

ILLUSTRATING COMPUTER DOCUMENTATION



The art of presenting information
graphically on paper and online

By
William Horton

William
Horton
Consulting



838 Spruce Street
Boulder, CO
80502-5122 USA
+1.303.545.6964
william@horton.com
www.horton.com

ABOUT THIS BOOK

Illustrating Computer Documentation is the *first* guide for documentation specialists who need to communicate difficult technical information clearly through the use of graphics. Not simply a "how to" book of computer graphics techniques, it is an "idea" book—a conceptual approach to negotiating the difficult mix of words and pictures.

With this guide, you'll learn how to produce attractive and clearly illustrated documents. William outlines an array of illustrative techniques used in his own professional consultancy work—from everyday lists and tables, symbols, to the more elaborate challenges of photos, drawings and diagrams, and maps—allowing you to literally mold, shape, and sculpt your ideas.

Written by an award-winning veteran of the communications industry, *Illustrating Computer Documentation* shows you a clear, learn-by-seeing approach to the basics as well as fine points of producing clear and creative graphics for documentation:

- Learn to think visually
- Language of graphics
- General purpose graphical forms
- Displaying graphics online
- Design a pictorial language
- Electronically link text and pictures

This book was first published by John Wiley and Sons in 1991. This new version in Adobe's Portable Document Format has been produced using the original Microsoft Word files used to print the original 1991 edition.

ABOUT THE AUTHOR

William Horton

William Horton has been in the forefront of electronic information design since 1971, when he created his first online documentation system. Today, he helps organizations and teams make the transition from traditional to online media.

William Horton practices what he preaches. He is a recipient of ACM's Rigo Award for contributions to software documentation. And his *Designing and Writing Online Documentation* was awarded a WinWriters Author's Choice award as outstanding book.

William Horton is a prolific author. His other books include *Designing Web-Based Training*, *The Icon Book*, and *Secrets of User-Seductive Documents*. He is co-author of *Getting Started in Online Learning* and *The Web Page Design Cookbook*. He is also the author of three books being published in ASTD's series on e-learning: *Leading E-learning*, *Evaluating E-learning*, and *Using E-learning*.

William and his wife Kit, the other half of William Horton Consulting, live in downtown Boulder, Colorado, just five blocks east of the Rocky Mountains, in a hundred-year old house they are lovingly restoring. The kitchen, which he and Kit redesigned themselves, was featured in the April 1999 and September 2000 issues of *Better Homes and Gardens*.

William Horton is a registered Professional Engineer, an MIT graduate, and Fellow of the Society for Technical Communication. He currently serves as a member of ASTD's commission on e-learning certification.

About William Horton Consulting, Inc.

For the past 12 years, the two-person team of William and Katherine Horton has helped organizations plan, design, justify, and perfect online documentation efforts.

William Horton Consulting, Inc., develops prototypes, critiques designs, leads Problem-bashing® sessions, and conducts training in the design and management of online documentation, database publishing, and e-learning.

They also offer on-site courses in the design, management, and development processes for both online documentation and e-learning.

William Horton Consulting's major clients include Apple Computer, Arthur Andersen, AT&T, Central Intelligence Agency, Cincinnati Bell Information Systems, Compaq Computer, Cray Research, DataChannel, EDS, Ericsson, Exxon, Hewlett Packard, IBM, Intel, Kodak, Lotus, Lucent, Macromedia, Microsoft, Mindlever.com, NCR, Nortel, Nokia, Novell, SAP AG, SAS Institute, Software 2000, SPSS, StorageTek, Sun, Tandem, Tektronix, ThinkCAD Bleu, and the U.S. Army.

William Horton—william@horton.com
William Horton Consulting, Inc.
838 Spruce Street
Boulder, CO 80302
+1.303.545.6964
<http://horton.com>

Copyright © 1991 by William Horton

Published by William Horton Consulting, Inc.
30-October-2001

Originally published by John Wiley and Sons, Inc.

All rights reserved.

Reproduction or translation of any part of this work beyond that permitted by section 107 or 108 of the 1976 United States Copyright Act without the permission of the copyright owner is unlawful. Requests for permission or further information should be addressed to the Permission Department, William Horton Consulting, Inc.

Trademarks

HyperCard is a trademark of Apple Computer, Inc. Canvas is a registered trademark of Deneba Systems, Inc. Intergraph and I/EMS are trademarks of Intergraph Corporation. Linotronic is a trademark of Linotype. Microsoft, Microsoft Excel for the Macintosh, and Microsoft Word for the Macintosh are registered trademarks of Microsoft Corporation. Windows is a trademark of Microsoft Corporation. EndNote Plus is a registered trademark of Niles & Associates, Inc. Pictionary is a registered trademark of Pictionary, Inc. Digital Darkroom is a trademark of Silicon Beach Software, Inc. Tektronix is a registered trademark of Tektronix, Inc.

CONTENTS

1	THE NEED TO SHOW	1
	WHY GRAPHICS MAKE DOCUMENTATION WORK BETTER	2
	Graphics aid job performance	2
	Graphics help documents go global	3
	Graphics reach nonreaders	3
	Graphics seduce reluctant readers	3
	Graphics add credibility	4
	Graphics aid thinking	4
	Graphics promote more efficient reading	5
	Graphics can explain visual and spatial concepts	6
	WHY GRAPHICS WORK	6
	Vision is our dominant sense	6
	Graphics are compact	7
	Graphics escape the limitations of linear text	7
	Graphics are readily understood	7
	Graphics are remembered	8
	Graphics are self-correcting	10
	WHY ARE MANY GRAPHICS BAD?	10
	Graphics are treated as secondary to words	10
	Graphics are used just to decorate	12
	Writers know words, not graphics	12
	Communicators lack training	12
	Writers and illustrators do not collaborate successfully	13
	There is no canon of excellence	13
	Research is incomplete	13
	WHEN TO USE GRAPHICS	14
2	VISUAL THINKING AND CREATIVITY	15
	VISUAL LITERACY REQUIRES VISUAL THINKING	15
	Advantages of visual thinking	16
	We all think visually	16

- LEARN TO THINK VISUALLY 17**
 - Learn to observe accurately 17
 - Get training 17
 - Learn to draw 18
 - Keep a visual journal 19
 - Put visuals in the rest of your life 19
- OBSERVE AND IMITATE 20**
 - Keep a notebook of effective visuals 20
 - Study fine art 20
 - Seek models of graphical excellence 21
- PUT PICTURES WITH WORDS 21**
 - Write to encourage graphics 21
 - Convert words and numbers to graphics 21
 - Find graphical forms for what you have to say 24

3 LANGUAGE OF GRAPHICS 27

- THE COMPONENTS OF GRAPHICS 27**
- GRAPHICAL LANGUAGES 28**
 - Parts of a graphic 29
- THE BACKDROP SETS THE STAGE 31**
 - Background 31
 - Frame 32
- GRAPHICAL ELEMENTS 33**
 - Points 33
 - Lines 33
 - Areas 34
- GRAPHICAL CHARACTERISTICS 34**
 - Dynamics 34
 - Position 35
 - Value 35
 - Size 36
 - Color 36
 - Texture 37
 - Pattern 37
 - Shape 38
 - Orientation 39
 - Combinations 39
- PRINCIPLE OF DATA-MAPPING 42**
 - How to encode visual meanings 42
 - Pick a graphical symbol for the concept 42
 - Pick a graphical characteristic 45
 - Choose scaling functions 46
 - Choose scaling parameters 47

Strive for direct mappings 47
 Follow standard mappings 48
MAKING VISUAL STATEMENTS: A BASIC PHRASEBOOK 48
 This exists: Make an object stand out from the background 49
 This is primary: Single out one object 49
 These are a group: Establish a family of objects 51
 These are different: Show contrast 52
 What order: Show rankings 53
 How much: Show quantity 54
 Remember this: Ensure ideas are remembered 54

4 PLANNING GRAPHICS 57

SET A CLEAR OBJECTIVE 58
 Viewer: Who will use the graphic? 58
 Results: What will viewers achieve? 61
 Conditions: How is graphic used? 62
 Success: How well must it work? 64
DECIDE MESSAGES TO CONVEY 65
SELECT THE GRAPHICAL FORMAT 66
 Decide and purchase the product 66
 Install the product 67
 Learn the user-interface and operating system 68
 Run application programs 69
 Program the product 70
 Repair the product 71
CONSIDER THE MEDIA 71
EVALUATE GRAPHICS 73
 Analyzing effort required 73
 Usability testing 73
 Checklist 74
WHO DOES WHAT? 75

5 GOOD GRAPHICS 77

TRUTHFUL 77
 Compare like items 77
 Represent information directly and simply 78
 Label and annotate 78
EFFICIENT TO USE 78
 Immediately obvious 79
 Focused on the subject 79
 Zoomable 79
 Easily viewed and scanned 80

- Consistent 82
- Encouraging exploration 82
- VISUALLY LAYERED 83**
 - Design a simple visual hierarchy 83
 - Create distinct levels of emphasis 84
 - Verify with the squint test 84
- SIMPLE 85**
 - Coherent 85
 - Easy to process 85
 - Clearly organized 86
- COMPLETE 86**
 - Make graphics self-explanatory 87
 - Don't overwhelm the viewer 87
- APPROPRIATELY DETAILED 88**
- VISUALLY HARMONIOUS AND BALANCED 89**
 - Balance 89
 - Stability 90
 - Proportion 90
- SOCIALLY RESPONSIBLE 91**
 - Egalitarian 91
 - Legal 92
- FOLLOW PROVEN CONVENTIONS 92**

6 SHOWING WHAT THINGS LOOK LIKE

- SHOW NECESSARY DETAIL 93**
- SELECT A REVEALING VIEWPOINT 94**
 - Viewing angle 95
 - Apparent distance 96
 - Multiple viewpoints? 96
- CLEARLY INDICATE SCALE AND VIEWPOINT 97**
- PHOTOGRAPHS VERSUS LINE DRAWINGS 97**
- LINE DRAWINGS 98**
 - Focus on the essential characteristics 98
 - Omit extraneous details 99
 - Make primary edges heavier 99
 - Surround objects with white space 99
 - Avoid impossible-scene drawings 99
- PHOTOGRAPHS 100**
 - Use "safe" techniques 100
 - Simplify the photograph 102
 - Keep photographs honest and credible 103
 - Avoid photographic clichés 103
 - Photographs for tracing 104

Color or black and white?	105
Special-purpose photographs	105
SHOWING HOW TO DO SOMETHING	106
Do not overload the picture or the viewer	106
Show where to act	106
Show people in action	107
Make change and motion visible	107
Show what the user sees	109
Use words too	109
SHOWING COMPUTER SCREENS	110
Distinguish different kinds of information	110
Reduce screen images	110
Highlight what is important	112
Reproduce the screen exactly	112
SHOWING PEOPLE	112
Don't let the person distract from the subject	112
Pose people carefully	113
Show average (beautiful) people	114
Avoid unnecessary detail	114
Don't dissect the human form	114
PAINT WORD PICTURES	115

7	SHOWING PROCESSES AND PROCEDURES	117
	SIMPLE SEQUENCES	117
	Paragraph	118
	Numbered list	119
	Checklist	119
	Action-response table	120
	Question list	120
	Sequence of pictures	121
	MULTIAGENT PROCEDURES	121
	Playscript	122
	Process diagram	122
	STRUCTURED PROCESSES AND PROCEDURES	123
	Structured English and pseudocode	123
	Bracket diagrams	125
	Logic-box diagrams	126
	FREE-FORM PROCESSES AND PROCEDURES	126
	Flowchart and logic map	126
	State-transition diagrams	128
	Fence diagrams	129
	MAKING DECISIONS	129
	If-then selection table	129

Decision table 130
Decision tree 131

8 SHOWING ORGANIZATION 133

PATTERNS OF LINKAGES 133

Chain 134
Grid 134
Tree 134
Web 135

TEXT LISTS 135

What are text lists? 135
Why use text lists? 135
How text lists work 136
Format of text lists 136
Multilevel indented lists 137
Make list items consistent 138
Complete the list 138
Keep the list short 139
Order the list meaningfully 139

TABLES 140

How tables work 140
When to use tables 141
Design headings for scanning 141
Minimize lines 142
Make tables accessible 142
Style for scanning 143
Common types of tables 143

DIAGRAMS 144

Symbol-link diagrams 145
Box-border diagram 148
Inclusion diagram 149

WHICH FORM SHOULD I USE? 150

SPECIFIC APPLICATIONS 150

Organization charts 150
Interior views 151
Menu maps 152
Syntax diagram 153

9 LABELING WITH ICONS AND VISUAL SYMBOLS 155

WHERE TO USE VISUAL SYMBOLS 155

QUALITIES OF GOOD SYMBOLS 157

Immediately obvious 157
Attractive 158

- Simple 158
- Informative 158
- Distinct 159
- Concrete 159
- Familiar 159
- Legible 160
- Few 160

PICKING SYMBOLS 160

- Mimicry 161
- Physical analogy 161
- Associated object 161
- Visual figures of speech 162
- Established and conventional symbols 164
- Abstract shape 166
- Forms to avoid or use with caution 166

DESIGN A PICTORIAL LANGUAGE 167

- Establish basic symbols 168
- Add a grammar for composite symbols 169
- Keep the language consistent 170

DRAW MEANING FROM THE REST OF THE DISPLAY 171

COMBINE VISUAL SYMBOLS AND WORDS 172

REVISE TILL YOU GET IT RIGHT 172

SYMBOLS YOU NEED 172

- Computer commands 172
- Mouse and keyboard actions 173
- Parts of manuals 173

10 DISPLAYING GRAPHICS ONLINE 175

A SCREEN IS NOT A PAGE 175

- Online pages are grainier 176
- Online color is different 176
- Navigation and perusal is electronic 177

COMMUNICATE MORE IN GRAPHICS 177

USE GRAPHICAL DESIGN CHARACTERISTICS OF SCREENS 178

- Everybody can use typewriter graphics 179
- Ensure foreground/background contrast 180
- Antialias to cure the jaggies 181
- Dither to blend colors and tones 181

WHEN THE GRAPHIC WON'T FIT ... 181

- Eliminate unnecessary information 182
- Reduce the size 182
- Use multiple pictures 182
- Provide a scrolling view 183

- Let users zoom in 183
- REDUCE DETAIL 183**
 - Fewer layers of detail 183
 - Limit tiny details 184
 - Selectively display detail 184
 - Progressively disclose information 184
 - Selectively mask or filter information 185
- ELECTRONICALLY LINK TEXT AND GRAPHICS 185**
- MAKE TEXT LEGIBLE 186**
 - Use well-formed character shapes 186
 - Size type for reading conditions 187
- MOTION 187**
 - Use visual transitions to guide the eye and mind 188
 - Animate dynamic concepts 189
 - Simulate complex systems for hands-on experience 192
 - Use video to show real objects in motion 193
 - Let the user control the action 194

11 THE AFFECTIVE EFFECT OF GRAPHICS 195

- REMEMBER THE EMOTIONAL COMPONENT 195**
- MANAGING THE EMOTIONAL RESPONSE 196**
 - Motivate the reader to read and to act 196
 - Build the viewer's confidence 197
 - Win trust 197
 - Communicate urgency 198
 - Make the viewer laugh 198
- CARTOONS 200**
 - Uses for cartoons 200
 - Develop a cartoon character 201
 - Use cartoons for negative messages 202
- PRETTY PICTURES 202**
 - Reasons to use pretty pictures 203
 - What is beautiful? 203
 - How to use pretty pictures 204
 - Ideas for pretty pictures 204

	NEVER USE JUST PRETTY PICTURES 205	
12	GLOBAL GRAPHICS	207
	RELY ON GRAPHICS 208	
	CONSIDER READING SKILLS AND HABITS 208	
	CONSIDER ARTISTIC CONVENTIONS AND EXPECTATIONS 210	
	GENERALIZE GRAPHICS FOR AN INTERNATIONAL AUDIENCE 210	
	ACCOMMODATE DIFFERENT LEARNING AND RHETORICAL STRATEGIES 211	
	CONSIDER CULTURAL VALUES AND SYMBOLS 212	
	Symbology 212	
	Modesty and taboos 214	
	Sexual stereotypes and gender roles 214	
	Checklist for cultural and national differences 215	
	LEAVE SPACE FOR TRANSLATION 216	
	WORDLESS INSTRUCTIONS 216	
13	COLOR	219
	WHAT IS COLOR? 220	
	Ways of specifying color 221	
	Color circles 222	
	Color scales 223	
	WHY USE COLOR? 223	
	PROBLEMS CAUSED BY IMPROPER USE OF COLOR 225	
	Color illusions 227	
	HOW TO USE COLOR FUNCTIONALLY 228	
	To control attention 229	
	Show associations 230	
	Speed search for objects 231	
	Represent value with color codes 231	
	Attract and hold viewers 232	
	Show appearances exactly 234	
	Ease reading 236	
	COLOR CODING 237	
	Assign codes in a meaningful manner 238	
	The simple answer: red, yellow, green, and blue 238	
	Use as few colors as possible 238	
	Recommended combinations 239	
	Define and display codes clearly 239	
	RELY ON LEARNED COLOR ASSOCIATIONS 240	
	Natural associations 241	
	Business conventions 241	
	Institutional standards 242	

Be aware of cultural differences 242
COMPENSATE FOR COLOR-BLINDNESS 242
TEST, TEST, TEST 243

14 ENRICHING GRAPHICS 245

CREATE COMPOSITE GRAPHICS 245
 Inserts 246
 Combinations and overlays 246
 Small multiples 246
 Overview and closeup 247
USE WORDS IN PICTURES 247
CAPTION AND TITLE 248
 Number graphics referred to elsewhere 248
 Title to identify graphics 249
 Include the description to guide the viewer 250
 Display the caption with the graphic 250
LABELS AND ANNOTATIONS 251
 Why label? 252
 Connect objects and labels 252
 Phrase labels carefully 253
 Use familiar symbols for labels 253
 Index labels 254
 Make labels and annotations visually distinct 254
 Arrange labels about the subject 255
 Use callout lines to connect label and object 255
 Annotate computer programs 256
DECODE SYMBOLOGY OF THE GRAPHIC 257
 Legends and keys 257
 Orientation cues 257
 Scales 258
NOTES 259
 Use notes for secondary information 259
 Place notes beneath the graphic 260
 Kinds of notes 260
 Source notes 261
 General notes 262
 Specific notes 262

15 PAGE AS PICTURE 265

DESIGN PAGES FOR GRAPHICS 265
DESIGN PAGES AS GRAPHICS 266
 List what will appear on a page 267

- Rank elements by importance 267
- Assign graphical characteristics 267
- Put elements on the page 268
- Test the design 268

PLACE GRAPHICS BY RELATIONSHIP TO TEXT 269

- Put graphics near related text 269
- Repeat graphics as necessary 269
- Put supporting graphics after related text 270
- Consider how graphics are read 270

REFER TO GRAPHICS IN TEXT 271

DESIGN PAGES FOR SEARCHING AND READING 272

- Make blank space work for you 272
- Make graphics easy to find 274
- Balance headings and graphics 274
- Allow continuous reading 275
- One column or more? 276
- Special cases: up, down, left, right? 276

FIT GRAPHICS TO THE PAGE 277

- Size graphics meaningfully 277
- Avoid sideways graphics 278
- Reduce or divide oversized graphics 278
- Divide with care 278

CONSERVE SPACE 279

MAKE TEXT LEGIBLE 279

- Size type 279
- Pick simple, standard typefaces 280
- Style paragraphs for legibility 281

PAINT IDEAS WITH PICTURES AND TEXT 281

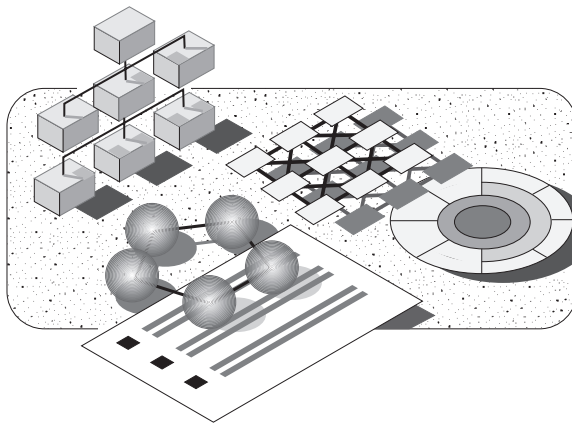
THE CHALLENGE OF THE FUTURE 283

REFERENCES AND BIBLIOGRAPHY 285

INDEX 297

SHOWING ORGANIZATION

8




Whether we are talking about the circuits of the computer, the steps of a procedure, or the reasons for buying a product, understanding depends on seeing how ideas are related and how parts fit together.

Thus, we need a clear, graphic organization that lets a user deal in concrete images rather than ephemeral abstractions (340). Such a visual organization provides a framework into which details can be readily assimilated (341) and makes information easier to understand and to remember (123; 340).

The techniques discussed in this chapter use horizontal and vertical position, proximity, borders, lines, marks, and labels to express relationships of sequence, control, causality, physical and electrical connection, and ranking.

PATTERNS OF LINKAGES

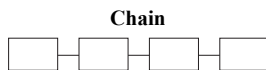
To make organization clear you must have a clear organization—a simple, familiar pattern of relationships among the parts of a system. Sometimes that pattern is determined by the design of the system. In

 To see the importance of making relationships clear, compare the difficulty of memorizing these two lists of words:

ash banyan buttercup chestnut
 conifers daisy dandelion deciduous
 delphinium elm flowers garden lupin
 mango palm pansy pine plants
 redwood rose spruce trees tropical
 violet wild willow

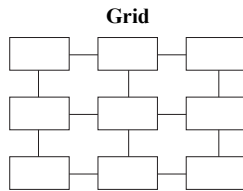
minerals	stones	masonry	limestone granite marble
		precious	sapphire emerald diamond ruby
	metals	alloys	bronze steel brass
		common	aluminum copper lead iron
rare	platinum silver gold		

certain systems one pattern or another may predominate or be the only pattern permitted. In other systems, especially ones that are conceptual rather than physical, it is up to you to fit information into a simple, logical pattern for the viewer. In most cases you must compromise between the patterns suggested by the subject, those most efficient for the task, and those easiest for the user to comprehend. Although no complex system has a single, pure, and simple structure, most can be described as combinations of a few simple models.



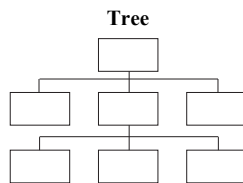
Chain

The simplest is the sequence. Item follows item. The reader has two choices: to go forward or to go backward. Though monotonously predictable, the chain is perfectly reliable. Because it is so safe and sane, the chain is the backbone of most textual documents; it is also implicit in processes and procedures.



Grid

The grid or orthogonal structure organizes and presents information along two logical dimensions. The reader can read down the columns or can skim along the row to compare various items. The ubiquitous grid is a permanent and familiar part of our psyche; we see it embodied in spreadsheets, tables, game boards, street plans, marching bands, and the rank and file of the workplace. This familiarity makes it a popular way of adding another dimension to structure without great loss of predictability.

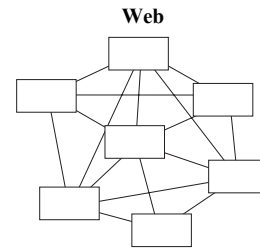


Tree

The same familiarity is also true for the tree structure. The simple hierarchy is the basis for classification and management. The Vatican, the Kremlin, the Pentagon, and General Motors all have hierarchical management structures. We see the tree structure in the 3.4.5 style of numbered headings common in technical manuals.

Web

The web structure is the ultimate in flexibility. Anything can be linked to anything else; associations are not bound to strict rules as for the other structures. The power of the web structure is that with it the designer can construct the other simpler structures, as well as special ad hoc structures, such as cycles, stars, and diamonds. The danger, however, with the web structure is that it quickly grows complex, resembling nothing so much as a bowl of spaghetti.

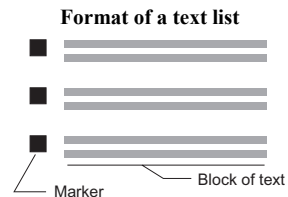


TEXT LISTS

Whether probing the limits of machine intelligence or making a shopping list, we rely on the simple organizing principle of the list. The list is fundamental to our language, even our experience of life. We progress through a succession of days, reason through a chain of events, pursue a train of thoughts, solve a string of crimes. Lists help regulate our lives and jog our memories. Who has not relied on laundry lists, shopping lists, wish lists, or to-do lists?

What are text lists?

The most common kinds of lists are display text lists. These all display a series of short text segments in a vertical stack with each item preceded by a visual marker. The marker is a symbol that provides an easy scanning target so the eye can reliably “fast-forward” to the next item in the series without reading through all the previous items. It provides a conspicuous flag of the beginning of the next item.



Why use text lists?

You might question including lists in a book on graphics. After all, lists, especially word lists, are hardly graphics at all. Yet they are quite important in a book like this for several reasons:

- Lists are the simplest of graphical forms. They are the easiest to understand and create.
- Lists occur as components of other graphics, such as column and row heads of tables and as the scales of graphs and charts.

“Lists help readers find information quickly and easily because readers can scan lists more quickly than they can scan paragraphs. Readers can also extract information more easily from lists than paragraphs.” (58, p. 218)

- Lists can be used in word-only documents where no other graphical form is possible.
- Text lists are the most effective way to present several short pieces of information, especially to novice users (153). They are understood more quickly and remembered better than the same information in body text.

How text lists work

The list format tells the reader at a glance that it is a list, what type of list it is, how many items it contains, and how long the items are (58). Transitions and organization are signaled by blank space and indentation rather than by words or punctuation (167). Each item is usually preceded by a visual marker. These visual markers:

- Help the eye to quickly find the beginning of the next item
- Signal the type of list: bullet, numbered, checklist
- Show how many items are in the list, especially if the items are closely spaced
- Convey information about each item, for instance, its order in sequence or ranking

Format of text lists

Popular style guides and experts are either evasive or contradictory on the subject of text lists (246). The following suggestions, though not universally accepted, seem to represent an intelligent compromise among common practice, common sense, and expert opinion (58; 246; 335; 337).

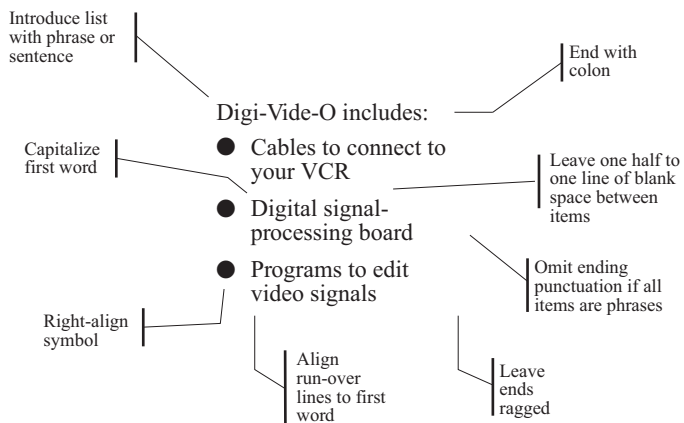
Avoid run-on lists

X No	X No
■ xxx xxxx xxx xx xxxx xxx	■ xxx xxxx xxx xx xxxx xxx
■ xxxx xxx xxxx xxx xx xxxx	■ xxxx xxx xxxx xxx xx xxxx
■ xxx xxxx xxx xxxx xxx xx xxxx	■ xxx xxxx xxx xxxx xxx xx xxxx
■ xxx xxxx xxx xxxx xxx	■ xxx xxxx xxx xxxx xxx
■ xx xxxx xxx xxxx	■ xx xxxx xxx xxxx

✓ OK, if space is tight

```


■ xxx xxxx xxx xx
xxxx xxx ■ xxxx
xxx xxxx xxx xx
xxxx ■ xxx xxxx
xxx xxxx xxx xx
xxxx ■ xxx xxxx
xxx xxxx xxx ■ xx
xxxx xxx xxxx
    
```



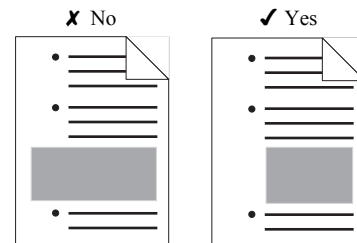
Do not indent the marker into the body of the list item as is often done with flush and run-on lists. If space is tight you may run list items together in a paragraph format, while making the marker bolder so it stands out from the text. Keep the marker small, no larger than a capital M, but make it prominent enough that the eye can easily find the beginning of each item.

Don't interrupt lists with graphics or make subordinate information more prominent than the list items. Doing so splits the list and makes it harder to scan.

The marker signifies the type of list and how the items are related.

Marker	Used for...	Notes
(None)	Very simple equivalent items	If all items are less than a line, you may omit the symbol (335).
Bullet ●	Equivalent items without sequence, ranking, or ordering (58; 246)	Instead of the standard bullet markers, you can substitute a simple visual symbol that conveys more information about the list item. For instance a list of office activities might include: 
Number 7.	Step-by-step procedure or set of ratings (58; 208)	Use letters if the list items are numbers (58). For short lists you can precede each step with an increasing number of bullets (180): <ul style="list-style-type: none"> • Step one •• Step two ••• Step three
Check box □	Lists where the reader must consider all items (58)	Because a checklist can be used only once, you may want to use a numbered list for step-by-step procedures that are repeated.
Word	Definitions of terms	Position and align terms to speed scanning.

Don't split lists



Multilevel indented lists

We can extend the format of text lists beyond the limits of the simple chain to include tree structures as well. Such multilevel lists use indentation to show multiple levels of abstraction, inclusion, or detail.

Multilevel bullet list

- First level
 - Second level
 - Second level
- First level
 - Second level
 - Second level
 - Second level

Multilevel numbered list

1. First level
 - a. Second level
 - (1) Third level
 - (a) Fourth level

Consider sublists for lists over five items (58). Multilevel lists let people find individual items quicker. The reader finds it easier to read an indented list than to scan a table. A hierarchical search involves only one point of attention. For quicker scanning, make subordinate heads complete, even if this requires some redundancy with higher-level heads (346).

In general, limit lists to no more than three or four levels. Use en-dashes (–) or hyphens (-) to label the second level in a bullet list. In a numbered list use these symbols: 1., A., (1), and (a).

Make list items consistent

List logically comparable items and format them similarly.

Present items of the same type. Do not mix logical categories within the items of a list. Violation of this rule can produce confusion ... or humor, as in Mark Twain's classic summary of his life:

I have been in turn reporter, editor, publisher, lawyer, burglar. I have worked my way up and wish to continue to do so.

Or Groucho Marx's definition of an ordinary fellow:

42 around the chest, 42 around the waist, 96 around the golf course and a nuisance around the house.

Present items in the same grammatical and pictorial style.

Remember that lists are scanned more than read and any elegant variation may obscure the meaningful differences the viewer depends on to distinguish similar items (246).

Complete the list

Often careless or lazy writers test our intelligence and patience by asking us to interpret statements such as:

The control panel contains knobs, etc.

This is like trying to geometrically define a straight line by giving only one point. The line can go in any direction. And so will the reader's imagination, unless clearly pointed in the correct direction. Almost as ambiguous is a statement such as:

The repair kit contains 100-ohm resistors, screwdrivers, a log book, and so forth.

Keep the list short

Lists work best for sequences of three to nine items. Fewer than that, and there is little advantage over the paragraph format. More than that, and the list looks intimidating and is hard to remember (210). If the series is longer than nine items, consider rearranging it as a multilevel list of sublists or else presenting it in alphabetical or numerical order to simplify finding individual items.

Order the list meaningfully

Order items in the list to accomplish your most important point. Arbitrary order or no order is do-it-yourself order. If the order is not apparent, the reader will impose an order on the list. The order the reader imagines may not be the one you intended. Pick a clear strategy for ordering the list and make the order clear.

For this purpose ...	Present items in this order ...
Teach location of controls on a panel or display	Spatially, left to right, top to bottom, or clockwise as in the user's field of vision
Teach use of controls	Chronologically by order of use in most common procedures
Describe a process	Chronologically from beginning to end; logically from cause to effect
Spell out a procedure	Chronologically from first step to last—save the flashbacks and time travel for your science fiction novel
Convince or persuade	Climactic from least to most convincing; "clincher" order, that is, from more to less convincing, but saving the strongest item for last
Sell a product	Logically from general feature to specific benefit
Have information remembered after some delay	From most to least important
Have information applied immediately	From least to most important

- Enable user to scan and find items in a long list Indexed order, arranged alphabetically or numerically. Use alphabetical lists only as a last resort. Users find information more quickly when arranged by familiar categories (346).
- Compare and contrast items Ranked from best to worst
- Explain a puzzling phenomenon, such as an error message Logically from effect to cause

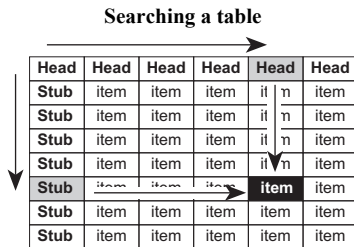
If the order is not readily apparent, explain it in the introduction to the list.

TABLES

For over 5,500 years people have used tables to organize complex information into neat rows and columns. The basic grid structure of the table permeates technological civilizations which march by rank and file and lay out their cities into a grid of blocks. No wonder, then, that tables are a natural way to organize many separate pieces of information needed by computer users.

How tables work

Tables ingeniously let the impatient reader zip right to the single nugget of information while bypassing everything else. By merely scanning two lists of headings—one horizontal and one vertical—the reader locates the information sought at the intersection of a row and a column. Likewise from row and column position, viewers can infer qualities of table entries and can accurately interrelate many concepts at a time (106).



When to use tables

Whenever items can be arranged by two characteristics, you can organize them into a grid and present them in a table. Tables work well for both small and large sets of data. They can summarize a few data items or provide reference to thousands. Use tables to:

- Present a large amount of detailed information in a small space (315).
- Facilitate detailed, item-to-item comparisons (223).
- Show individual data values precisely (149).
- Simplify access to individual data values (50).

Design headings for scanning

Place in the column and row headings information that is unique to the row or column and that applies to all its members. If information is too long or detailed to go in the heading, put it into a table note and cite the note in the heading.

Tables can include multiple levels of column and row headings. If the table contains more than one level of column headings, let the main heading span subheadings. Include a line under the main heading. Extend the underline from the beginning of the first column to the end of the last column covered. Always leave visible space between the underlines of adjacent columns (81). Indent subordinate row headings. Indent them more than continued lines of headings (192).

Place an ellipsis (...) after any header continued in other headings or in the body of the table.

Design tables so that all columns, including the leftmost, have headings. The leftmost column heading labels the row headings below it, not the other column headings to its right (81; 118).

If table headings are boxed, center them vertically. If unboxed, center them flush bottom near the start of the columns they label (81).

Two-level column heads

Column head		Column head	
Subhead	Subhead	Subhead	Subhead

Two-level row heads

Row head
Subhead
Subhead
Row head that is continued
Subhead
Subhead

Areas of a table

Column heads	
Row heads	Body

X Seldom necessary

Column head	Column head	Column head	Column head
Row head	Item	Item	Item
Row head	Item	Item	Item
Row head	Item	Item	Item
Row head	Item	Item	Item

✓ Often sufficient

Column head	Column head	Column head	Column head
Row head	Item	Item	Item
Row head	Item	Item	Item
Row head	Item	Item	Item
Row head	Item	Item	Item

Minimize lines

Avoid the fish-net school of table design. Excessive lines make a table harder, not easier, to read (118). So do without them if you can; use thin lines if you must (314).

Since space is usually adequate to show functional groupings in a table, lines are seldom required. Add lines only as they seem necessary:

- To separate title, heads, body, and notes
- To show the extent of a heading spanning multiple columns
- To show logical groupings
- To separate closely spaced columns
- To guide the eye.

Make tables accessible

To find information in a table, the user must formulate a question in terms of the table's row and column heads. Success, then, depends on how well the table's organization anticipates the user's questions (346).

Arrange rows and columns to make finding an individual item in the table simple and natural (86). Order rows and columns by a clear, logical scheme that the reader can readily grasp and use to quickly locate the appropriate column and row headings.

In tables, group similar items so viewers can compare them and see logical relationships (346). Make items in a row or column parallel in form and logical category (138). Information may vary by column or by row—but not both at the same time. Especially avoid unnecessary changes of units: for example, switching from inches to centimeters. Use chronological order for information recorded in sequence or by date or time. Put more important and more frequently accessed items toward the top and left so they are found more quickly. Arrange major and subordinate items in order from whole to parts. Group together items of the same type or size. Place items that will be compared close together. Put comparable numbers in a column so they can be compared or summed digit by digit. Put pictures and words side by side (51).

Style for scanning

Never space out the columns of a table merely to fill out a text column. Space columns for legibility and either center or left-justify the table within the text column (335). Gaps between columns should be no more than three to five times the distance between lines. To achieve this ratio, stack column heads, run them vertically, or use a moderately condensed typeface. If you cannot closely space columns, increase the space between rows.

If the layout of a table is awkward, consider switching rows and columns (161). If a table has too many headings and subheads, consider breaking it into two or more tables (192). If a table is too wide, try converting columns to rows (335).

In tables that are scanned, such as tables of error messages, emphasize the differences between individual headings and entries so users can locate the sought after item quickly. In such tables, show items with only two or three possible values graphically rather than as separate columns for each alternative.

Unless obvious, flag and explain missing data. Indicate missing data with words such as “none” or “not applicable” or with a symbol such as a dash (81; 223).

Common types of tables

The remainder of this segment considers the design of specific types of tables.

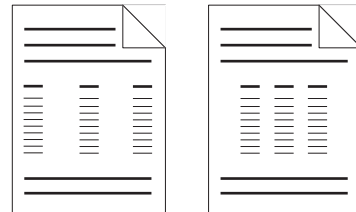
Look-up-a-value tables

Most tables are designed to let the reader quickly find one single value. In such tables the reader scans the row and column headings for those that describe the target item. The desired information is then located at the intersection of the row and column bearing these headings.

For such tables, design column and row headings for scanning. Make them distinctive and keep them short. Use column and row headings and subheadings to express a hierarchy of choices. Use blank space or lines to guide the eye horizontally and vertically about the table. Consistency of formats and alignment within columns and rows help guide the reader's eye and emphasize the logic and organization of the table.

Keep columns close together

✗ No ✓ Yes



Emphasize the differences

✗ No

Model	Good	Better	Best
3841	■		
3851		■	
3861			■

✓ Yes

Model	Quality
3841	■
3851	■■
3861	■■■

Example of look-up-a-value table

Model	Switch settings		
	640K	2Mb	8Mb
2860	1	2	3
3860	4	5	6
4860	7	8	9

Example of a selection table

File format	Color?	Option
.PDX	No	PX
	Yes	PCOLOR
.QDZ	No	QZ
	Yes	QCOLOR

Example of a matrix table

Cambricomp System Boards			
CPU	Speed		
	20MHz	30MHz	40MHz
68020	202C	230C	240C
68030	302C	330C	340C
68040	402C	430C	440C

Matrix shows interrelationships

From	To				
	A	B	C	D	E
A	-	●	●		
B	●	-	●	●	●
C	●	●	-	●	
D		●	●	-	●
E		●		●	-

Simplify matrix

	E	D	C	B
A			●	●
B	●	●	●	
C		●		
D	●			

Decision and selection tables

Decision tables guide the reader in making complex decisions. They simplify selecting one alternative from many possibilities. They summarize if-then conditions in a way that the reader can quickly and reliably identify the current situation and decide how to proceed. Such tables can thus summarize long, complex sets of instructions. They are ideal for quick reference or summary. (Decision and selection tables are described in Chapter 7).

Matrix tables

Matrix charts are grids in which the row and column headers are uniformly spaced scales or categories and each cell presents information about the combination of values represented by the cell. The periodic table of the elements is an example of a matrix table. In addition to looking up a value, the viewer can read the table from inside out. The viewer locates a familiar item in the matrix and then deduces its characteristics by its row and column and by its neighbors.

Any diagram can be represented as a matrix with one row and one column for each object and their relationship posted at the intersection (24). If every item is related to every other one, use the matrix table. If interrelationships are sparse, use a diagram (223).

In matrix tables that show reciprocal relationships, you can usually omit half the table and rearrange the rows and columns to simplify reading (81).

DIAGRAMS

Diagrams show how pieces work together. Since they express relationships, they are especially suited to showing how various components of a system interact. Diagrams connect items in recognizable patterns or topologies, such as chains, rings, trees, and webs.

Diagrams used alongside text help reveal the structure of information. Displaying relationships two-dimensionally this way helps users understand complex relationships more easily (178; 340) and classify ideas more reliably (340).

Diagrams also enable designers to exchange ideas and plan massive projects. And because diagrams promote clear thinking, they can speed the work and improve the quality of a design.

Symbol-link diagrams

Symbol-link diagrams are the most versatile way for showing any pattern of conceptual relationships. They are widely used in technical documents and readers are well acquainted with their conventions. They are especially appropriate when many concepts are tied together by a sparse network of relationships. If every concept is related to every other, consider a matrix table instead (223).

How symbol-link diagrams work

Symbol-link diagrams consist of symbols, which represent the objects of the system, and links, which represent the relationships among them. Symbols may be pictures, icons, dots, boxes, and words; links are lines and arrows.

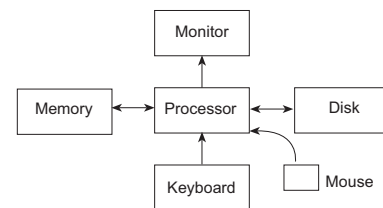
Create recognizable symbols

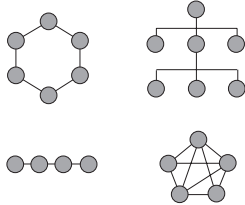
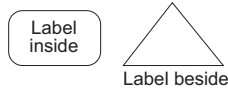
Symbols represent the objects or key concepts of a system. They can be a combination of:

- Detailed pictures
- Silhouettes or icons of familiar objects
- Solid or outlined geometric shapes
- Words
- Points

“The essential purpose of a diagram is to analyze or break down an object or event into its parts, rather than merely describing it verbally or representing it photographically. The complete picture is therefore either stylized, cut up, or dissected, so that a construction, a mechanism, or a function can be explained.” (97, p. 229)

Block diagram of a computer



Simplify symbols when showing patterns**Label symbols**

Use realistic, detailed drawings for symbols in diagrams to highlight critical characteristics and to aid low-verbal learners (201; 340). If a diagram mixes hardware and software or concrete and abstract, use more detailed, realistic, three-dimensional symbols for concrete and tangible objects and use simple, geometric shapes for abstract concepts and software constructs. If only the pattern of relationships among objects is important, use only dots or squares for the objects and make the illustration quite small.

Use larger symbols for more important objects in a diagram. Do not use so many symbols that the reader cannot easily learn and remember the meaning of the symbols. More than five or six basic symbols is too many.

Label all symbols. The more abstract or schematic the diagram, the more it relies on text labels for explanation (97). Put labels next to or within the visual image they label. Put labels inside hollow shapes unless they will not fit. If space does not permit a complete label, place a short label in or near the shape and use a footnote to provide more information.

Draw links to show relationships

Links connect symbols. Each symbol should be connected to at least one other symbol. Links express the relationships of the system. The pattern of linkages among symbols is the message of the diagram. Each link is like a sentence expressing a relationship between two items of the system. Links can show relationships in one direction, in both directions, or in no particular direction. Links are represented by lines and optional terminal symbols and labels.

Various types of connections can be shown by using different types of lines. You can vary or restrict the following:

- **Weight or width of the line.** Use heavier lines for more powerful or important relationships.
- **Number of lines.** Use double lines for primary relationships and single lines for secondary relationships.
- **Style of line.** Use solid lines for primary and concrete relationships. Use dashed and dotted lines for secondary or abstract relationships. Use the line pattern to distinguish between a few different types of relationships.
- **Curvature or direction of the line.** Straight lines suggest directness; jagged lines, excitement; fluid curves, smooth transition. You may also vary direction and curvature to make lines easier to distinguish and to follow.

If the diagram contains different types of lines, label them (201). Keep the labels horizontal if possible. Place the label next to the link. Do not use arrows to connect labels to links. In some cases, however, it may be necessary to run the text along the link. Avoid curving text. Rotate the entire label, not its individual letters.

The shapes of the ends of bars and lines can reveal the nature of the link symbolized by the line. Terminators are small symbols at the ends of lines that further qualify relationships; for example, arrow heads show direction of a relationship.

Arrange symbols for meaning

In arranging symbols in the diagram, use position and proximity to express or reinforce relationships among objects (340; 341).

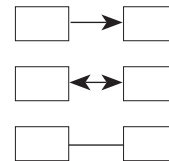
- Arrange objects with respect to their analogous real-world positions, orientations, and directions. Pay special attention to objects that are typically above or below the viewer's horizon.
- Arrange objects in diagrams by the “semantic distance” between them. Put similar and closely related items close together. Put more distant concepts farther apart.
- Put more general or powerful concepts “over” more specific or less powerful concepts.
- Put central concepts in the center. This will draw attention to them first and then let the eye explore related concepts.
- Arrange sequential concepts in a line and cyclical ones in a loop.
- If in doubt about placement of objects, follow the natural word order of the language.

Simplify and clarify the display

Free-form diagrams are often called “can-of-worms” diagrams or “COW” diagrams for short. The lines between symbols seem to meander like the trails of cattle (196). They are difficult to understand, to maintain, and to revise (109). But these difficulties are not necessary. Without changing the meaning of the diagram, we can often simplify and clarify its display.

Text along a line

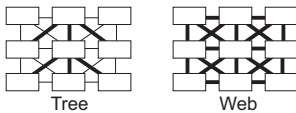
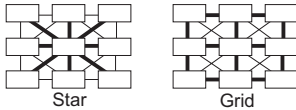
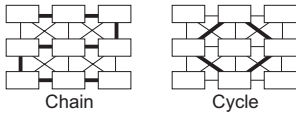
Show direction of relationships



“For English speakers, as for speakers of many other languages, sequences of ideas are expected to run from left to right and from top to bottom over the page. Thus simply arranging elements in this configuration, even without using lines or arrows, is an effective device for illustrating sequential processes.” (340, p. 302)

Emphasize the primary pattern

Different patterns emphasized



“Sometimes the advocates or owners of a particular diagramming technique defend it more like pagan priests defending a religion than like computer scientists seeking to advance their methods.” (196, p. 4)

- Emphasize the primary pattern of relationships in a diagram (340).
- Group or consolidate similar lines or closely related objects (201). If a diagram involves more than about 30 components, try grouping some of the components and showing them on a supplementary diagram (223).
- Simplify all lines and other paths the eye must follow (345). Make the paths between resting points smooth, short, and simple. In decision trees and flowcharts, consistently position yes and no answers.
- Make the natural flow through a diagram from top to bottom and left to right. Minimize the backward flows and clearly label them (340).
- If objects are highly interrelated, arrange them in a circle so all interrelationships can be shown by straight lines (24).

Follow conventions, if any

Most technical disciplines, such as computer science and architecture, have formal diagramming techniques. These techniques are standardized and well codified. If such a system exists, you should follow it scrupulously. Failing to do so can result in miscommunication or even worse. Architectural house plans, for instance, are part of a legal contract. When using a standardized diagrammatic form—such as logic circuits, Warnier-Orr diagrams, or electronic schematic diagrams—draw the diagram in the simplest, most unadorned style possible. Any attempt at decoration will make the standardized symbols harder to recognize.

Box-border diagram

Like symbol-link diagrams, box-border diagrams arrange symbols to show relationships and to represent concepts. With box-border diagrams, concepts are represented by blocks or areas. Relationships are represented, not by lines, but by borders between adjacent objects.

Stacked-block diagrams represent conceptual relationships through the familiar metaphor of stacked blocks. They use vertical position or gravity to represent support and dependency and use common borders to represent connections. They are visually attractive, and the analogy to familiar, three-dimensional objects ensures they are easily understood (340). Each layer provides an additional type of service by drawing on services provided by lower levels.

Three-dimensional blocks also offer another dimension of relationships as blocks can be drawn beside as well as on top of one another. Because three-dimensional blocks look more like concrete objects, they further enhance the solid-blocks metaphor. Our experience with solid objects and with gravity provides a strong, familiar metaphor to make the supporting role of lower blocks obvious and understandable.

Inclusion diagram

Inclusion diagrams use borders and areas to show relationships of inclusion, overlap, and exclusion. A box reduces the semantic distances between the objects it contains and increases the distance between objects inside and outside the box. Use boxing to emphasize similarities of the objects within the box (341).

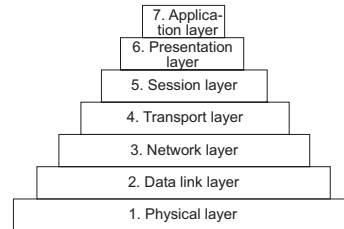
Chinese-box diagram

Chinese-box diagrams use boxes within boxes to show a hierarchy of inclusions. In such diagrams, place subordinate concepts within the boundaries of encompassing concepts (340).

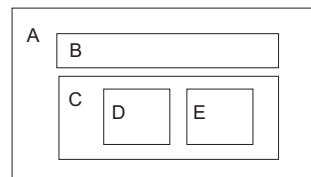
Onion diagram

To emphasize the inclusive nature of layers and to reinforce a shell or onion metaphor, draw a hierarchy as a shell or onion diagram. Such a diagram emphasizes the equality of parts and the fact that the core can be reached only through the outer layers.

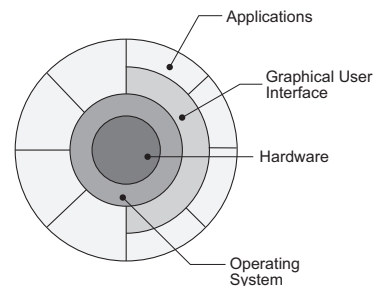
Example of box-border diagrams

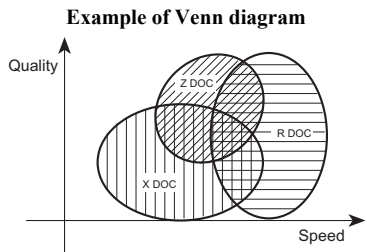


Example of a Chinese-box diagram



Example of an onion diagram





Venn diagram

Venn diagrams use bordered areas to represent conceptual categories. Such diagrams can show which concepts include or exclude other concepts. They can also show concepts that overlap—something that the other diagramming forms cannot.

WHICH FORM SHOULD I USE?

The general-purpose techniques described in this chapter are both flexible and familiar. Because they are flexible, you can use them for various subject matters: hardware and software, concrete and abstract. Several of them, especially symbol-link diagrams, can describe various structures and their variants and hybrids. They are familiar to readers of technical publications. Their many incarnations are well established and readily understood by readers of scientific and technical documents.

The following table lists the main graphical forms and the structures they can represent.

Graphic	For this pattern of relationships ...			
	Chain	Grid	Tree	Web
Text list	■			
Indented list	□		■	
Table		■		□
Symbol-link diagram	□	□	■	■
Stacked-block diagram	■	□	□	
Inclusion diagram	□		□	

■ = Primary use □ = Secondary use

SPECIFIC APPLICATIONS

Now let's look at some established formats for showing how specific kinds of systems are organized.

Organization charts

Organization charts are symbol-link diagrams that display the interrelationships within a hierarchical organization. Organization charts thus show the makeup (or breakdown, depending on viewpoint) of a system. That system may be the divisions, departments, and work groups of a corporation; the assemblies,

subassemblies, and components of equipment; or the modules, routines, and subroutines of a computer program.

Organization charts can be drawn vertically as a pyramid, vertically as a tree, horizontally, or circularly. On a multilevel organization chart, the biggest problem is usually running out of space for boxes. Solutions include starting in the center and branching outward or turning the chart on the page (180). The drop-down tree diagram emphasizes sequence at the expense of hierarchical level.

Organization charts should be balanced, like a well-developed tree: not too many branches on one side or another. An unbalanced organization chart will draw attention to the imbalance in the organization (180).

In an organization chart, use solid lines to show official command and control relationships. Use dashed lines to show coordination, communication, and temporary relationships. To show relative importance, use larger boxes, bolder borders, and higher (or leftward) positions for more important items.

Interior views

Showing physical organization requires looking inside to see how things are put together. Such interior views help us understand, appreciate, and repair equipment.

Internal views are not a new invention of twentieth-century technology. Australian aborigines include internal organs in drawings of kangaroos. Children often draw the baby inside the mother's abdomen (11). Cutaways, skeletal views, and phantom views provide a familiar frame of reference for the viewer and give us X-ray vision (8; 125).

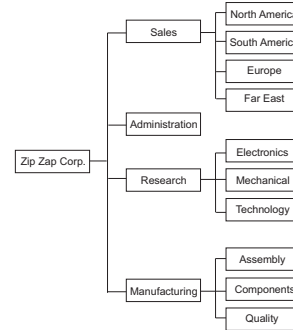
Cross-section

A cross-section shows an imaginary slice through an object. It reveals the location of ordinarily hidden components.

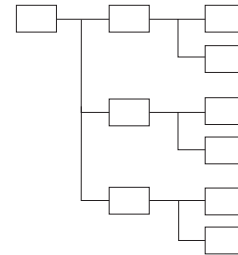
Cross-sections work better for more technical viewers. Engineers prefer cross-sections for showing how something is designed or constructed. Repairmen prefer simple exploded parts diagrams to show how it is assembled.

A broken section removes a surface from an external view to reveal a cross-section of an important component (223).

Example of an organization chart

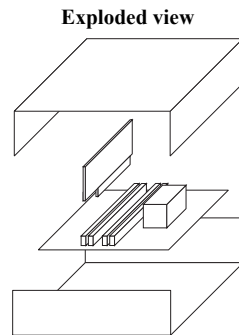
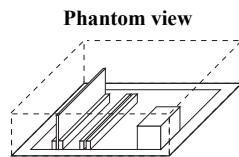
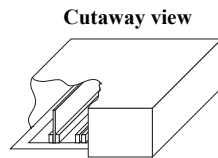
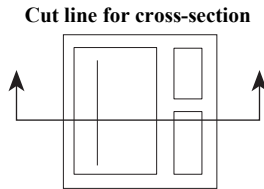


Example of a drop-down tree diagram



Cross-section





Sometimes the most revealing cross-section is not one that cuts along a straight slice but one that zigzags or even circles through the features of most interest.

To help viewers understand cross-sections, include a separate graphic showing the cutting plane line. In this view, show the object 90 degrees from the cross-section view. Use a heavy dotted line to show the cutting plane line. For symmetrical objects, you can draw a half-section showing the surface of one-half of the object and the interior of the matching half.

Cutaway view

Cutaway views show a small part of the interior of an object through a break in its exterior surface (223). They show both the construction of the object and its exterior. For untrained viewers, the cutaway provides better orientation than a cross-section.

Phantom view

To clearly show hidden parts, draw them in full and superimpose an outline of the edges of surrounding objects. Such a drawing is called a phantom view (223).

Exploded view

Exploded views show a complex device separated into its components to reveal how the parts fit together and to make clear internal relationships that are invisible on the assembled unit (138). Exploded views are excellent for showing technicians and laymen how to take something apart and how to put it back together again.

If assembly is not along a single straight line, use a dotted center line to show the direction along which parts are collapsed. Use branching lines to show alternative assemblies (223).

Menu maps

Menu maps combine techniques of flowcharts and state transition diagrams to give users a road map of the screens or menus they go through to perform a task. Such menu maps help users navigate a complex interactive system. Showing a command's position in menus answers two important questions: Where does this fit in the scheme? And, how do I select it?

