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“The Great Man Has Spoken. Now What Do I Do?”

A Response to Edward R. Tufte’s
“The Cognitive Style of PowerPoint”

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“The Great Man Has Spoken. Now What Do I Do?”

A Response to Edward R. Tufte’s “The Cognitive Style of PowerPoint”

OVER the last two decades, Edward R. Tufte, Professor Emeritus at Yale University, has become the preeminent expert on information display. His self-published books—The Visual Display of Quantitative Information (1983), Envisioning Information (1990), and Visual Explanations (1997)¹—are required texts for anyone involved in presenting complex information. Each book makes for lively reading. Not only do they all provide startling insights into ways to present numbers and concepts, but they also contain withering critiques of failed efforts at information presentation. Tufte has achieved oracular and guru-like status for graphic designers, statisticians, engineers, and business professionals.

Tufte has now turned his formidable critical and polemical powers against Microsoft PowerPoint. In a recently published 23-page monograph, The Cognitive Style of PowerPoint, Tufte skewers the software program as “slideware” that “reduces the analytical quality of presentations.”² When we told a colleague about Tufte’s unbridled contempt for PowerPoint, his look of dismay was palpable. “Now what do I do?” he asked plaintively.

Alas, those who rightly admire Tufte, yet also rely extensively on PowerPoint for training sessions, briefings, and the classroom, will no doubt be equally deflated. Some will simply ignore Tufte’s many valid criticisms and keep on using PowerPoint just as they have in the past. Some will abandon PowerPoint (probably to Tufte’s delight, though in his monograph he never calls for junking the program entirely).

Both responses, we believe, are ill-advised. Instead, we propose a middle ground, with an approach to PowerPoint presentation design and organization that addresses a number of Professor Tufte’s criticisms, yet allows PowerPoint users to deploy the tool effectively as a communication platform. In the end, we argue that PowerPoint is not the cause of poorly planned, disorganized presentations; instead, a bad PowerPoint presentation is a symptom of the writer’s failure to employ simple slide design principles, basic communication skills, and—most importantly—fundamental rhetorical techniques.


The four qualities under attack

Professor Tufte’s criticism of PowerPoint is wide-ranging, but he concentrates his wrath on four qualities of many PowerPoint presentations: (1) bullet text/lists; (2) the ready-made PowerPoint templates and “default” graphics (presumably generated by the Microsoft wizard tool); (3) the “sequentiality” of a PowerPoint presentation (“one damn slide after another” Tufte complains); and (4) the “extremely low resolution” of PowerPoint, meaning that the slide format presents small amounts of information, with less detail on a single slide, compared to other paper-based display venues such as newspapers, magazines, and reports.

Tufte asserts these four qualities combine to create “the cognitive style of PowerPoint” — a style which “weaken[s] verbal and spatial reasoning. . . almost always corrupt[s] statistical analysis,” creates a “foreshortening of evidence and thought,” and leads to “a preoccupation with format not content” and “an attitude of commercialism that turns everything into a sales pitch.”

This is a sweeping indictment, to be sure.

Throughout his monograph, and postings on his web site, Tufte again and again vilifies PowerPoint, portraying the software program as inherently malevolent, with users as “victims” of its corrupting effects. Tufte seems to believe that PowerPoint turns clear thinking adults into addled-headed boobs. The question we ask is this: Is PowerPoint at fault for making presenters “stupid,” or do stupid presentations instead stem from a lack of logic and a lack of rhetorical and design skill?

Tufte’s evidence of PowerPoint flaws

As evidence of PowerPoint’s horrible flaws, Tufte analyzes in detail a now infamous slide prepared by Boeing engineers in January 2003 while the ill-fated space-shuttle Columbia, which broke up upon re-entry and killed its crew, was still in orbit. The Boeing team prepared this slide as part of an effort to determine the possible damage to Columbia’s left wing from the impact of foam debris that fell 81 seconds after liftoff from a bipod connecting the shuttle to its large central fuel tank. (The Columbia Accident Investigation Board, in its report, determined that this foam debris damaged the thermal protection tiles on the leading...
edge of the left wing, thereby allowing superheated air generated by the friction of re-entry to “penetrate through the leading edge of the insulation and progressively melt the aluminum structure of the left wing, resulting in a weakening of the structure until increasing aerodynamic forces caused loss of control, failure of the wing, and breakup of the Orbiter.” 

Tufte’s critique of this single slide (Figure 1, right) spans more than three pages in his monograph, and his criticisms of the rhetorical elements of the slide—its muddied and obtuse content, its imprecise use of language (what he calls “verbal fudge factors”), its messy and non-transparent use of bullet point hierarchies—are all devastatingly valid. 7

Is PowerPoint the villain?

But who is responsible here? Tufte concludes it’s the bullet point outline format of PowerPoint, an approach that “dilutes” thought and “coerces slide makers into using the compressed language of presentation.” PowerPoint is the culprit that has banished these engineers into the wilderness of incoherence.

But PowerPoint did not cause such problems. Rather, the engineers apparently do not understand fundamental rhetorical principles. They don’t ask themselves, “What does my audience need to know? What point am I trying to make? How do I make that point clearly, thoroughly, transparently? And is the organization of information effective for making my point clear and understandable?” The problem with this slide—and indeed the problem with ANY piece of poorly organized writing—is that a reader must work too hard to decipher meaning. Tufte rails against PowerPoint when the failure here is one of clear thinking, clear writing, and clear organization. With this slide, the writer needs the answer to this question: “What does the test and flight data tell us about the danger to the shuttle from damage caused by impact of the foam?”

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We would argue that it is quite possible to answer this question effectively in a PowerPoint format. Immediately to the right, you can see a complete reworking of the important components of the test and flight data—on a single PowerPoint slide (Figure 2). You will note that our version includes information not on the original slide. Based on this additional information, which we extracted from other slides in the Boeing presentations, as well as some extrapolations we made, it appears that the engineers reviewed three sources of data. In the revised slide, these three sources of data provide an organizing framework. In constructing this slide, we followed Tufte’s principle of assembling information “adjacent in space” as opposed to “stacked in time” using bullet point lists. Tufte makes a valid criticism about the rhetorical hazards of bullet point lists, and inside PowerPoint, authors often lose their way in a thicket of points and sub-points. PowerPoint users should instead should look to a more table-like setup as the basic way to capture issues “at a glance” in the slide format—though bullets do have their place.

![Figure 2](image-url) Slide created by Communication Partners. This slide, and others we have created, were converted from the original PowerPoint into picture files, and thus lack the typographical crispness of the originals. Contact us at info@communipartners.com if you would like the original PowerPoint versions.

**What does the test and previous flight data tell us about the danger to the shuttle from damage caused by foam impact?**

| Situation -- Team reviewed test data from three sources: |
| Crater | Southwest Research | M/O/D |
| a computer program that modeled damage caused by foam chunk (20” x 18” x 6”) equal in size of bipod ramp* that struck Columbia | an analysis of foam impact (probably from bipod ramp piece) that occurred on shuttle flight STS-6 | LEO, Micromedia Orbital Debris Study (1990) (M400) which analyzed damage to thermal protection system from collisions with objects in space |
| Key data: Shows that impact could create dangerous damage crater in thermal protection tiles ranging from 2.3 to 4.7 inches deep, 19.0 to 32.0 inches long, and 2.4 to 7.2 inches wide. | Damage to all X-ray tiles was .5 inches deep, 9 inches long, 4.5 inches wide, an acceptable level of damage in a non-critical area. | Provides detailed analysis of burn-through dangers from damage resulting from debris impact |
| Shortcoming: No data on damage to reinforced carbon-carbon panels on leading edge of wing; also predicts more damage than has occurred in actual conditions. | Represents result of single flight only, circumstances on Columbia may be different. | Assumed that debris chunk striking the spacecraft has volume of 13 in³ vs. 1920 in³ for foam ramp. |

**Conclusion:** Test and flight data too inconclusive, and therefore insufficient to determine extent — and even more important, location — of possible impact damage, and resulting danger to shuttle. Recommend visual inspection via space walk or spy satellite photography.

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We would also argue that PowerPoint cannot take the blame for the leaps in logic that led the Boeing engineers to the conclusion they announced on Slide 13 (Figure 3, right): “safe return indicated even with significant tile damage” (“contingent” on future analysis based on a study whose assumptions didn’t really apply). The conclusion on our revised slide (Figure 2)—the evidence is insufficient to make a judgment and therefore visual inspection is warranted—stands in stark contrast to Boeing’s. In fact, the Boeing engineers soft-pedaled the dramatic damage effects predicted by the “Crater” model. Did they conclude that there was no risk to Columbia because PowerPoint’s bullet lists and its “cognitive style” drove them to that conclusion? No, rather, in the culture of NASA, with its pressure to avoid being alarmist, its “reliance on past success as a substitute for sound engineering practices,” the engineers simply concluded what they wanted to conclude—a conclusion that was likely foregone before the first slide was even created.

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Figure 3. Slide 13 in the PowerPoint packet entitled Orbiter Assessment of STS-107 Bipod Insulation Ramp Impact, January 23, 2003

<table>
<thead>
<tr>
<th>Summary and Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Impact analysis (“Crater”) indicates potential for large TPS damage</td>
</tr>
<tr>
<td>- Review of test data shows wide variation in impact response</td>
</tr>
<tr>
<td>- RCC damage limited to coating based on soft SOFI</td>
</tr>
<tr>
<td>• Thermal analysis of wing with missing tile is in work</td>
</tr>
<tr>
<td>- Single tile missing shows local structural damage is possible, but no burn through</td>
</tr>
<tr>
<td>- Multiple tile missing analysis is on-going</td>
</tr>
<tr>
<td>• M/OD criteria used to assess structural impacts of tile loss</td>
</tr>
<tr>
<td>- Allows significant temperature exceedance, even some burn through</td>
</tr>
<tr>
<td>- Impact to vehicle turnaround possible, but maintains safe return capability</td>
</tr>
</tbody>
</table>

**Conclusion**

- Contingent on multiple tile loss thermal analysis showing no violation of M/OD criteria, safe return indicated even with significant tile damage

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9. The Columbia Accident Investigation Board, Report, Volume 1, August, 2003, p. 177. In Chapter 7 of its report, “The Accident’s Organizational Causes,” the CAIB addresses these cultural biases inside NASA. The report lists (in bullet format) a series of “critical” issues that program managers must address going forward. Under the bullet-point heading, Importance of Communication, the report states: “…the managers in charge resisted new information. Early in the mission, it became clear that the Program was not going to authorize imaging of the Orbiter because, in the Program’s opinion, images were not needed…Program leaders decided the foam strike was merely a maintenance problem long before any analysis had begun. Every manager knew the party line, ‘we’ll wait for the analysis—no safety of flight issue expected.’” This attitude was conditioned by NASA’s “strong cultural bias and optimistic organizational thinking…learned attitudes about foam strikes diminished management’s wariness of their danger” (p. 181).
**PowerPoint can work**

Tufte lacerates PowerPoint as a program that obviates serious analysis. Yet even thorny engineering problems, such as the analytical challenges faced when determining damage caused by the impact of the foam debris, can often be illustrated in the simple landscape frame of an 8 ½ by 11 piece of paper—i.e., a PowerPoint slide.

Ironically enough, Tufte provides in his monograph a perfectly straightforward and simple analytical flow chart to view the problem. We have created a PowerPoint slide (Figure 4) using Tufte’s analytical flow chart (note: Tufte used only the text presented under questions 1, 2, and 4; Tufte excluded a key component of the analysis—the measurable extent of the damage caused—which we addressed under question 3).

With this frame of reference now clearly on display, the overarching organizational principle of “debris assessment” analysis now becomes clear; and subsequent slides in this or any other presentation can use the 4-box analytical flow chart as a useful rhetorical signaling device when delving more deeply into various aspects of the analysis. This overarching organizing structure can be used again and again to keep the “big picture” in view even as one slide follows another in the sequential process that characterizes PowerPoint.

For example, suppose there is

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**Figure 4** – Slide created by Communication Partners using the analytical flow chart from *The Cognitive Style of PowerPoint*.

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**Assessing the potential danger to Columbia upon re-entry requires the following analytical process**

<table>
<thead>
<tr>
<th>Key Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How fast and hard did foam debris hit the shuttle wing?</td>
</tr>
<tr>
<td>2. What portion of the wing did foam debris hit?</td>
</tr>
<tr>
<td>3. What is the extent of damage caused by debris impact?</td>
</tr>
<tr>
<td>4. How dangerous is damage caused by debris impact?</td>
</tr>
</tbody>
</table>

- Kinetic energy of debris impact (function of mass, velocity, angle of incidence)
- Debris hits locations of varying vulnerability on the left wing
- What is length, width, and depth of crack/ crater/ holes in heat-shielding tiles?
- Resulting level of threat to Columbia during re-entry heating of tiles

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a follow-on slide focusing on
the specific location of where
the debris might have hit,
such as the slide we created
on the right (Figure 5). Three
of the four boxes in this
flowchart are now
highlighted as key issues
addressed in this slide, while
the third one fades slightly
into the background as a
particular aspect of the
analysis not directly
addressed here. Now the
PowerPoint slide has indeed
become a “high resolution”
venue.

And what of the dreaded
bullet points? Tufte is right to
condemn lists gone amuck,
but it is not bullet points per
esse that are malevolent.
Instead, following one KEY
rhetorical principle will keep
PowerPoint authors from
stumbling with their use of
text only slides:

On each bullet point slide,
authors should address only
one main idea: a single
discrete category with sub-
items consistently related to
that category. Do not use
bullet points to present a
sequence of ideas. In other
words, use bullets to present
inductive reasoning, not
deductive reasoning.
The slide below (Figure 6) shows how to follow that principle. It only deals with one concept—the benefits of selecting our firm, Communication Partners, to develop a training program. Each sub-category relates to the main idea, and that main idea only. This “category discipline” then allows you to write complete sentences, with subjects and verbs, to communicate clearly the content of each sub-category.

Note the clean look, too: the simple monochrome background, the choice of just two hierarchies of text (if your category is properly discrete, that is all you will need), the simple em-dashes instead of cartoonish wing-dings. Tufte is right to trash PowerPoint templates; they are often garish and unprofessional. Avoid them.

**Figure 6.** Slide created by Communication Partners.

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**Knocking down a straw man**

While PowerPoint has limitations—including the design choices embodied in many of the Microsoft templates and default graphs—Tufte’s condemnation of those templates and graphs has all the earmarks of a straw man being propped up as a convenient target to attack. It is not right to display the worst that a program has to
offer and to condemn the program on that basis. It is better to ask the question “What can PowerPoint do at its best? Can it communicate effectively and produce good information display?”

For example, Tufte displays six PowerPoint slides of cancer survival rate data extracted from an article in the prestigious medical journal, The Lancet. The slides (whose creator and source are not disclosed) are presumably based on PowerPoint default-designs and wizard created graphs. The end product, Figure 7 below, is appallingly ugly, as well as impossible to decipher, a horrific example of the concept that Tufte has labeled “chartjunk.”

Figure 7. From The Cognitive Style of Power Point, pp 14-15. Tufte does not cite a source for these slides. He states that “applying the PowerPoint templates….yields [these] analytical disasters.” Note that this graphic was taken from Tufte’s web site, and thus lacks the visual and typographic crispness of the original.


To show how the data SHOULD be displayed, Tufte created an elegant “table-graphic” which he states “does give something of a visual idea of the of time gradients for survival for each cancer”13 (Figure 8, below). Tufte does not disclose the software program he used to create this display.

Probably the table-graphic was produced using a high-end graphic design program such as QuarkXPress, Adobe Illustrator, or Adobe InDesign, each a powerful program, yet extremely complex and requiring many hours to master. So how should a business person or technical specialist with no graphic design background—and no experience with these expensive, complex programs—execute such a table graphic? Logic says they should use a program they do know and have mastered: PowerPoint! In Figure 8 below, immediately next to Tufte’s table graphic, is a replicated version of his design, executed in PowerPoint.

Figure 8 – Table graphic comparison.  
Tufte’s version from The Cognitive Style of PowerPoint, p. 16. Again view original to see a typographically crisper version.

| Survival rates of cancer patients by cancer site; percent of patients surviving over time |
|---------------------------------|----------------|----------------|----------------|----------------|
| Prostate                        | 5 year | 10 year | 15 year | 20 year         |
| Thyroid                         | 96     | 96      | 87      | 81              |
| Testis                          | 95     | 94      | 94      | 95              |
| Melanomas                       | 89     | 87      | 91      | 88              |
| Breast                          | 86     | 79      | 84      | 83              |
| Hodgkin's disease               | 85     | 80      | 71      | 65              |
| Corpus uteri, uterus            | 84     | 83      | 81      | 67              |
| Urinary, bladder                | 82     | 76      | 70      | 68              |
| Cervix, uteri                   | 71     | 64      | 63      | 60              |
| Larynx                          | 69     | 57      | 57      | 57              |
| Rectum                          | 63     | 55      | 46      | 38              |
| Kidney, renal pelvis            | 62     | 54      | 46      | 38              |
| Colon                           | 62     | 55      | 46      | 34              |
| Non-Hodgkin's                   | 58     | 55      | 44      | 34              |
| Oral cavity, pharynx            | 57     | 54      | 44      | 33              |
| Ovary                           | 55     | 49      | 44      | 33              |
| Leukemia                        | 43     | 44      | 44      | 33              |
| Brain, nervous system           | 32     | 29      | 29      | 26              |
| Multiple myeloma                | 30     | 26      | 26      | 26              |
| Stomach                         | 24     | 13      | 7       | 5               |
| Lung and bronchus               | 15     | 11      | 8       | 5               |
| Esophagus                       | 14     | 11      | 8       | 6               |
| Liver, bile duct                | 8      | 6       | 6       | 8               |
| Pancreas                        | 4      | 3       | 3       | 3               |

Here we chose the portrait option inside PowerPoint, instead of landscape. And by using simple text boxes, the autoshape alignment tools, and lines from PowerPoint’s drawing menu, one can achieve virtually the same effect using the very program Tufte finds unacceptable.

To be sure, Tufte’s design is more polished, with better spacing, crisper connecting lines, and a more tabular feel to the display, presumably because he used a program meant for the professional graphic designer. Yet with a good visual sense—and probably a lot less time—one can achieve a similar effect with a program considerably easier to use and much more of a “standard” in the world of business and communication.

By critiquing these chartjunk-laden slides, Tufte unfortunately blurs distinctions. The information display challenge with the cancer survival rate data is one of genre choice: do I use a graph, a table, or some hybrid form to convey this information? Erecting his straw man, Tufte presumes that PowerPoint will lead the user by the nose to the chartjunk “analytical disaster.” He doesn’t put responsibility on the presenter to choose a table or table-graphic with complete data, which is the best genre choice for communicating this data.

Nor does he show us that PowerPoint is capable of presenting simple clean graphics that can also convey useful information in a transparent fashion, particularly slices of information. To illustrate, we have created a PowerPoint slide, Figure 9 right, that graphs the long-term survival percentages for cancer types whose 5-year survival rate is 30% or below. This graphic was created within PowerPoint’s graphic engine. We simply selected a specific graph-type option, adjusted some of the data for a slightly better fit (taking a cue from Tufte’s table graphic, which abandons precision scale accuracy in favor of easy-to-read spacing), and formatted lines, labels, axes, and text to achieve the look desired.
Tufte also doesn’t show that PowerPoint can be a reasonable tool for implementing some of his other information display suggestions. For example, in his monograph, Tufte convincingly urges speakers at presentations to use paper handouts, saying that “a useful size for handouts is 11 by 17 inches, folded in half to make 4 pages.” 14 Ironically enough, PowerPoint’s page setup function allows for a layout in those very dimensions (see Figure 10 below).

Figure 10 – Screen shot of PowerPoint slide, and page setup dialog box, to create an 11 inch by 17 inch page.

In our consulting work, we have used PowerPoint to create large poster-like displays (sometimes larger than 11 by 17) printed on a large plotter at a local copy shop. Again, PowerPoint gives users who are not professional graphic designers a tool to quickly layout complex and content-rich information displays.
So who—or what—is to blame?

So, are bad presentations the fault of PowerPoint or the presenter? Does PowerPoint have a “cognitive style” that quashes content and “allows speakers to pretend that they are giving a real talk, and audiences to pretend that they are listening” (italics Tufte’s)?

Clearly, PowerPoint is not a perfect tool. Making graphics and tables in PowerPoint is hard and often frustrating work—though the work is faster and easier than using QuarkX Press, Illustrator, or other powerful graphic design programs. And the sequential nature of PowerPoint (slide after slide after slide) does not easily map onto the hierarchical complexity required by in-depth analyses—though providing an ongoing view of the “big picture” can be done using verbal and graphical cues to indicate how a single slide fits into a hierarchical structure.

As Tufte admits toward the end of The Cognitive Style of PowerPoint, “presentations largely stand and fall depending on the quality, relevance, and integrity of the content. The way to make big improvements in a presentation is to get better content.” That is clearly indisputable. As we have seen, the failures of presentations are most often failures to develop adequate content, failures to gauge what the audience requires, failures to determine the purpose for your talk and the message you want to convey. They are, in other words, failures to understand fundamental rhetorical principles.

Do these failures go away when a person uses a different presentation tool? That would seem to be one implication of Tufte’s line of argument. On his web site, Professor Tufte says:

PP is inherently defective. PP is not serious. We need serious methods of communication for serious problems...My essay, "The Cognitive Style of PowerPoint," reports evidence based on several thousand PP slides, 5 case studies, and many quantitative comparisons between PowerPoint
and other methods of communicating information. The comparative data are particularly telling: some methods of presentation are better than others. And PowerPoint is rarely a good method. 17

We disagree that PowerPoint is automatically a poor communication platform—or that any other particular software package is by itself going to provide inherently better ideas and clearer communication. Having read hundreds of poorly worded business letters in our consulting practice and teaching, as well as many dense and impossible-to-decipher engineering reports, would we be fair in saying that word processing software is just “not serious?” Had the Boeing engineers sat down to write a prose report on Debris Assessment using a word processing “tool,” would the language in such a report have been less murky, the data less opaque, and the conclusion completely different? By the same token, couldn’t a forceful, direct, confident analyst of the situation, with sharp rhetorical skills (perhaps even someone who has absorbed many of the practical insights about information display revealed by Tufte in his books) have created an articulate and content-rich PowerPoint presentation arguing for a visual inspection in orbit?

In the end, Tufte falls prey to an attitude of victimology, making PowerPoint the villain that oppresses its users, and almost by default absolving the presenter from taking any personal responsibility for providing significant content and communicating that content clearly. This attitude is clearly on display with his postings on his web site. In response to those who have said that PowerPoint is a simply a “tool” for communicating, he asserts that “the tool metaphor does not provide any intellectual leverage. Some tools are in fact better than others; some poor performances are in fact the fault of the tool. Saying that the problem is with the user rather than the tool blames the victims of PP (audience, content, presenter).” 18


We find this attitude surprising and disappointing. If there is one thing we have learned from Professor Tufte in the 20 years that we have been his fans, it is that communicators must take personal responsibility for designing the best information display possible with the tools they have. That means hard mental work (not necessarily graphic design or typographical expertise), sharp analysis, clear thinking, and transparent communication. And it requires understanding how your tools can achieve those requirements. Presenters who do this hard work and understand the important principles behind creating and sequencing slides can use PowerPoint as an effective communication platform.

In contrast, presenters who opt for PowerPoint’s default designs and wizard graphics, or who use bullet points with no rhetorical or logical structure, or who fail to keep their purpose, audience, and message in mind, are not oppressed by PowerPoint: they are at worst lazy, and at best naïve.

Over the years, Professor Tufte has given us startling insight into the world of information display. The Cognitive Style of PowerPoint continues that work. Everyone who uses PowerPoint should read it. But like so many other stimulating and powerful essays, we should cast a cold critical eye on it, and not accept everything it says as gospel just because it has sprung from the software tools used by Edward R. Tufte—great man though he is. It is our hope that his criticisms will make us all smarter about using PowerPoint—not simply make us feel guilty.

19 Taking this view to a satirical and admittedly amusing extreme, Tufte equates PowerPoint with a totalitarian regime. Tufte’s metaphor for PowerPoint presenters and PowerPoint audiences is a 1956 photo of a military parade in Stalin Square, Budapest. This photo graces the cover of his monograph, and is available for sale as poster from his web site. The photo can also be found in the magazine, Wired, September 2003, p. 119.