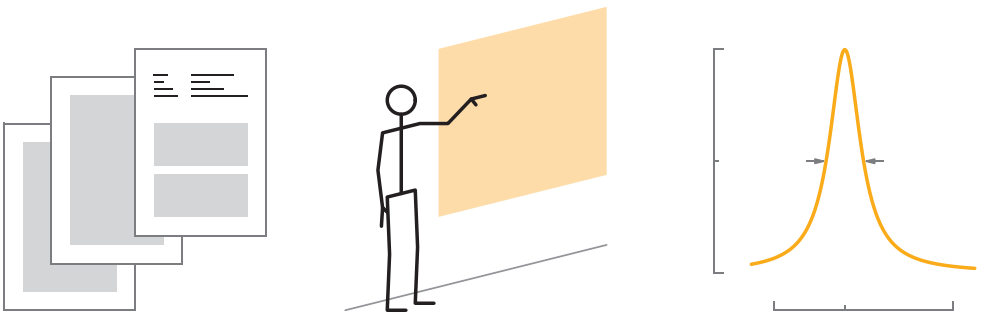
Trees, maps, and theorems

Effective communication for rational minds

Jean-luc Doumont



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About this book

In quest of solid written support for the participants of my training sessions, I searched libraries, bookstores, and mail-order catalogs, but to no avail: I did not find a reference that quite matched the approach I had developed. Encouraged by the feedback on my lectures and publications, I thus set to create my own book on effective communication, for my usual audiences of engineers, scientists, and managers. The outcome of this endeavor is the book you are now reading.

This book is about first principles. It is about strategy and, especially, about structure. To borrow Hemingway's words, it is about architecture, not interior decoration. It is about constructing communication deliberately and methodically. It is about reaching a given purpose with a given audience, in virtually any professional situation—and in any language.

This book is for professionals who want to master the basics, that is, to understand them clearly and apply them carefully when communicating on the job. It is for those who believe that effective communication skills are an invaluable, lifelong personal asset and who want to keep strengthening this asset. As such, it benefits students, too, notably graduate students.

This book, however, is no self-study course—no book can be. Sharpening one's skills requires practice on one's own material. Moreover, it requires feedback, for practice without feedback is of little use. Global feedback may come out of the situation (*Did I get my message across?*). A careful analysis, in contrast, requires an instructor or mentor—a human being, not a book.

This book has been described both as a minimalist user guide, with its concise instructions, carefully selected applications, and answers to frequently asked questions, and, interestingly, as a children's book, with its precise yet straightforward tone, its exposition of one topic per double page (most of the time), and its illustrations. These two descriptions are fine with me.

On what do you base your recommendations?

The guidelines in this book are based mostly on common sense and experience. They have been put to the test, not only in my own practice, but also by thousands of engineers, scientists, managers, and other professionals worldwide who took part in some of my training sessions. I hope the guidelines can be as useful to you as they apparently are to these professionals.

Moreover, my approach is no doubt influenced by my education as an engineer and scientist, and—in ways difficult to trace or to quantify—by all I have read or heard on communication.

Do you rely on empirical research at all?

Well-conducted research in any scholarly field is normally thought-provoking at the very least, so research findings should not be disregarded. Still, empirical research about communication suffers from very many confounding factors and is thus hard to generalize toward practice. In my experience, far too many people apply poorly understood research outcomes blindly, sometimes to the extent of generating myths. I would rather that they thought for themselves.

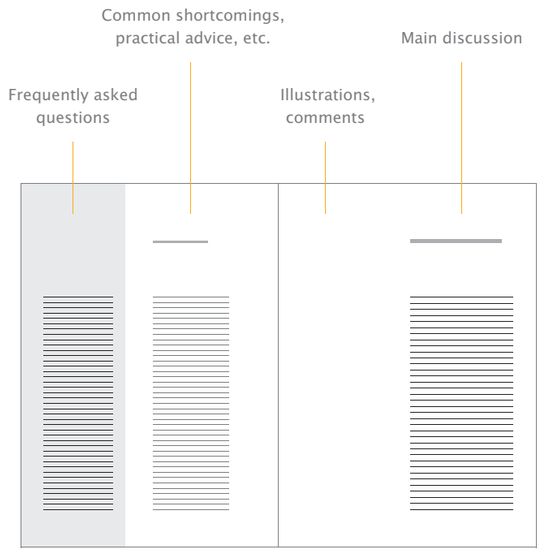
Why such a focus on counterexamples?

Remarkably, there is nothing quite remarkable about instances of effective communication: they draw one's attention to the ideas expressed, not to themselves, so they are hard to learn from by imitation without the contrasting viewpoint provided by a counterexample. Also, learning to pinpoint shortcomings in one's own practice is a necessary step toward improving on them.

How to use this book

This book was designed to propose a logical flow for the discussion while enabling selective reading of individual parts, chapters, or sections. Feel free, therefore, to read the complete discussion linearly or to jump ahead to the themes of interest to you. Topics are discussed in one double page each time (or in a small integer number of them), to facilitate their direct access or out-of-sequence processing.

The pages, too, are formatted for selective reading. The right page is reserved for the main discussion, with illustrations, limited examples, or comments placed left of the text. In relation to this discussion, the left page answers frequently asked questions collected at the occasion of lectures and workshops, set on a gray background. In the remaining space, it lists typical shortcomings, offers practical advice on specific subtopics, or broadens the discussion.



This book is organized in five parts: first, fundamentals, then written documents, oral presentations, and graphical displays, and finally application to five more specific types of document. It ends with notes and references, as well as an index of topics.

Part one, *Fundamentals*, introduces the ideas that underpin the four subsequent parts. Probably the most arduous part of the book as it lacks the examples that appear further on, it can be skimmed or perhaps skipped at first by the reader eager to start work on documents, presentations, or displays. Still, it answers many a *why* about further recommendations and, by offering a minimal set of universal principles, it equips readers for most challenges of professional communication.

Part two, *Effective written documents*, offers a methodology in five steps to proceed from scratch to a complete document, namely planning, designing, drafting, formatting, and revising the document to be created. It details each of these five steps.

Part three, *Effective oral presentations*, proposes a similar yet distinct approach in five steps: planning the presentation, designing it, creating the slides, delivering the presentation, and answering questions. Though meant to stand on its own, it does not repeat uselessly what has already been discussed in detail about written documents, in particular planning.

Part four, *Effective graphical displays*, first classifies pictures as a way to help readers choose the right representation, then discusses how to plan, design, and construct optimal graphs, and finally how to draft a caption that gets the message across.

Part five, *Applications*, illustrates how the general guidelines in the previous parts apply to five common types of documents. Specifically, it examines sets of instructions, electronic mail, Web sites, meeting reports, and scientific posters, each time particularizing earlier recommendations or adding new ones.

Contents

Need paragraphs always be parallel or serial?

Paragraphs need not always be entirely parallel or entirely serial. They may use a combination of the two structures, or be "pseudo-parallel," (lining up comparable yet not identical subjects). To be readable, however, they should not miss opportunities for a parallel or serial structure, such as introducing a switch in subject (A → C) that does not reflect a switch in topic (yielding A–B C–A, instead of the parallel link A–B A–C) or positioning a new item (C) before an item (B) mentioned in the previous sentence (yielding A–B C–B, rather than the serial link A–B B–C).

Is the parallel structure not boring to read?

Parallelism may seem to encourage repetition. Not so, however: unpleasant repetitions must of course be removed lest they become noise, but not by uncalled-for variations in structure. When attempting to "parallelize" a paragraph, you can remove resulting repetitions by using pronouns and by combining related sentences, not unlike rewriting $3ax + 5ay$ as $a(3x + 5y)$.

How should I punctuate a displayed list?

The rules for punctuating displayed lists vary from book to book (and language to language). Whichever you decide to apply, be consistent. For written documents, consistency suggests using in lists the general rules of punctuation and capitalization: thus, capitals and periods for full sentences, and commas or semicolons to separate phrases or clauses within a sentence. For oral presentations, the desire to be visual may suggest dropping the punctuation marks in lists (and perhaps in some other text items).

Drafting effective lists

Common not only in written documents but also on oral presentation slides, lists too often exhibit shortcomings that render them plainly ineffective. Lists are for displaying comparable items in a way that encourages their comparison or memorization, not for making a loose set of items look organized. Whether they are displayed (with or without bullets) or typeset as part of a solid paragraph, lists should

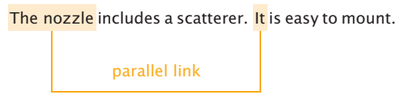
- comprise few items (in other words, five or fewer), to allow their nonsequential, visual processing;
- introduce the items by a clause (or part of one), to let the readers know what the list is about;
- phrase all items in a grammatically similar way, to reflect in the form the parallelism of content.

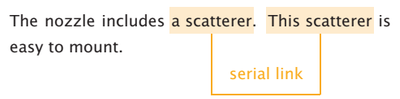
The manner in which the items are phrased should obviously be a grammatically correct continuation of the introductory component. The use of bullets to reveal items does not alter the rules of grammar.

- To prepare a meeting, define its purpose
- You must also prepare an agenda
- Everyone should receive this agenda
- Does everyone know who the others are?
- The chairperson should not be secretary
- Ground rules may be appropriate, too
- Always review the purpose and agenda

When preparing a meeting,
- define the purpose and agenda,
- send the agenda to all participants.

As you start the meeting,
- welcome and introduce participants,
- clarify the roles (chair, secretary, etc.),
- set up ground rules if appropriate,
- review the purpose and the agenda.





Above all else, sentences within a paragraph are connected by content: one element in a sentence, normally its subject, points to an element in the previous sentence. A reference to the previous subject is best done with a personal pronoun (*it*, *they*, *we*, etc.), whereas a reference to the previous object or other item appearing at the end of the previous sentence is best indicated by a demonstrative adjective (*this*, *such*, etc.). By analogy with elementary electrical circuits, we might call the first case a parallel link and the second case a serial link.

Parallel or serial links can be repeated for several sentences: a parallel structure lines up sentences with the same subject,

Recent years have seen an increased popularity of codes based on the Diabolo algorithm. Speed is a main advantage of these codes, compared to the traditional Demon ones. Also, one can implement them reasonably easily, and it is possible to extend them so they can handle hybrid transforms. On the other hand, they require about 45% more memory, but this is less critical with today's architectures. Typical applications are …

In recent years, codes based on the Diabolo algorithm have become increasingly popular. Compared to the traditional Demon codes, they are about twice as fast, are reasonably easy to implement, and can be extended to handle hybrid transforms. As a drawback, they require about 45% more memory, a less critical limitation with today's architectures. Typically, they are applied to …

whereas a serial structure chains sentences by using what is introduced in one sentence as the subject of the next sentence.

All current implementations of the Diabolo algorithm are based on the so-called Angel transform. F. Angel first described this transform in [2]. The idea is to separate the data into high and low values before proceeding with generation. The implementation then stores the high and low values separately …

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Both structures can be used to construct entire paragraphs. The parallel structure, using the paragraph's topic as subject of all its sentences, is the more readily applicable of the two. The serial structure is well suited to introductory paragraphs, organized from general to particular, and to substructures, for example within a more complex parallel–serial paragraph.

Should every slide convey a message?

Ideally, every slide indeed conveys a message, especially for a short, intensive presentation. If you decide to show a slide to your audience, surely you are trying to tell something with it.

Should I not include bibliographical references on slides, to show where the data come from?

Full bibliographical references are often noise. Do you expect audience members to read them? If yes, then do not expect them to listen to you. If no, then why do you include the references? References are important information indeed but are best placed in a companion document.

To give credit to someone for the data you show, simply include the person's name together with the year of publication in Harvard citation style, as in "Doumont, 2005"—not the full reference.

How can I display complex information, such as equations or intricate diagrams?

Before you look for solutions, question the need for displaying complex information on slides: typically, such information can be presented more clearly in a companion document instead.

If you must convey the information on a slide after all, provide a global view before moving to the details. For example, identify and label the main "blocks" of your equation or diagram.

$$\nabla \times \mathbf{B} = \mu_0 \mathbf{J} + \mu_0 \epsilon_0 \frac{\partial \mathbf{E}}{\partial t}$$

current term | field term

Most slides just include too much text

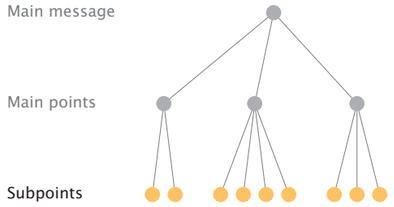
Audience members know it: most slides out there include too much information (as text or otherwise) for them to even start processing it while listening to the speaker. Strangely, when these same people become speakers, they too create crowded slides. Why so? Three explanations readily come to mind.

First, many speakers create slides for themselves, as a personal memory aid, not for their audience. These slides are often cryptic (not self-explanatory) and text-heavy. Such material may aid the speaker in preparing or even in delivering the presentation, but it should simply not be shown to the audience.

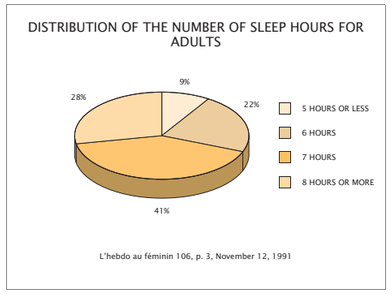
Second, a drive toward efficiency pushes speakers to think their slides must double as written report. Alas, slides designed with such a purpose in mind tend to include too much to be effective as slides, yet probably too little to make a convincing report. In most situations, they fall short of both objectives.

Third, speakers who create their slides in a hurry often use material copied from written documents (paragraphs, spreadsheets, etc.) without adapting it. They know the result is less than perfect but see it as "better than nothing". Inasmuch as they distract, such slides are in reality worse than no slide at all.

The three reasons above must be complemented by two frequent confusions. First, some speakers conclude that, to stand on their own, slides must include pretty much everything they say. Not so: what appears on the slide must be self-explanatory, but not everything said needs to appear on a slide. Second, and for fear of stating facts out of context, speakers sometimes include extra data on the slide; for example, they mention three numbers but show a detailed table, to allow comparisons if desired. The audience cannot (and should not) spend time analyzing a large table while listening to a speaker, however; such a large table belongs in a handout.



Convey each subpoint with a slide

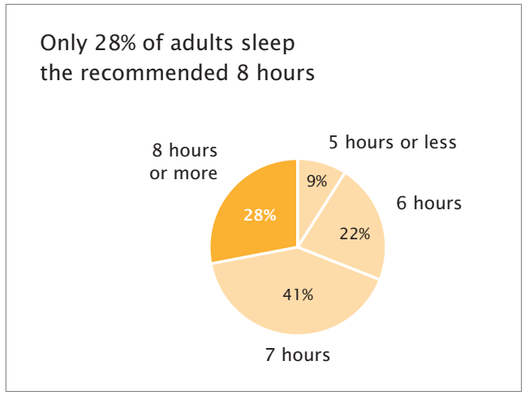


The slide above is poorly designed. First, it conveys no message: the title expresses what the data are, not what the data mean (the *what*, not the *so what*). Second, it is not as visual as it seems: the legend of the pie chart is an arbitrary dictionary of colors, hard to process while one listens to a spoken text. Finally, it is noisy: the pie chart's third dimension distorts the perception of the data, the reference at the bottom will either distract or not be read, etc.

Designing the slides

After you have structured the body of the presentation in main points and subpoints, get each subpoint across with one slide—and one only, at least in first approximation. State the subpoint's message on the slide as a short sentence (in the title area): express the *so what*, not merely the *what*. Illustrate your message as visually as possible, limiting text. Question the pertinence of any item you intend to include; if you are not going to mention it, do not put it on your slide.

A draft by hand may save you many iterations at the computer and help you identify what you need instead of trying to use what you have. First state each of your messages as a sentence and sketch an illustration for it, and later construct all slides.



To verify whether your slides stand on their own, show them to someone representative of your audience without providing your spoken text. This someone should be able to figure out *what* each slide displays and *why* you are showing the slide as part of your presentation. Printing the slides in small size (typically six on a page) allows you to test their legibility, too: whatever is hard for you to make out on such a printed page will likely be hard for an audience to make out on the screen.

Can a display become too complex?

Just like any other communication component, a display can be too complex for its audience or in view of the constraints of space and time. Still, what makes displays too complicated is most often a suboptimal spatial arrangement of its panels. To keep the perception global, align the panels visually in meaningful groups of up to five—both horizontally and vertically.

What is the optimal size for a graph?

Finding the most appropriate size for a graph is not automatic: one must take into account not only the data displayed but also the page or slide on which the graph must be inserted, to achieve an effective and harmonious whole.

Graphs in reports and on slides are often drawn unnecessarily large for the data set they display, wasting space that could be put to better use, such as having text next to the graph in a report or larger margins around the graph on a slide. As a rough guide, question the size of graphs that take up more space than you would need for a table listing the same data as in the graph.

At the other end of the spectrum, small graphs are seldom too small for the data they display but may no longer accommodate legible labels or distinguishable data markers, in particular on devices that suffer from limited resolution, such as projected computer screens. Limiting text labels, numbers, and data markers can help.

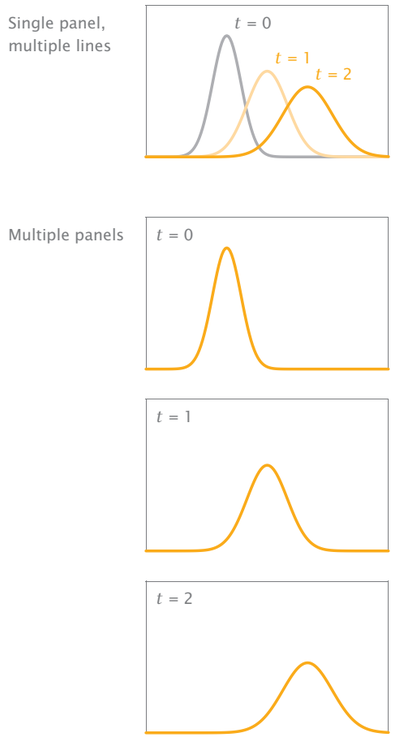
Beyond the size of the graph in itself, optimize such parameters as font size and line thickness, especially if you scale the display up or down. Many slides have huge graphs… with a tiny font.

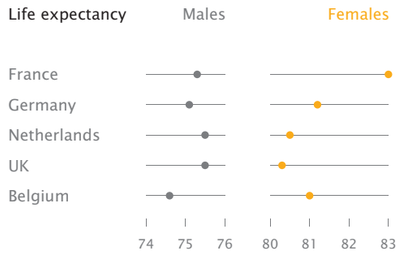
Constructing complex displays

Complex data sets (those including many variables) may require complex displays, with enough panels to search for correlations or compare evolutions among continuous variables, or to display subsets resulting from the presence of discrete variables. These panels must then be meaningfully organized on the page, to show the structure of the data set: panels with a common horizontal or vertical scale are thus best placed under or beside one another, respectively (with the scale appearing only once), panels showing subsets must use the same scales, etc. Principles of proximity, similarity, prominence, and sequence apply here as they do for page layout: the display must indeed provide insight as a whole.

In contrast, data sets including but few variables seldom require complex—or even large—displays, even when they include many values per variable. Effective graphical displays can convey many data in a small space and can often be reduced in size without loss of clarity as long as labels are legible. Small graphs are particularly appropriate as panels in complex displays, where their size allows richer, clearer spatial arrangements. Such small multiples are usually clearest with as few labels as possible. They can often do without the scales, for example.

The sample histograms at right take up less than 0.5 cm^2 each (and could be drawn smaller still), yet they still allow comparisons.

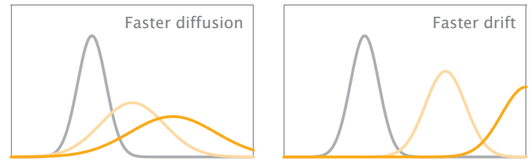




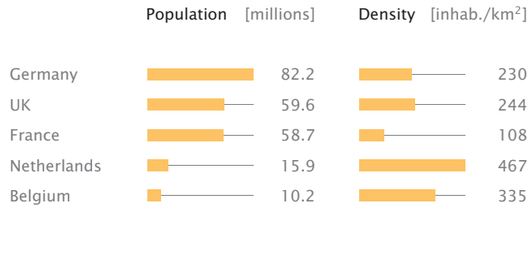
Comparing groups of data

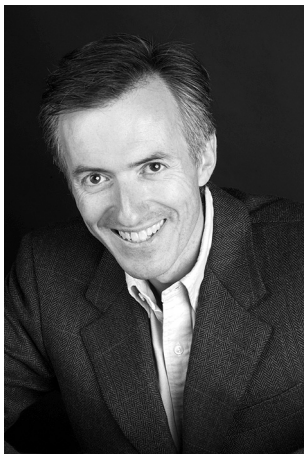
Discrete variables, dividing the data set into subsets, can be represented in either of two fundamental ways: the subsets can be shown in a single panel and distinguished by a visual difference such as marker shape or line thickness, or they can be shown in as many separate, juxtaposed panels. A single panel allows a more accurate comparison of subsets but may not provide a satisfactory view of individual subsets when data points are numerous and subsets largely overlap.

When the data set involves more than one discrete variable, the resulting displays can use multiple devices, for example different marker shapes, each in solid and hollow versions, or multiple panels organized both horizontally and vertically. They can of course use a combination of the two approaches.



Multiple panels representing subsets of the same variables must use the same scales to offer a meaningful comparison. By contrast, multiple panels representing different variables, as in a matrix plot, may use a different scale for each variable, for example in an effort to resolve closely grouped data better.





An engineer from the Louvain School of Engineering and PhD in applied physics from Stanford University, Jean-luc Doumont now devotes his time and energy to training engineers, scientists, business people, and other rational minds in effective communication, pedagogy, statistical thinking, and related themes.

With his rational background, Jean-luc approaches communication in an original, engineering-like way that contrasts sharply with the tradition of the field, rooted in the humanities. He is thus well received by students and professionals in search of a method they can apply with the same rigor they have come to value in every other aspect of their occupations.

An articulate, entertaining, and thought-provoking speaker, Jean-luc successfully reaches a wide range of audiences around the world, in English, French, Dutch, and Spanish—as a trainer or invited speaker at an array of companies, top-ranked universities, research laboratories, and international conferences.

Based on hundreds of interactive training sessions, this long-awaited book offers Jean-luc's guidelines and practical tips toward getting messages across optimally in written documents, oral presentations, and graphical displays. Wide-ranging yet compact, it is true to Jean-luc's renowned style, proposing no-nonsense, down-to-earth, readily usable advice underpinned by a simple yet solid conceptual basis and presented in a highly modular visual structure.

Principiæ

Structuring thoughts

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