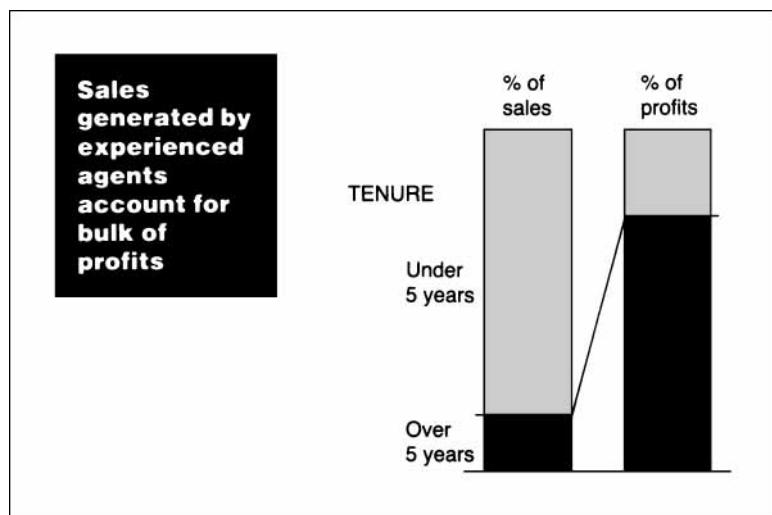


Chart 9 illustrates that, as soon as you need to show the relationship among components for more than one total, you are better off with either 100 percent bars or 100 percent columns. Commonly referred to as the 20/80 chart, this chart demonstrates that, although the more experienced agents account for the smallest share of sales, they concentrate on those sales that generate the larger share of profits.

► 10

You can show more than two items and two components per item in a 100 percent column chart, as Chart 10 indicates, but you should avoid using more than three of each because it may become confusing to follow this kind of comparison. Charts 9 and 10 could be shown with horizontal rather than vertical bars. However, the arrangements shown have become widely used and accepted.

Largest share of time spent on accounts generating smallest share of profits

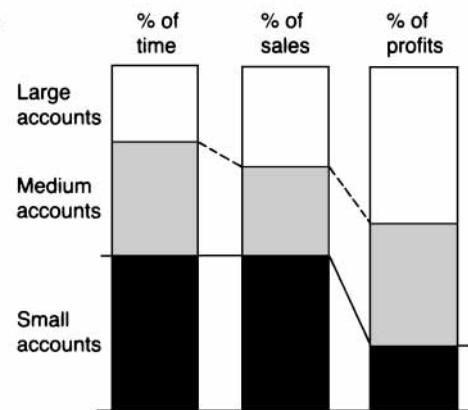
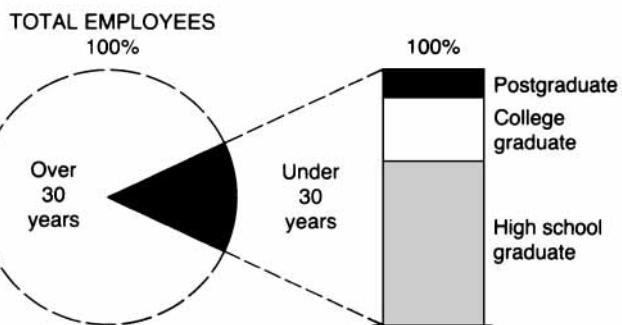


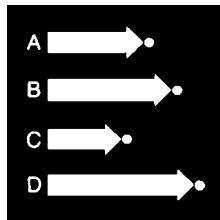
Chart 11 combines a pie chart and a 100 percent column to permit comparison of a total within a total: (1) of total employees, the percentage who are under 30 years old; and (2) of those under 30, the percentage distribution by education level.

When using this combination, always start with the pie chart and follow with the 100 percent column, not the other way around.

► 11

10% of the employees under 30 years have postgraduate degrees





ITEM COMPARISON

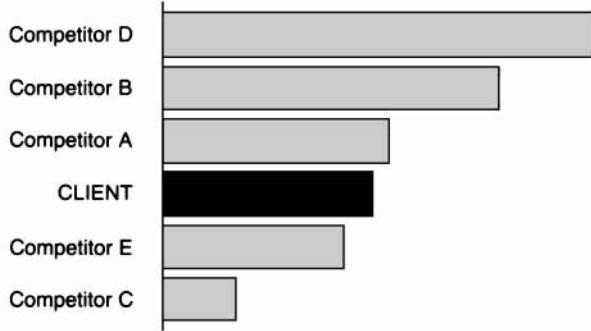
Shows ranking of items

ITEM COMPARISON

► 12

In a bar chart, such as Chart 12, the order of the items can be important. In this presentation, the items are sequenced from high to low to provide a ranking from best to worst performance and to show where the client ranks in the lineup. The client's return on sales has been highlighted by using a darker shading and a different type style for the label.

Client's return on sales ranks fourth



Instead of ranking the items from high to low or vice versa, Chart 13 uses a haphazard arrangement to emphasize the unevenness of salespersons' performance mentioned in the message title.

► 13

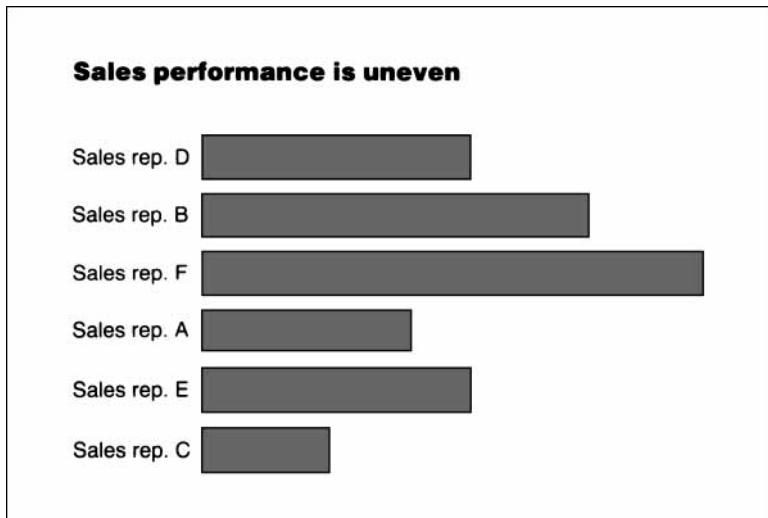
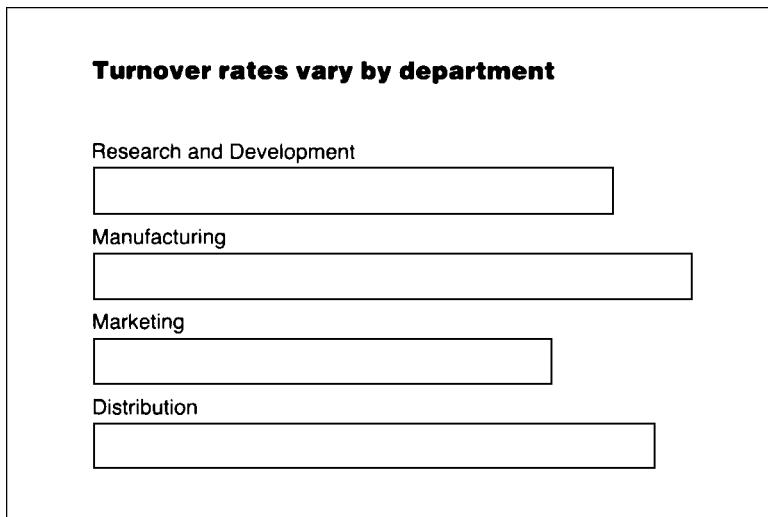


Chart 14 places the labels above instead of beside the bar. In this case, better use is made of the vertical space, permitting a smarter-looking and more compact layout. In the process, more space for the horizontal scale is provided to stress the important differences between departments.

► 14



► 15

Two divisions suffered losses after cancellation of government contracts

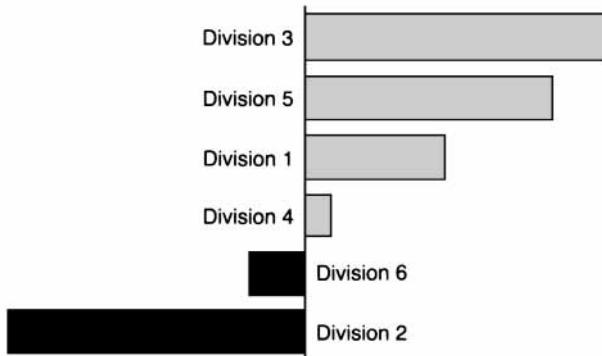


Chart 15 is a deviation bar chart in which bars extended to the left of the baseline—like columns extended below the zero line—suggest unfavorable results or conditions. The vertical baseline separates the profitable divisions from the losers. The items are ranked from most profitable to least profitable. To keep the chart compact, the labels are shifted from the left for profits to the right for losses.

► 16

Range of discounts offered for the new model varies widely by area

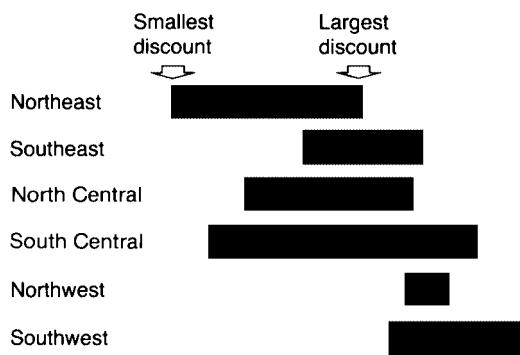


Chart 16, a range bar chart, shows the spread between low and high amounts, rather than just the single amounts. Range bars are useful when interest is in the amounts at each end of the range as well as in the difference between them.

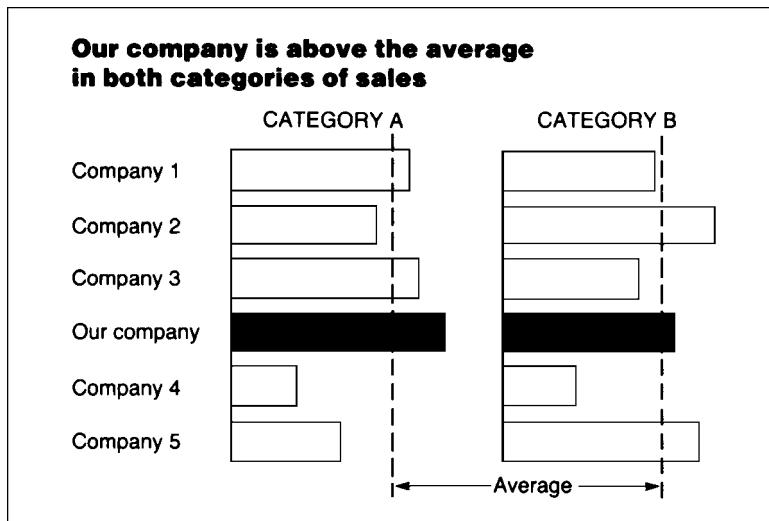
ITEM COMPARISON

Chart 17 is a bar chart in which two or more sets of bars can be compared, providing for both vertical and horizontal comparison. Of the two comparisons, the vertical one is more direct because the items are measured against a common baseline, while it is more difficult to compare the items horizontally, since they do not stack against the same baseline.

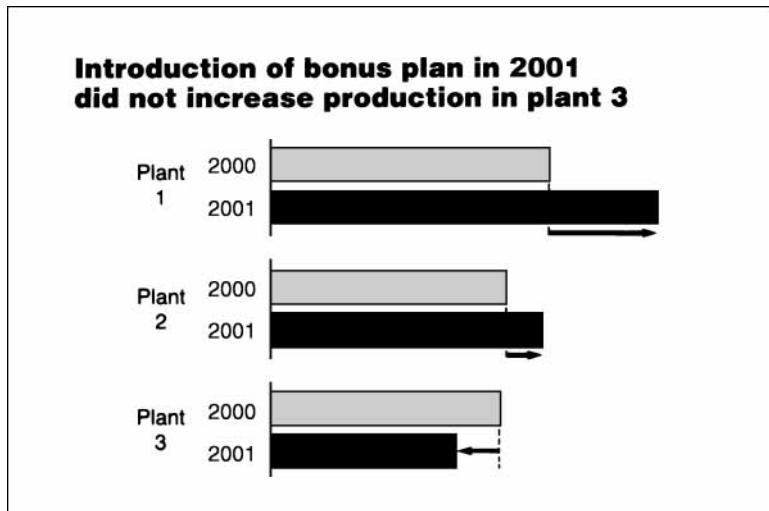
Although the averages could have been shown as bars, the dashed lines that cut across each company's performance distinguish more clearly those sales that are above the average from those that are below.

Chart 18 is a grouped bar chart that compares a number of items—Plants 1, 2, 3—at two points in time. Different shadings are used to distinguish time periods. The dashed lines and arrows, although not necessary, help to emphasize the direction and amount of change.

► 17



► 18



► 19

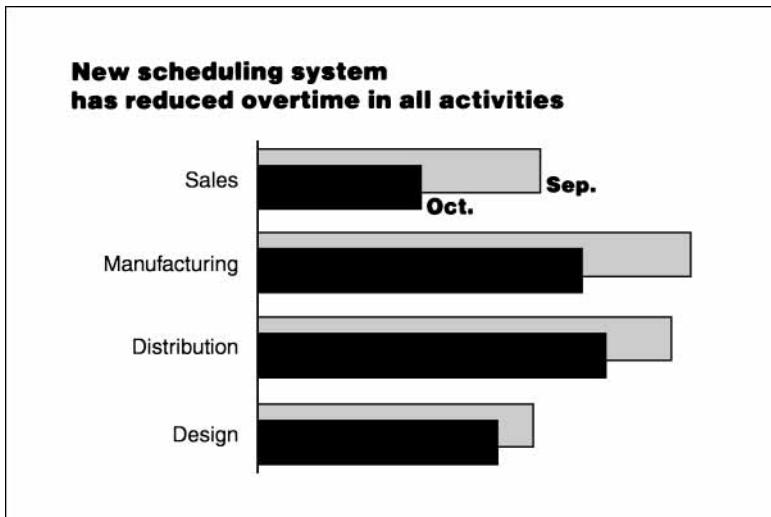


Chart 19 is a special form of grouped bar chart that is sometimes effective. Overlapping the bars saves vertical space, helps to emphasize the more recent time period, and focuses attention on the gap between the two time periods. In this example, the activities are listed by the decreasing size of the gap. They could also have been arranged by the normal flow of activities, i.e., from design to manufacturing to distribution to sales. Note: this technique is effective only if the bar in the background is consistently longer than the one in the foreground. If it is not, the background bar appears thinner than the foreground bar and may confuse the viewer.

Charts 18 and 19 disregard the guideline against using bar charts to show changes over time. It works here with only two time periods. With more than two, use column charts.

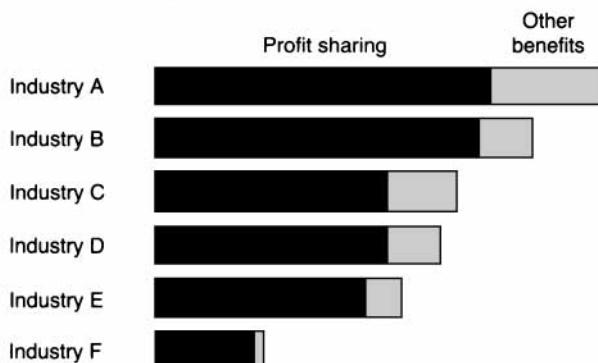
Chart 20 is a subdivided bar chart in which the bars and their components are plotted according to absolute values—that is, in dollars, tons, customers, or some other direct unit of measurement instead of in percentages.

Note that for all subdivided bar, column, and line charts, you should put the most important component against the baseline, since only the components against the base can be compared accurately.

Chart 21 is a 100 percent subdivided bar chart in which each bar and its components are plotted according to the relative (percentage) size of its components regardless of the absolute total value represented by the bar. In this type of chart, there are two baselines against which to place the important components—the one at the left, which connects the bars, and the one at the right, which is not connected.

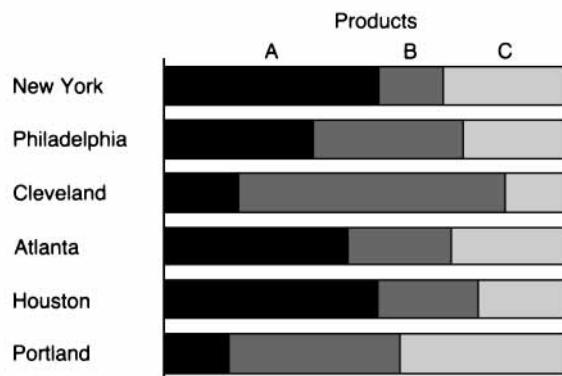
► 20

Although total fringe benefits vary, profit sharing is the largest portion in all industries



► 21

Product mix varies by area



► 22

**Ratio of domestic to foreign investment
is similar throughout the industry**

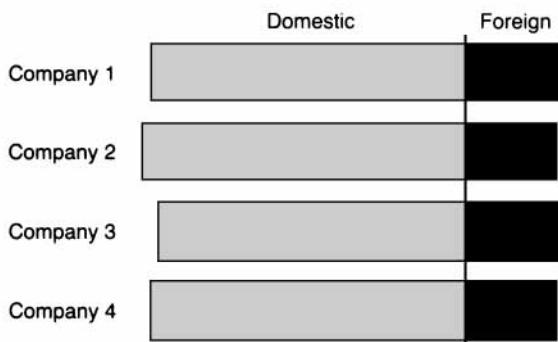
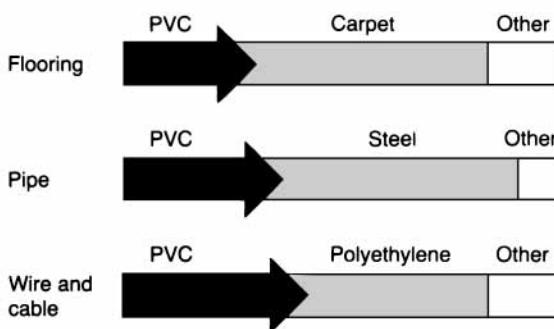


Chart 22 is a sliding subdivided bar chart, useful when there are only two components (or two major groups of components). Because the dividing line between the two segments serves as a common baseline, each component can be compared accurately. In this case the bars are 100 percent, although absolute values can also be used.

► 23

PVC has penetrated the market



Charts 23 through 27 introduce the use of arrows in bar charts. Although not necessary, the arrows add a sense of direction and movement that can often add emphasis to the message title.

Chart 23 is, like Chart 21, a subdivided 100 percent bar chart. Here, however, the arrows used to show PVC's share accent the idea of penetration mentioned in the title.

Chart 24 can prove valuable for visualizing the highlights of a profit and loss statement. The components of assets are built up to their cumulative total and balanced against the components of liabilities. Certainly the bars could be vertical instead of horizontal, although the treatment used here provides more room to the left of the bars for labeling the components.

► 24

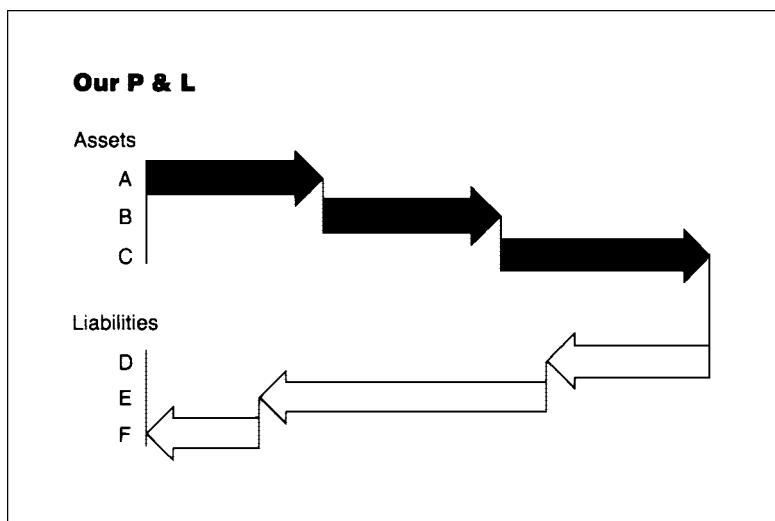
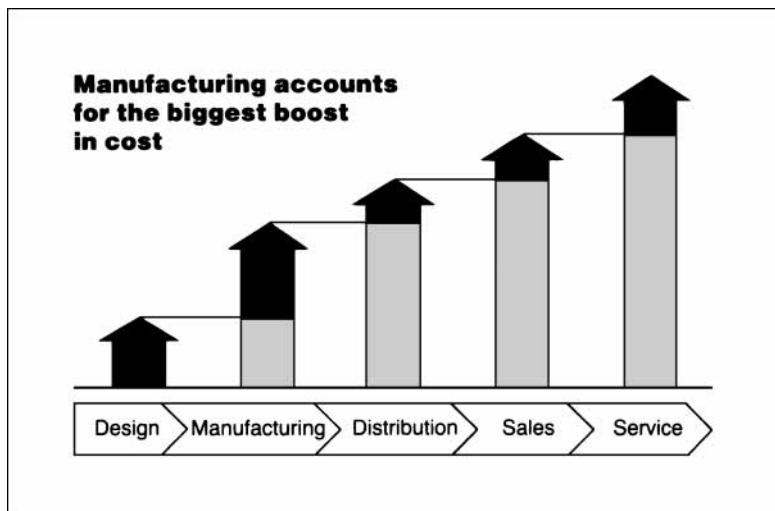
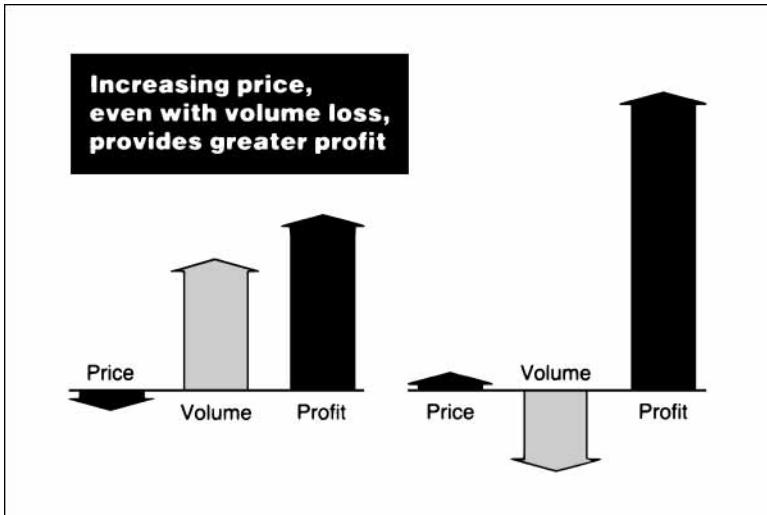


Chart 25 has become known as a source of change chart. The solid arrows show the cost that is *added* at each successive stage of a process; the lighter segments indicate the carry-over from the previous stages.

► 25



► 26



Sensitivity analyses are often demonstrated using the treatment shown in Chart 26. This deviation chart stresses the impact on profits of various changes in one or more related items. Here, use of dynamic arrows, rather than static bars, emphasizes the nature of the changes, both positive and negative.

► 27

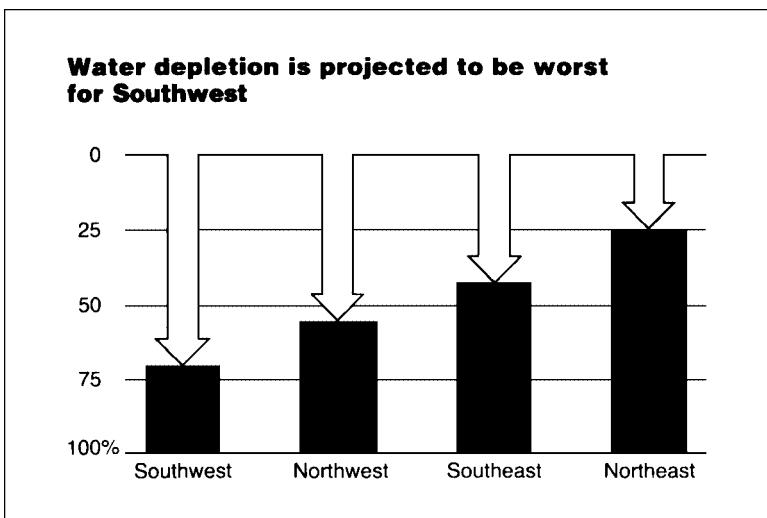
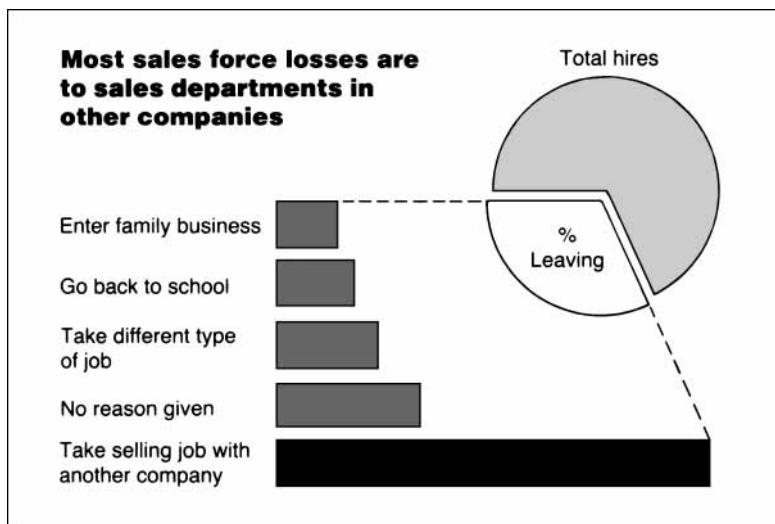
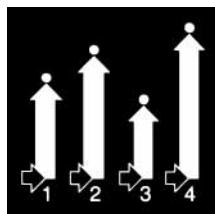


Chart 27 works well in spite of—or perhaps because of—the unconventional treatment of the scale, which begins at the top with 0 percent and moves down to 100 percent. The arrows stress the magnitude of the depletion while pointing to the percentage that remains. The items have been ranked beginning with the region most affected by the depletion and progressing to the region least affected.

Chart 28 combines a pie chart, which summarizes the total picture, with a bar chart, which itemizes the reasons salespeople are leaving their current company. The solid bar focuses attention on the fact that most are leaving to take on similar positions with other companies, indicating a problem with their position in this company.

► 28





TIME SERIES COMPARISON

Shows changes over time

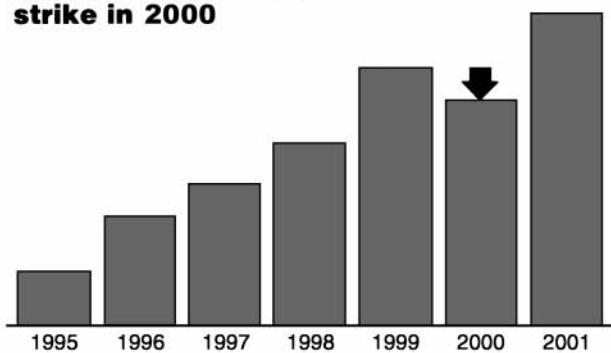
TIME SERIES COMPARISON COLUMN CHARTS

► 29

Chart 29 is a simple column chart suitable for showing changing levels over time. The column chart is best used for fewer than eight time periods.

Use graphic treatments—arrows, lines, shadings, or color—when you want to emphasize a specific aspect of the data, as shown here and on the next three charts. In this presentation, the arrow serves the dual purpose of focusing attention on the year 2000 and emphasizing the downward level.

**Sales continue growing
despite setback from
strike in 2000**



In Chart 30, the arrow emphasizes the increase from 1995 through 2001.

► 30

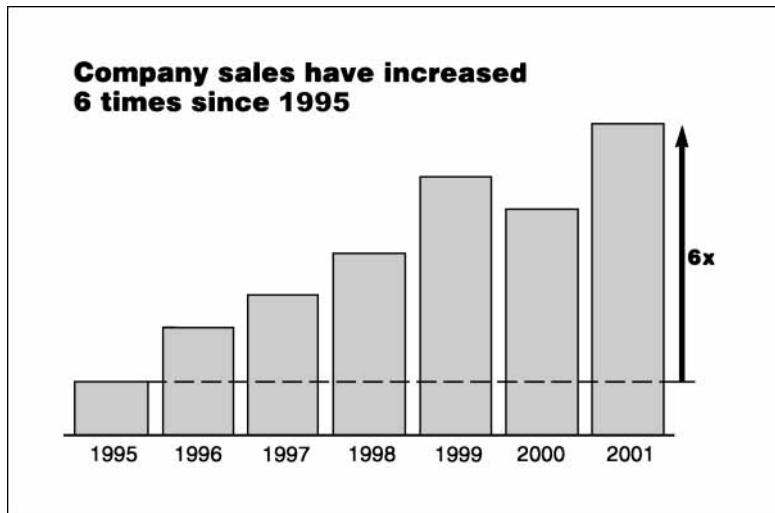
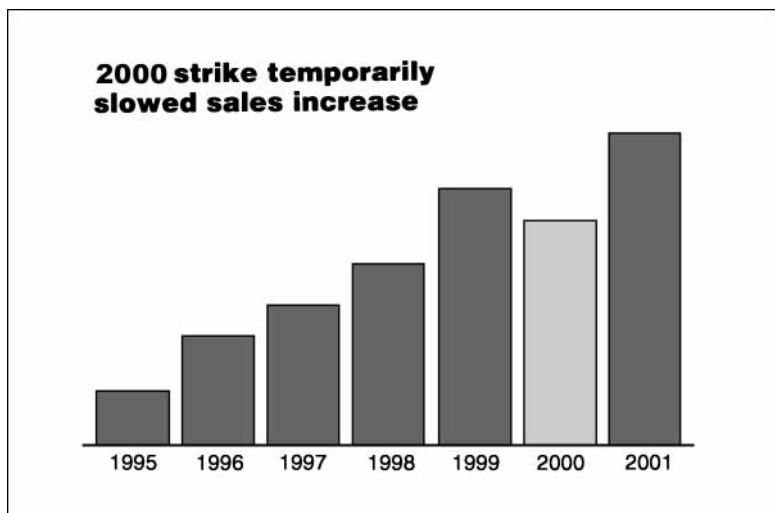


Chart 31 uses lighter shading for 2000 to distinguish that year from all others. This treatment emphasizes how much sales *were* in 2000, rather than how much *less* they were than in 1999. This use of dark and light shading can also prove effective for distinguishing actual from estimated data or historical from projected data.

► 31



► 32

**Since 1995, sales have risen
in every year except one**

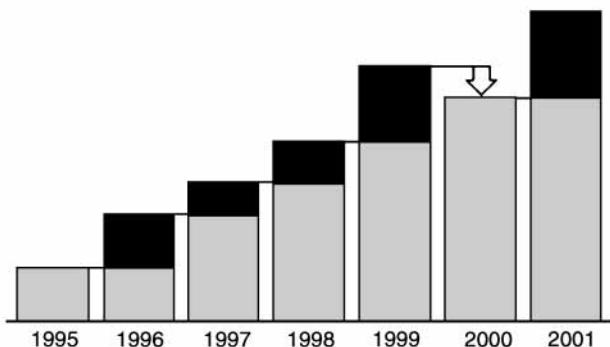


Chart 32 combines graphic treatments—darker column caps and an arrow—to highlight the amount of change from year to year and to distinguish between periods of growth and the period of decline.

► 33

**New management team has successfully
turned losses into profits**

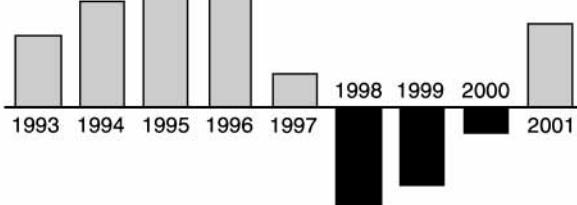


Chart 33 employs several techniques to distinguish between positive and negative data: (1) extending columns below the zero line to indicate deficits or unfavorable conditions; (2) using different shadings; and (3) staggering the column labels.

Chart 34 is on the page of our daily newspaper when we study the performance of the stock market. It is a range column chart and emphasizes the spread between two sets of values—in this case, the daily high and low—rather than just the magnitude of the values. The crossline, generally used to indicate the average of the high/low values, here indicates the closing level for each day.

► 34

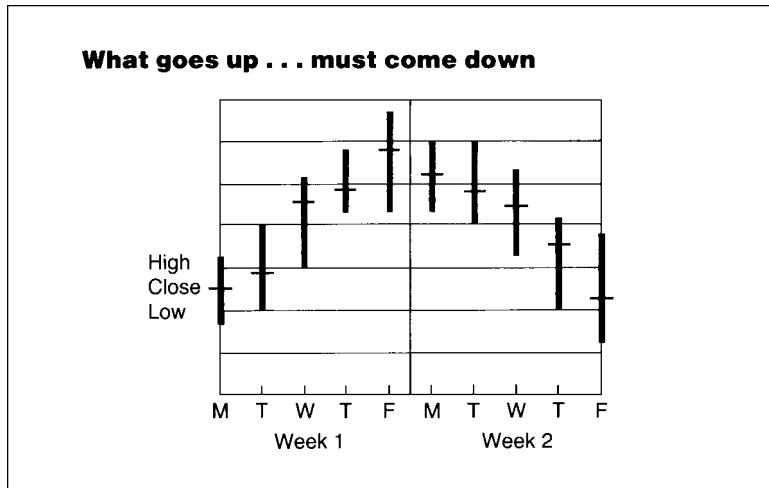
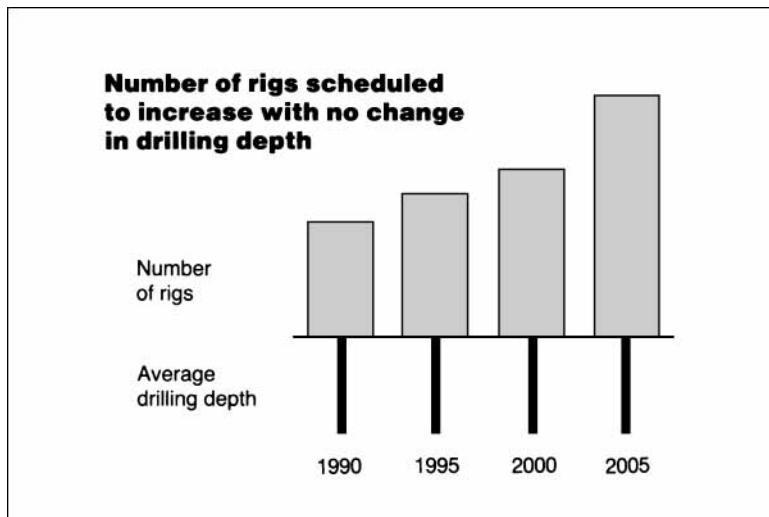


Chart 35 butts two column charts on either side of the baseline: above, the columns indicate the increasing number of rigs; below, they show the average depth the rigs drill into the earth. In this case, the columns extended below the line indicate neither a deficit nor an unfavorable condition, but instead reinforce the idea of depth; also, the columns have been narrowed to suggest drilling bits.

► 35



► 36

Five-year objectives call for substantial increases in stores, revenues, and profits

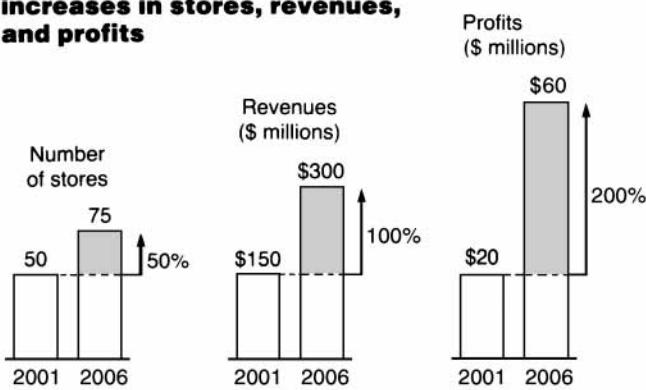


Chart 36 is a grouped column chart for three sets of data that are measured in different kinds of units (number of stores versus dollars) and in different sized units (revenues in \$ hundred millions versus profits in \$ ten millions). To provide a common base of comparison, translate the absolute data into percentages (or an index) of the base value (in this case, 2006 divided by 2001) and plot the 2001 base values at equal heights. In other words, we assume that in 2001 the number of stores equaled the revenues and the profits. Then plot the 2006 values according to their percentage increase. The result is a “visual” index chart that allows you to show the absolute values while plotting the percentage changes in proportion to one another.

Overlapping columns, as in Chart 37, works well when the two items are related aspects of the same measurement. In this case, the two items—planned versus actual—are related aspects of production. (Remember, one item should be consistently greater than the other. Otherwise the overlapping column hides the thickness of the column in the background.)

► 37

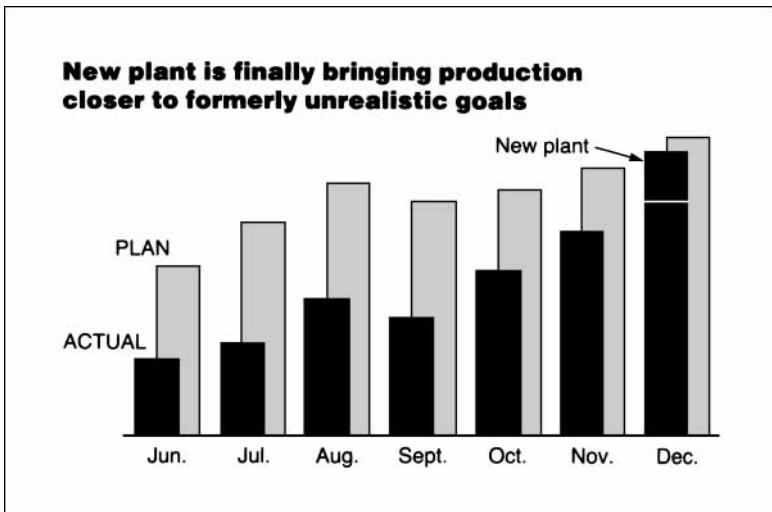
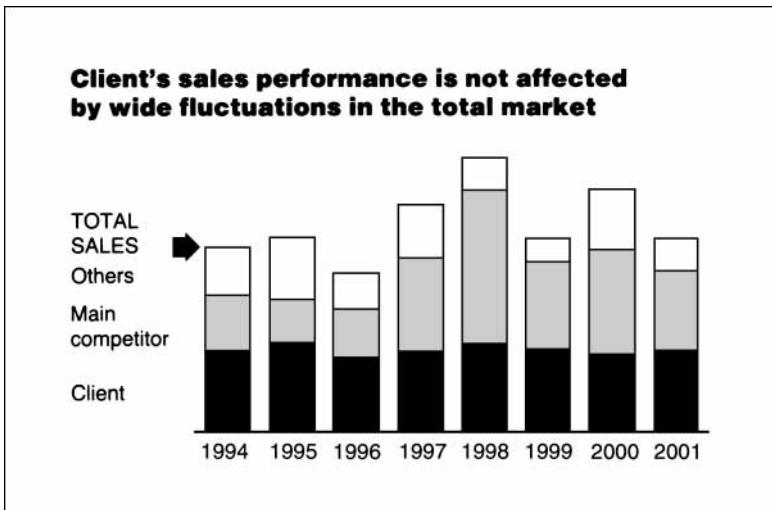


Chart 38 is a subdivided column chart that shows how the totals change over time and the components contribute to the change. For all subdivided charts, the tendency is to show too many components, making individual segments difficult to identify and compare. Use not more than five. If you need accurate measurements of each component, rely on the approach illustrated by the next chart.

► 38



► 39

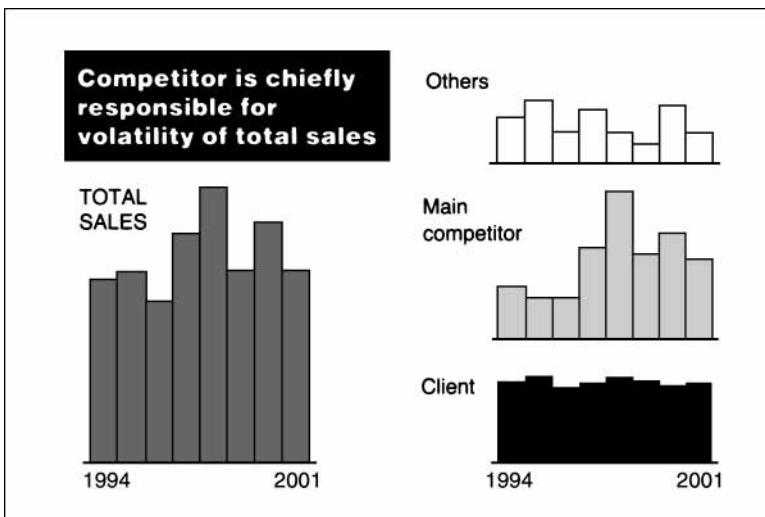


Chart 39 employs the same data used in Chart 38 but presents them in such a way that the trends for the total and for each component can be measured accurately against its own baseline. This alters the focus of the chart from how the components contribute to the changing trend over time to how each item varies over time.

► 40

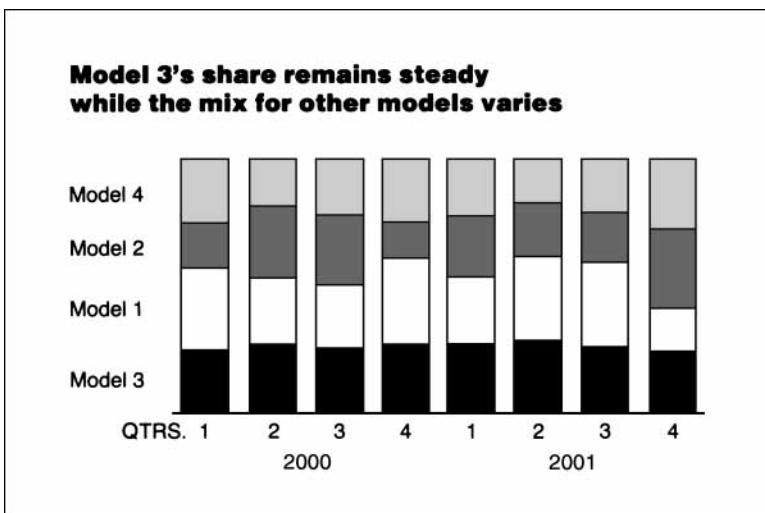


Chart 40 is a 100 percent subdivided column chart. Although the eye is accustomed to reading a page from top to bottom, a column chart is measured from the zero line up (as is a subdivided surface chart). For this reason, the most important component is usually positioned against that base. Use different shadings to distinguish the components within the columns and to help identify the pattern of change for each component across the chart.

Chart 41 is a column chart that indicates the source of change from the volume at the beginning of the time period to the volume at the end. Here, arrows reinforce the positive and negative nature of the changes while measuring the amounts of change each account represents.

► 41

Gains from A and B have failed to offset losses from C

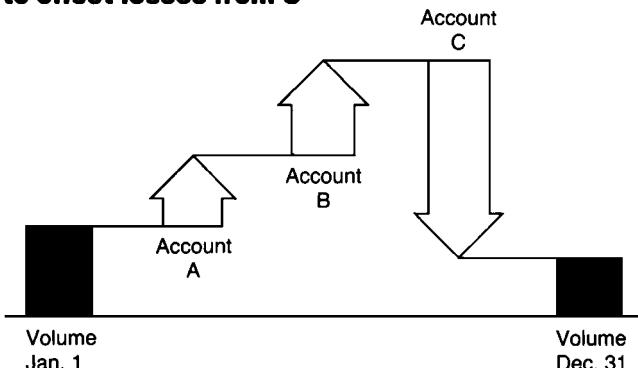
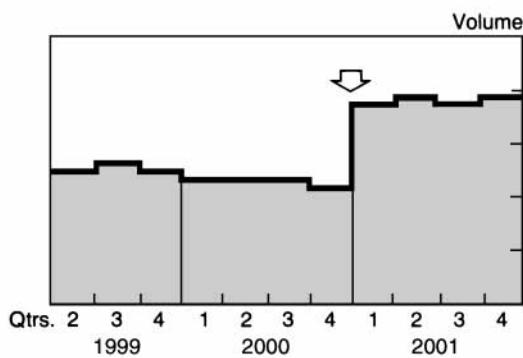
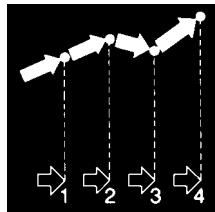


Chart 42, a step-column chart, could be thought of as a column chart with no space between the columns or as a surface (line) chart with the space between the line and the base shaded; without the shading, it becomes a line chart. It is best for presentation of data that change abruptly at irregular intervals, such as staffing levels.

► 42

A higher production plateau has been reached since introduction of new equipment in early 2001





TIME SERIES COMPARISON

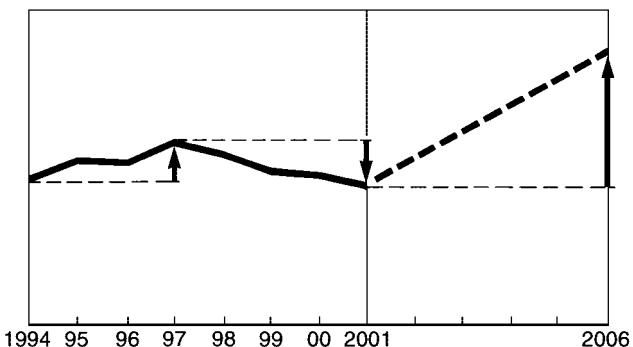
Shows changes over time

TIME SERIES COMPARISON LINE CHARTS

► 43

Chart 43 is a simple line chart that shows changes over time when you have many periods. Two graphic treatment are used: (1) the solid line for the actual is distinguished from the dashed line for the forecast; and (2) the arrows emphasize the direction and amount of change.

**Projected growth seems unrealistic
in light of recent performance**

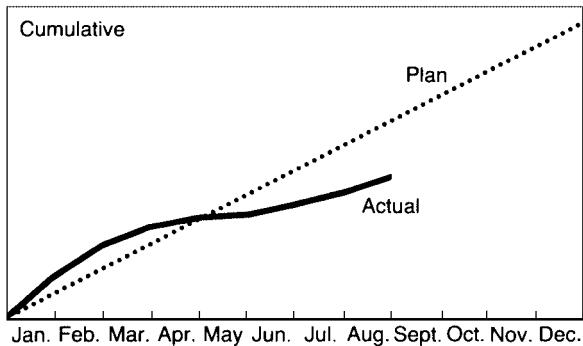


Charts 44 through 53 are examples of grouped or multiple line charts.

As Chart 44 shows, when lines cross, use different patterns (e.g., dotted, dashed, solid, thick, thin) to eliminate confusion; when lines do not cross, this is not necessary. In any case, the bolder, solid line should be reserved for the most significant item.

► 44

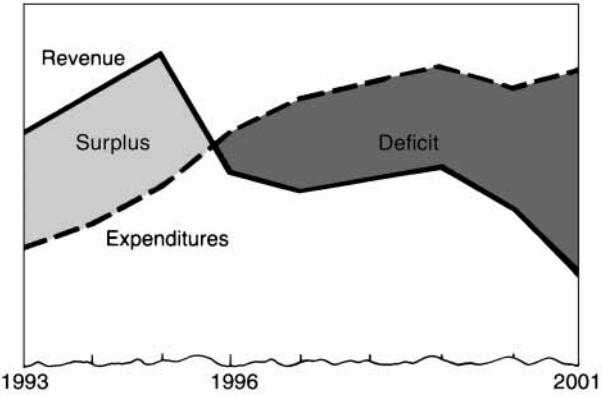
Actual performance suggests goal will not be reached



The wavy line at the base of Chart 45 indicates that the bottom of the vertical scale has been cut. In this case, the focus is not on the relative levels of revenue versus expenditures (in that event, the chart should be plotted from the zero line) but on the differences between the two. Here, different shadings are used to distinguish surplus from deficit.

► 45

Deficits continue to grow



► 46

Projected net income should reach break-even during the next 12 to 18 months

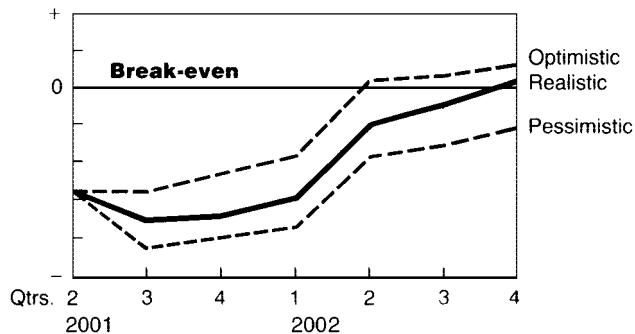


Chart 46 provides a cushion of safety when showing projected data. Establishing an optimistic/pessimistic range around the best-guess (realistic) trend line reduces the risk of being held accountable for a projection that is tenuous at best, no matter what the assumptions are. In this case, thin dashed lines are used to establish the range; shading the range would also work.

► 47

Home buyers are caught in the crisscross of decreased building and increased construction costs

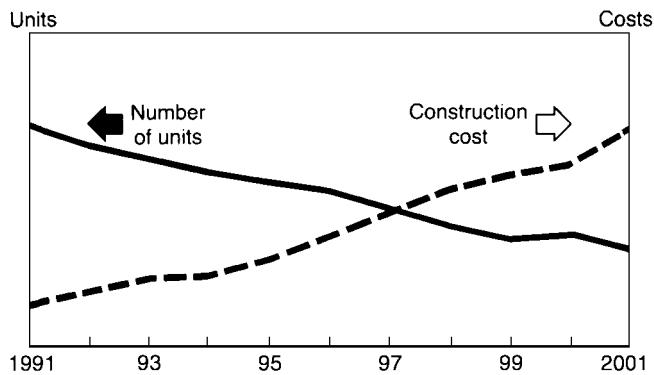
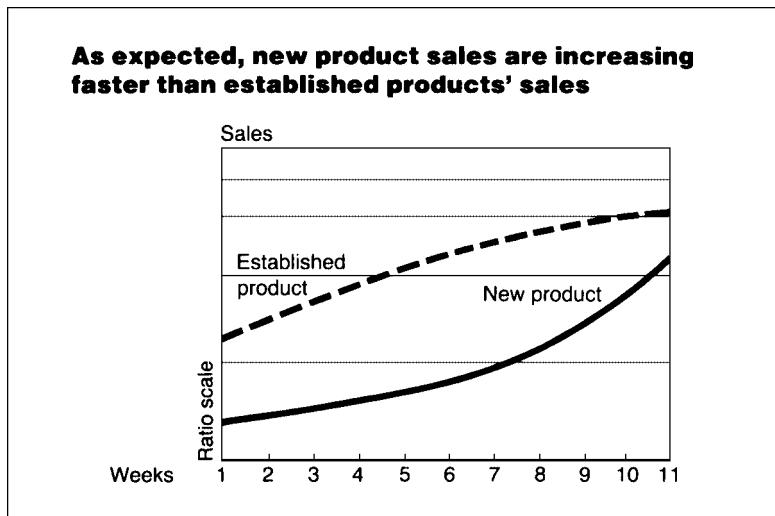


Chart 47 is a multiple scale chart (i.e., different scales to the left and right), which brings together for close comparison two or more curves that are measured either in different units or are so far apart in size that they would be difficult to compare. If you wish to compare change or growth, make the zero lines of both scales coincide and select the scale intervals so that both curves meet at some meaningful point. Better still, convert both series to a common base (e.g., index numbers or percentage changes) and use only one scale.

Chart 48, plotted against a logarithmic (semilog) scale, shows the rate of change from any point to any other point in a series of data. On this kind of chart, absolute figures increasing at a constant rate (e.g., 5 percent each week) would be shown as a straight line; on an arithmetic scale chart, absolute figures increasing at a constant 5 percent rate would appear as a curving line slanting up at a steeper and steeper angle.

Since there is no zero line, this chart should not be used to measure levels, magnitudes, or negative data. It cannot legitimately be shown as a surface chart (or a column chart). Always use logarithmic scales with caution; if there is any chance that the reader may not understand the scale, explain how to read it and what to look for.

► 48



► 49

Net sales are increasing at a slower rate than selling expenses

Index: 1991 = 100

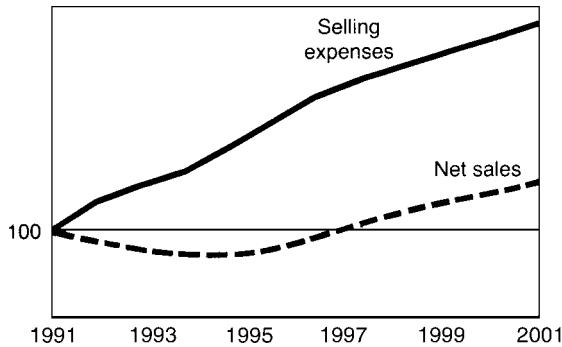


Chart 49 is an index scale chart, which shows data that have been converted into percentages of a base value. Unlike the logarithmic scale chart, which shows the relative change between *any* two points in time, the index scale chart shows the relative change only from the base value for each period. It offers an advantage over absolute amount scales since it can be used for comparing two or more series of data that are measured in different kinds of units or in different-sized units. This kind of comparison may be clearer if changes are presented as simple percentage differences. For example, "Percentage increase in sales since 1991" shows exactly the same picture as "Index of sales: 1991 = 100," except that in the former the scale is divided to read 0, 25 percent, 50 percent, instead of 100, 125, 150.

Instead of index values, Chart 50 uses a scale that shows percentage changes between 1996 and 2001. To provide meaningful comparison between the three items—income, assets, and sales—the scales must be the same for all three. An option here is to show only two charts, one for Company A and one for Company B, and to plot each company's percentage change in income, assets, and sales on its own grid.

► 50

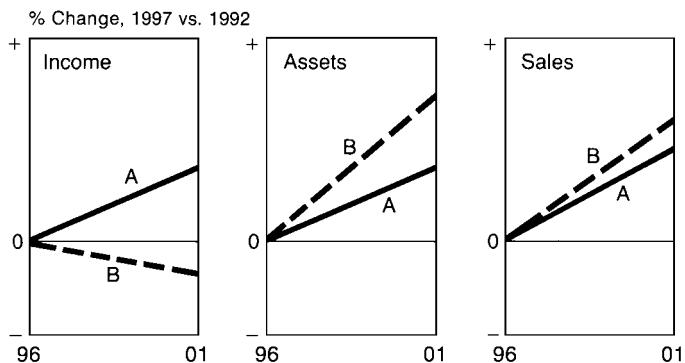
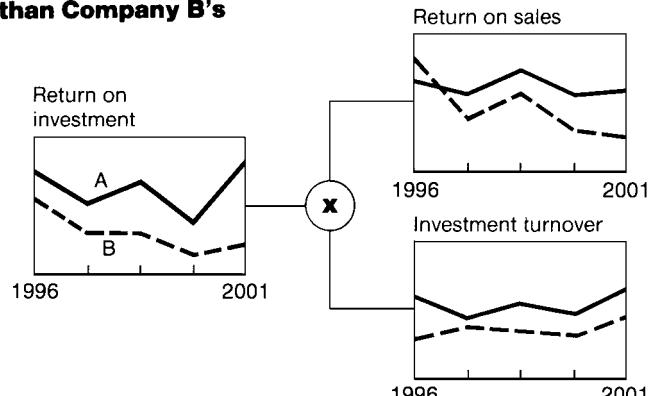
Company A outperformed Company B despite B's greater growth in assets and sales

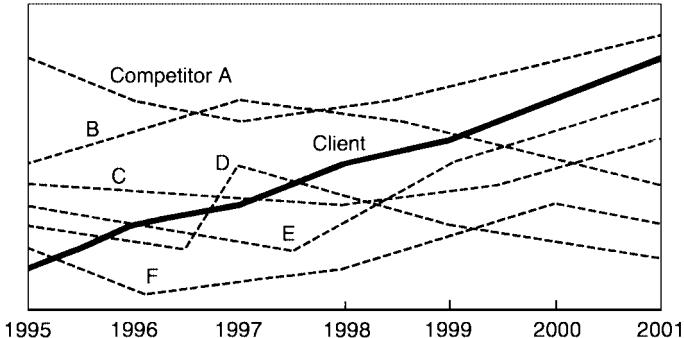
Chart 51 uses a calculation tree to visualize a mathematical formula—in this case, return on investment equals return on sales multiplied by investment turnover. In each window, the trend for two companies is shown, allowing the reader to study the various branches of the tree for the source of any problem in the resulting ROI performance.

► 51

Company A's ROI remains better than Company B's

► 52

Client demonstrating steady growth in contrast to erratic patterns of competitors



In Chart 52, the line representing the client is emphasized as a bold solid line and is compared to the lines for *all* competitors. If, on the other hand, you want to compare the client to *each* competitor, the technique in the next example is more appropriate.

► 53

Client has shown steady growth in contrast to erratic pattern of competitors

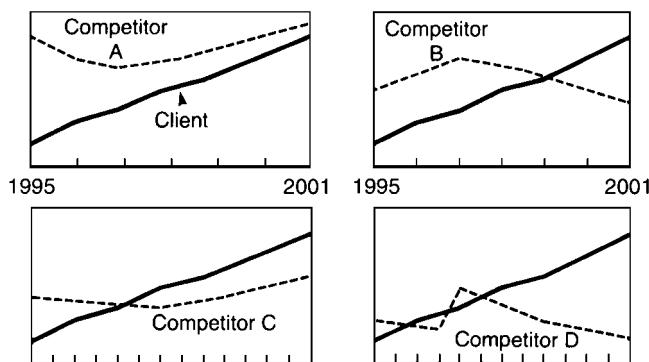


Chart 53 contains more charts (and therefore requires more drafting time) since it compares the client separately to each competitor, but the comparison per chart is simpler than in the previous example. The client line is identical on each chart. Using this approach, you can group the comparisons for easy reading (e.g., by competitors who were ahead, about the same, or behind the client at a given point in time). You might also emphasize client performance by using a surface chart rather than a curve.

Chart 54 is a surface chart, a line chart with the space between the trend line and the baseline shaded to give a greater feeling for quantity. The graphic treatment in this example—darker shading for the periods of decline—calls attention to the two quarters under scrutiny.

► 54

Only two brief periods of decline have occurred during past 12 quarters of sales performance

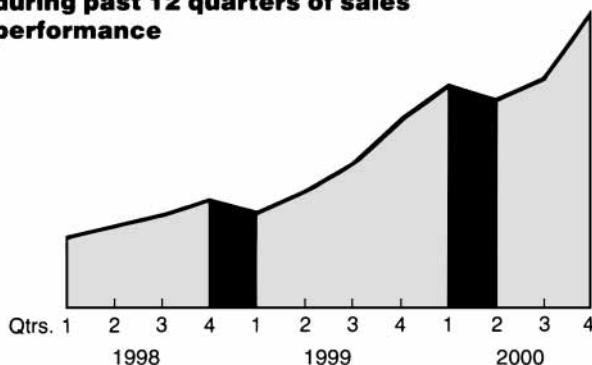
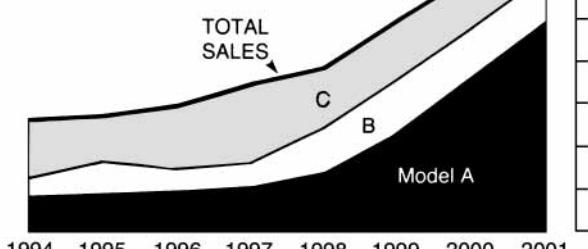


Chart 55 demonstrates the change in the absolute contribution of three components over time, but with the primary emphasis on the total. Only the bottom layer is measured directly from a fixed base. All other layers are measured from a changing base, and their size can be gauged only approximately. To permit direct reading, use the approach illustrated by Chart 39. If the layers fluctuate sharply, use a subdivided column chart (see Chart 38) or the approach illustrated by Chart 39.

► 55

Model "A" sales responsible for continuing sales increase



► 56

If trends continue, new models will squeeze model X out of the market

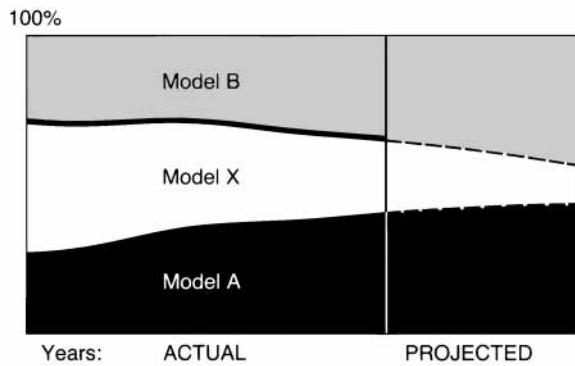
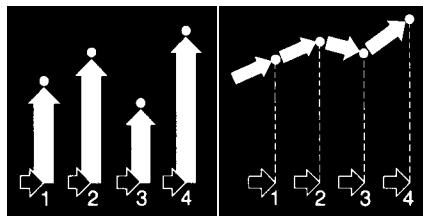


Chart 56 shows the change in the relative contributions of components over time. The important component—in this case, Model X share—is sandwiched between the two competing models to stress the message. Like all charts illustrating relationships, this type of chart can be misleading if the percentages are based on absolute amounts that are not fairly stable. For example, if 100 percent represents a sharply rising total, a decreasing percentage may actually represent an increasing amount. In such cases, there is a special advantage in picturing the absolute amounts in an accompanying chart or table.



TIME SERIES COMPARISON

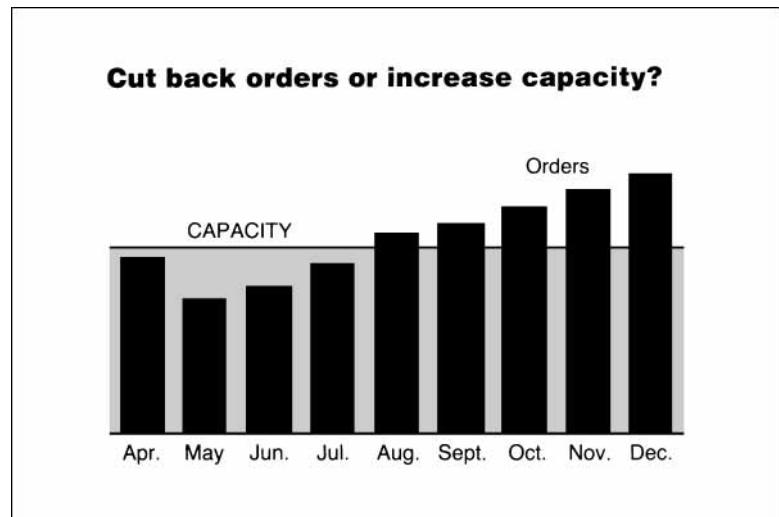
Shows changes over time

TIME SERIES COMPARISON COMBINATION CHARTS

Charts 57 through 63 combine column and line charts to provide additional perspectives on changes over time.

Chart 57 could use grouped columns (that is, one column for capacity and another for orders) but, since capacity is constant, it is shown instead as a background line/surface chart. To emphasize the difference between capacity and orders—instead of their levels, as in this example—an option is to use a deviation chart (see Chart 33) with capacity as the baseline and measuring the number of orders below or above capacity.

► 57



► 58

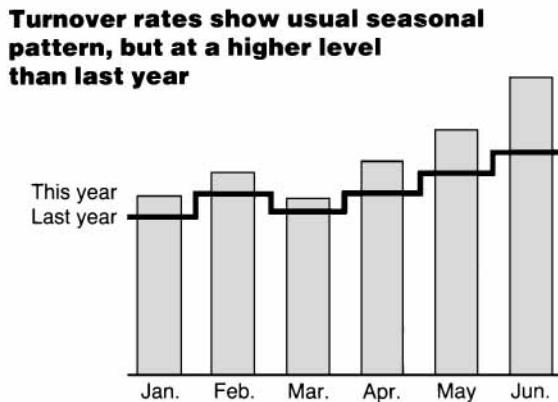


Chart 58, too, could be presented as grouped columns (one column for this year, one for last year). On the other hand, this column and line technique places primary emphasis on the columns representing this year's activity and secondary emphasis on the comparison of this year's versus last year's data.

► 59

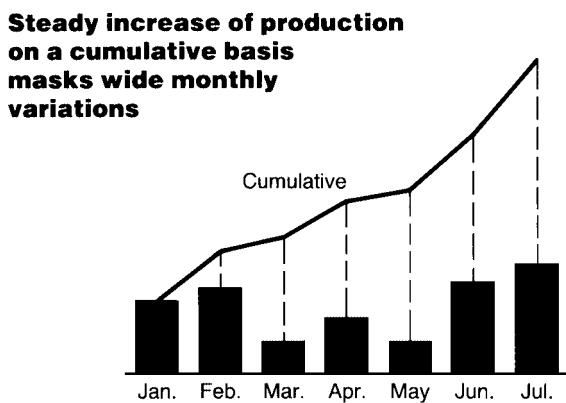


Chart 59 combines a column chart to show the fluctuation in monthly production with a line chart to show the cumulative (sometimes referred to as year-to-date) trend since January.

Chart 60 uses a deviation column chart to show how the initial investments in 1996 and 1997 turn positive in 1998, and a line chart to indicate when the break-even point is achieved.

► 60

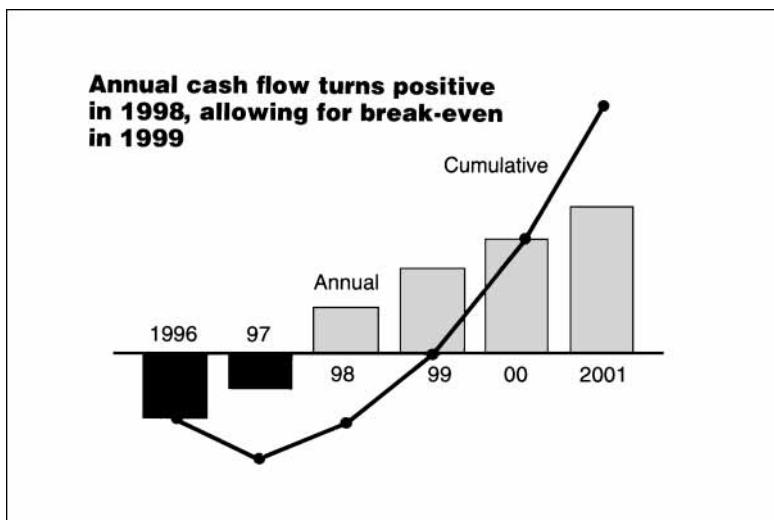
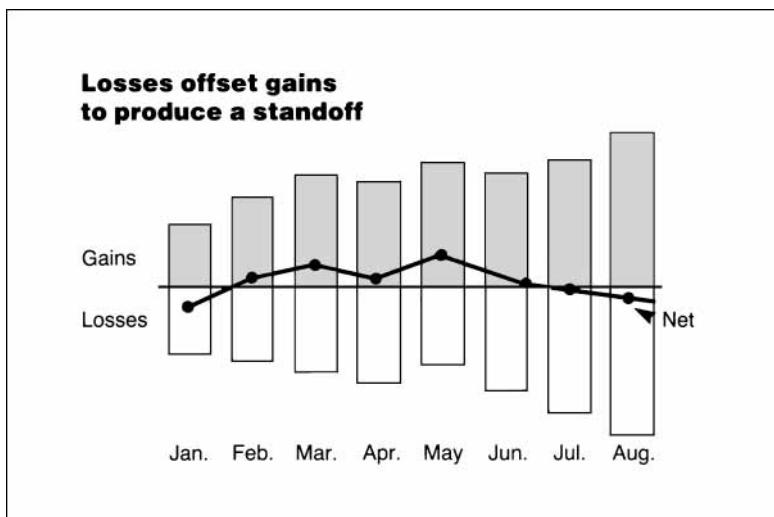


Chart 61 is similar to Charts 59 and 60 but, in this case, the line represents the net difference between the gains and losses for each month rather than the cumulative trend.

► 61



► 62

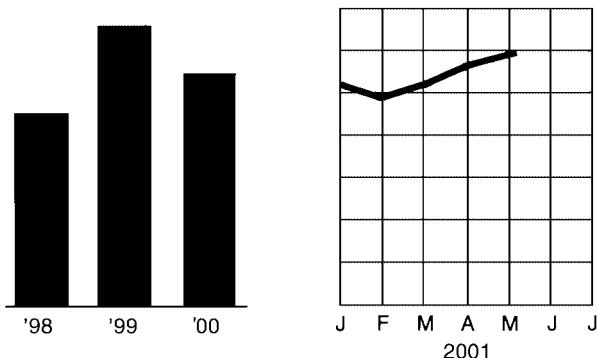
Inventories continue to increase

Chart 62 uses columns to summarize past annual data and a line chart to study this year's performance on a month-by-month basis. This technique is often used in management information systems; it leaves space to add monthly performance data, thereby eliminating the need to prepare a new chart each month.

► 63

Actual shipments fell short of plan for second month

— Plan
— Actual

Year-to-date

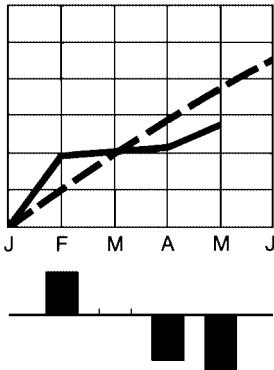
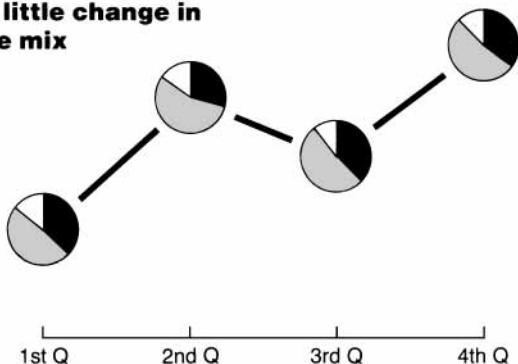


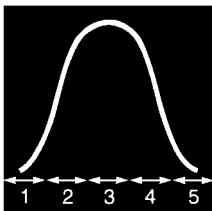
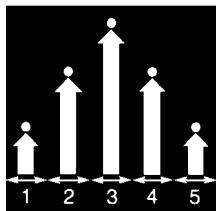
Chart 63 is also often seen in management information systems. It is a plot of actual monthly (or weekly or quarterly) results against the plan set at the beginning of the year (or against an objective or last year's total). On a cumulative basis, the differences between actual and plan usually tend to be small and often fail to focus attention on problem periods. To magnify these differences, it is a good idea to show the percentage variations of actual versus plan, as illustrated in this example.

Chart 64 combines pie charts with a line chart. The pies show the share mix at each point in time, and the line chart shows the changing totals over time. Keep it simple—not more than three components per pie, not more than one trend line, not more than six periods of time.

► 64

Volume has fluctuated with little change in share mix





FREQUENCY DISTRIBUTION COMPARISON

Shows how many items fall into a series of progressive numerical ranges

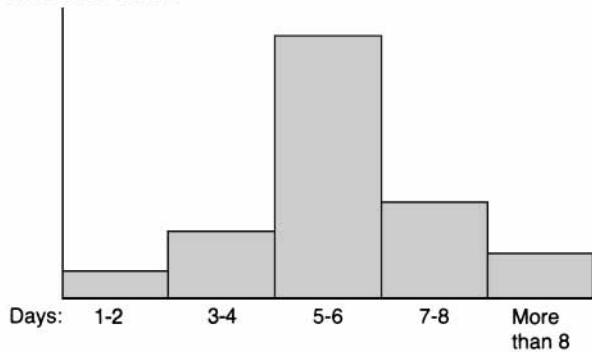
FREQUENCY DISTRIBUTION COMPARISON

► 65

Chart 65 shows the histogram form of frequency distribution. Note that the ranges across the horizontal scale are equal and discrete.

The majority of shipments are received in 5 to 6 days

Number of orders



For continuous data—instead of discrete data as in Chart 65—use the histogram approach shown in Chart 66. Here, the horizontal scale shows the values lined up against the ticks rather than expressed as groups.

► 66

Most sales are between \$30 and \$50

Number of sales

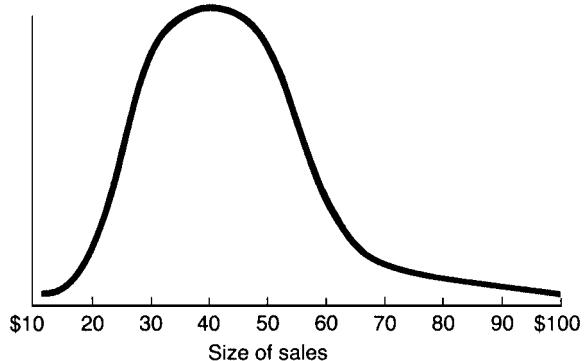
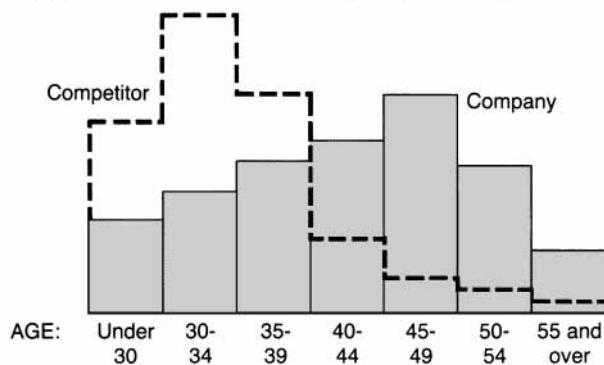


Chart 67 combines the step column and step line to compare two distributions in the same chart.

► 67

The age distribution of company employees differs sharply from that of the company's competitor

► 68

Compared with industry, company has a larger proportion of older employees

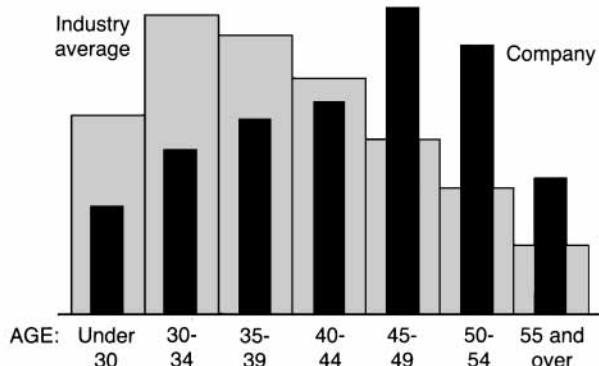


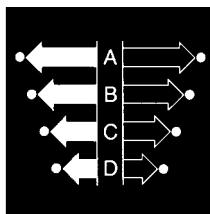
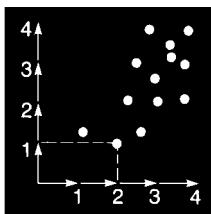
Chart 68 combines a column chart for company data and a step-column chart for the industry. This sort of treatment is especially appropriate for this kind of one-against-all comparison. In this case, some of the overlapping columns are bigger than the background columns without creating confusion (see discussion of Charts 19 and 37).

► 69

More employees in the higher salary brackets have degrees



Chart 69 is a subdivided histogram that shows, primarily, the distribution of the total number of employees and, secondarily, the components of each salary grade. Here, the salary grade is a shortcut to showing the actual salary ranges.



CORRELATION COMPARISON

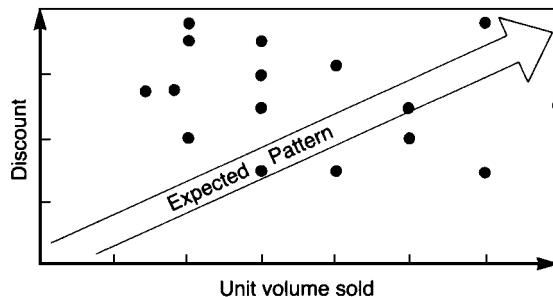
Shows whether or not the relationship between two variables is as expected

Chart 70 is a dot chart (scatter diagram), which helps determine whether the relationship between two variables follows an expected pattern. In this example, it would be expected that the greater the discount offered, the greater the volume sold. The arrow indicates where the expected pattern might fall and highlights the fact that the expected and actual patterns differ widely. Although the dots represent individual transactions, they do not specifically identify the salespersons, since labeling each dot would clutter the chart. An option for identifying specific salespeople is suggested in the following chart.

CORRELATION COMPARISON

► 70

There is no relationship between discount and volume sold



► 71

There is no relationship between discount and volume sold

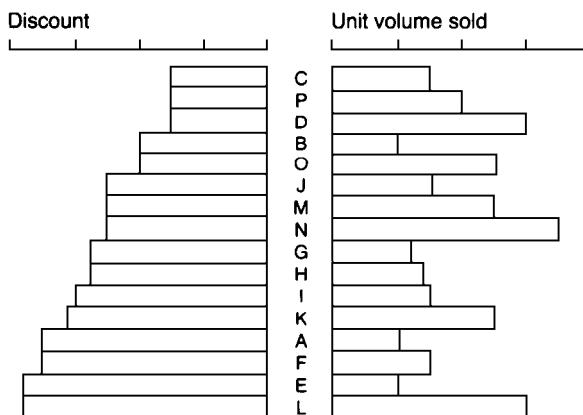
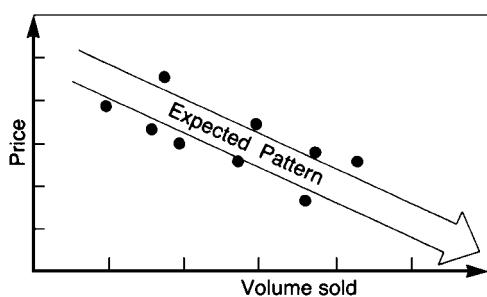


Chart 71 is a paired bar chart that lets you identify each transaction as well as see the overall correlation. Using the same data as in the previous chart, it ranks the items by size of discount. If the correlation ran as normally expected, the volume bars would mirror the pattern of discounts.

► 72

There is a relationship between lower prices and increased volume sold



Depending upon the data, the expected pattern could be horizontal (indicating no relationship) or downward, as shown in Chart 72. Here, the dots cluster around the expected pattern pointing out that there *is* a relationship between increasing prices and declining volume sold.

Chart 73 uses the same data used in Chart 72, but presents them as a paired bar chart. In this example, the bars do not form a mirror image, but instead show a consistent pattern between prices and volume sold.

► 73

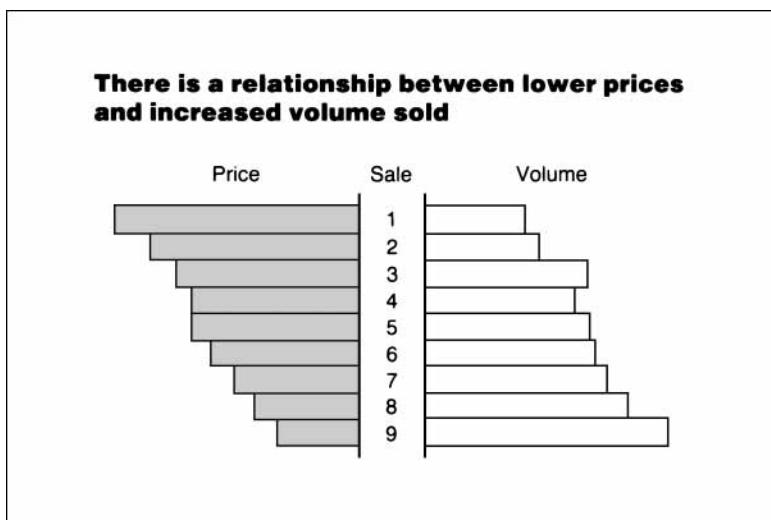
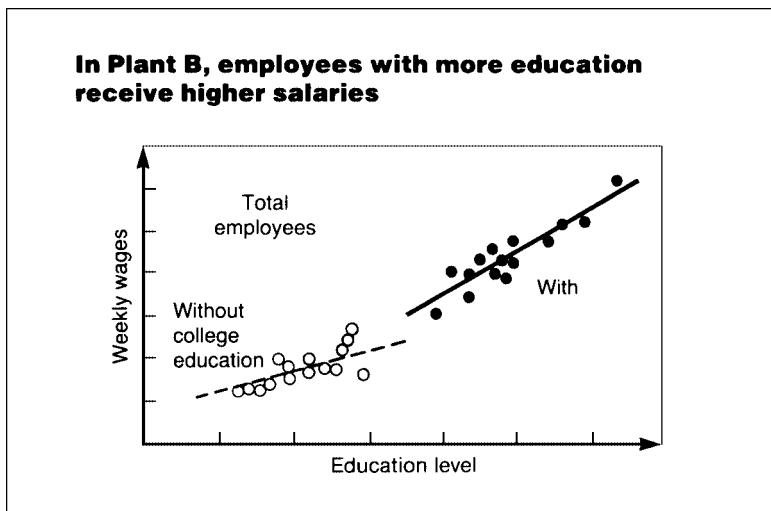


Chart 74 is a grouped dot chart that shows more than one item. To make the distinction between the two items, the chart uses dots and circles; other symbols, such as squares and triangles, can also be used.

► 74



► 75

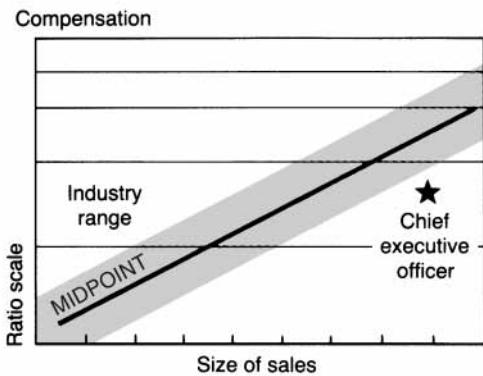
**Chief executive officer compensation
is out of line with rest of industry**

Chart 75 shows a correlation comparison using semilogarithmic scale. The two items in this example are the industry range (perhaps 5 percent above and below the midpoint) and the chief executive officer's compensation relative to his company's sales (shown by the star, the equivalent of a dot). On an arithmetic scale, the industry range would become larger as it moved across the chart, since it is usually computed as a constant percentage increase; it would also curve upward, making it difficult to study the relationships. This scale arrangement clarifies the comparison by "straightening out" the industry relationship and maintaining the range at a visually constant width.

Chart 76 is similar to Chart 75 except that the range is defined by the maximum, midpoint, and minimum of each salary grade. The dots represent the actual salaries of the employees in each grade and their relation to the range. The reason for reevaluating the structure is that most employees are above the midpoint of their range and many are above the maximum.

► 76

Actual salaries call for reevaluation of salary structure

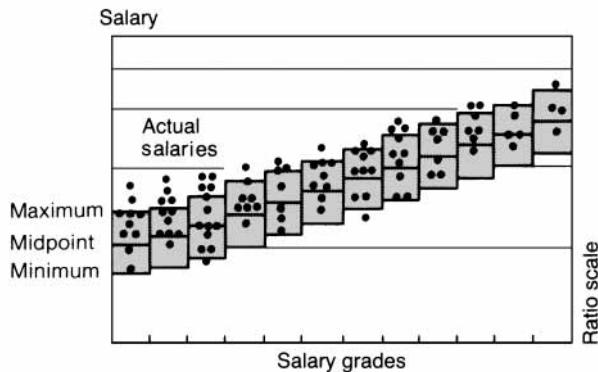
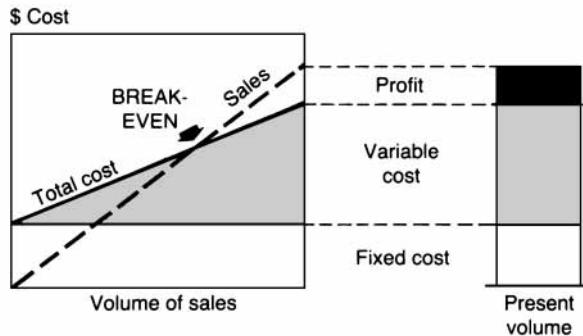


Chart 77 is a break-even chart that combines a subdivided surface chart to show costs (fixed and variable) with a line chart to show volume of sales. Although it appears out of place here among the dot charts and paired bar charts, it is used to show the correlation between increasing volume and higher cost. The vertical bar at the right can be added to identify the components of costs at a specific volume of sales.

► 77

Present cost structure provides reasonable profit



► 78

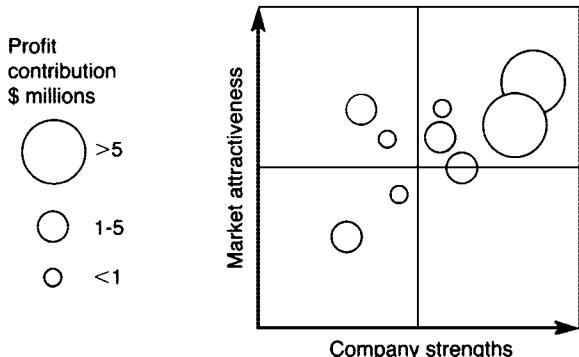
We are well positioned in the marketplace

Chart 78 is also known as the “bubble chart.” It is little more than a dot chart in which dots of differing sizes reflect a third dimension. In this example of a company’s business portfolio, each of nine businesses is positioned according to the correlation of market attractiveness and company strength; the farther into the upper right-hand corner, the better the business. The dot representing each business is enlarged into a “bubble” to indicate, in this case, the range of profits contributed by that business.

► 79

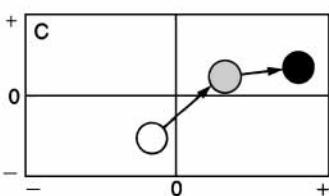
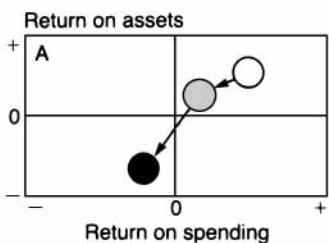
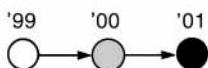
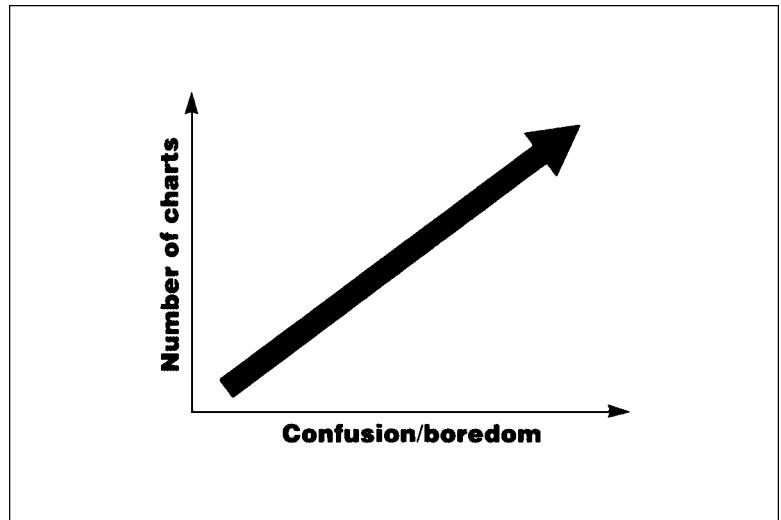
One of our three business units has moved into a loss position

Chart 79 takes three of the nine businesses shown on Chart 78 and illustrates each business’s movement over time in terms of its profitability measured by the correlation between return on assets and return on spending. Placing each business on its own grid is less confusing than placing all three on one grid. More charts? Yes. But simpler comparisons per chart.

Chart 80. Oops, I'd better quit while I'm ahead.

► 80



Section 3

SAY IT WITH CONCEPTS AND METAPHORS

SOLUTIONS IN SEARCH OF A PROBLEM

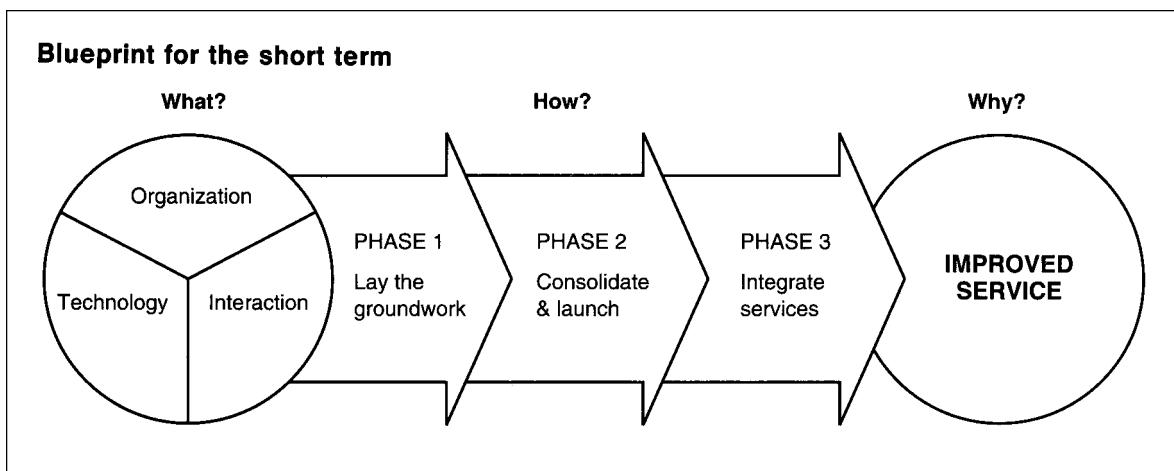
So far I've presented ideas for translating quantitative information into chart form. However, some non-quantitative messages present visual challenges. Among them are images for ideas such as *interaction*, *leverage*, *obstacles*, and *interrelationships*, as well as images that convey *structure*, *sequence*, and *process*.

Sensing this gap, I worked with several talented designers to create the following portfolio of visual images, for use in your reports, presentations, and articles. They fall into two broad categories: "concept visuals," which consist of abstract geometrical shapes such as arrows, circles, triangles, and "visual metaphors," which include everyday objects such as puzzles, mazes, ladders. Here are a few suggestions for making the most of them.

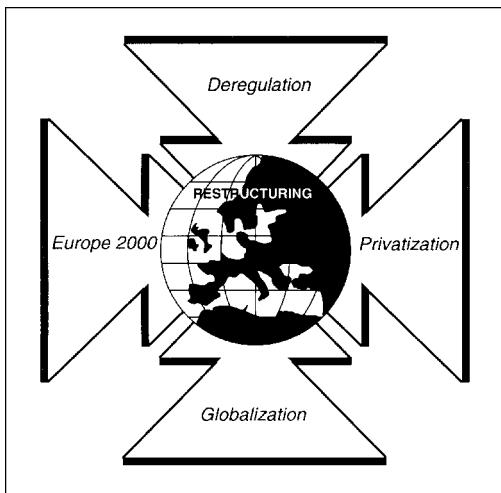
When you're searching for the visual that meets your need, use this section as a portfolio of thought starters. In a sense, the visuals are *solutions in search of a problem*. In isolation, none is right or wrong, good or bad. The appropriateness of any visual depends on its fit with the message that you're trying to visualize—and that's for you to determine.

As you search for a visual solution to a communication problem, you can look at the following images from left to right, or turn the pages around to see what the images reveal from different perspectives. You can simplify them, expand them, multiply them, or otherwise play with and modify them—in short, mold them to meet your needs. Once you've selected a diagram, add the words, around or inside the diagram, that bring your message home. Take a look at these examples.

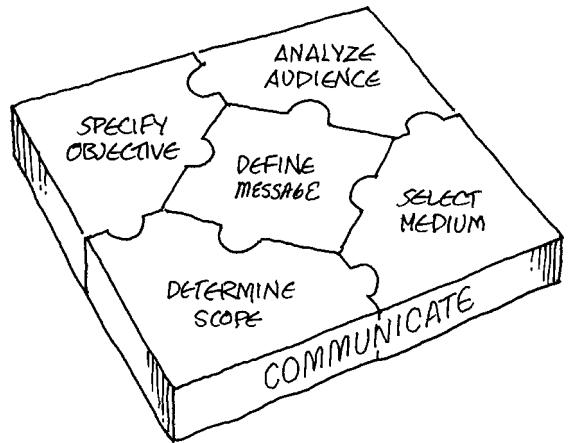
STRUCTURE VISUAL



FORCES AT WORK



INTERRELATIONSHIPS



Don't necessarily settle for the first idea that grabs you. Keep looking, playing with the diagrams, so that you find the right fit. For example, let's assume that you need to visualize the following:

PROJECT PHASES

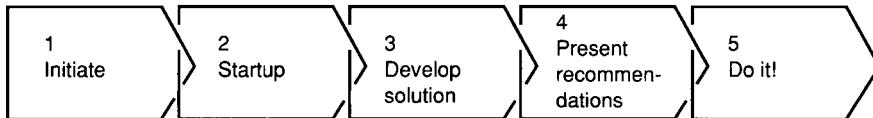
1. Plan the project
2. Start up
3. Develop solution
4. Present recommendations
5. Do it!

Here, selected from the pages of this chapter, are nine diagrams from which you might choose to visualize the process, depending on which one tells you story best.

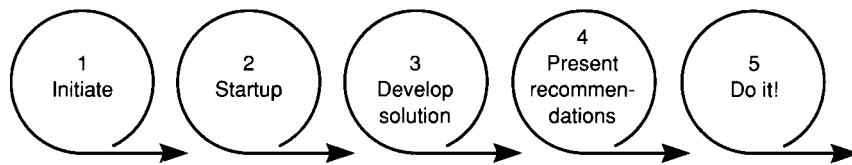
By the way, like other visual images, these diagrams will have different meanings for different people. Therefore, I suggest you test the visual with colleagues to be sure that it clearly and easily reveals the concept you intend to convey, making sure that they understand what you want it to show.

Have fun.

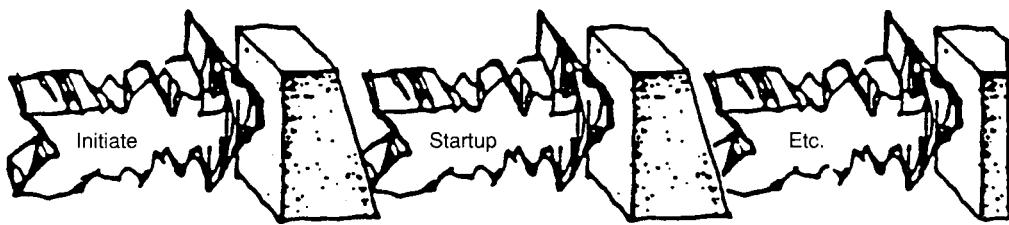
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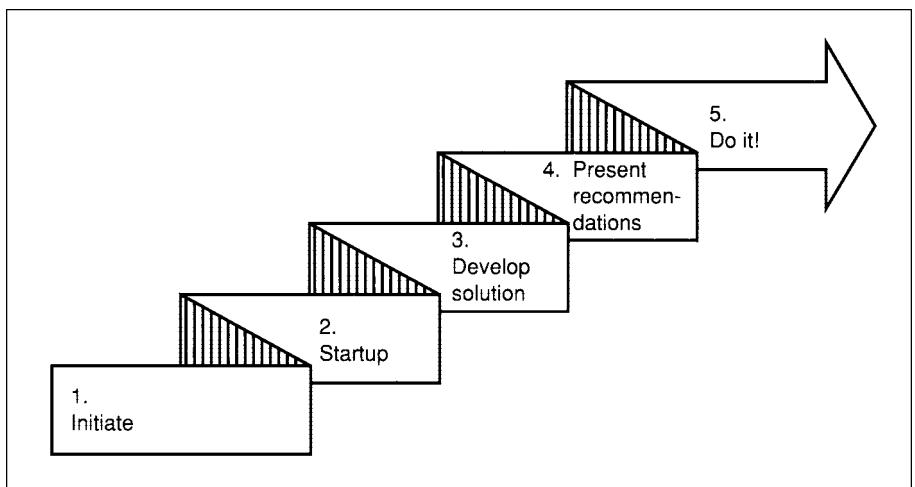
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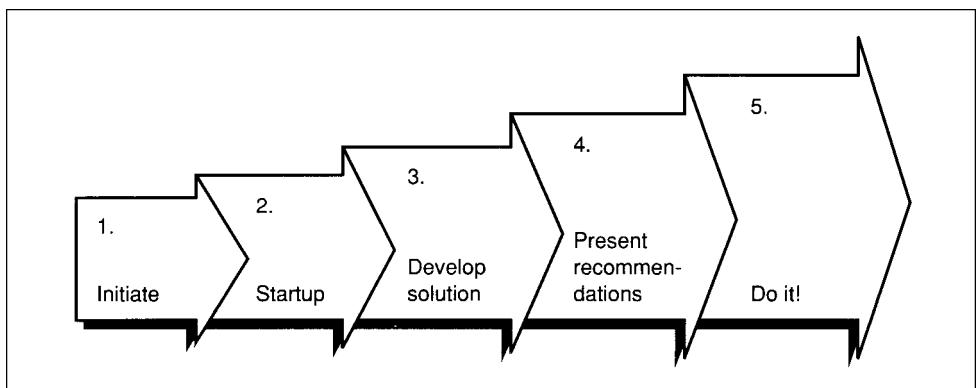
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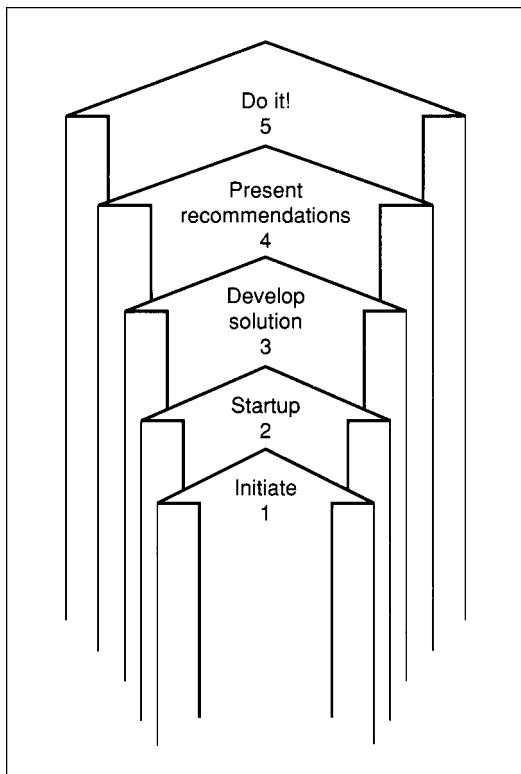
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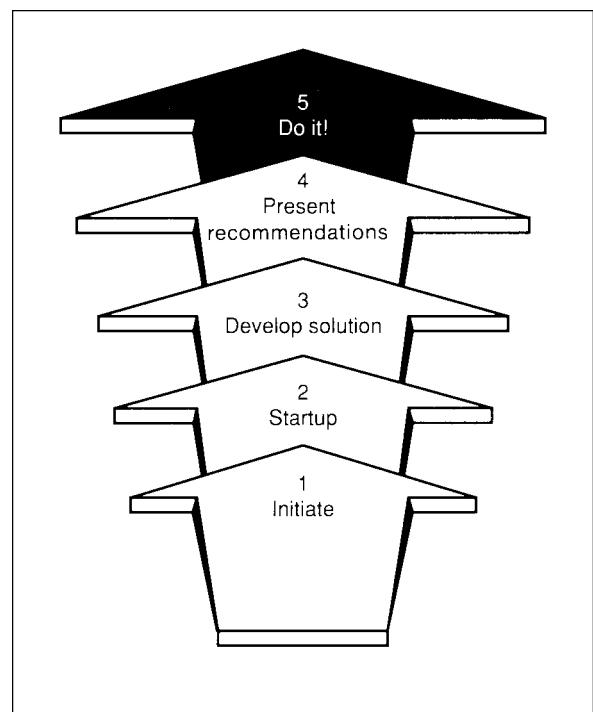
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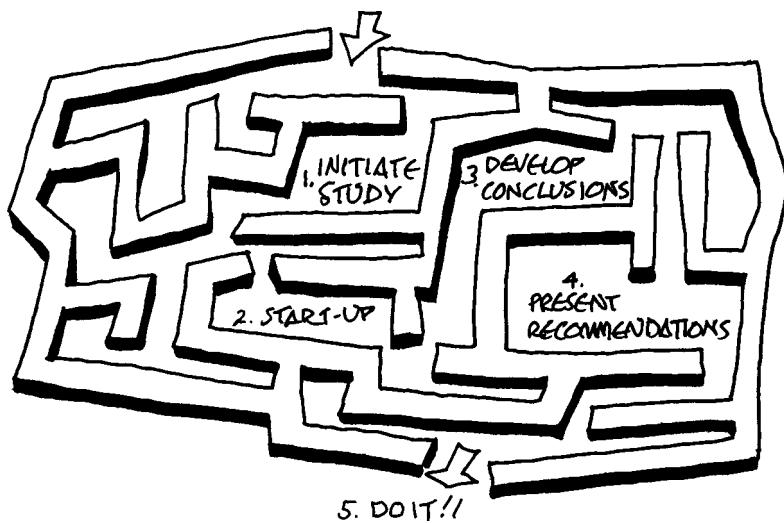
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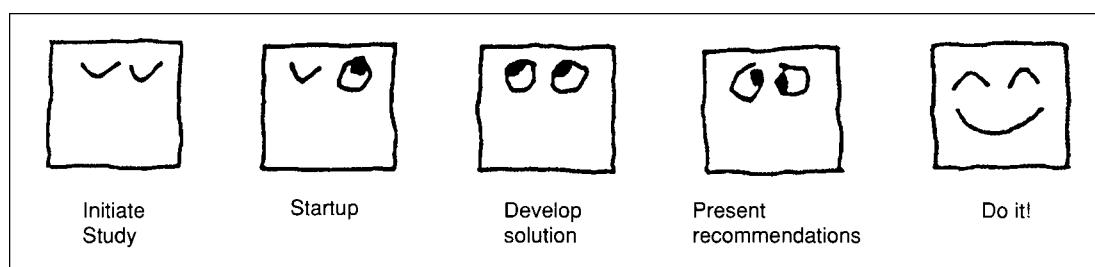
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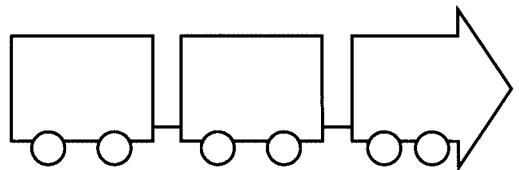
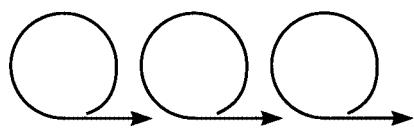
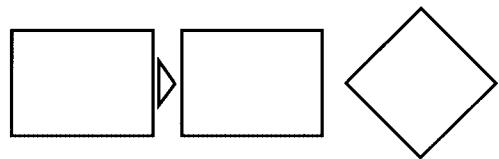
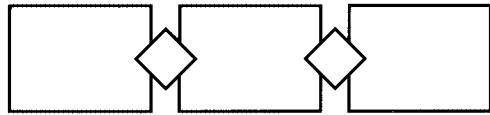
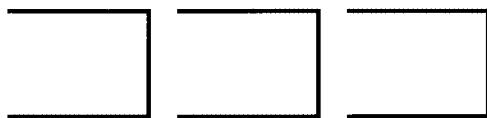
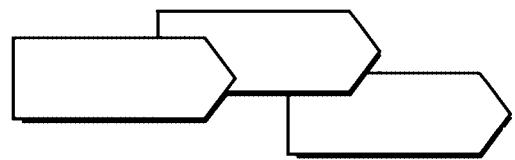
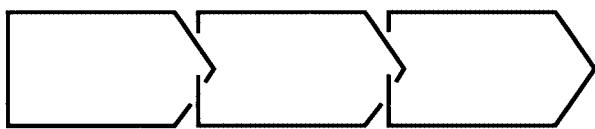
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SOLUTIONS IN SEARCH OF PROBLEMS VISUAL CONCEPTS

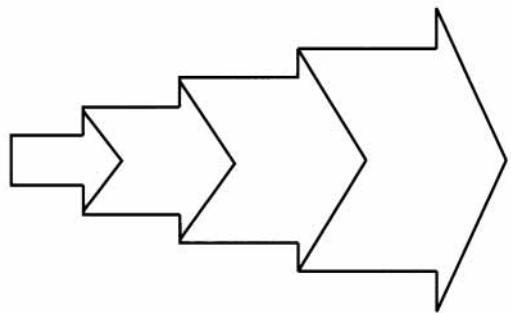
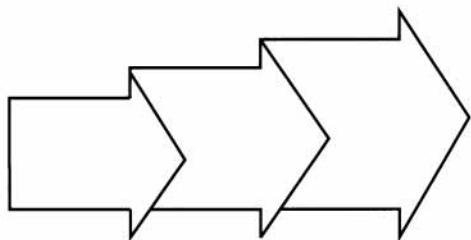
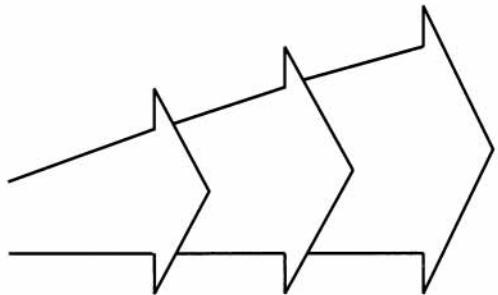
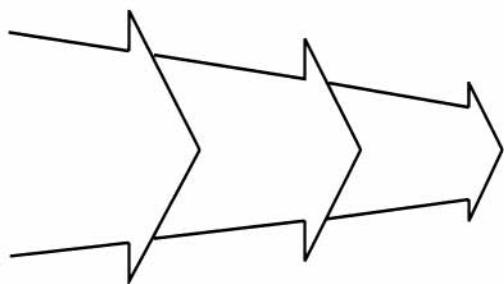
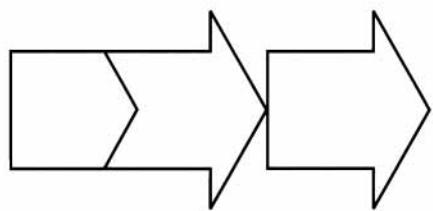
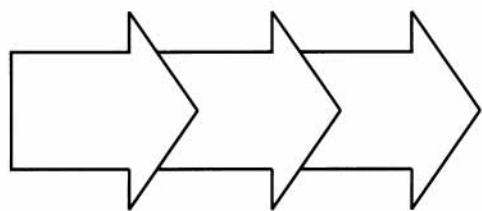
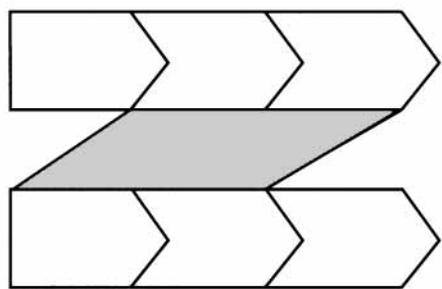
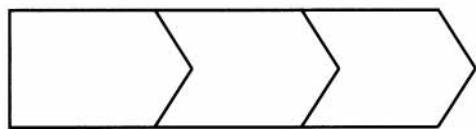
- 139 LINEAR FLOWS
- 142 VERTICAL FLOWS
- 144 CIRCULAR FLOWS
- 148 INTERACTION
- 151 FORCES AT WORK
- 155 CHANGING COURSE
- 157 LEVERAGE/BALANCE
- 159 PENETRATION/BARRIERS
- 160 FILTERS/SCREENS
- 161 INTERRELATIONSHIPS
- 165 PROCESSES
- 166 SEGMENTATIONS

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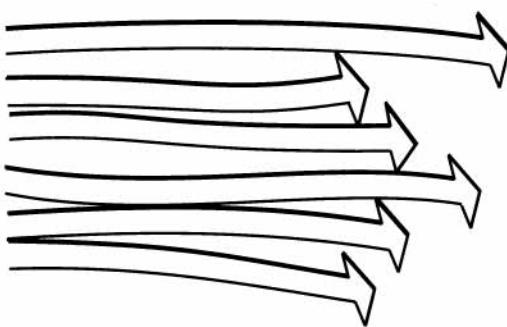
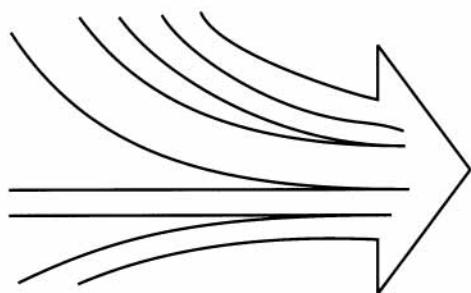
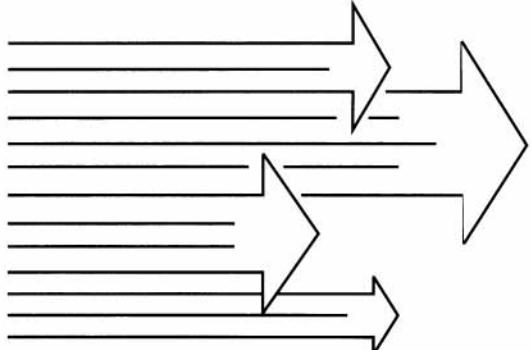
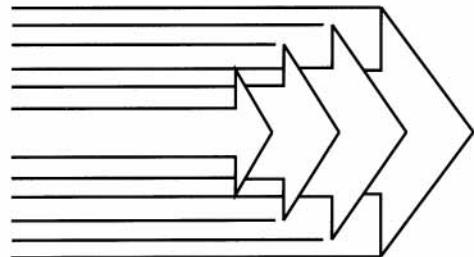
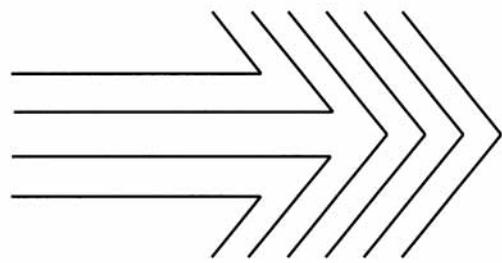
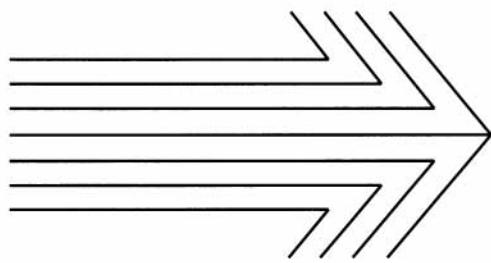
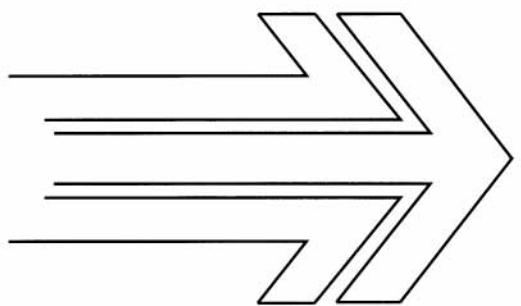
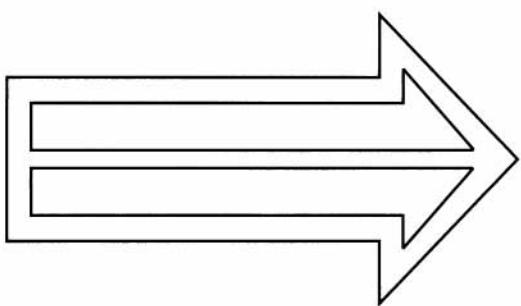
LINEAR FLOWS



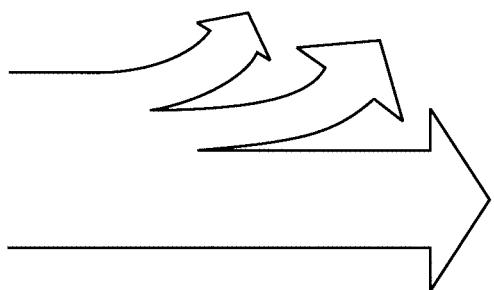
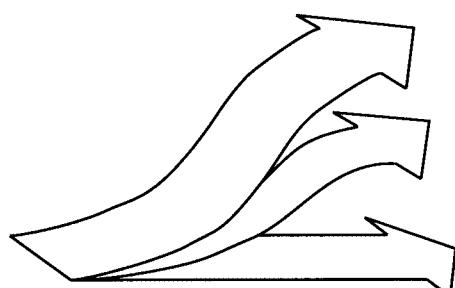
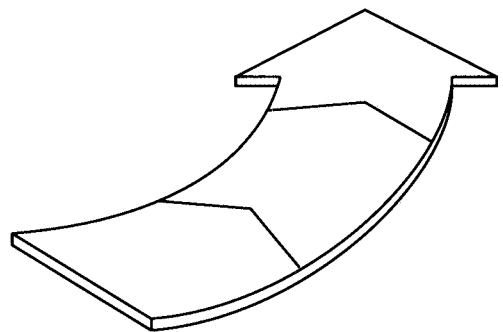
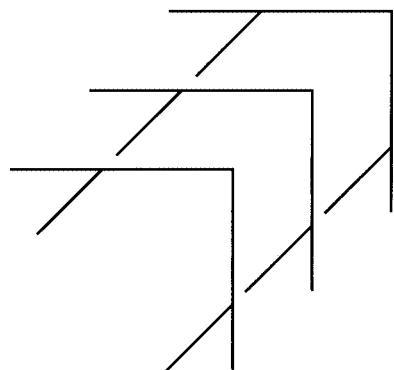
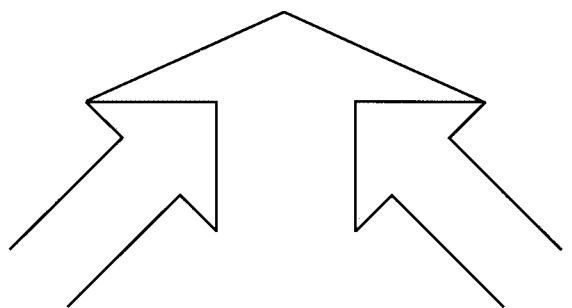
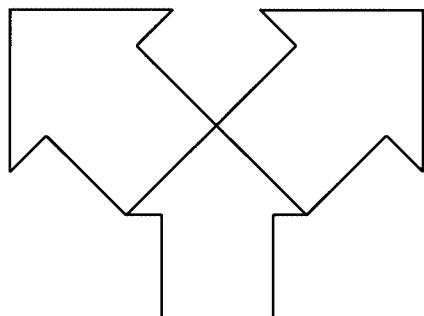
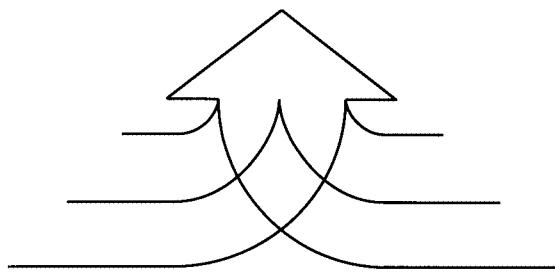
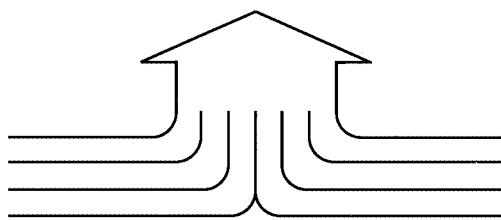
LINEAR FLOWS



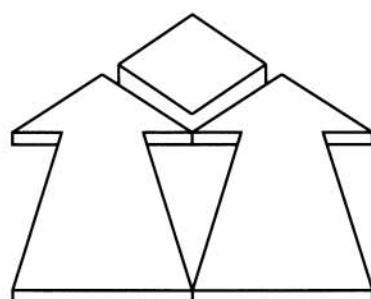
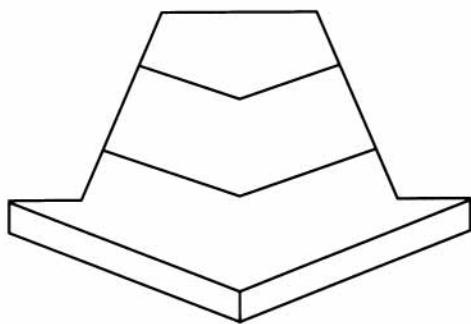
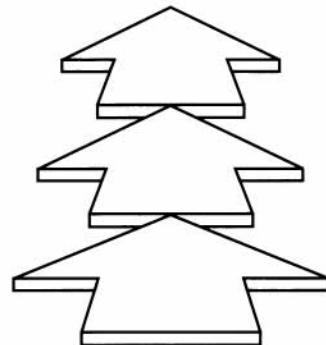
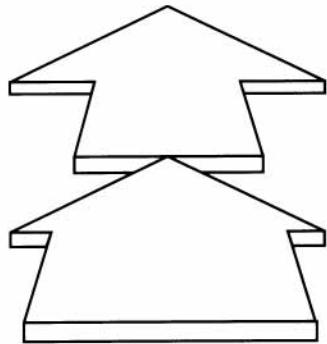
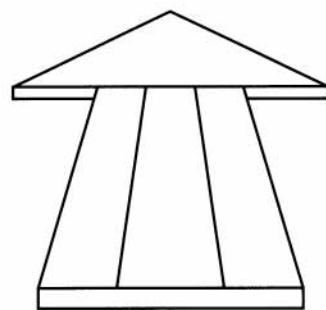
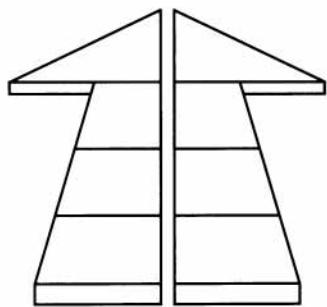
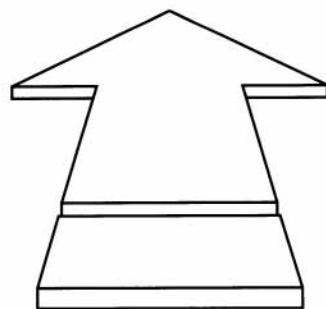
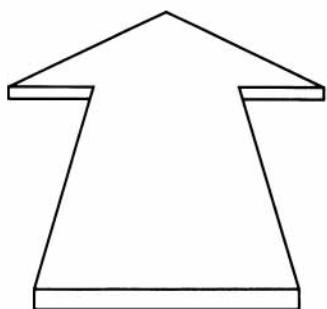
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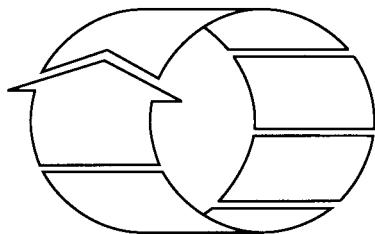
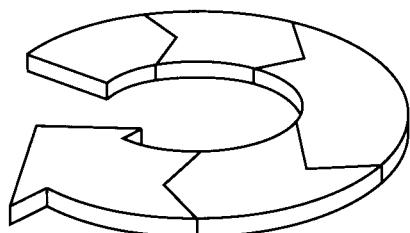
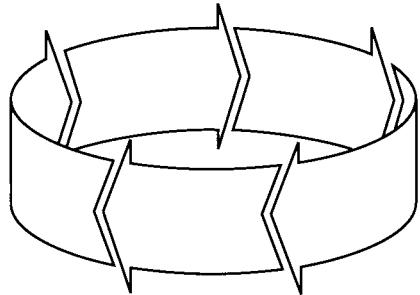
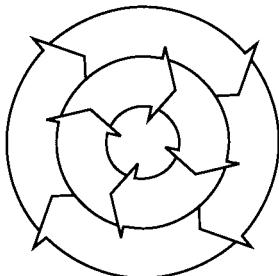
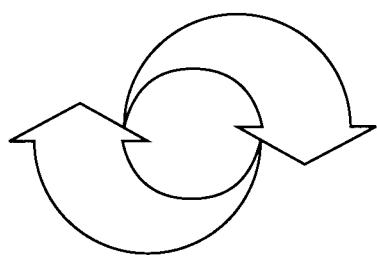
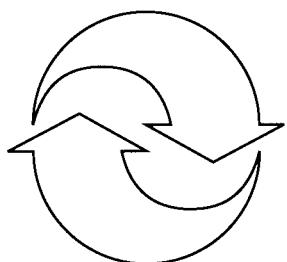
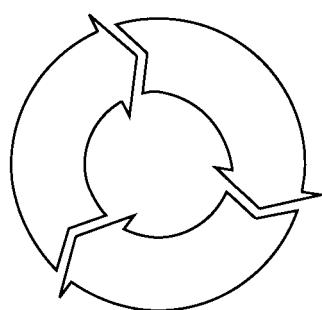
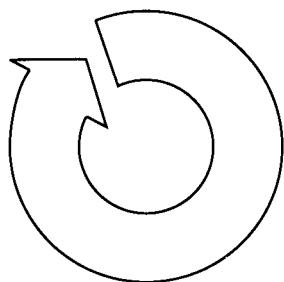
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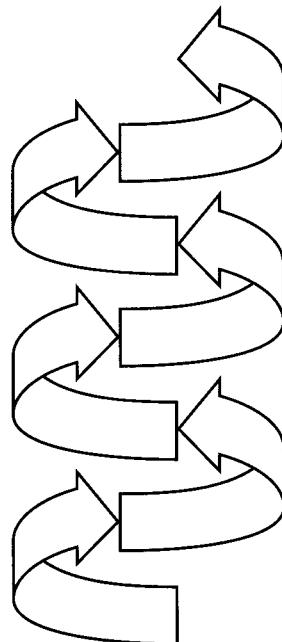
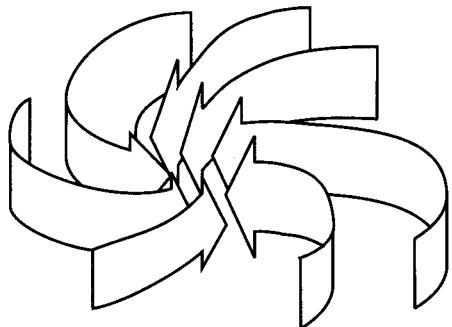
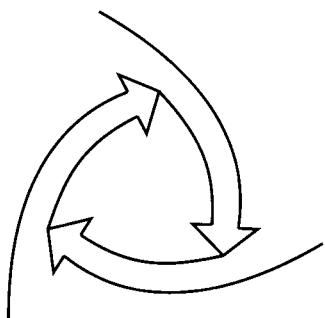
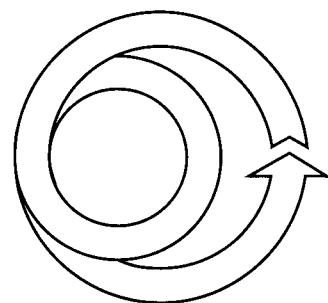
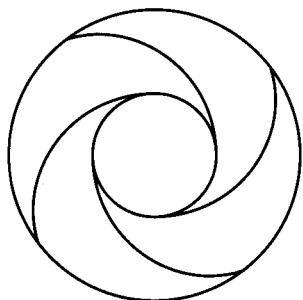
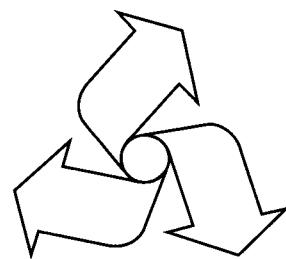
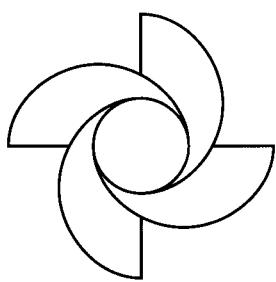
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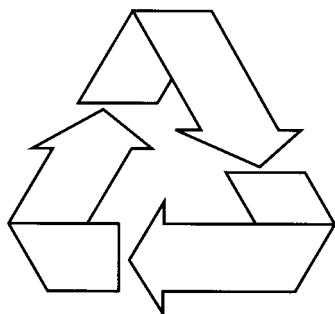
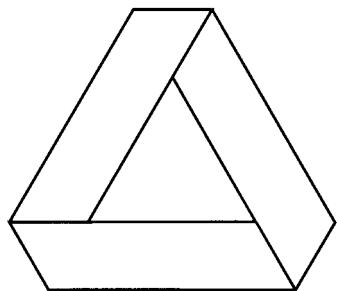
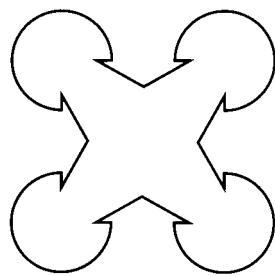
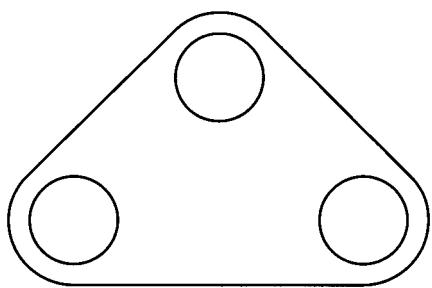
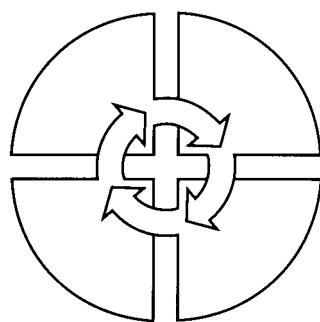
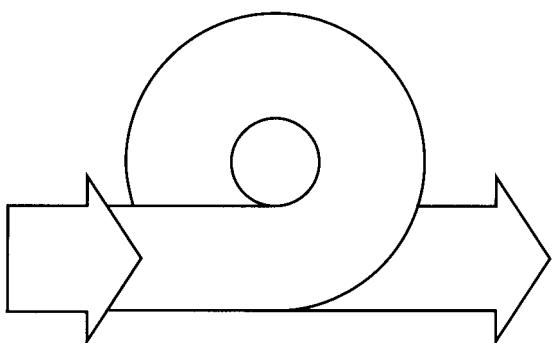
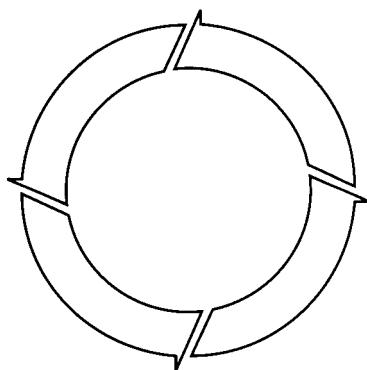
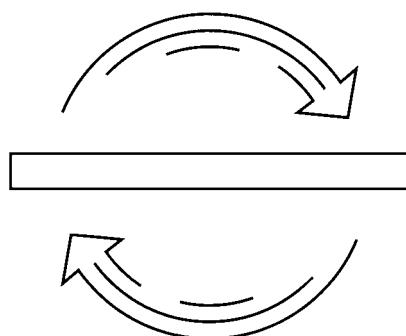
CIRCULAR FLOWS



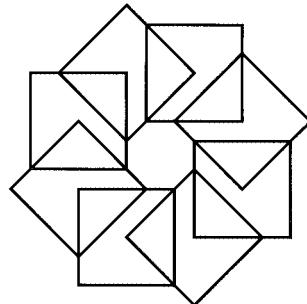
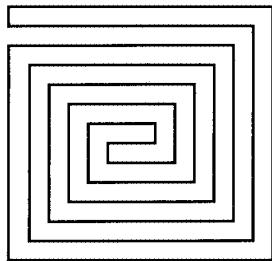
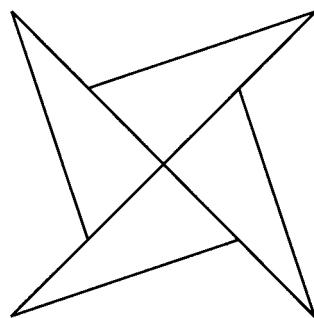
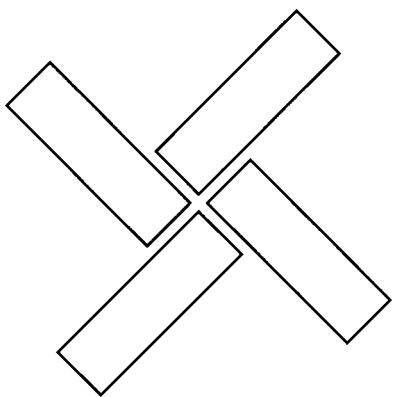
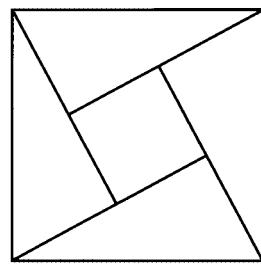
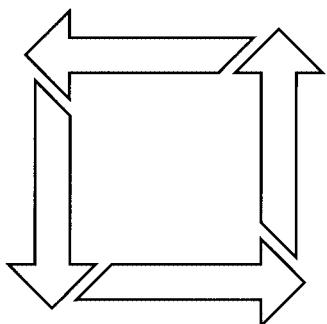
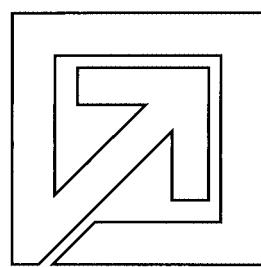
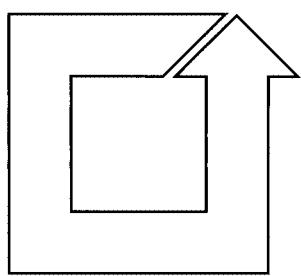
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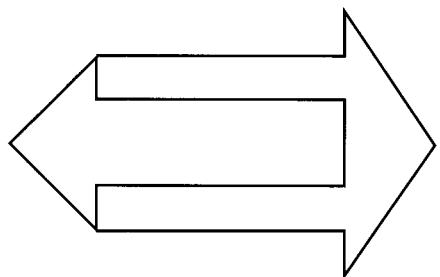
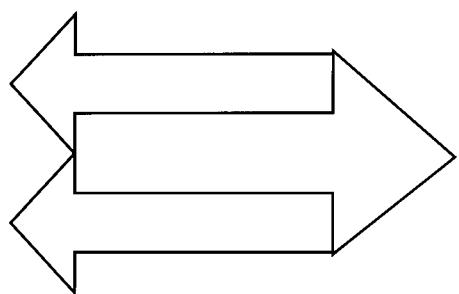
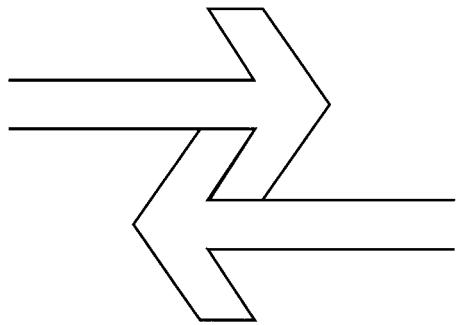
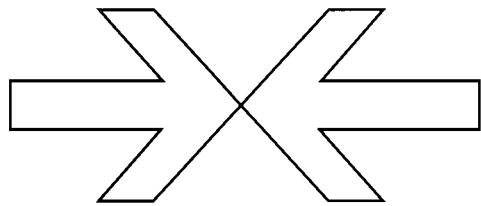
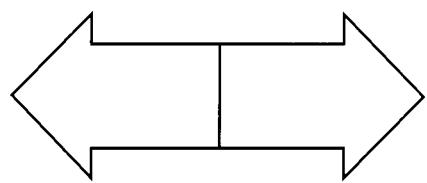
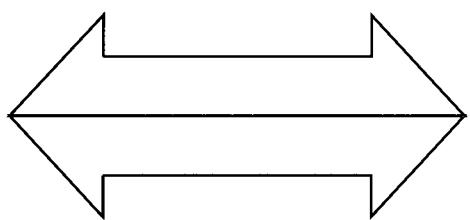
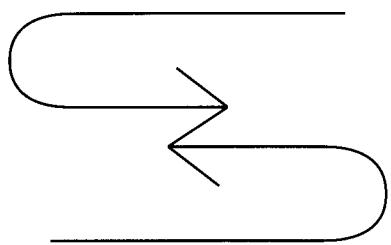
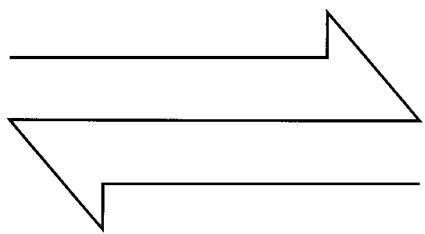
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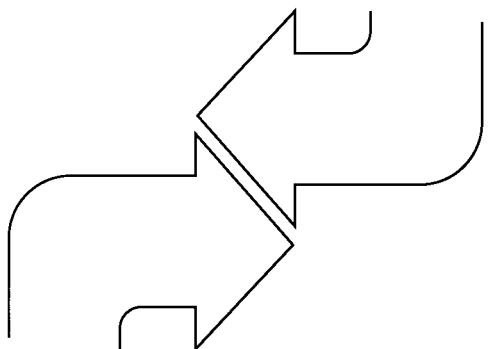
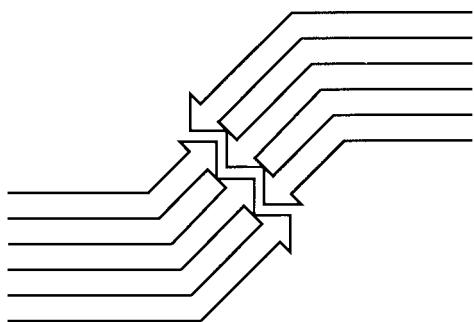
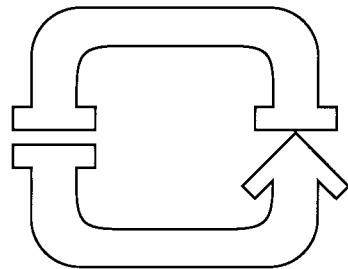
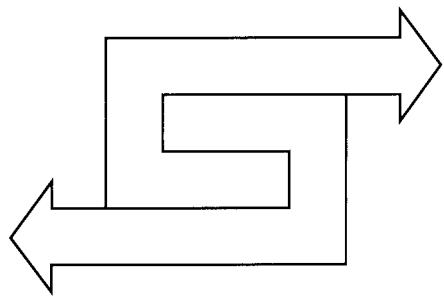
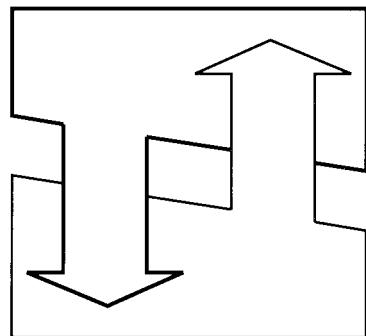
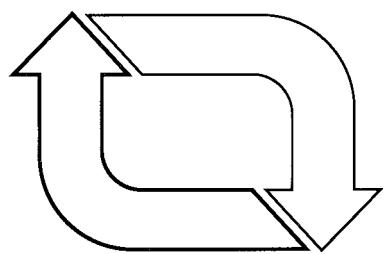
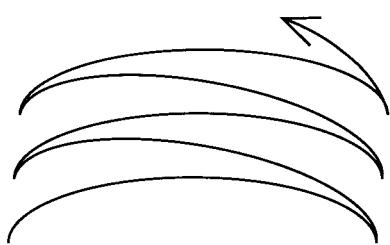
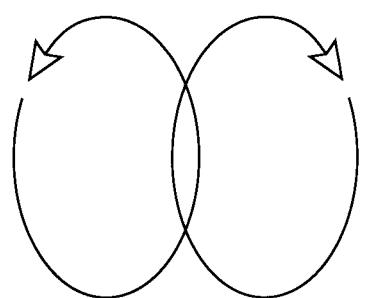
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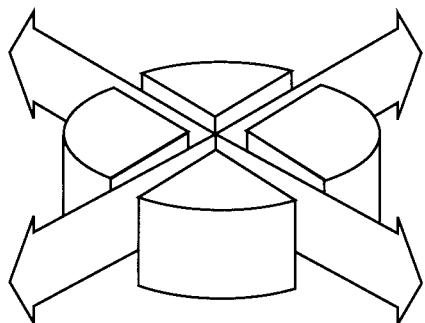
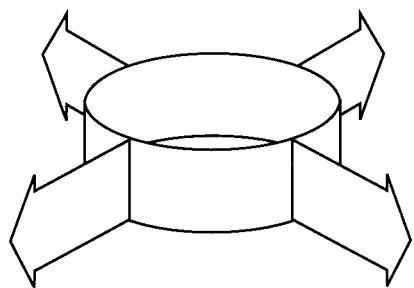
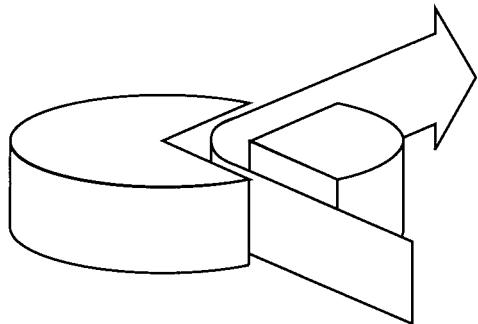
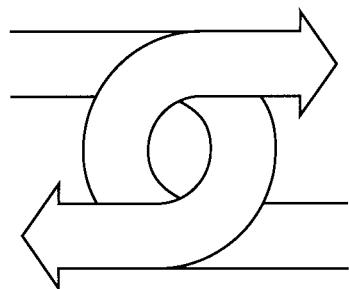
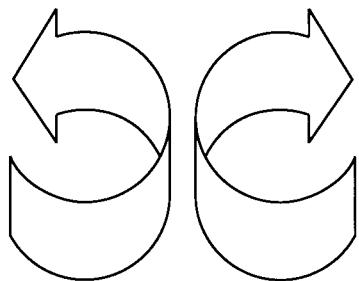
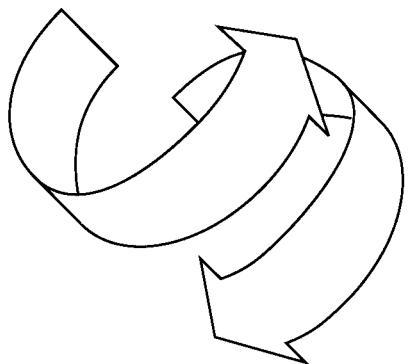
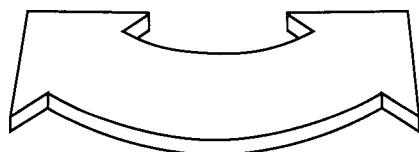
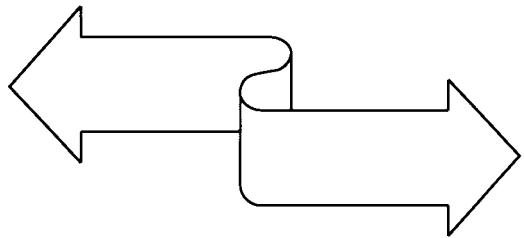
INTERACTION



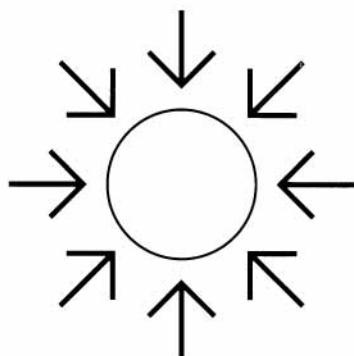
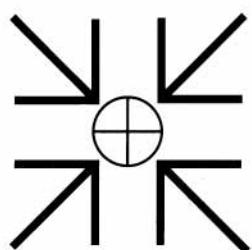
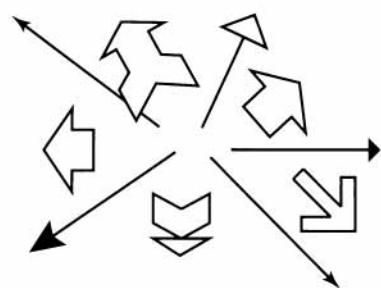
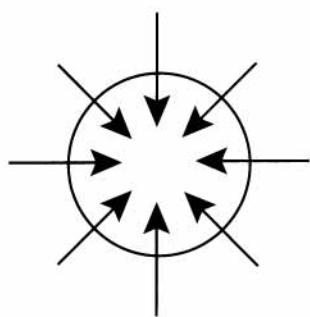
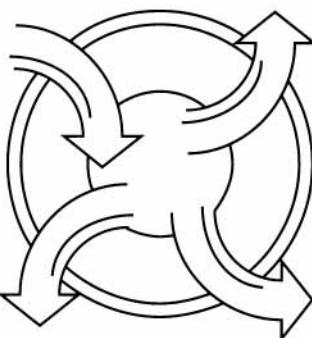
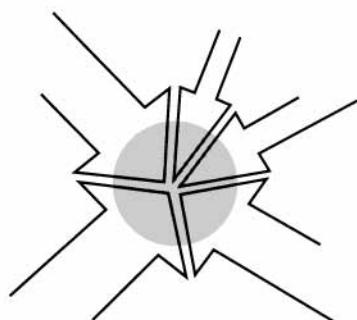
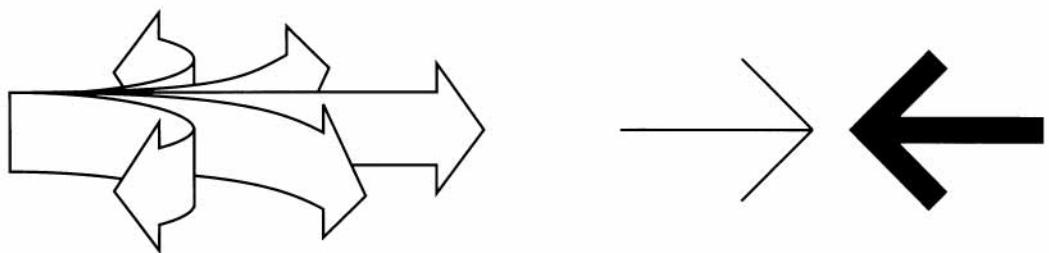
INTERACTION



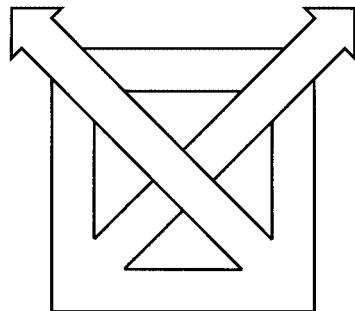
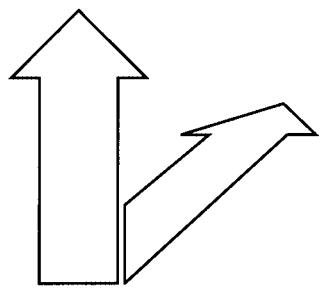
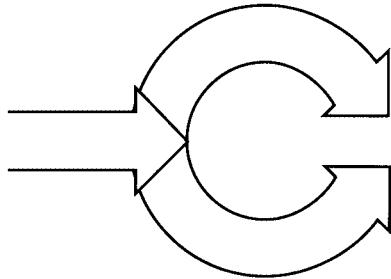
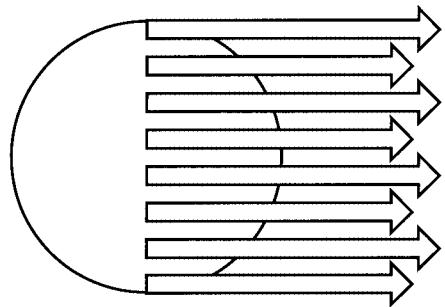
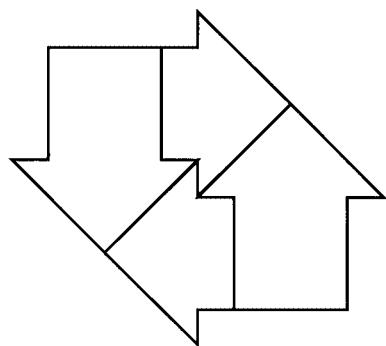
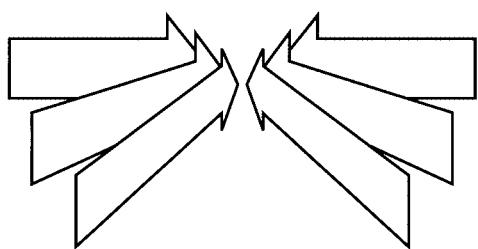
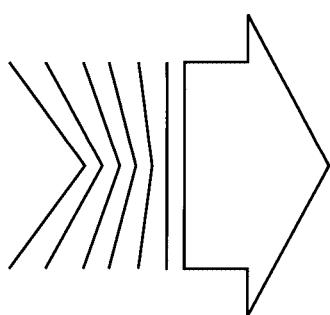
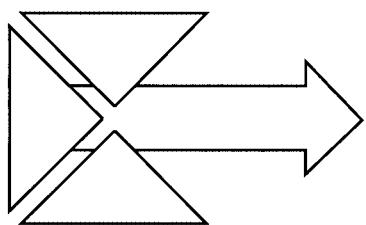
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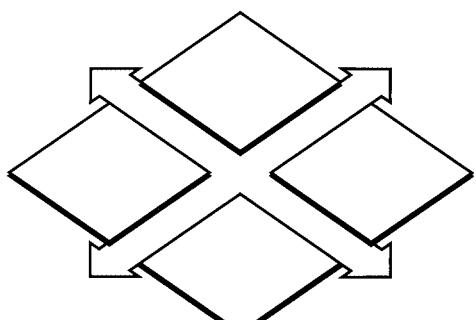
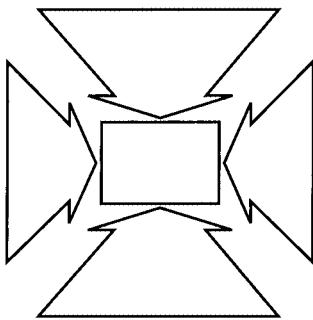
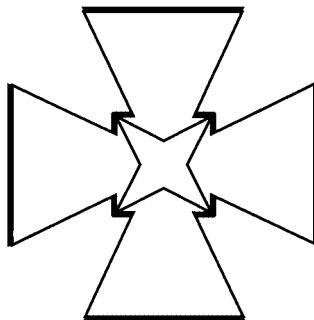
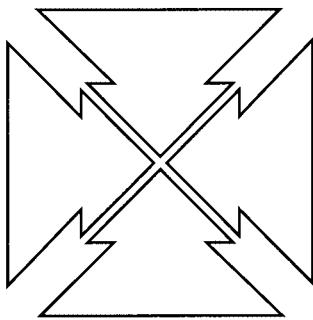
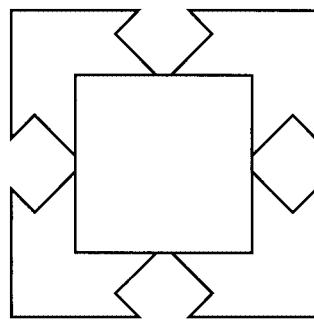
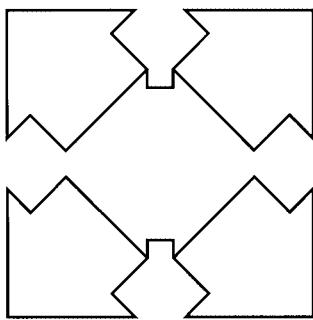
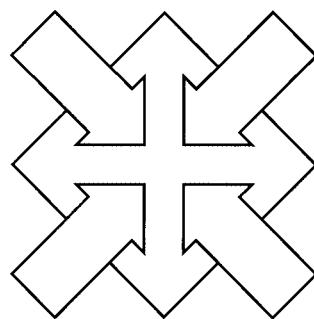
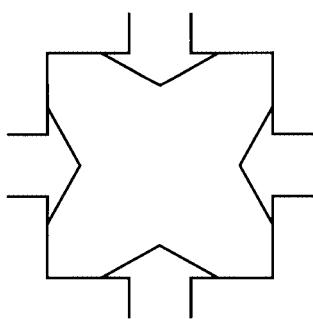
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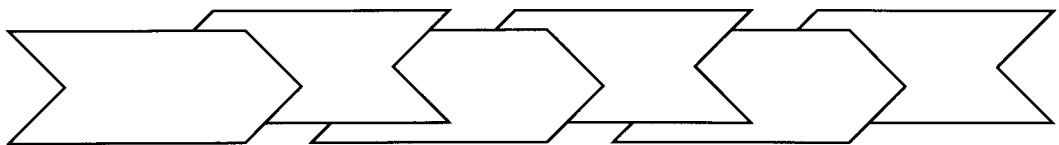
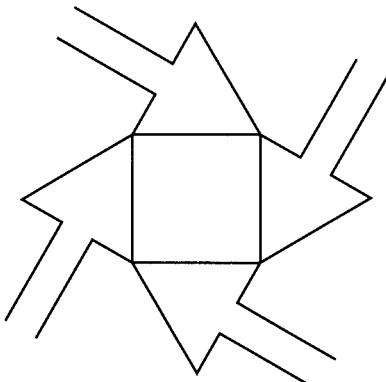
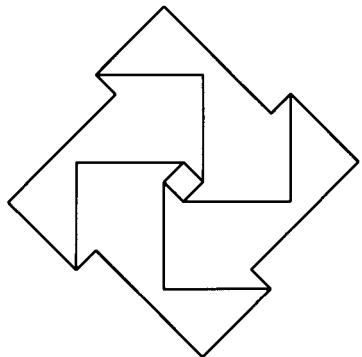
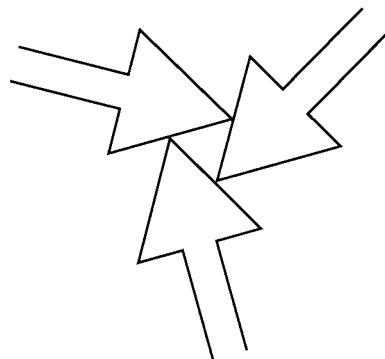
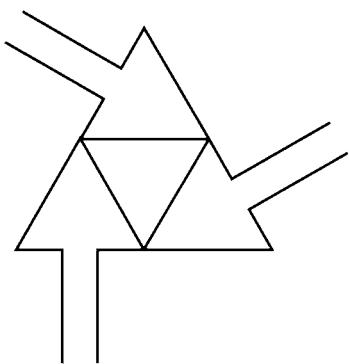
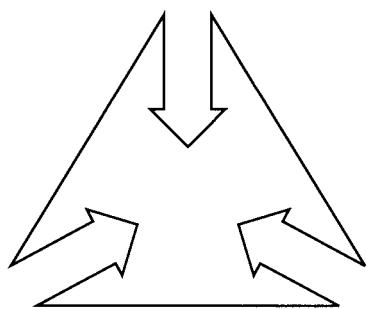
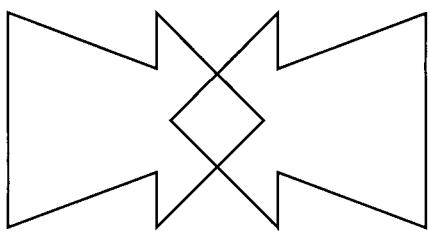
FORCES AT WORK



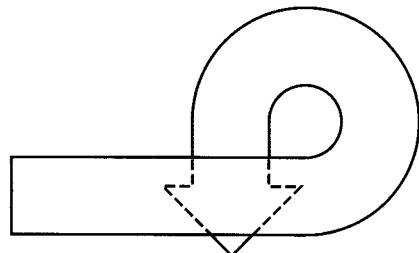
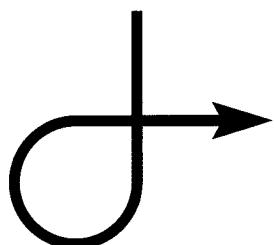
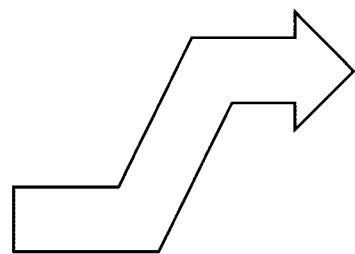
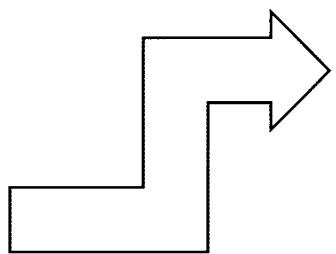
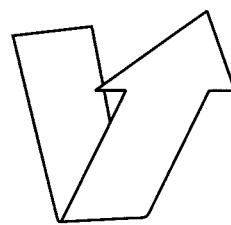
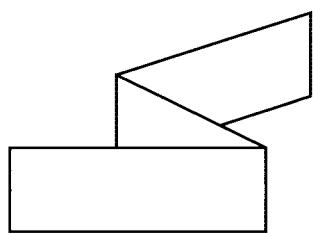
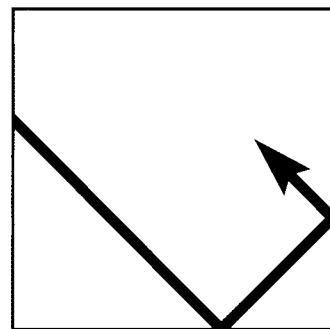
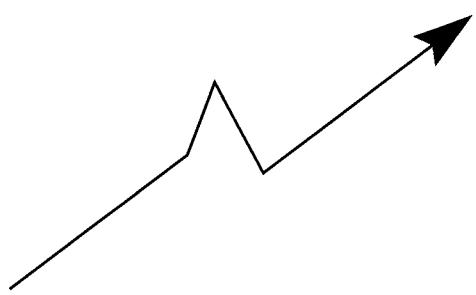
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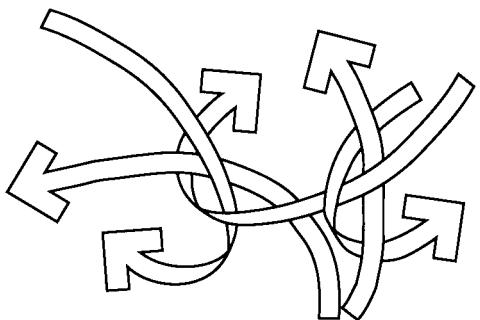
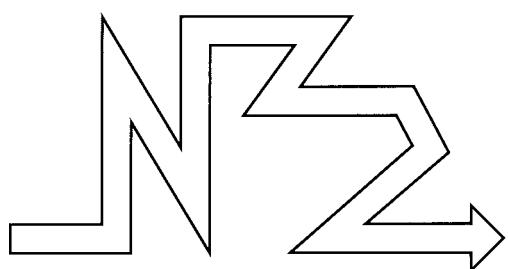
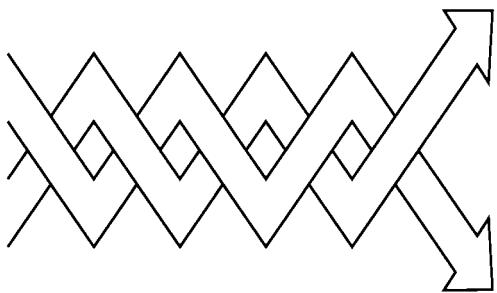
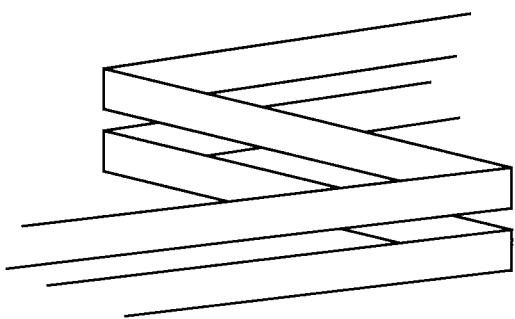
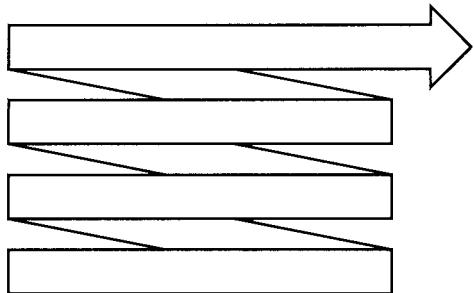
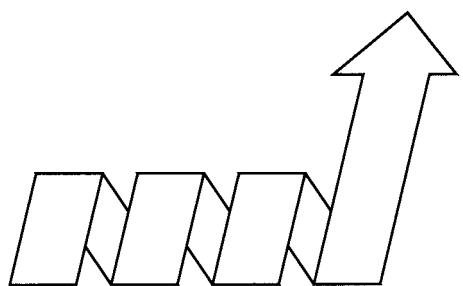
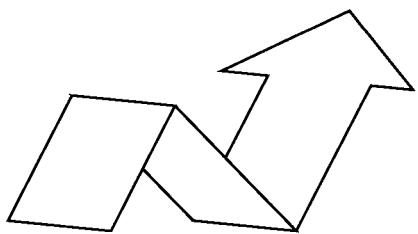
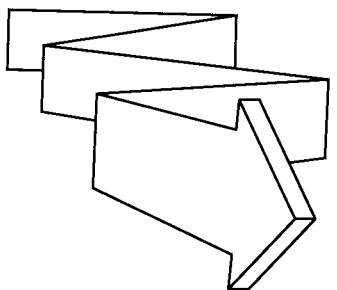
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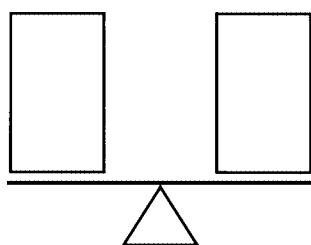
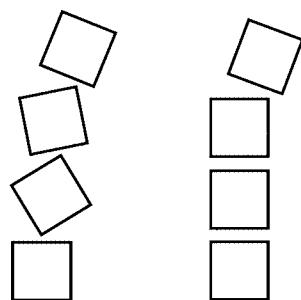
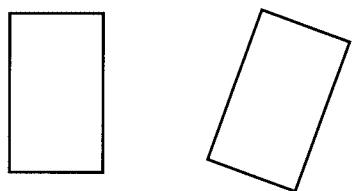
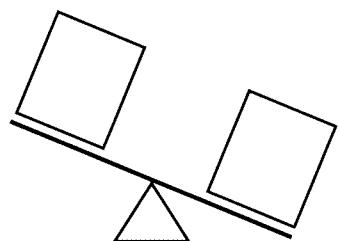
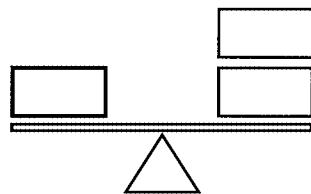
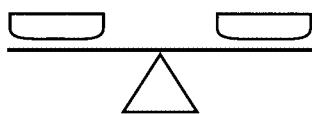
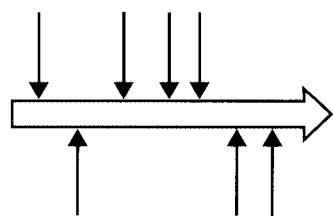
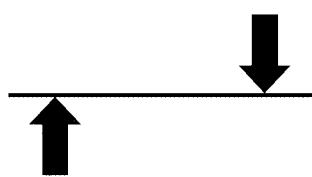
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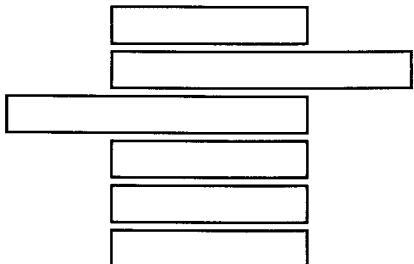
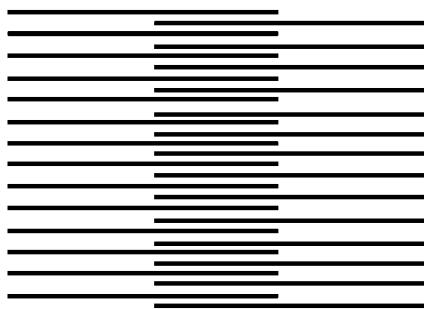
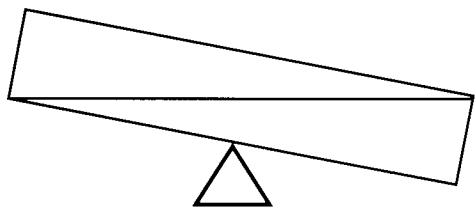
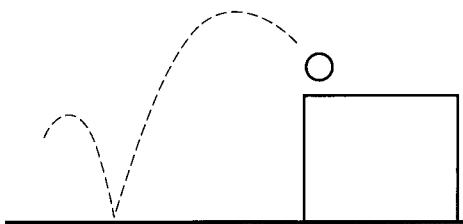
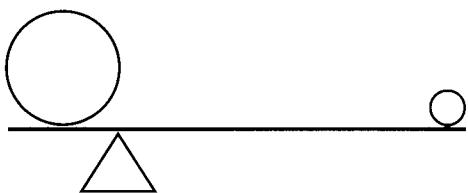
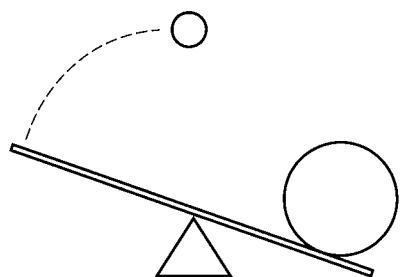
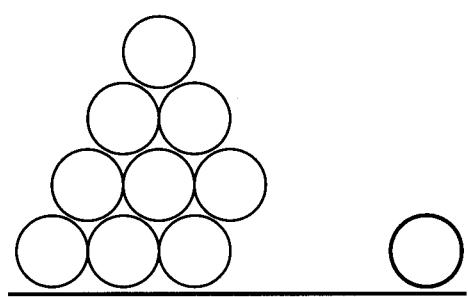
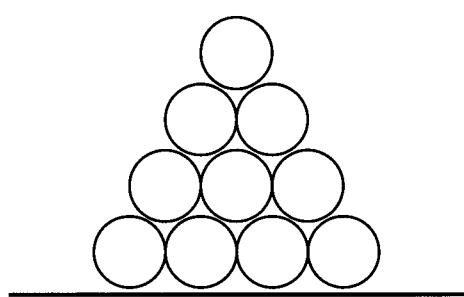
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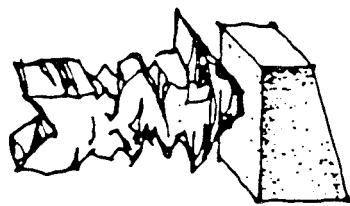
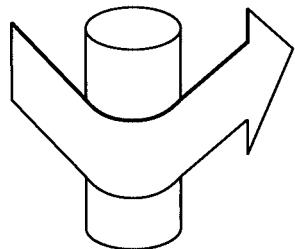
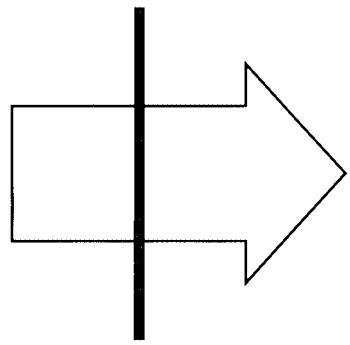
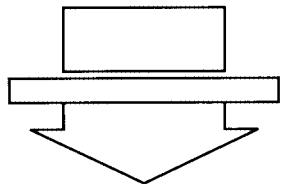
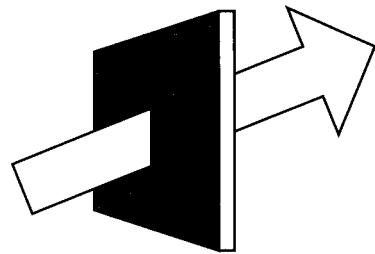
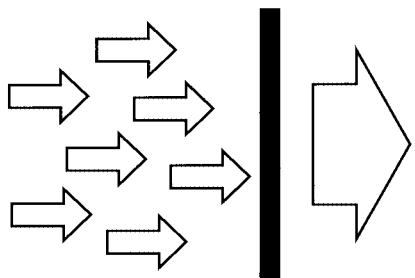
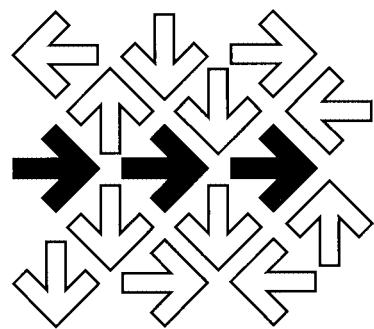
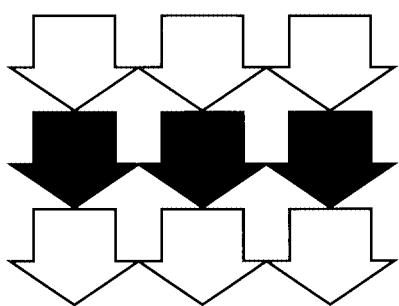
LEVERAGE/BALANCE



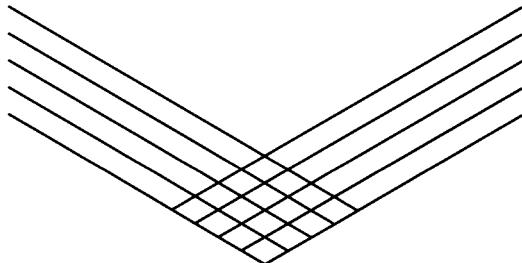
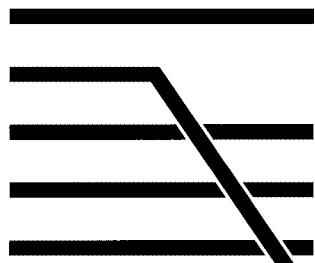
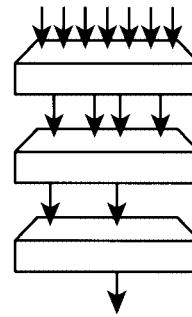
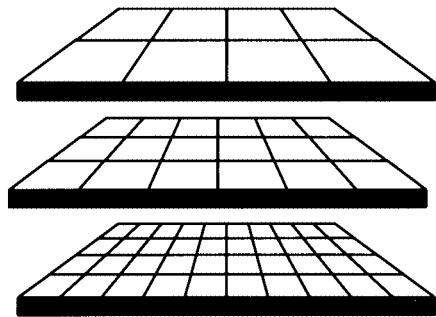
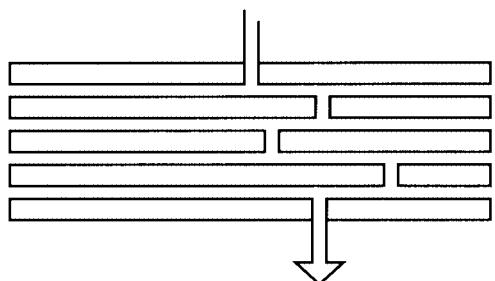
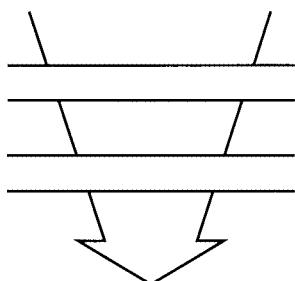
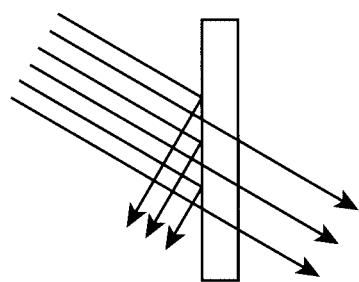
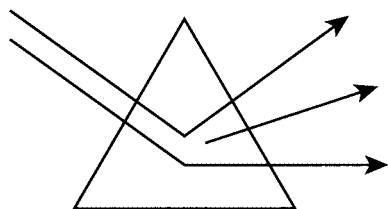
LEVERAGE/BALANCE



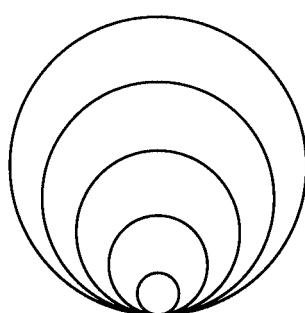
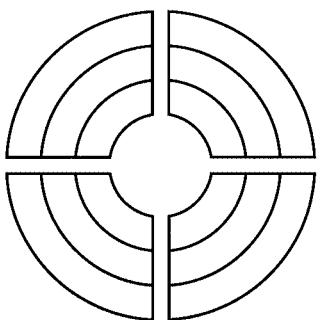
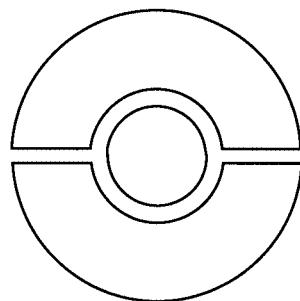
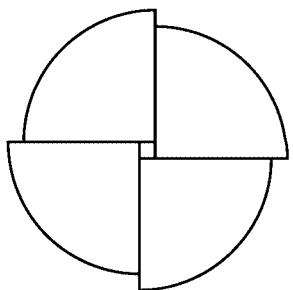
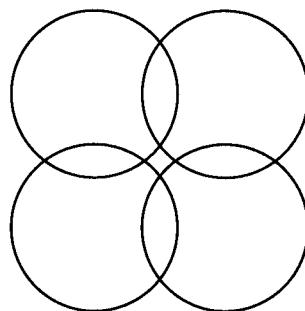
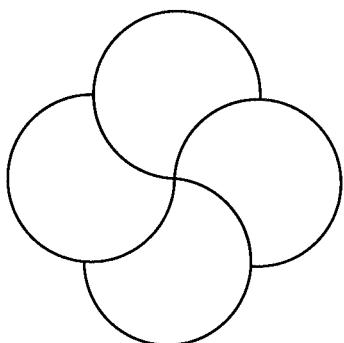
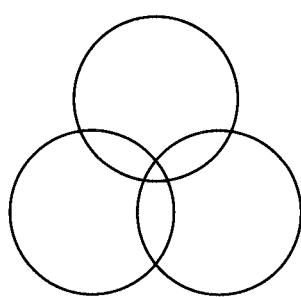
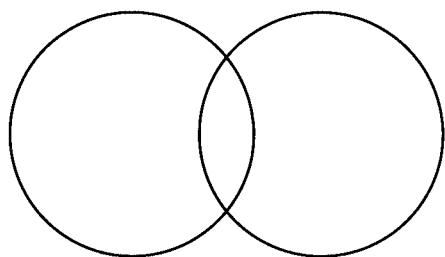
PENETRATION/BARRIERS



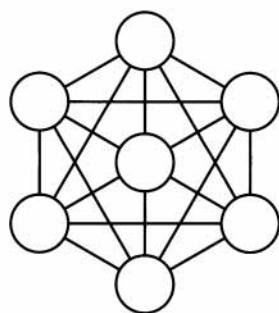
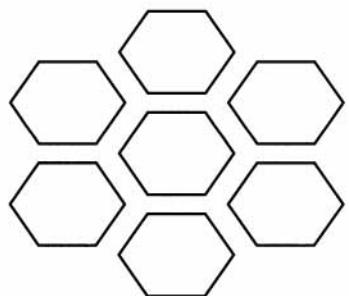
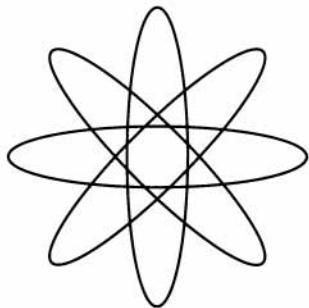
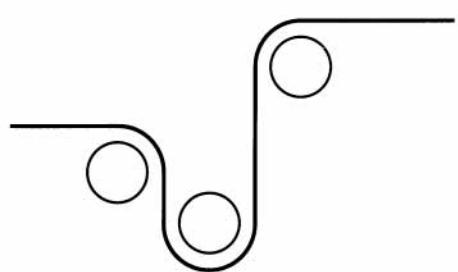
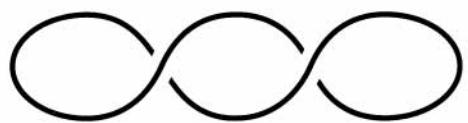
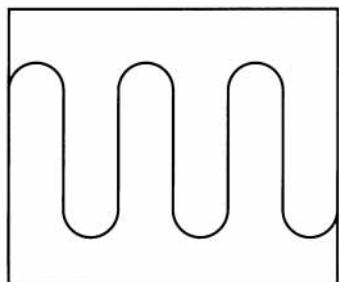
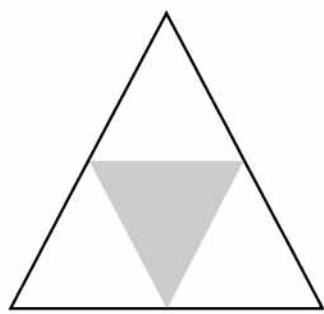
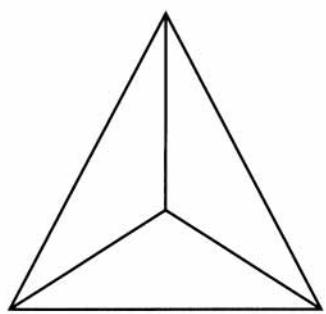
FILTERS/SCREENS



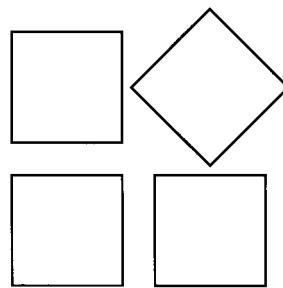
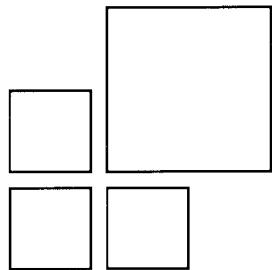
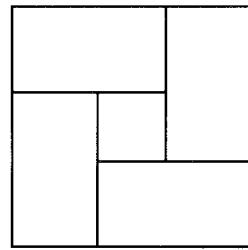
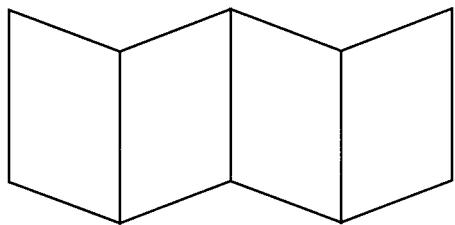
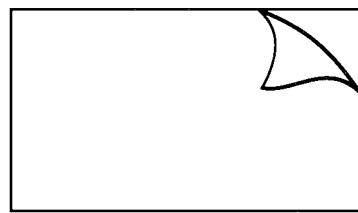
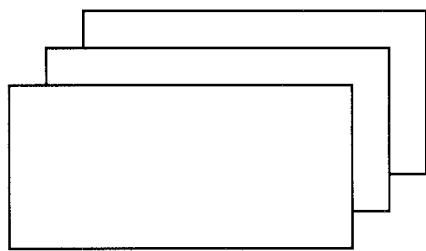
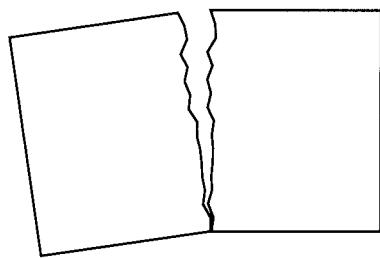
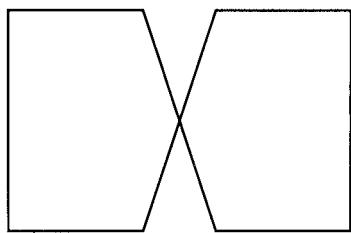
INTERRELATIONSHIPS



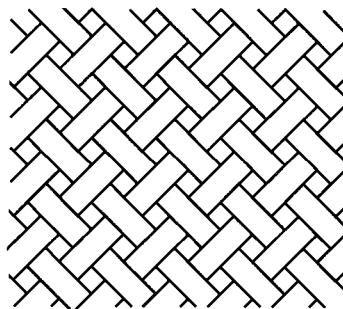
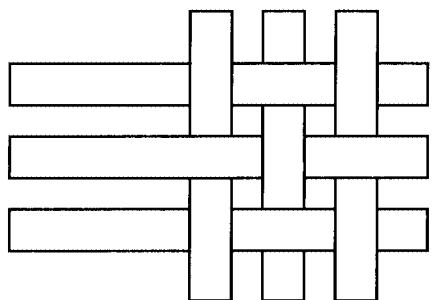
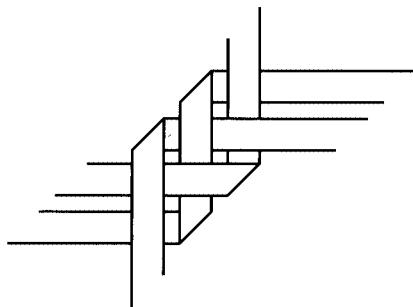
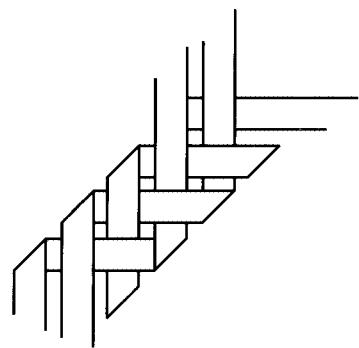
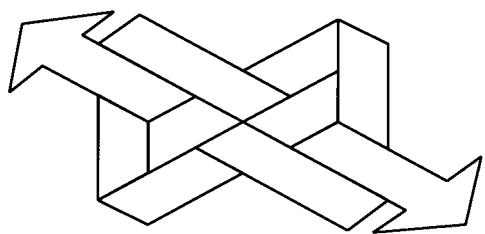
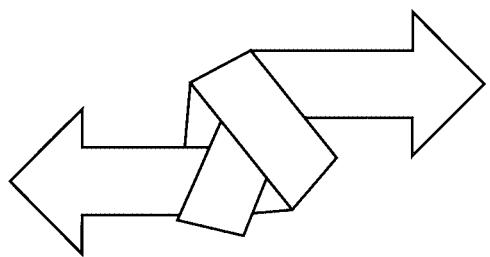
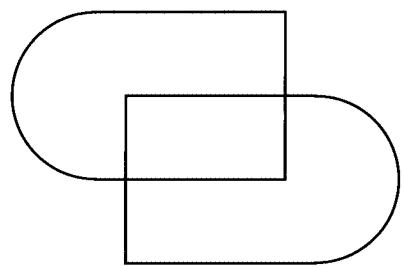
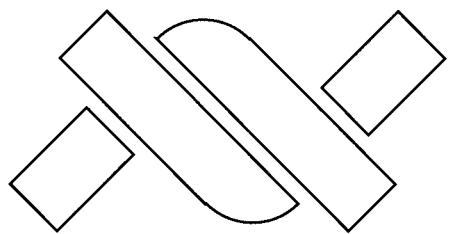
INTERRELATIONSHIPS



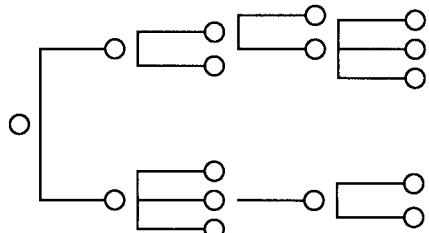
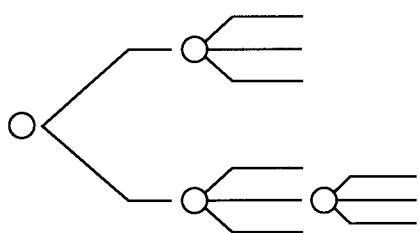
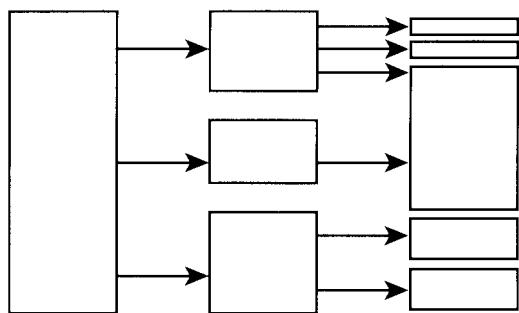
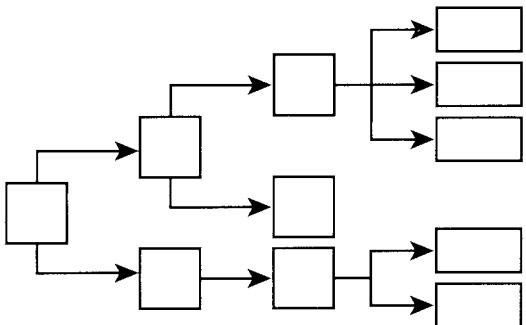
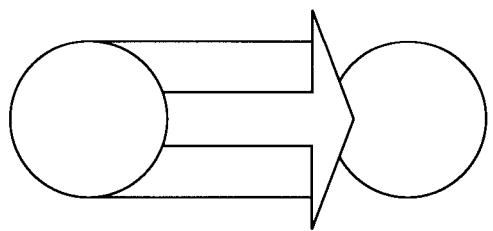
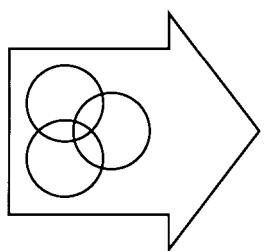
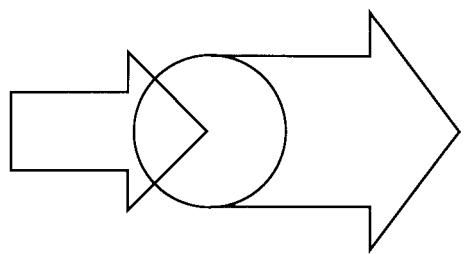
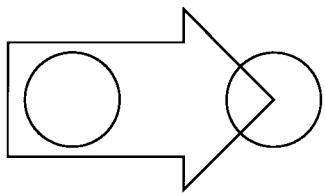
INTERRELATIONSHIPS



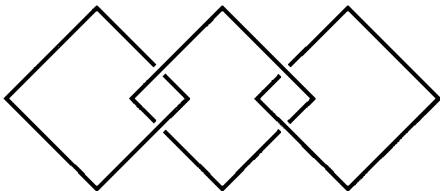
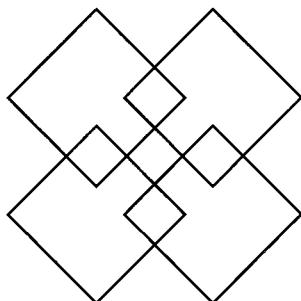
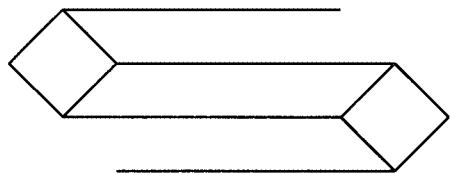
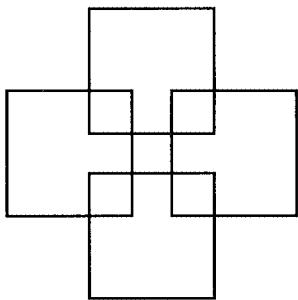
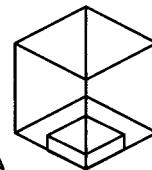
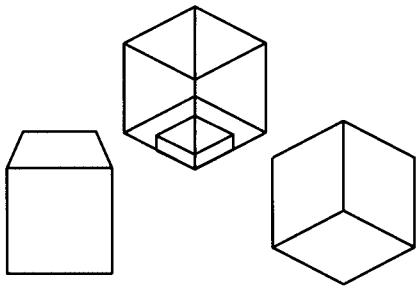
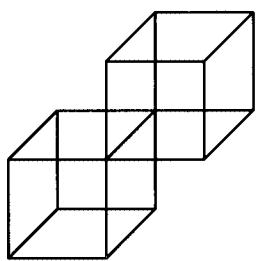
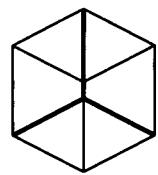
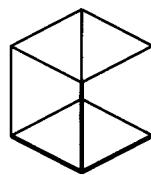
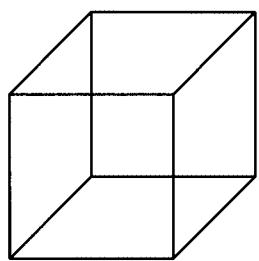
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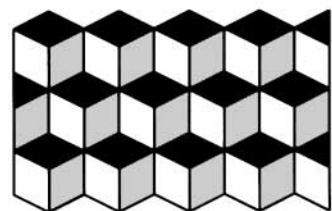
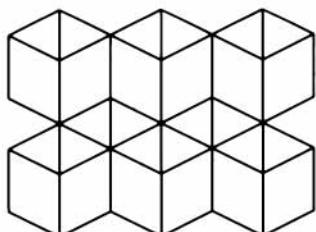
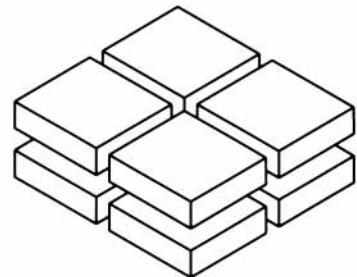
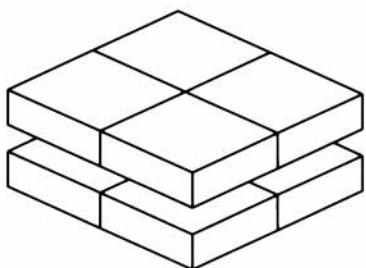
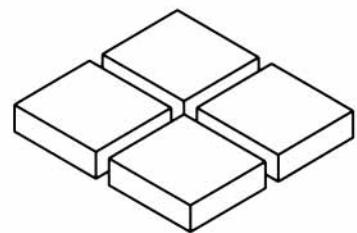
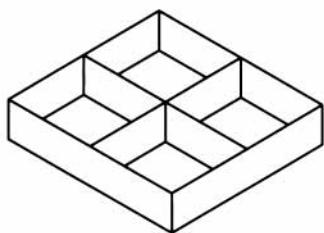
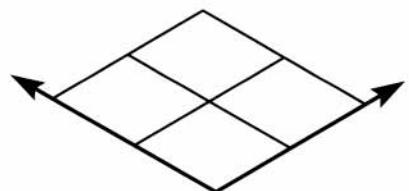
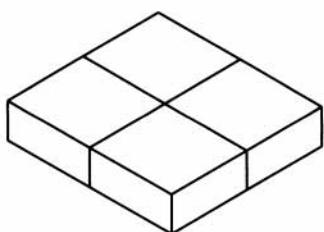
PROCESSES



SEGMENTATIONS



SEGMENTATIONS



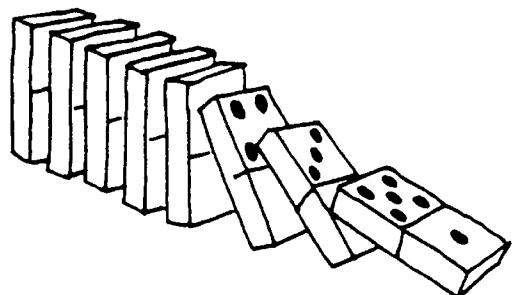
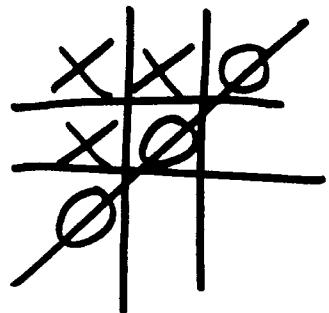
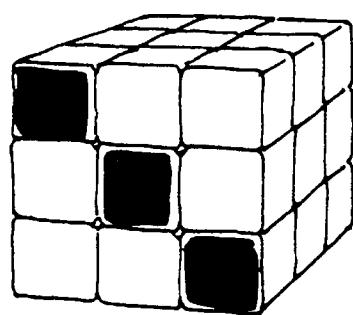
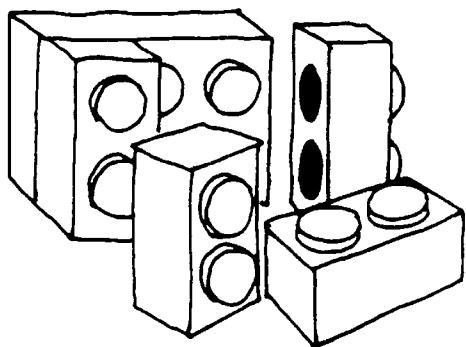
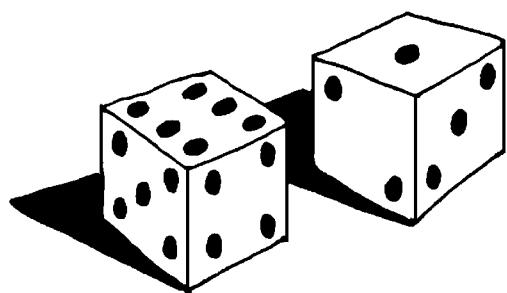
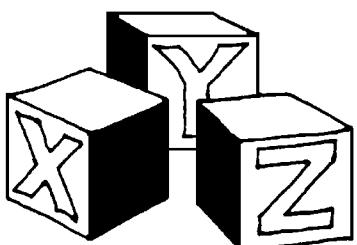
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SOLUTIONS IN SEARCH OF PROBLEMS VISUAL METAPHORS

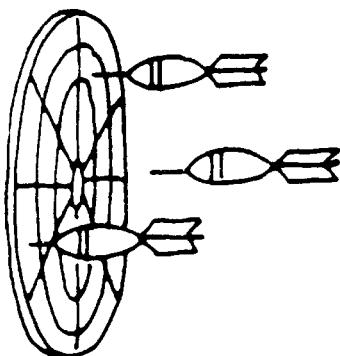
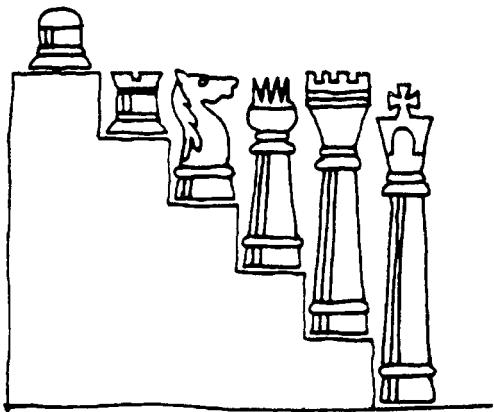
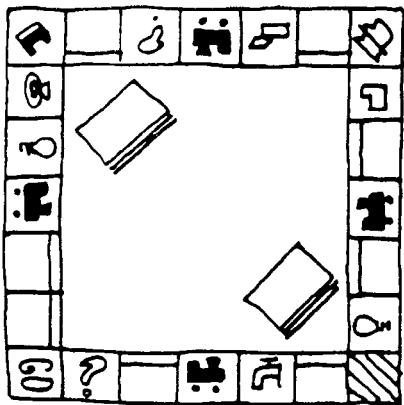
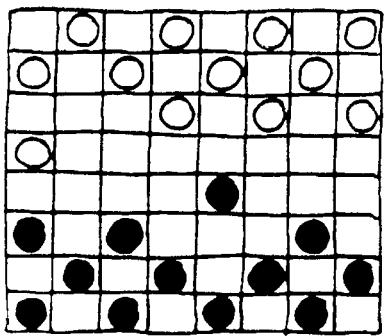
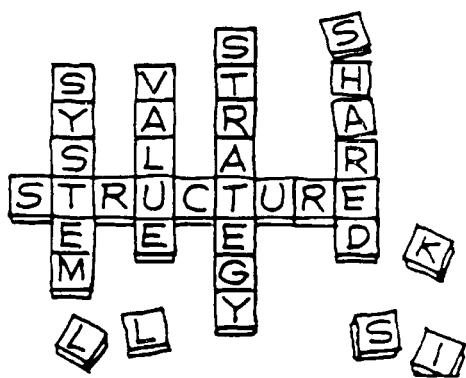
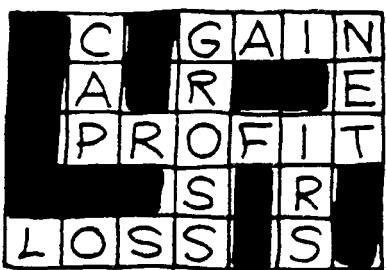
- 171 GAMES
- 174 SPORTS
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- 178 OPTICAL CONFUSION
- 180 STEPS AND STAIRS
- 181 STRINGS AND THINGS
- 182 PUNCTUATION
- 183 WORDS, WORDS
- 185 DRIPS AND DROPS
- 186 OFFICE STUFF
- 188 GOING AND COMING
- 189 COMING AND GOING
- 190 FAR OUT
- 191 ETC.

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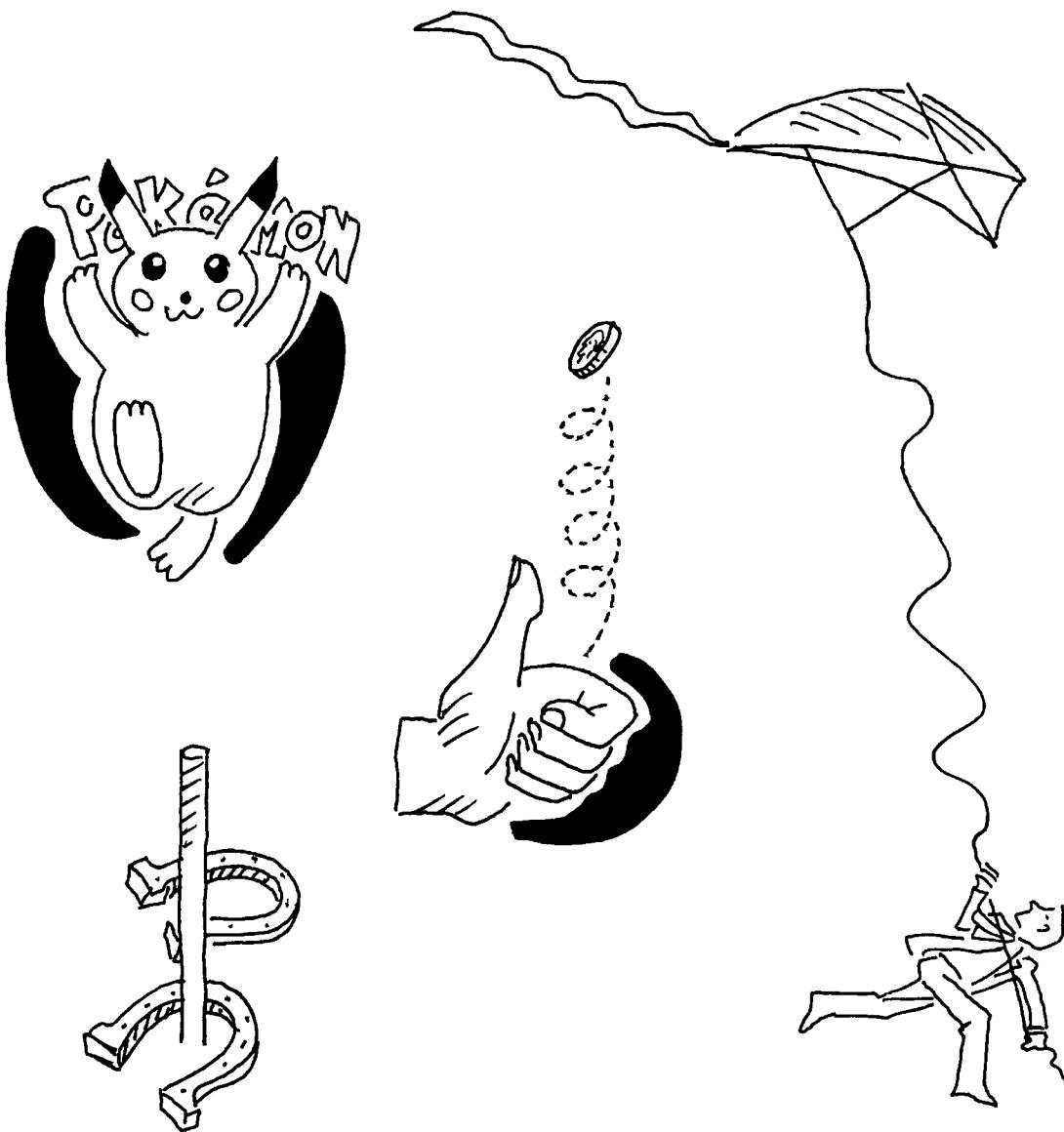
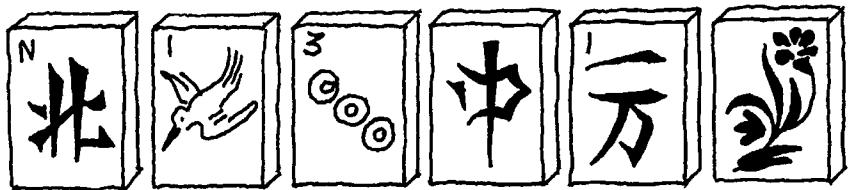
GAMES



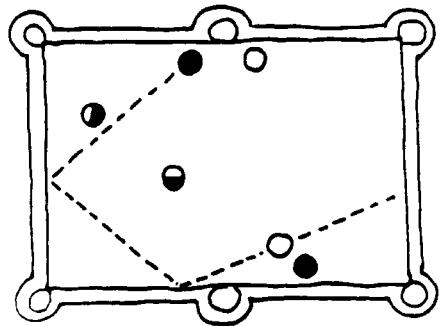
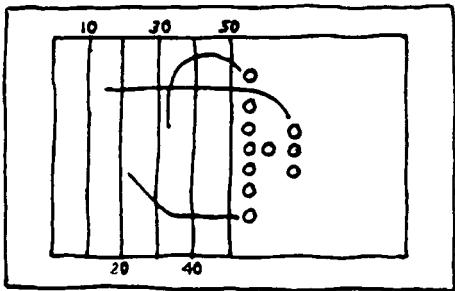
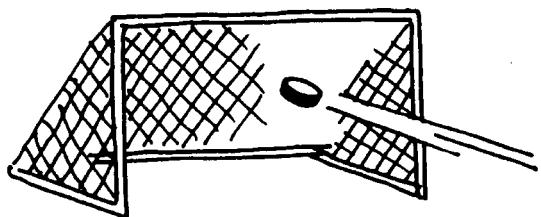
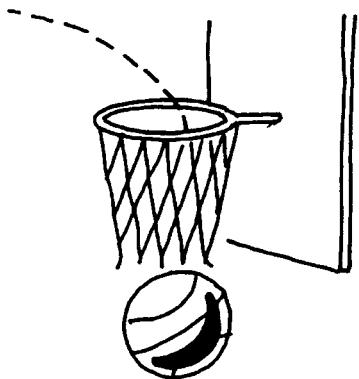
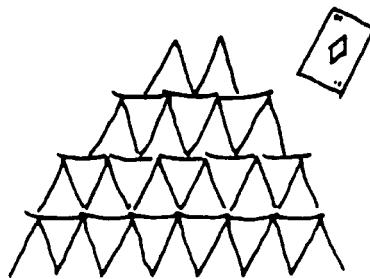
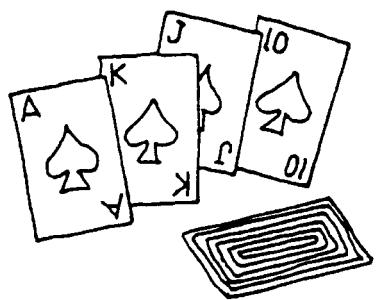
MORE GAMES



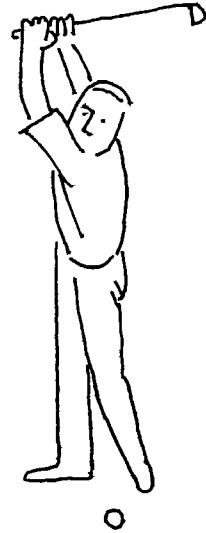
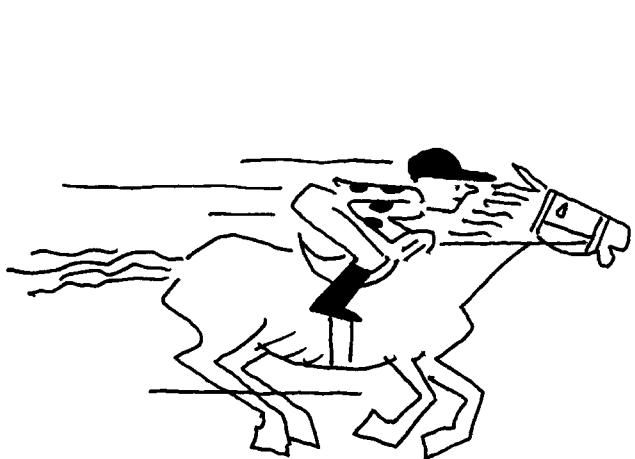
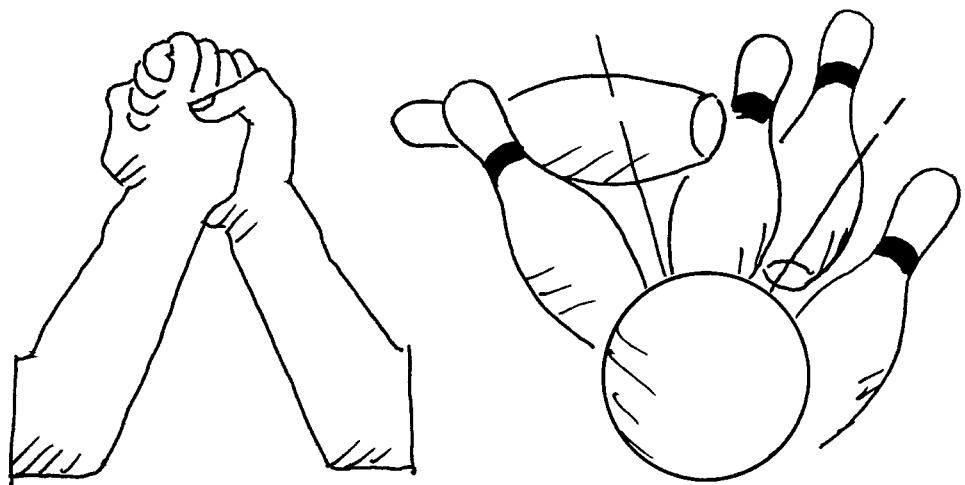
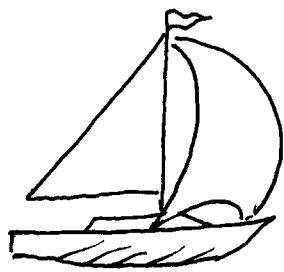
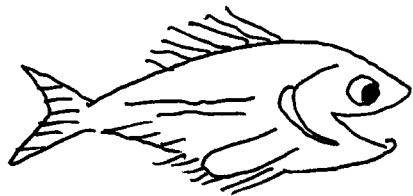
MORE GAMES



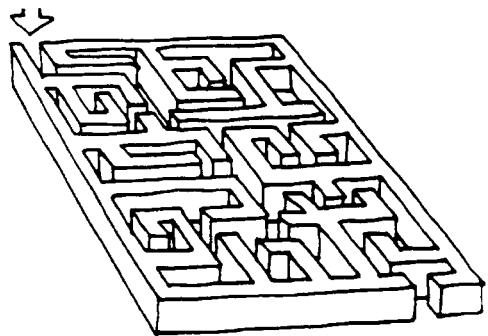
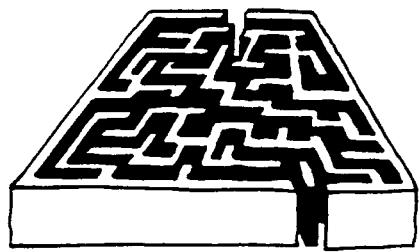
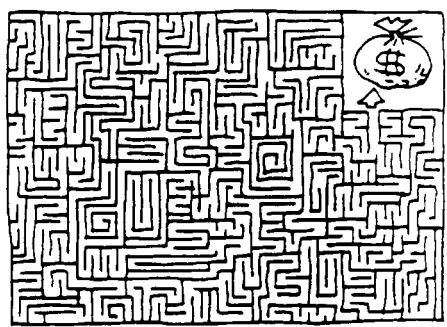
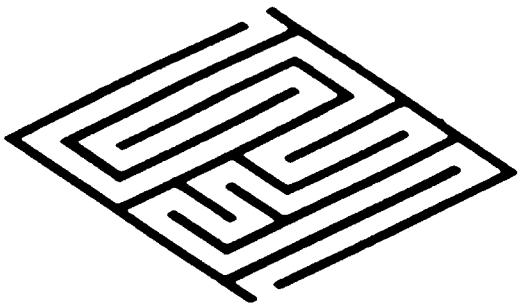
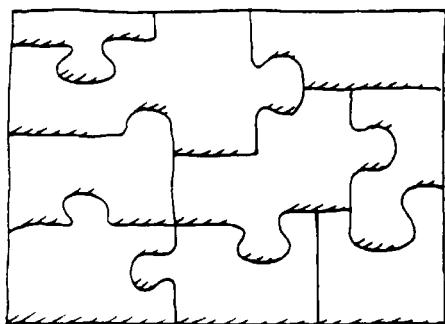
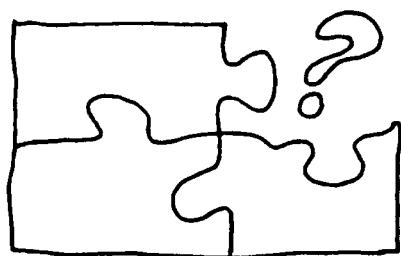
SPORTS



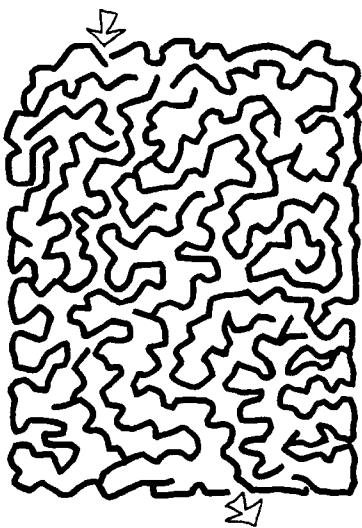
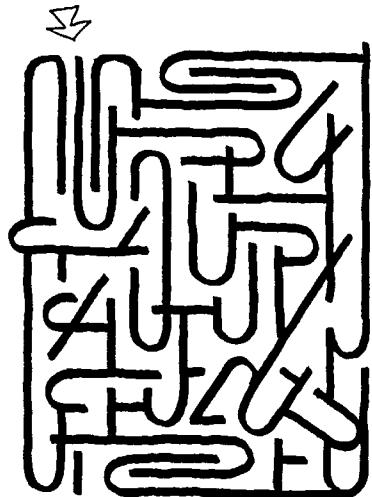
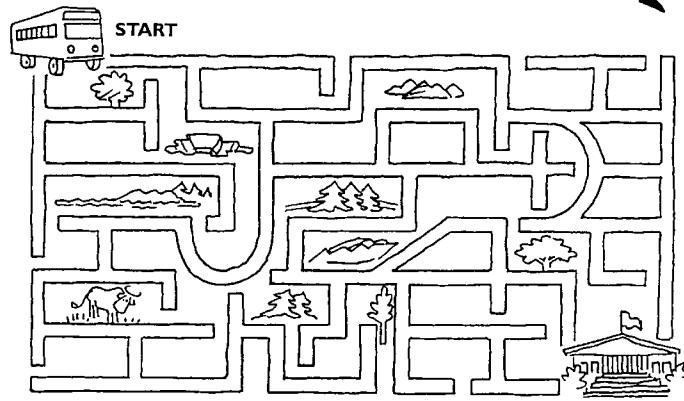
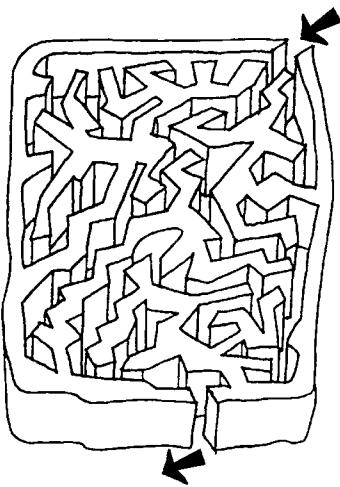
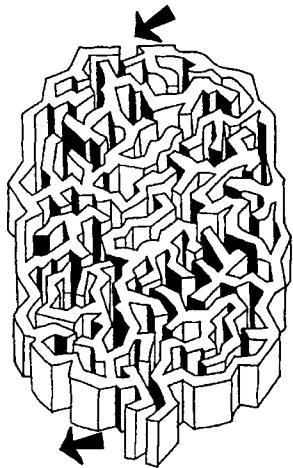
MORE SPORTS



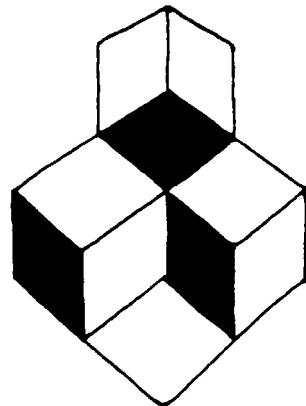
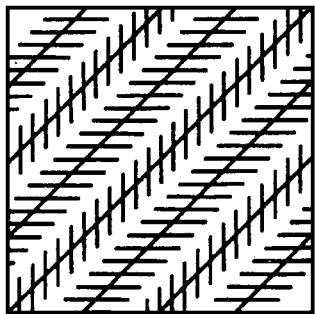
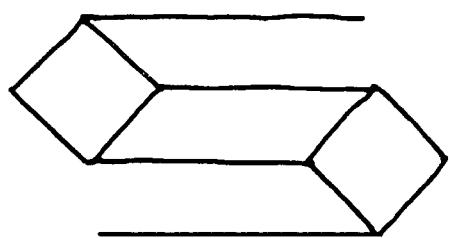
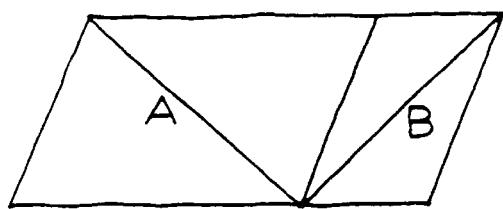
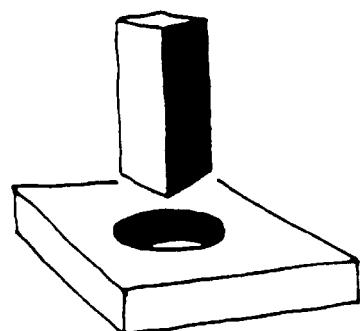
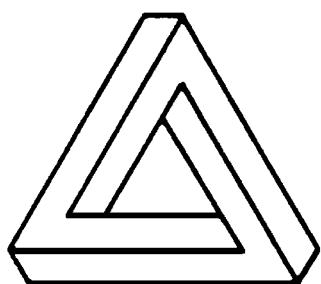
PUZZLES, MAZES



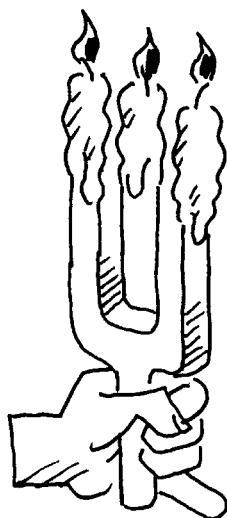
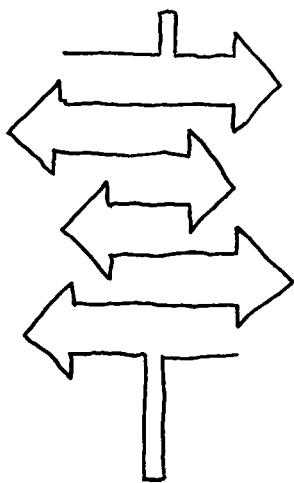
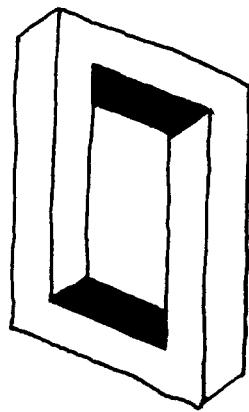
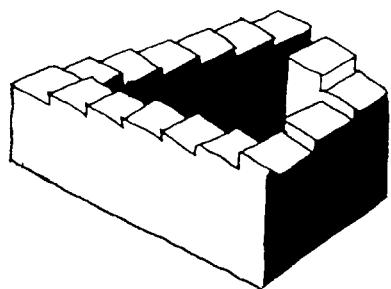
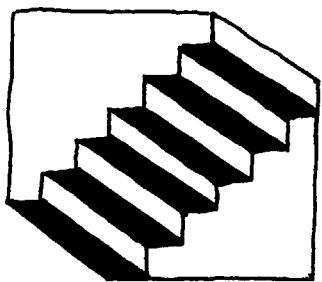
MORE MAZES



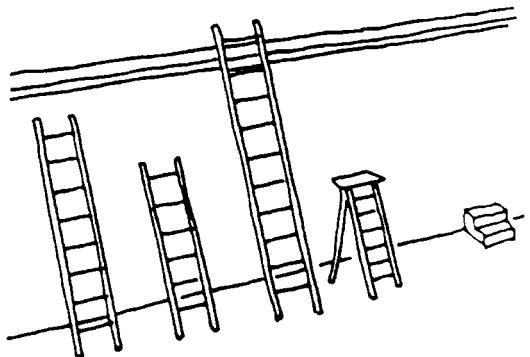
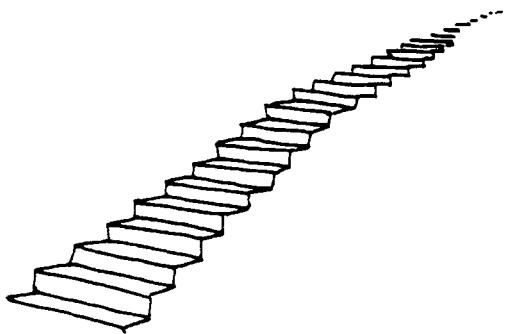
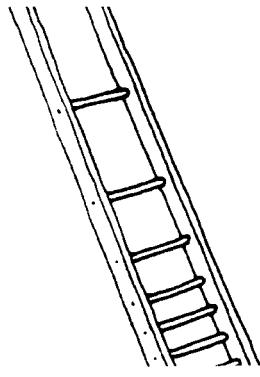
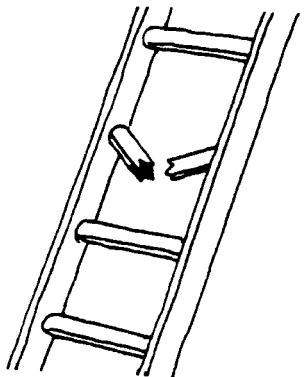
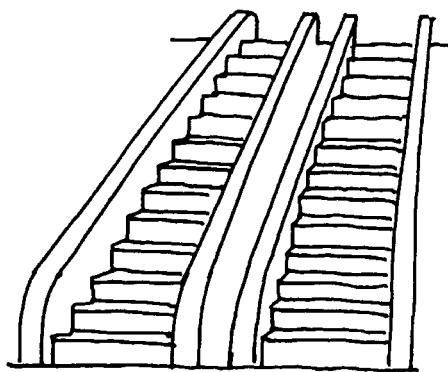
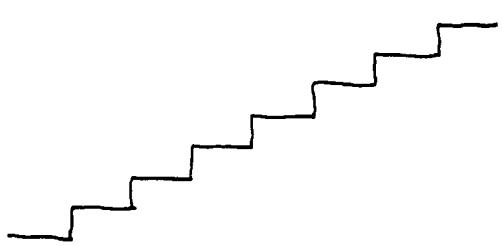
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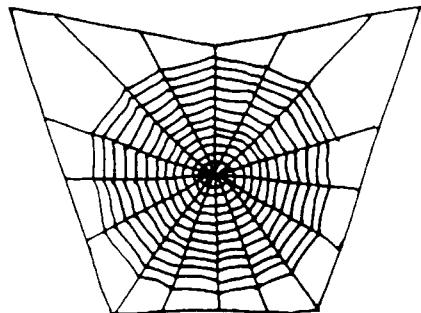
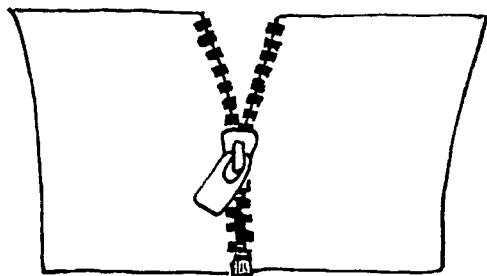
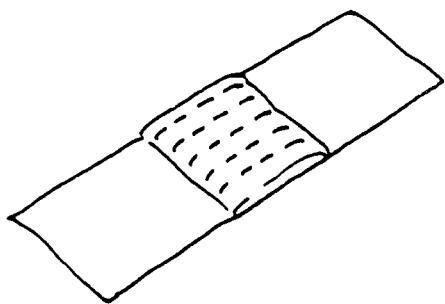
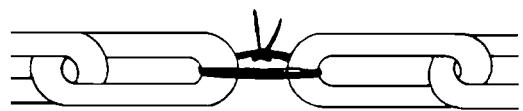
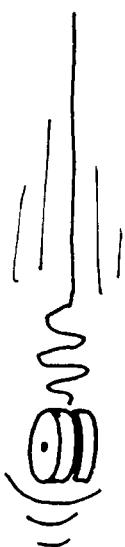
MORE CONFUSION



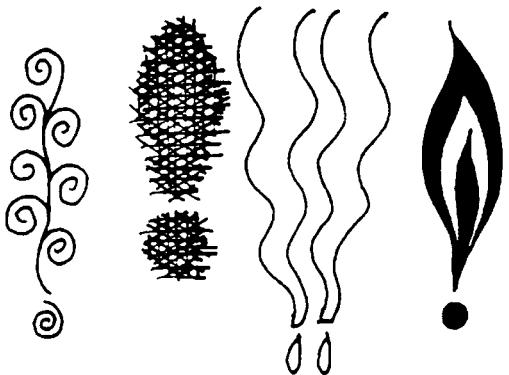
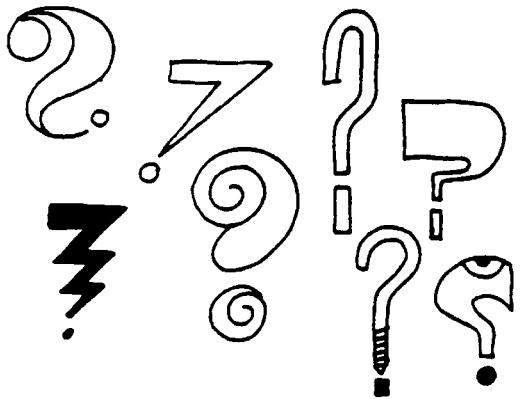
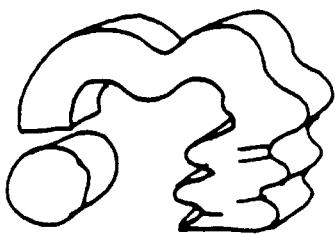
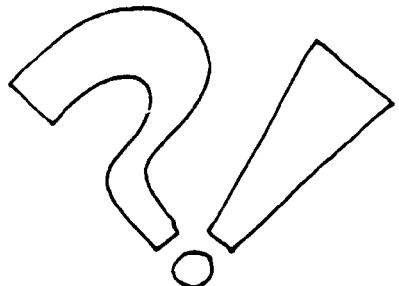
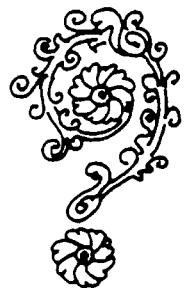
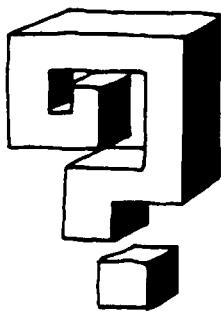
STEPS AND STAIRS



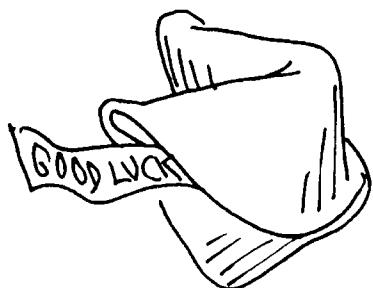
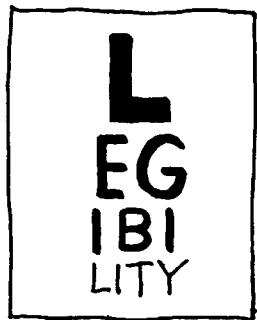
STRINGS AND THINGS



PUNCTUATION



WORDS, WORDS



MORE WORDS

KICKBACK

FAST

BALANCE

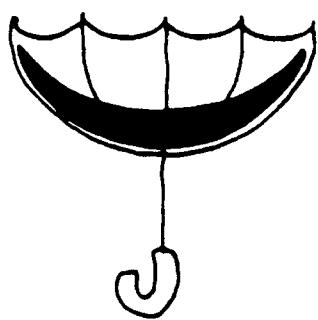
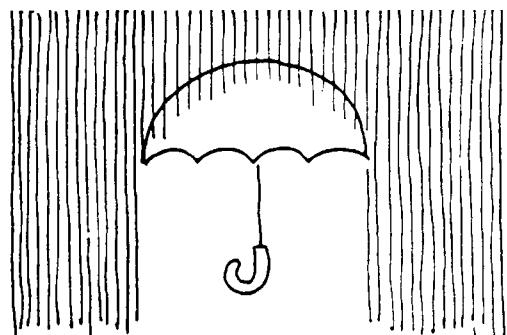
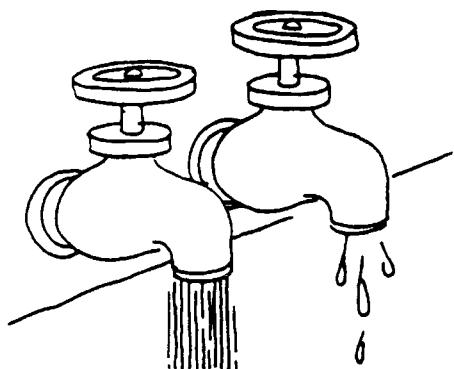


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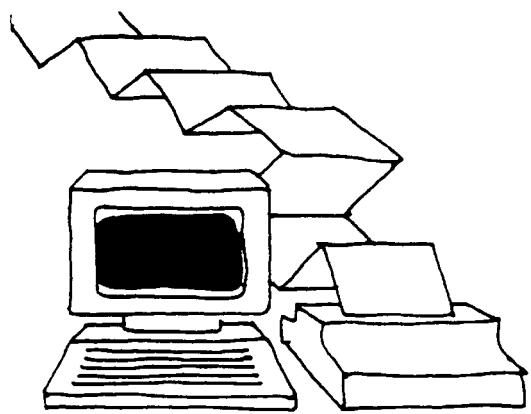
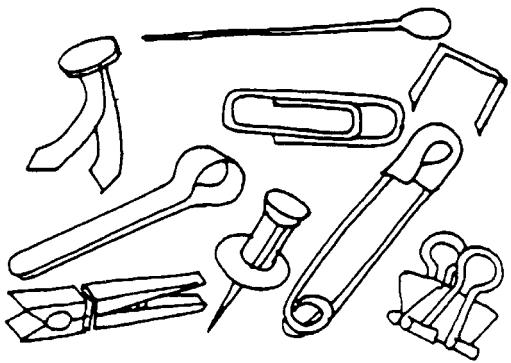
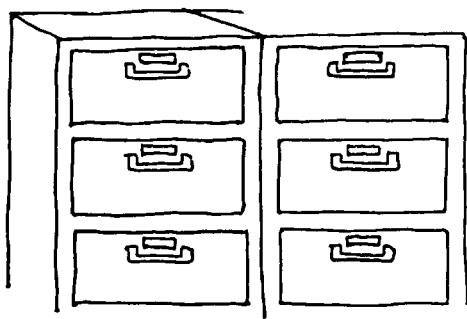
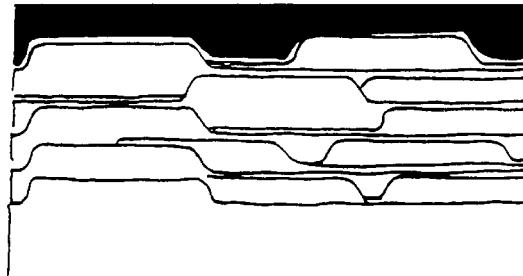
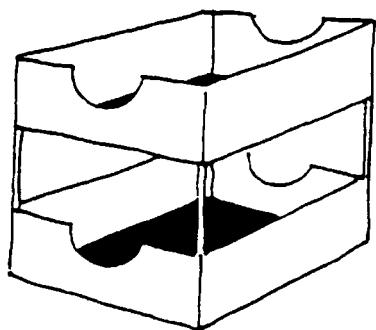
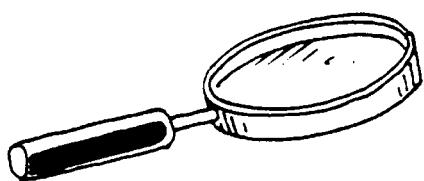
SSSSH!

ZAP

DRIPS AND DROPS



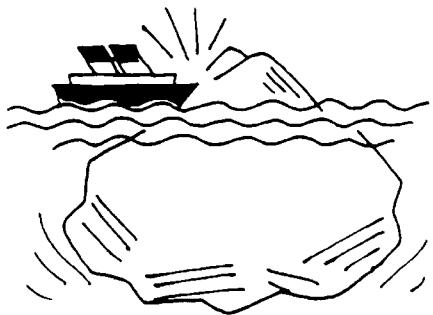
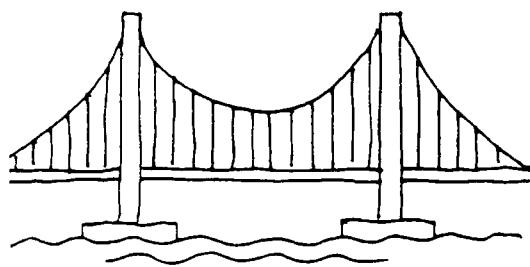
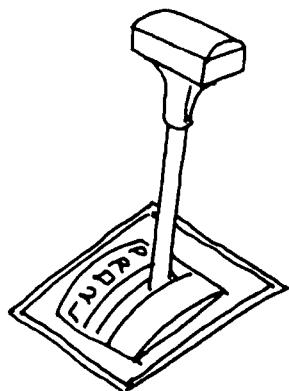
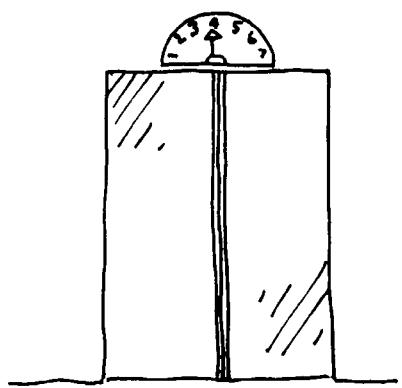
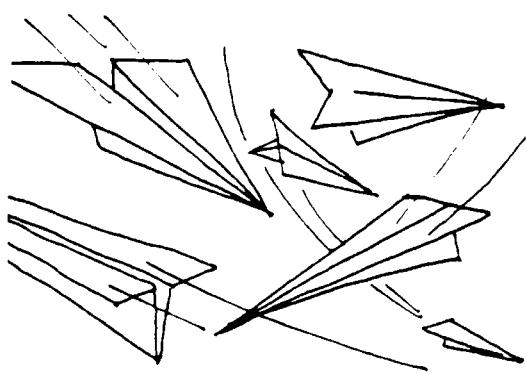
OFFICE STUFF



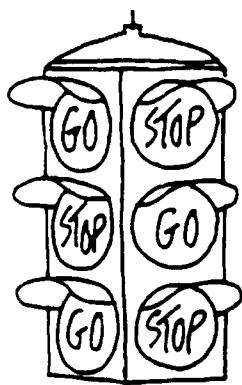
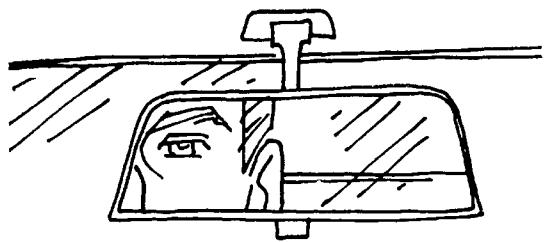
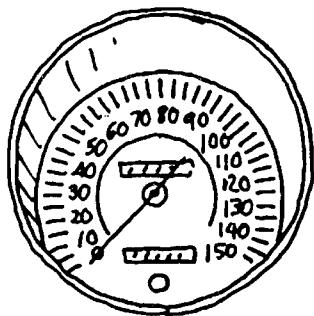
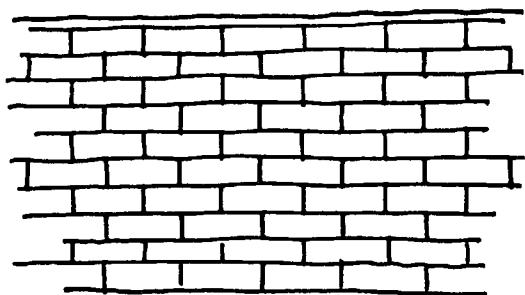
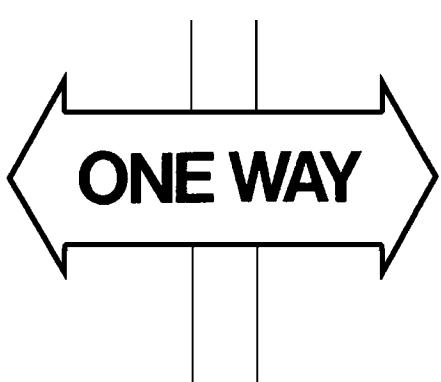
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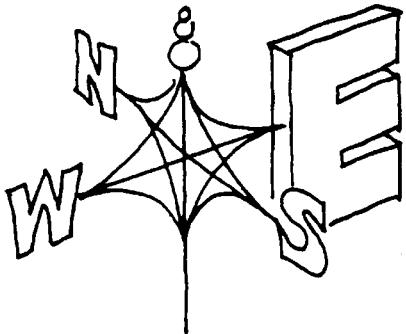
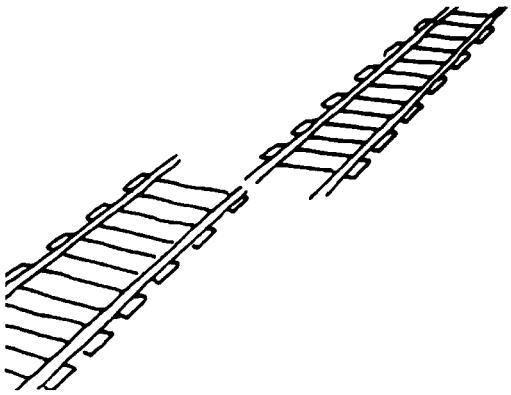
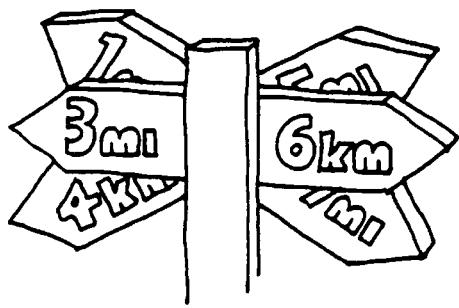
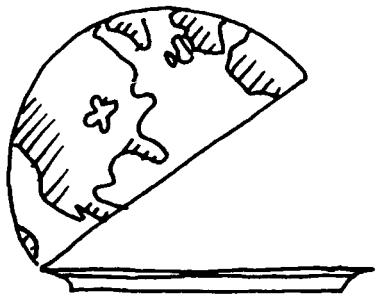
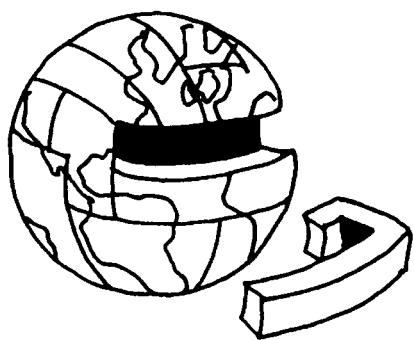
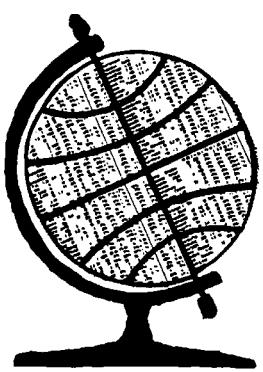
GOING AND COMING



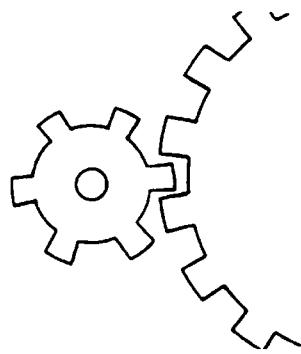
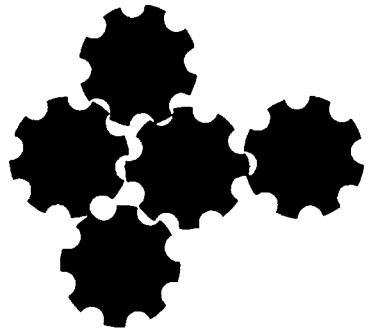
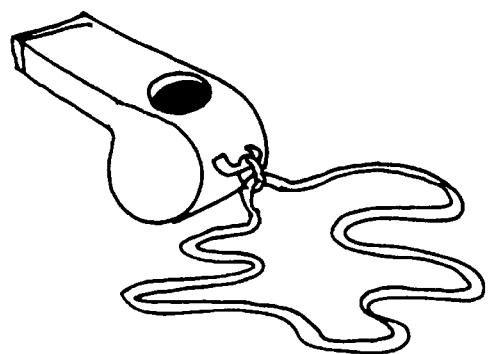
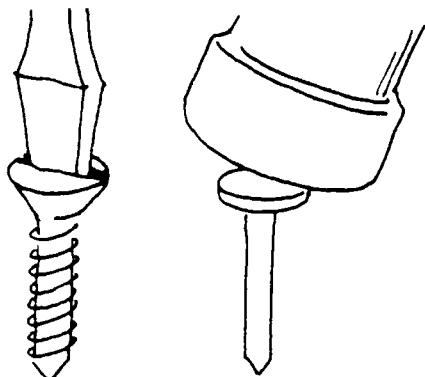
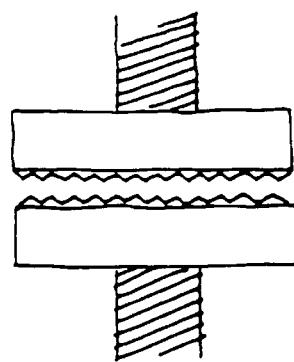
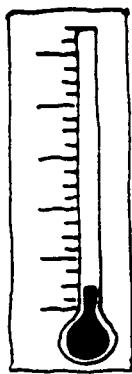
COMING AND GOING



FAR OUT



ETC.



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ABOUT THE TALENTED DESIGNERS WHO CONTRIBUTED TO THIS SECTION

Jan White is a communication design consultant who lectures worldwide on the relationship of graphics to editing. Architect by training, he was art director with Time Inc. for 13 years, then in 1964 opened his own publication design studio.

He is the author of a dozen books on visual techniques in publishing including *Editing By Design* and *Graphic Idea Notebook*, *Graphic Design for the Electronic Age*, *Color for the Electronic Age*, and recently, *Color for Impact*.

Vera Deutsch is known as well for her graphic design for publications as for her corporate identity programs, which range from the design of mailing labels to the creation of annual reports. Notice that she is the graphic consultant for the design of this book.

Dan Nevins is a freelance cartoonist. He was formerly a staff artist for the American Management Association and later Art Director of the advertising department at the New York Daily News.

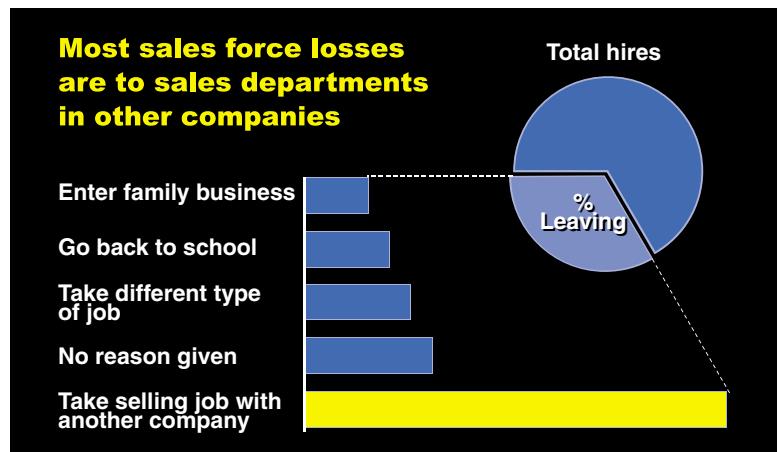
Peter Weishar has been a designer, animator and computer artist for 14 years. He is currently a full time professor at the New York University Undergraduate School of Film and Television where he teaches computer animation. Professor Weishar is the author of "Digital Space: Designing Virtual Environments," McGraw-Hill ©1998 and the "3D Pro Video Series," EduPro ©2000.

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Section 4

SAY IT.COM

I can't help but marvel at how much technology has changed our lives. For example, as I think about how we produce our charts today, I find it incredible that using my laptop, I can produce this chart in less than 10 minutes . . . in black and white . . . or in color . . . correct typos . . . create animations such as fly, zoom, fade . . . add scanned pictures . . . add sound . . . add video clips . . . link it to a URL . . . send it to be reviewed by colleagues all over the world . . . make copies . . . project it in conference rooms of any size . . . all in 10 minutes. Awesome.



It wasn't always like that. I entered the field of visual communications in the year 1961 B.C. That's Before Computers, Before Calculators, Before Copiers. Here's how it worked then.



A visual aids draftsman at a drafting table, would create the lines and the plots of the chart using a light blue pencil, triangles, T-squares, protractors, compasses, oval templates, and engineer's scales.

If you needed to translate absolute values into percentages of their total, you'd use a slide rule.

The chart would go next to a varitype operator. These typewriters had several type fonts, none larger than 11 pt.

From there, the chart went to proofreaders, who indicated typos.

Changes were made through a process known as "cut-outs." Don't ask.

The chart went back to the draftsman, who would go over the blue lines with ruling pens and India ink.

Then, on to someone who would apply *Zip-a-tone*: commercially available self-adhesive sheets of black and white patterns—diagonals, crosshatched, etc.—used for shadings.

If you were to use the chart in a presentation, it and its companions would be sent out overnight to be produced as enlarged photostats, or overhead transparencies, or 35 mm slides.

I leave you to imagine how much time all of this took, but it was significantly more than 10 minutes.

Along with the time saving benefit of technology comes a degree of sophistication never before available, and along with this, new design challenges. That's what this section is about: how to design visuals for successful onscreen presentations.

Here's the range of possibilities that can be created with this technology. These printed pages limit what I can demonstrate, but you'll get an idea of what can be done by following this progression of applications, each of which adds a higher level of sophistication to your presentations.

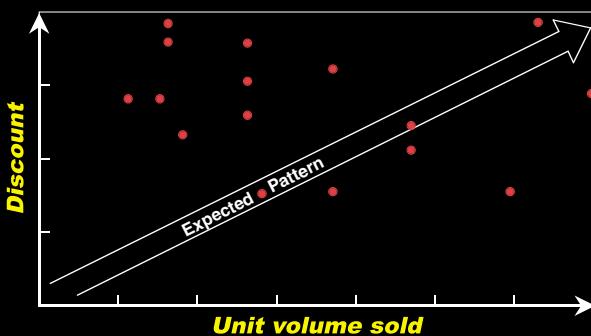
We start with basic onscreen colored visuals and add animation. You can add motion and direction to your visuals by "zooming in or out," "wiping up or down," "dissolving" shapes or objects. With these kinds of animation, you can show the movement of goods in a process, or the flow of responsibility in an organization chart, or the lack of correlation between the size of discount offered and the corresponding unit volume sold.

WIPE vertical
and horizontal
axes

FLY expected
pattern arrow

ZOOM IN
dots indicating
transactions

**There is no relationship between discount
and volume sold**



Add scanned images. It's easy to scan commercially available colored pictures of products or of people into the visuals. Also, with digital cameras, you can take the picture you want, import it into the computer, and modify it as you need to.

Add sound. How about the ring of a telephone, the honk of a car horn to add reality to the pictures you're showing. How about listening to music to create a mood, or hearing a series of quotes from the sales people explaining the need for promotional material.

Add video. How about inserting a video clip of the scene you're describing: the bottleneck in the production line, or the different approaches salespersons use to make sales.



Add links. Link the product to its manufacturing source by making it possible to click on its URL to learn the details as published on the manufacturer's Web site. Link to a software program that lets you create on-the-spot calculations for alternative scenarios. (*Link it to my web site www.zelazny.com and share it with the children in your life when you have nothing better to do.*)



All in all, an impressive series of techniques that can contribute significantly to the success of your presentations.

As with any new technology, there are pros and cons to be aware of.

The single most important benefit of onscreen presentations is that you can make changes to the visuals **during** the presentation, or between meetings while you're traveling from one presentation site to another, which allows you to add timely content and create "what-if" scenarios.

Because these presentations enable nonlinear branching into content, one presentation can serve multiple audiences in multiple ways. With little effort, you can start with the recommendations for an audience who will be receptive, or leave the recommendations to the end of the presentation for an audience who may be resistant.

For certain, the mix of video, sound, animation, and special effects makes for more engaging communication that can improve retention.

On the debit side, the equipment is not nearly as simple to set up as, say, overhead projectors, which require only a single wire plugged into the wall outlet. Trying to wire the laptop to the LCD projector and both to power sources, turning the equipment on in the right sequence, replicating the image from the laptop to the projector . . . and so on, is a great test of patience.

Unless expertly handled, the constant parade of visuals can limit the interaction so important to business presentations. This happens because the focus is more on the **visuals** on the screen than it is on **you**, the speaker.

Depending on the audience, the use of animations, dissolves, wipes, flying arrows, etc., might appear to be gimmicky, giving the impression that you're spending time and money to make your visuals flashier than they need to be to get your messages across—that you value form over content.

Given the pros and cons of onscreen presentations, here are my recommendations for legibility, color, and special effects that will enable you to make the most of the visuals.

Ensure legibility for the person sitting farthest from the screen

No member of the audience will ever complain if the lettering on the visual is too big; all should complain if it's too small.

Here's a table that shows how far from the screen a member of the audience can sit and find various type sizes comfortably legible on a 6-foot, 8-foot, or 12-foot screen.

(Allow for a 5 to 10 percent variance in legibility depending on the brightness of the LCD projector, the contrast created by the darkness of the room, and the intensity of the image the closer the projector is to the screen.)

MAXIMUM DISTANCE FROM SCREEN

Size of type	Width of screen		
	6 ft	8 ft	12 ft
16pt. lowercase	15 ft	18 ft	20 ft
18pt. lowercase	23	25	27
20pt. lowercase	30	35	45
22pt. lowercase	35	40	50
24pt. lowercase	45	50	60
30pt. lowercase	50	60	70
32pt. lowercase	62	70	80

There are some obvious and simple steps you can take that improve legibility. For example:

- ¶ Round out figures or cut decimal places unless they are important to your message—you can always use the precise number in your talk.
- ¶ Use scales on your charts instead of numbers at the end of bars or within components of columns.
- ¶ Substitute symbols for words: a \$ sign is better than “dollars”, a % sign is better than “percentage of . . .”
- ¶ Abbreviate where possible without causing confusion.
- ¶ Edit words: cut 10 words down to 4, 4 words to 3, 3 words to 2.
- ¶ Delete footnotes; build the information into what you say if it’s important.
- ¶ Omit sources; leave them for the handout.

While the table and these suggestions may help occasionally, they don’t go far enough to indicate what to do when the chart defies simple solutions. Here, therefore, are specific examples of legibility problems, along with what I would recommend to make them legible. Perhaps these examples will trigger similar thinking with your problem charts.

BIGGER IS BETTER

This chart presents the information the way it was conceived. Obviously, it wouldn't be legible with any screen size. Among the more obvious suggestions are to delete those columns that show no data, or to break the chart horizontally in half, and stack one half above the other.

TRADITIONAL MATERIALS END-USE MARKETS
Percent

Material	Market													Total
	Aircraft/aerospace	Recreation/consumer	Automotive/transportation	Industrial/mechanical	Electrical/electronic	Petrochemical	Construction/building	Plumbing	Packaging	Adhesive	Furniture/furnishings	Other	Total	
PVC	--	4	3	--	8	--	64	--	10	2	6	3	100%	
PP	--	15	7	--	8	--	--	--	22	--	24	24	100%	
HDPE	--	10	5	4	4	--	10	--	52	--	3	12	100%	

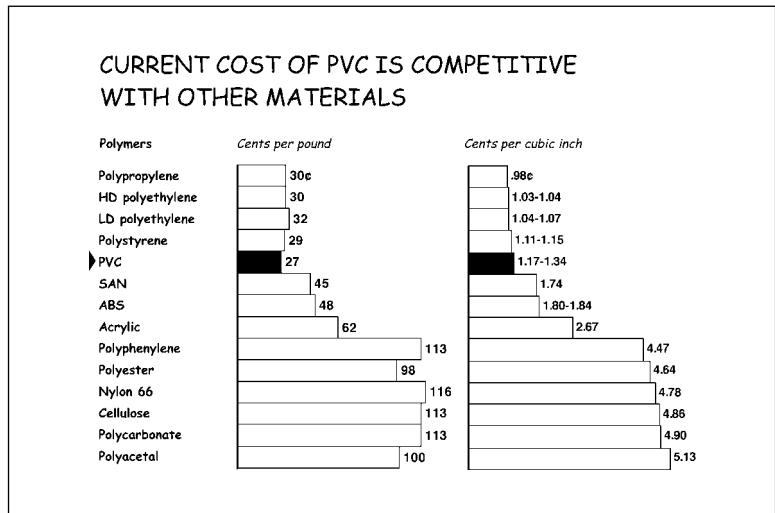
In this case, the solution is simple: change the layout—by switching the axes, the chart fills up the layout space proportionately, and a much larger type can be used.

TRADITIONAL MATERIALS END-USE MARKETS

Market	PVC	PP	HDPE
Aircraft/aerospace	—	—	—
Recreation/consumer	4%	15%	10%
Automotive/transportation	3	7	5
Industrial/mechanical	—	—	4
Electrical/electronic	8	8	4
Petrochemical	—	—	—
Construction/building	64	—	10
Plumbing	—	—	—
Packaging	10	22	52
Adhesive	2	—	—
Furniture/furnishings	6	24	3
Other	3	24	12
Total	100%	100%	100%

SIMPLER IS BETTER

This chart was used in a document to support the point that PVC is the lowest-cost polymer.

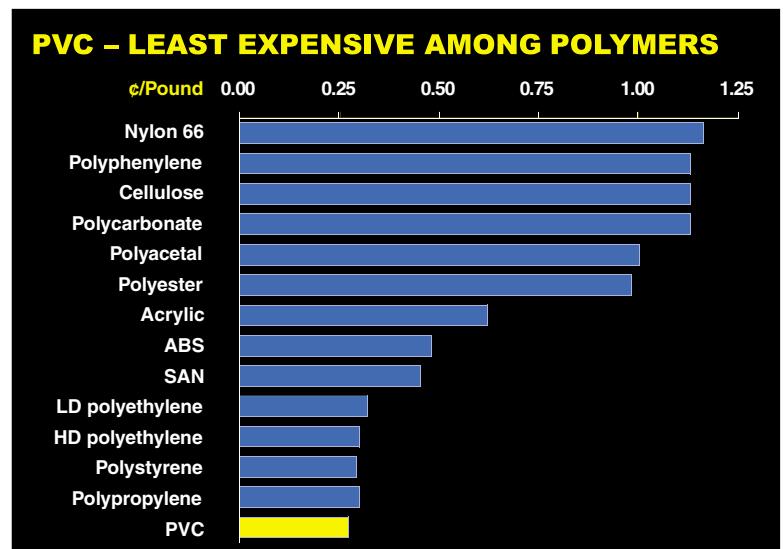


For an onscreen visual, the content can be greatly simplified.

For example:

- ¶ Do we need two measures of cost performance to support the same message—one expressed in cents per pound, the other in cents per cubic inch? No. *Cents per pound will do.*
- ¶ Must we show the data at the end of every bar? No. *A scale will be sufficient to show the relationships.*
- ¶ Because this is an item comparison, can we change the sequence of the bars, ranking them from high to low to better show PVC's position? Yes.

Incorporating all the recommendations results in this simplified—and more legible—visual that focuses attention on the message that PVC's cost is lower than all other polymers.



MORE IS BETTER

To appreciate the solutions for the next series of examples, we need to go to the electronic white board after school and to write the following message 100 times:

It takes exactly the same amount of time to present five ideas on 1 slide as it does to present 1 idea on each of 5 slides.

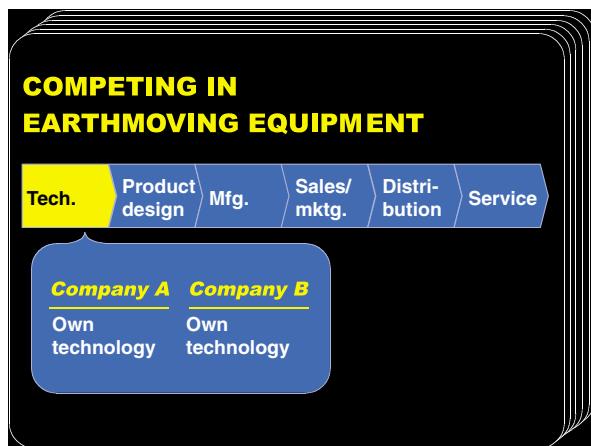
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It takes exactly the same amount of time to present five ideas on 1 slide as it does to present 1 idea on each of 5 slides.

In this chart, I show the way the information was captured on paper. As you can see, it compares how the two competitors approach the different elements of their respective business systems.

THE BUSINESS SYSTEM FOR EARTHMOVING EQUIPMENT						
Business system element	Technology	Product design	Manufacturing	Sales/ marketing	Distribution	Service
Company A	<ul style="list-style-type: none">Own technology	<ul style="list-style-type: none">Limited engineering investment because CAT works with the best suppliers to create their equipment	<ul style="list-style-type: none">Subcontracted with CAT doing assembly	<ul style="list-style-type: none">Heavy investmentSell to broad marketCompetitive pricing	<ul style="list-style-type: none">Extensive dealer network	<ul style="list-style-type: none">Fast repair time
Company B	<ul style="list-style-type: none">Own technology	<ul style="list-style-type: none">High engineering investment to design to their own equipment	<ul style="list-style-type: none">Vertically integrated for a large percent of their equipment parts	<ul style="list-style-type: none">Limited investmentSell to asset-intensive segmentsCompetitive pricing	<ul style="list-style-type: none">Limited dealer network	<ul style="list-style-type: none">Low frequency of equipment breakdown

For the onscreen presentation to a large audience, we used six legible slides with each slide comparing the competitors' approach to one of the components of the business system.



An added benefit to this approach is that the audience members focus on one idea at a time as it's presented; no risk that some will focus on different aspects of the visuals than the one you may be discussing.

DIFFERENT IS BETTER

At times, splitting a detailed chart into several visuals isn't the answer to legibility; simplifying the story can result in a single legible slide.

This series of item comparisons shows that the Tuckahoe plant is doing an excellent job of keeping variable costs low in the manufacture of three out of four products. For HFCS-42 and HFCS-55, it ranks as the second-lowest-cost producer. While it ranks fourth for pearl starch, the cost differential with the lowest-cost plant is small. However, for corn syrup, the combination of a seventh ranking and a sizable cost differential indicates the need to search for cost-reduction opportunities.

VARIABLE MANUFACTURING COST \$ per hundredweight

HFCS - 42

Clinton - Clinton, IA

Tuckahoe - Keokuk, IA

Staley - Decatur, IL

Staley - Lafayette, IN

ADM - Decatur, IL

CPC - Argo, IL

ADM - Cedar Rapids, IA

Staley - Busch/Lafayette, IN

Great Western - Johnston, CO

Cargill - Dayton, OH

Clinton - Montezuma, NY

Staley - Loudon, TN

Cargill - Memphis, TN

American Maize - Decatur, AL

Staley - Morrisville, PA

CPC - Winston/Salem, NC

Anstar - Dimmit, TX

CPC - Stockton, CA

Holly - Tracy, CA

PEARL STARCH

Cargill - Cedar Rapids, IA

Grain processing - Muscatine, IA

CPC - Argo, IL

4 ► Tuckahoe - Keokuk, IA

Penick & Ford - Cedar Rapids, IA

Staley - Decatur, IL

AM - Cedar Rapids, IA

American Maize - Hammond, IN

Cargill - Dayton, OH

Staley - Busch/Lafayette, IN

American Maize - Decatur, AL

Anstar - Dimmit, TX

CPC - Winston/Salem, NC

Staley - Morrisville, PA

CPC - Stockton, CA

Corn Processing Total

\$4.79 1.28 \$6.07

4.85 1.31 6.16

4.94 1.31 6.25

5.10 1.38 6.68

4.89 1.38 6.47

4.85 1.09 6.54

4.89 1.38 6.57

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5.73 1.82 7.35

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5.48 1.24 7.69

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5.61 1.32 7.93

Corn Processing Total

\$4.79 1.28 \$6.07

4.85 1.31 6.16

4.94 1.31 6.25

5.10 1.38 6.68

4.89 1.38 6.47

4.85 1.09 6.54

4.89 1.38 6.57

6.38 1.32 6.70

6.08 1.05 6.74

5.12 1.73 6.85

5.02 1.85 6.87

5.44 1.43 6.87

5.40 1.61 7.01

5.67 1.38 7.06

5.48 1.73 7.26

5.73 1.82 7.35

5.78 1.38 7.36

5.48 1.24 7.69

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Corn Processing Total

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5.12 1.73 6.85

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5.44 1.43 6.87

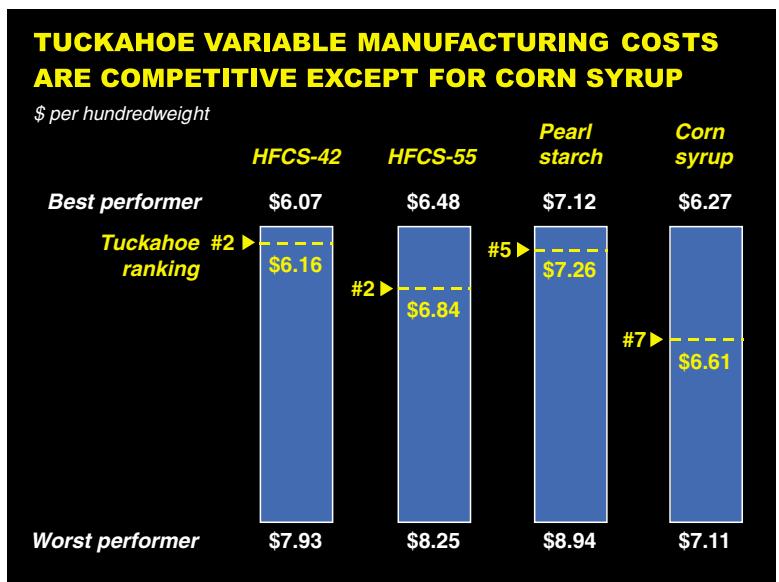
5.40 1.61 7.01

5.67 1.38 7.06

For the visual presentation, the most obvious solution would seem to be to use a separate slide for each product, simplify each visual by showing only the totals, and substitute a scale for the figures at the end of the bars. However, with 19 plants listed, the plant names and cost figures would still be illegible.

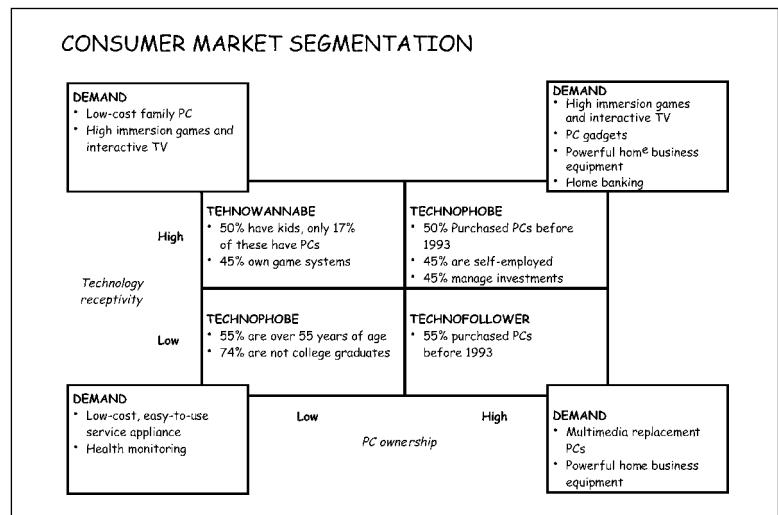


In this case, we need a drastically different approach to get the message across and to making it legible. Let's use a range column chart to show the spread in total variable cost between the best and the worst performers for the four products. (*I should have used a bar chart to be consistent with my advice in the earlier section. Somehow the column chart is more suggestive of "best" at the top and "worst" at the bottom.*) In this example, the ranges are the same length, creating an index chart; that is, the spread equals 100 regardless of cost differentials. I show Tuckahoe's ranking against the top and bottom performers. The message comes across with one legible—and simple—visual.

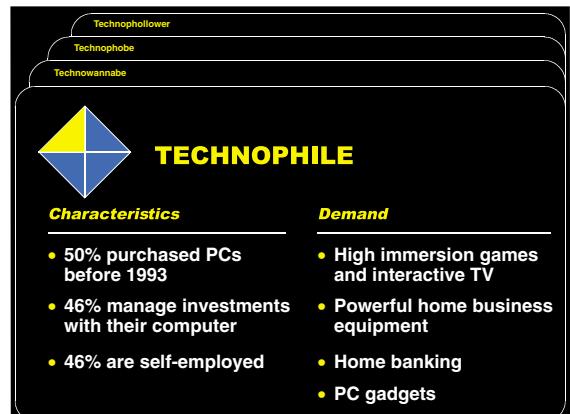
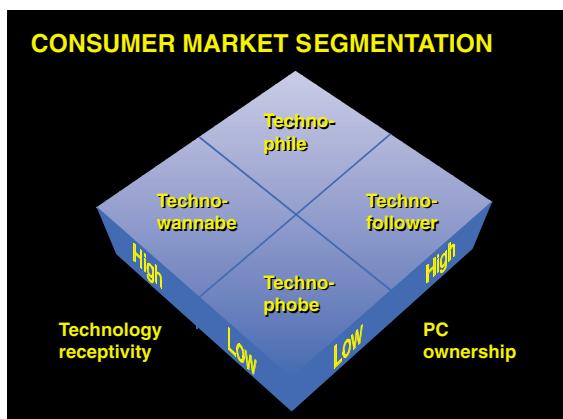


IMAGINATION IS BETTER

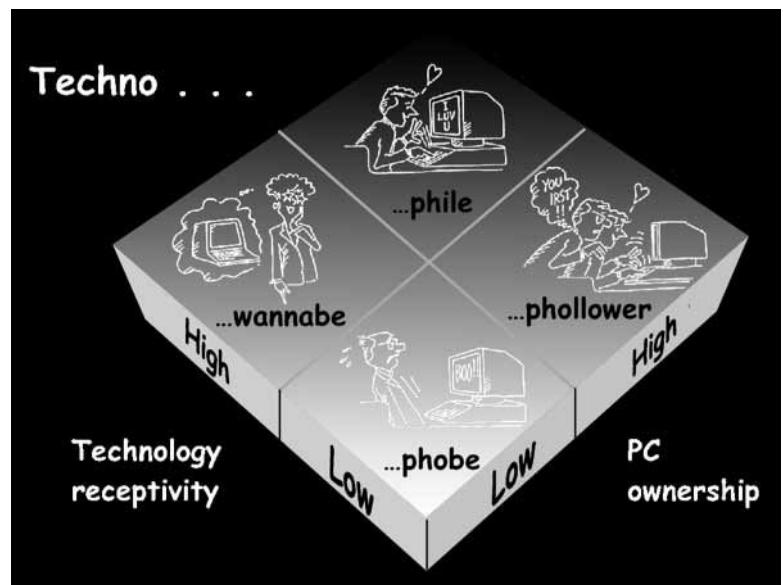
Here's one more example of a chart as it was designed for a document. As you see, it presents the characteristics and demand for four segments of the consumer for market for technology.



For the presentation, one solution is to design several visuals: the first to introduce the four quadrants, the second through fifth, to show the detailed characteristics and demand for each of the four quadrants.



In this situation, however, we took the challenge of legibility one step further. Here we characterized the four quadrants with illustrations that give a personality to each segment. In this manner, the speaker was able to elaborate in as much or as little detail as the audience needed.



There you have several suggestions for improving legibility. Let's keep in mind that if it's important enough to be on a visual, it's important enough to be legible. Sorry about the sermon.

Use color with purpose, not for decoration

So far, most of the charts in this book achieve the desired visual impact in black and white. A good test of the effectiveness of your visuals is to see if their messages come across clearly in black and white; if they don't, color isn't going to help much. However, we do live in a world of colors, and today's technology has made it easy to create colorful visuals. So here's how to make the most of them.

CHOOSING COLORS

I'm told that some computer graphics systems can create 8,000,000 permutations of colors, give or take a few thousand. That's 7,999,997 more than I recommend showing on a typical visual. Not only does this simplify color selection, but it also prevents business-minded executives from thinking about how their money is being spent making visuals "jazzy" when your message is to cut costs. Besides, it usually looks better.

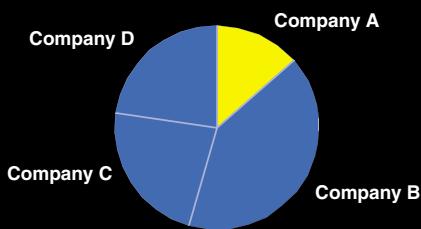
Generally, the professionals I work with use a black background so the colors for the visual stand out. Against the black, they use cool colors such as blue and green. For emphasis, they rely on white and yellow.

Unless you're creating visuals of color pictures or specific colors are needed to represent a logo or a flag, leave the choice of colors to experienced specialists whom you trust. Work out guidelines with them to ensure legibility while retaining a professional image.

USING COLORS

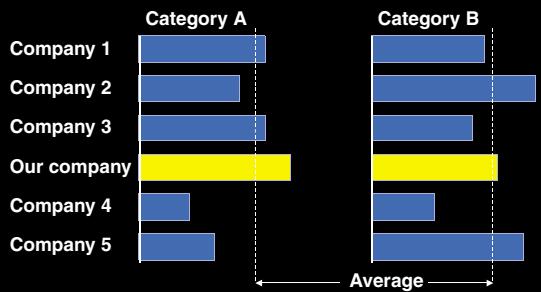
If the *choice* of color can be left to specialists, the *use* of color is the presenter's responsibility. Make certain to discuss each visual with the specialist so colors are used not just for decorations, but with a purpose:

Company A has the smallest share of industry sales

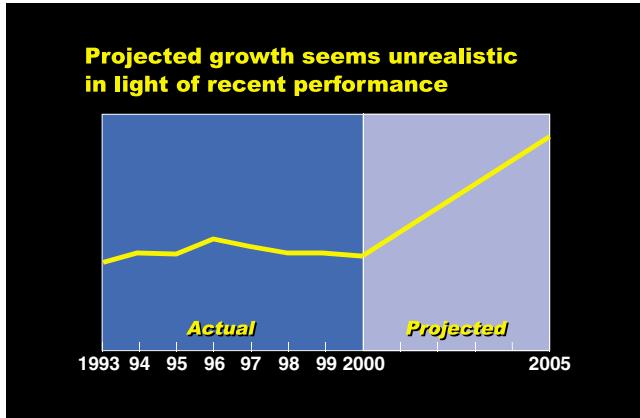


To emphasize, for example, one component of a pie chart, one segment of a bar or column, a trend line, a row of figures, words such as a title.

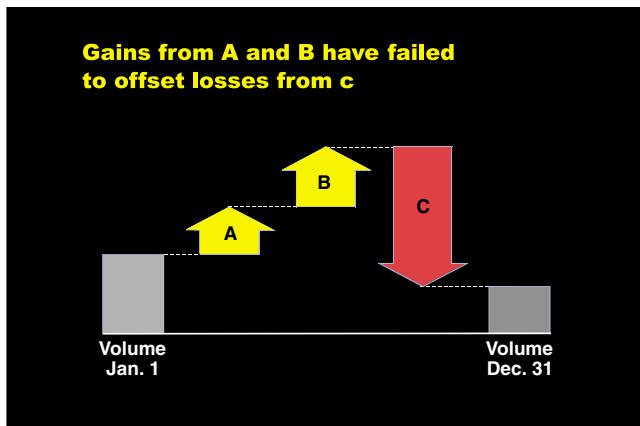
Our company is above the average in both categories of sales



To identify a recurring theme: for example, showing your company-related data in the same color throughout the presentation.



To distinguish, for example, actual from projected, one set of bars or columns from another, one trend line from another.



To symbolize: for example, red for losses, green for profits; red for stop, yellow for proceed with caution, and green for go.

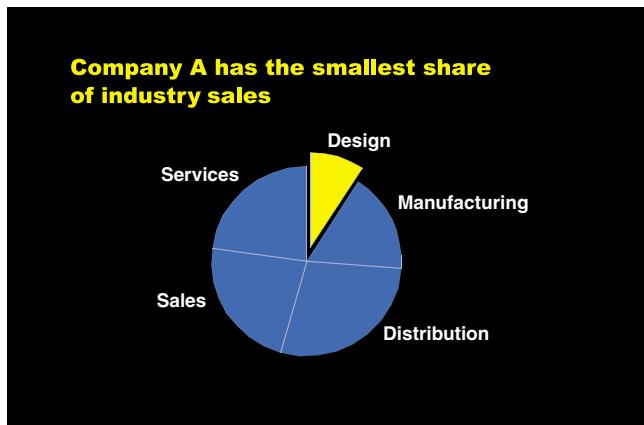
Let content drive the use of special effects

Here are just a few of the most popular special effects that can be created with commercially available software packages. (*I've created this shorthand visual language for indicating the most commonly used animations. You're welcome to use it—or create one of your own.*)

ANIMATION EFFECT SYMBOLS

P	Peek from bottom		Box in	F	Fly from right
P	Peek from left		Box out	F	Fly from left
P	Peek from right			F	Fly from bottom
P	Peek from top			F	Fly from top
	Split horizontal in		Flash once, fast	F	Fly from bottom left
	Split horizontal out		Flash once, medium	F	Fly from bottom right
	Split vertical in		Flash once, slow	W	Wipe left
	Split vertical out		Wipe right	W	Wipe right
			Wipe up	W	Wipe down
					Zoom in
					Zoom out
					Stretch across
				D	Dissolve

The following are examples of how these special effects can be used to emphasize the messages implied by each of the chart forms.



FLY

1. The pie chart appears whole
2. The design component FLIES UP.



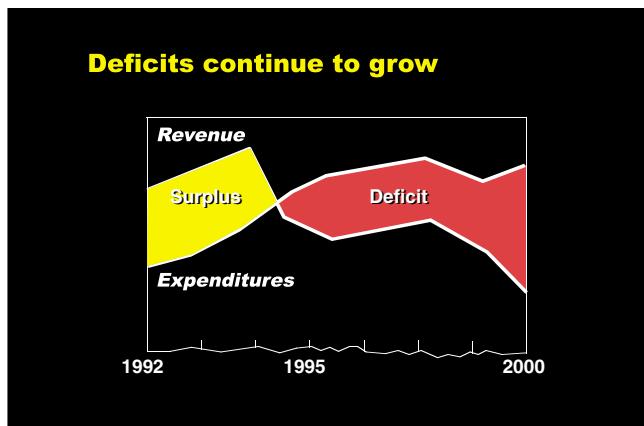
WIPE

The bars WIPE RIGHT from the base.



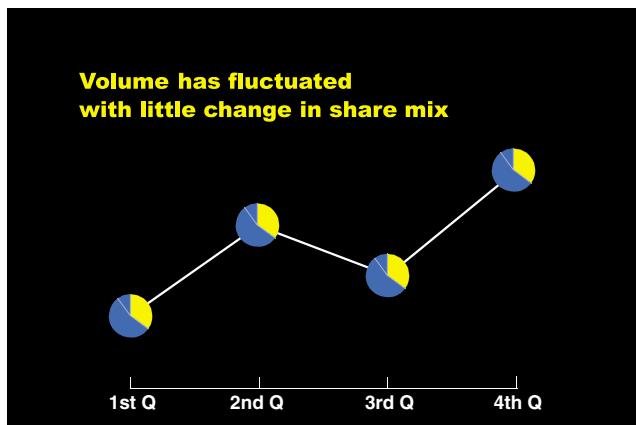
WIPE

The green columns WIPE UP and the red columns WIPE DOWN as they WIPE RIGHT across the visual.



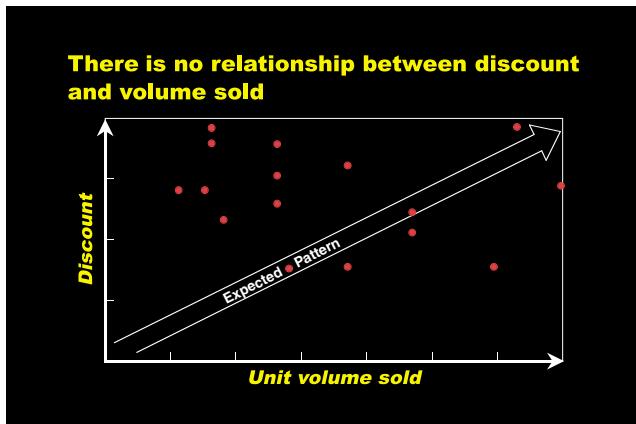
WIPE and DISSOLVE

1. The trend lines WIPE RIGHT
2. The green surplus DISSOLVES
3. The red deficit DISSOLVES.



ZOOM and WIPE

The pie charts ZOOM OUT one at a time as the trend line WIPES RIGHT.



ZOOM and FLY

1. The dots ZOOM OUT
2. The expected arrow FLIES UP.

At the rate technology is changing, I wouldn't be surprised if the ideas in this chapter will need to be revised in the next few years. For now, I would settle for LCD projectors that project bright images so I don't have to douse the room lights, projectors that are as simple to hook up to my laptop and to power sources as it used to be to plug an overhead projector into an electrical outlet back in 1961 B.C. (that's Before.com).



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ABOUT GENE ZELAZNY

Gene Zelazny is the Director of Visual Communications for McKinsey & Company.

Since joining the Firm in 1961, Gene has provided creative advice and assistance to the professional staff in the design of visual presentations and written reports, which has included planning the communication strategy; structuring the story line; interpreting data or concepts and recommending the best visual formats in terms of charts, diagrams, etc.; designing storyboards; and rehearsing the presenters. Also, he has designed and led communication training programs throughout the Firm.

On behalf of the Firm, Gene regularly presents his ideas for *Making The Most of Your Business Presentation* at business schools including Chicago, Columbia, Cornell, Darden, Harvard, Haas, Kellogg, Michigan, Sloan, Stanford, Tuck, UCLA, Wharton, and Washington in the United States, and INSEAD, London Business School, and Oxford in Europe.

Otherwise, you'll find him on a tennis court or on a bicycle, designing chess sets and sponsoring children to do the same, writing essays for his friends, playing with Nate, and always holding hands with Judy.