Discovering the Power of PowerPoint: 
Rethinking the Design of Presentation Slides 
from a Skillful User’s Perspective

Michael Alley
Engineering Education Dept.
Virginia Tech

Kathryn A. Neeley
School of Engineering & Applied Science
University of Virginia

Abstract

Slides projected as overheads or by computers have become a conventional and dominant feature of engineering presentations in academia, business, and professional societies. The traditional format for presentation slides—a phrase headline supported by a bullet list—has recently come under harsh criticism. In this paper, we propose an alternative to the traditional design that can communicate engineering content more effectively. The alternative design relies on a succinct sentence headline supported by visual evidence. Its chief strength is that it aids the audience’s understanding of the engineering principles and arguments being presented, as opposed to the traditional phrase headline/bullet list design, which tends to function more as notes for the speaker.

Although the alternative design offers several clear advantages in an engineering presentation, many engineering students and faculty strongly resist veering from the traditional format defaults of PowerPoint. This paper outlines the key features and advantages of the alternative design and explores the ways in which resistance to the alternative design can be seen as a measure of how embedded a particular way of using PowerPoint has become in engineering professional practice. Drawing upon student and faculty resistance to the design, this paper uses PowerPoint as a case study in the ways skillful users adapt tools such as PowerPoint to better accomplish their own goals rather than simply accepting the default approaches encouraged by the tool.

Introduction

PowerPoint is used to make an estimated 20 to 30 million presentations every day and, depending on whose estimate you choose to accept, has between 250 and 400 million users around the globe (Goldstein 2003; Schwartz 2003; Simons March 2004; Zielinski 2003). The traditional form for PowerPoint slides is familiar, perhaps overly so, to engineering students and practitioners: a phrase headline supported by bulleted lists. In many if not most engineering contexts, the design templates and default slide layouts of PowerPoint have become standardized, and the name “PowerPoint” has become virtually synonymous with bulleted lists, “presentations,” and “professionalism.” In this paper we present an alternative design for
presentation slides, one that can more effectively convey engineering content and that responds to recent criticism of PowerPoint and the traditional slide design. The alternative design uses succinct sentence headlines supported by visual evidence and more effectively meets the audience’s need to understand the engineering concepts and arguments being presented.

The criticism of PowerPoint and the traditional slide design has surfaced in a variety of specialized and general readership publications, from the *Harvard Business Review* and *Wired* to the trade journals *Presentations* and *Successful Meetings* and widely read periodicals such as *The New Yorker*, *The New York Times*, *The Chicago Tribune*, and the *Times* of London. There is also a thriving discourse about PowerPoint on the Web, most notably the weblogs www.edwardtufte.com and www.sociablemedia.com. The range of these publications and the vivid, emotional language used to discuss PowerPoint reflect the key role that PowerPoint has played in a cultural shift in the way information is presented. As one critic put it, “PowerPoint has become as much a part of the fabric of professional life as power ties and protein bars” (Zielinski 2003). In our own efforts to get students to adopt the alternative design, we, too, have perceived the extent to which PowerPoint and the traditional slide design have become embedded in engineering education and professional practice. We have also gained insight into the resistance of the engineering professional community to new ideas and the crucial role that skilled use plays in discovering the power of a tool like PowerPoint.

**The Critique of PowerPoint: Evil, the Devil, Stupidity, Reductionism, and other Vices**


Yale professor Edward Tufte, a sociologist and respected expert in the analysis and visual display of quantitative information, is perhaps the most prominent academic critic of PowerPoint (2003a–c and 2004). He has been a vocal proponent of a common theme in the criticism of PowerPoint: presentation slides that follow Microsoft PowerPoint’s defaults tend toward reductionism because they oversimplify and fragment the subject matter. For instance, in a critique of the investigative report about the Space Shuttle Columbia disaster, Tufte (2003b) argues that traditional slides failed to characterize the risk that the ill-fated Columbia faced from its collision with debris at lift-off. These criticisms were echoed in a *New York Times* article by Wald and Schwartz (2003). In his essay “The Cognitive Style of PowerPoint,” Tufte (2003a) expands his criticism of the Columbia slides and challenges the use of PowerPoint in all engineering presentations. One of Tufte’s major criticisms is that the default styles of PowerPoint limit the amount of detail that can reasonably be presented. These default styles also encourage presenters to use bulleted lists that create many layers of hierarchy and ultimately obscure logical connections (or the lack thereof) among facts used to make an argument.
As Shaw and others (1998) point out in a *Harvard Business Review* article, bullet points “leave critical assumptions unstated” and “critical relationships unspecified.” In a similar vein, Larry Gottlieb (1985) of Lawrence Livermore National Lab argues that a failing of traditional slides lies in the use of phrase headlines that leave unclear the purposes of the slides. Since the 1980s, Lawrence Livermore National Laboratory has eschewed phrase headlines and, instead, has advocated a short sentence headline that states the main assertion of the slide. The slide design advocated in this paper builds on the Lawrence Livermore National Laboratory concept. It also responds to many other criticisms that are likely familiar to anyone who watches significant numbers of presentation.

Perhaps the most common of these criticisms is that PowerPoint presentations are overly predictable and generic. John Schwartz (2003) of *The New York Times* characterized this phenomenon as “PowerPoint’s tendency to turn any information into a dull recitation of look-alike factoids.” He begins his article by asking the question, “Is there anything so deadening to the soul as a PowerPoint presentation?” As Goldstein (2003) put it, the result of pervasive use of PowerPoint is that most presentations look and feel “exactly the same.” He continues, “All too often, originality and content get buried, too.” To illustrate this principle and mock the abuses of PowerPoint (2003a), Tufte includes an infamous parody, created by one of Google’s founders, on what the Gettysburg Address would have been like if Lincoln had used PowerPoint’s default design of phrase headlines supported by bullet lists. An undercurrent in many critiques is the sense that speakers are somehow coerced into using PowerPoint and that audiences must necessarily suffer through it. The frequent use of the word “ubiquitous” to describe PowerPoint is one prominent symptom of this undercurrent. (See, for example, the bulletin board at www.edwardtufte.com, Heavens 2004, Schwartz 2003.)

Other frequently voiced concerns are that text dominated slides tend to serve as planning tools and notes for the speaker rather than as aids to the audience, and that the special effects PowerPoint provides are often over-used or used in distracting ways. There is also a strong tendency for the slides to become the message rather than a means to enrich the message (Goldstein 2003). For most speakers, this front-and-center role of PowerPoint means that they forego an important opportunity to connect with the audience as human beings. Other critics worry that PowerPoint simply covers up deficiencies in the speaker’s ability to present or creates the illusion but not the reality of preparation (Bell 2004). A related criticism is that PowerPoint and the conventions associated with it eliminate the incentive or need to think about the arguments a speaker is making or the strategy a speaker is going to use to present a piece of work (Simons 2004).

**The Defense of PowerPoint as a “Tool” That Requires Intelligent Use**

Those who defend PowerPoint also critique the practices outlined above but defend what they usually term “the tool itself.” Interestingly, they use titles like “Power Has Always Been the Point” (Zielinski 2003). Microsoft and others tend to characterize PowerPoint as an enabling tool that can be used either badly or well (Schwartz 2003, Wikimedia 2004, Atkinson 2004a–f, Simons 2004). The defenders point to the ways in which PowerPoint is a vast improvement over the days when presenters faced lead times of days or weeks for getting slides or transparencies made, depended on “middlemen” such as an in-house staff or Kinko’s, and paid very high costs for features such as photographs or color. The advocates of intelligent use seek to create a
community of skilled users, to specify the knowledge that skillful users possess, and to identify the limits on what the tool can reasonably be expected do.

Perhaps the most prominent academic in the “intelligent use” camp is Donald Norman, author of The Design of Everyday Things, co-founder of the Nielsen Norman Group, and one of the early advocates of user-centered design and simplicity. In an interview with Cliff Atkinson (2004c), Norman argues that bullet points and outlines are not in themselves bad ideas: “A proper outline structures the talk. Proper bullet points summarize important concepts. The problem comes about when speakers prepare a dense set of outlines, turn them into bullets, and mindlessly read them to the audience.” Norman recognizes that PowerPoint slides can be an extremely effective way to present visual aids, with emphasis on visual material—that is, material that cannot easily be conveyed with words. He suggests that many of the big problems with PowerPoint arise when speakers try to use one set of slides as (1) speaker’s notes, (2) slides the audience will see, (3) handouts to be studied after the talk, and (4) a substitute for a written paper.

The most prolific advocate of intelligent use is Cliff Atkinson (2004a–f), an independent consultant, founder of sociablemedia.com, and author of Beyond Bullets, a book forthcoming in February 2005 from Microsoft Press. He agrees that there is a dysfunctional “paradigm that results in people presenting certain types of information in limiting, linear ways. . . .But there’s no reason the bullet-point mindset has to prevail” (in Simons March 2004). He emphasizes the importance of the “fundamental mindset that gives form to [a speaker’s] presentations” and asks the question: “Is your PowerPoint static, inflexible, and fixed in stone; or is it fluid, flexible, and living?” He sees PowerPoint as a second language in which it takes significant effort to become fluent, and as an entirely new media category, “in order to use the tool most effectively, we need to honestly admit that it doesn’t fit into any other media category” (Atkinson 2004d).

One key distinction for the intelligent use advocates is between PowerPoint as a medium and PowerPoint as a method of presentation. Richard E. Mayer, an educational psychologist on the faculty of the University of California, Santa Barbara, asserts, “I do not think it makes sense to refer to PowerPoint as a method. Instead…PowerPoint is a medium that can be used effectively—that is, with effective design methods—or ineffectively, that is, with ineffective design methods. We would not say necessarily say that books are rarely a good method, because books can be designed using effective or ineffective methods. In my opinion, the same principle applies to PowerPoint” (Atkinson 2004a).

The bottom line emerging from the intelligent use community is that speakers who consider using PowerPoint have a medium but not a method. The method would require getting beyond “addiction to text” (Simons 2004) and the “relentless and lazy use” of PowerPoint (Schwartz 2003), beyond the approach of using the technology for its own sake (Bell 2004). It would mean using PowerPoint to accomplish particular goals rather than doing (a) what the tool seems to do best or most easily or (b) what everybody else is doing. Some specifics would include the following:

1) designing slides with the audience’s needs and the specific nature of the material being presented in mind,
2) understanding a presentation as a total experience of which slides are just one part,
3) becoming a sophisticated user easily able to override program’s defaults,
4) understanding that effective and powerful presentations require thoughtful attention to design, structure, and delivery (not just slides),
5) staying open to new possibilities, including more sophisticated presentation software (sometimes dubbed “PowerPoint on Steroids” as in Zielinski 2003), live demonstrations or interaction with the audience, or using few or no slides, and
6) recognizing the things that PowerPoint cannot do, such as substituting for written documents and arguments, or automatically exploiting the inherent interest of the particular subject being presented.

The alternative design we propose here both responds to the criticisms and follows the suggestions of intelligent use.

The Key Features of the Alternative Design

Arising in the past four years has been an alternative design that addresses both of these weaknesses. The alternative design calls for a succinct sentence headline, as was advocated at Lawrence Livermore Lab. However, the alternative design goes further, calling for having this headline be supported by evidence presented in a visual arrangement (Alley 2003a). The specific guidelines for this alternative design have come from critique sessions of more than 400 technical presentations given over four years at Virginia Tech. The purpose of these presentations was for seniors in mechanical engineering to explain and persuade an audience of engineering faculty and graduate students about solutions to various technical problems (Alley and Robertshaw 2003b). At the end of each critique session, the audience discussed what details from the slides they had comprehended and what details they remembered. Each year, the lessons learned from these discussions were incorporated into the slide design guidelines taught to the next round of mechanical engineering seniors. The final product of these four years of critique sessions is the alternative design discussed in this paper. Appearing in Table 1 are the guidelines for this design, and appearing in Figure 1 is a contrast of the traditional design (left) with this alternative design (right).

Table 1. Guidelines for alternative design of slides in a technical presentation (Alley 2003a).

<table>
<thead>
<tr>
<th>Style</th>
<th>For every slide, but the title slide, use a sentence headline that states the slide’s main assertion; left justify the headline in the slide’s upper left corner.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In the body of each slide, present supporting evidence in a visual way—with images, graphs, or visual arrangements of text (such as a table or text blocks connected by arrows). Avoid bullet lists, because such lists do not show the connections among the listed items. Limit the number of slides so that at least 1 minute can be spent on each slide (preferably more time in a longer presentation such as an hour seminar).</td>
</tr>
<tr>
<td>Typography</td>
<td>Use a bold sans serif typeface such as Arial. On a typical slide, use 28 point type for the headline and 18–24 point type for the body text (larger type is appropriate for the title on the title slide). Avoid placing text in all capital letters.</td>
</tr>
<tr>
<td>Layout</td>
<td>Keep blocks of texts, including headlines, to one or two lines. Keep lists to two, three, or four items. Be generous with white space.</td>
</tr>
</tbody>
</table>
Figure 1: Contrast of a traditional slide (left) with a slide (right) that uses the alternative design (Robertshaw, 2004a). In the alternative design, the sentence headline not only identifies the topic, but also states an assertion for that topic. In the slide’s body, a visual presentation of text and images memorably supports the headline’s assertion.

Advantages of the Alternative Design: Meeting the Audience’s Needs

As mentioned earlier, the advantages of the alternative design grow out of a recognition that meeting the audience’s needs is the best way for speakers to achieve their communication goals. In a typical engineering presentation, which calls for clearly, efficiently, and persuasively communicating technical information, this alternative design has several advantages over the traditional design. These advantages are described below in terms of the audience’s needs.

Need/Advantage #1: The audience needs a clear and well developed orientation to the subject, purpose, and, where applicable, argument of the presentation. The alternative design orients the audience significantly better both during the presentation and later when the slides are used as a set of notes. The main reason for this advantage lies with the design’s call for a sentence headline, which has more potential than a phrase headline at orienting the audience to both the topic and purpose of the slide.

First, the alternative design orients the audience significantly better both during the presentation and later when the slides are used as a set of notes. The main reason for this advantage lies with the design’s call for a sentence headline (Alley and Robertshaw 2004a). Simply put, a sentence headline has more potential than a phrase headline at orienting the audience to both the topic and purpose of the slide. Illustrating this point is Figure 2, which contrasts a weaker phrase headline in the left slide with a much stronger sentence headline on the bottom. The sentence headline is more effective at orienting the audience to the slide’s main point. Unfortunately, in such situations, many technical presenters would choose phrase headlines. While a capable presenter using the slide on the left side could orient the audience during the presentation to the main result, the slide on the right side works much better with a less experienced speaker, such as a graduate student. In addition, the slide on the right works much better weeks later when the audience has to use those slides as a set of notes.

Need/Advantage #2. The audience needs a clear mental picture of any phenomenon being described and help remembering key facts. The alternative design is more memorable than the traditional design, because the alternative design presents its details visually in the slide’s body. Presenting those details visually, rather than with a bullet list, makes much stronger
Computations show that the fillet prevents the leading edge vortex and delays the passage vortex. The alternative design emphasizes the key detail on the topic. In addition, the headline of the alternative design's call for visually presenting details in the slide's body. Illustrating this advantage is Figure 3, which contrasts a soon to be forgotten bullet list in the traditional slide on the left with a much more memorable visual representation on the right (Schreiber 2004). The test scores in a large class on the information from this slide support this assertion. Students who saw the left slide answered a question about that slide correctly only 62 percent of the time as opposed to 91 percent for the students who viewed the right slide (Alley, Schreiber, and Muffo 2005).

![Figure 2](image1.png)

**Figure 2.** Contrast between a slide (left) that uses a phrase headline and a slide (right) that uses a sentence headline (Zess and Thole 2001). The sentence headline explicitly states the principal result of the presentation.

![Figure 3](image2.png)

**Figure 3.** Contrast of a traditional slide (left) with a slide (right) that uses the alternative design (Schreiber 2004). The alternative design shows relationships among the details in a visual way. In addition, the headline of the alternative design emphasizes the key detail on the topic.

Cognitive psychology research supports this assertion that the visual representation is more memorable. According to Sadoski and Paivio (2001), the retention of the audience increases significantly if the audience experiences the information in verbal and visual ways. Explaining the increase in retention is the dual correlation hypothesis, which Paivio (1986) proposed. This hypothesis states that verbal codes and pictorial codes are processed and stored in different ways in the brain. Note that in the examples on the right-hand sides of Figure 1 and
Figure 3, the images serve to represent the work, rather than just decorate the slides. As Carney and Levin (2002) point out, representative images increase audience recall, but decorative images, such as the background art of PowerPoint’s templates, do not. In fact, according to Carney and Levin, decorative images actually reduce audience recall.

**Need/Advantage No. 3:** In order to be persuaded, the audience needs to clearly understand the speaker’s key assertions and the logical connections between those assertions and the evidence presented to support them. The alternative design is more persuasive than the traditional design, because having the presenter identify the main assertion of each slide puts the presenter in a much better position to identify the assumptions or warrants of the presentation’s argument. According to Stephen Toulmin, making clear the argument’s claims and warrants to the audience significantly increases the persuasiveness of the argument. The increased persuasiveness of the alternative design arises from the alternative design’s call for sentence headlines. If well chosen, the sentence headlines present the audience with the assertions and assumptions of the presentation. Explicitly stating these assertions and assumptions in a technical presentation is advantageous, because audiences are more inclined to believe the presentation’s argument if they realize the claims (assertions) and warrants (assumptions) of that argument (Toulmin 2003).

Also from a rhetorical perspective, relying on sentence headlines can increase the ethos in the presentation. The reason is that experience has shown that sets of presentation slides that use sentence headlines have significantly fewer slides than sets of slides for similar topics that use phrase headlines (Robertshaw 2004b; Thole 2003). In the alternative design, if the presenter cannot come up with a sentence headline for a slide, then the presenter drops the slide from the presentation. Having fewer slides allows there to be more of the speaker in the presentation which increases speaker’s opportunity to connect with the audience as a live human being.

Finally, once the presenter has decided upon the headline, the presenter is in a much better position to put forward persuasive evidence to support that assertion. Consider, for instance, the evidence brought forward to support the headline assertion in Figure 4. Without the headline focusing the graduate student’s attention of what assertion needed to be supported, she might not have chosen such cogent evidence.

**Figure 4.** Persuasive slide that uses the alternative design (Zhu 2002). The assertion of the sentence headline makes it clear to the presenter what type of evidence is needed in the slide’s body.

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**Power passive modules perform the same functions as discrete circuits but with smaller volumes**

- **Passive module**
  - 82 cm³
- **Discrete Components**
  - 168 cm³

The total volume is cut by more than half

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Resistance to the Alternative Design by Faculty and Students

Both of us have spent most of our careers teaching undergraduate engineering students to communicate more effectively. We have also taught graduate students and practitioners and interacted extensively with engineering faculty. In our attempts to get faculty, students, and professionals to think critically and adopt a more effective alternative design for slides, we have encountered resistance that was both strong and surprising.

Practical Reasons. For this strong resistance to using the alternative design, we probably should not have been surprised. Despite its advantages, the alternative design poses a number of challenges to the user. For younger presenters, especially, the task of writing a succinct sentence headline that states the main assertion of each slide is particularly difficult. To write such a headline, the presenter has to understand the subject well enough that he or she can state the role of each slide in the presentation. In other words, creating a sentence headline that specifies the slide’s assertion challenges the presenter significantly more than writing a phrase headline that simply identifies the slide’s topic. Another challenge is the requirement of presenting the evidence in the body in a visual way. As stated in Table 1, this visual representation could be an image, graph, or visual arrangement of text. Given the emergence of digital cameras and computer graphics programs, though, incorporating visual representations into presentation slides has become much easier in the past few years.

A second reason that the alternative design is not easily accepted is that adherence to the design requires much effort to overcome the defaults of presentation slide programs, such as PowerPoint. For instance, overcoming defaults for type choice, type size, placement of headings, and automatic insertions of bullets and sub-bullets in PowerPoint requires many key strokes and much time for the presenter. One effective way that we have found to overcome this hurdle has been through using the web to distribute PowerPoint templates that replace Microsoft’s defaults with defaults for the alternative slide design. This distribution has been successfully used both in professional workshops and in large courses at Virginia Tech and the University of Illinois (Academic 2003). These templates are readily available on the web at the number 3 site, according to Google (2004), for the topic of presentation slides. Nevertheless, users have to make significant investments of time in order to master the new approach. Many engineers feel that time pressures make it difficult for them to make those investments.

Probing Deeper into the Resistance. The objections outlined in the preceding subsection are the ones that people most frequently and easily articulate when presented with the alternative design, but probing more deeply into the resistance reveals a number of other factors at work. Perhaps chief among these is that many engineers have a resistance to trying something that is out of the norm. Many engineers adhere to the presentation techniques that they see, and overwhelmingly what they see in classrooms and at professional meetings is the traditional design of a phrase headline supported by a bullet list. Engineers like other professional groups are strongly oriented to norms of professional practice, sometimes independently of their individual understanding or acceptance of the basis on which the norm was established. This orientation often means that when engineers are confronted with something new and different from the norm, they will have a strong resistance to it.

That resistance is partly because the scientific process calls for challenging new ideas; however, there is something more going on, because some engineers will weigh the advantages
and disadvantages and go with what makes the most sense, while others will not veer from the norm, perhaps because of fear of being different. Students especially want to be accepted into the professional engineering community, and being different puts that acceptance at risk. For a new idea to be accepted into an isolated community, the idea needs to have merit. The idea also needs to have a “critical mass” of supporters who make the others willing and perhaps slightly pressured to try the new idea. Our experience suggests that, at least in an academic context, one of the best ways to create a critical mass and apply slight pressure is to teach the method explicitly and require it as part of graded presentation assignments.

**Experience at Virginia Tech.** In the past four years, undergraduates in the Mechanical Engineering Department at Virginia Tech have used the alternative design in a laboratory course sequence that begins in the second semester of the junior year and ends in the first semester of the senior year. Unlike the situations discussed above, the slide design is considered the norm in the course sequence. The faculty members use the design in their teaching, these faculty members spend class time teaching the design to students, and the students are challenged in their assignments any time that they rely on phrase headlines and bullet lists. Given that, it is not surprising that almost all the student presentations in this course sequence follow the alternative design.

More interesting is that the readiness to accept the alternative design by these classes of mechanical engineering undergraduates has noticeably increased over the past four years. Part of this increase is probably because the faculty members have become more adept at teaching the alternative design. For instance, the faculty members incorporate more examples from previous mechanical engineering students in their instruction. Another part of this increase is probably because the students have seen older students use the design in senior design presentations and have interpreted the alternative design as an integral part of this engineering community.

What is also interesting is an examination of the slide designs that these undergraduates use after they leave the laboratory course sequence. Our examinations of senior design presentations over the past three years have found that in these presentations, only about half of the students continue to use the alternative design. However, for those that do, the adherence to the alternative design can be almost religious.

For instance, in the Fall 2004 semester, one senior design team had a heated debate about whether to use the alternative design (Robertshaw 2004c). The team consisted of four aerospace students who did not learn the design in their undergraduate curriculum and two mechanical engineering students who did. For their senior design presentation that semester, both mechanical engineering students wanted to use the design (even to the point of creating on their own an entire presentation that followed the design), but the four aerospace students insisted on the traditional design with phrase headlines supported by bullet lists. While the mechanical engineering students tried to argue on the basis of which design communicated the work better, the aerospace students argued on the basis of what was the norm. In this team’s case, the majority ruled for the first design presentation. Interestingly, when the team made that first design presentation to the advisors for the project (two mechanical engineering professors and one aerospace professor), the team was criticized because many slides seemed unnecessary, key images were lacking, and many connections between details were unclear. Both mechanical engineering professors in fact suggested that the team use the sentence headline design taught in the Mechanical Engineering Department. While the aerospace professor was ambivalent on what slide design to use, he did insist that each slide should have a clear purpose, and that in the first
presentation, each slide did not. In its second presentation, the team chose the alternative slide design.

In workshops on the alternative slide design to faculty, graduate students, and professionals, acceptance of the new slide has not occurred readily. In the past two years, about ten of these workshops have been given to more than 100 faculty, graduate students, and professionals. Before the workshop begins, participants are given a template for the alternative design and asked to create a short presentation using that specific template. In general, only about half the participants actually try the template on the first go-round. Many ignore the template and submit a set of slides that follows the traditional design. Interestingly, a survey reveals that three months after the workshop many continue using the design (Alley 2004). The results of the survey are shown in Table 2. Note that only about half of those who have taken the workshops have responded to the survey, which suggests that the percentages of those continuing to use the alternative design could be significantly less than this survey indicates. Still, this survey does indicate a divergence in the acceptance of the alternative design among the people who responded—particularly with regard to the use of the sentence headline, which is strikingly different from what occurs in the traditional design. In fact, in the specific comments about audience reaction to the design, those who found audiences averse to the design said that the sentence headline was the aspect with which those audiences felt most uncomfortable.

Table 2. Results from survey of 58 professionals, faculty, and grad students on use of the alternative design.

<table>
<thead>
<tr>
<th>Continued use of sentence headlines</th>
<th>All slides</th>
<th>Most slides</th>
<th>Some slides</th>
<th>No slides</th>
</tr>
</thead>
<tbody>
<tr>
<td>29%</td>
<td>31%</td>
<td>31%</td>
<td>9%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Continued use of visual evidence</th>
<th>All slides</th>
<th>Most slides</th>
<th>Some slides</th>
<th>No slides</th>
</tr>
</thead>
<tbody>
<tr>
<td>37%</td>
<td>45%</td>
<td>18%</td>
<td>0%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Audience reaction to alternative design</th>
<th>Mostly receptive</th>
<th>Somewhat receptive</th>
<th>Mixed reaction</th>
<th>Somewhat or mostly averse</th>
</tr>
</thead>
<tbody>
<tr>
<td>55%</td>
<td>11%</td>
<td>17%</td>
<td>4%</td>
<td></td>
</tr>
</tbody>
</table>

Experience at the University of Virginia. In the Spring and Fall of 2004, two groups of fourth-year engineering students from a variety of majors at the University of Virginia were exposed to critiques of PowerPoint, required to use hard copy slides rather than live PowerPoint, and limited in the number of slides they could use (5 slides maximum in an 8 minute presentation). The Spring 2004 group were specifically instructed in the technique presented in this paper. The Fall 2004 group were encouraged to use a variety of visual aids and to respond to the particular opportunities and challenges of their material; they were also told that creativity would be an important part of their presentation grade. In the beginning, many students in both groups thought the instructor had taken leave of her senses. When surveyed at the end of the semester, all but a few had gained an appreciation for the limitations of the traditional bulleted, slide-dominated form of oral presentation.

Many of the specific realizations they reported echoed the published critiques presented earlier in this paper, but some new dimensions also emerged.

1) When there is less emphasis on slides, the speaker is more aware of the importance of delivery and establishing a rapport with the audience. As a corollary, PowerPoint can insulate weak speakers, but it may pull the audience’s attention from the topic at hand.
2) People respond to visuals, imagination, and demonstrations more than slides with bulleted chunks of information.
3) A person leading you through a presentation is much more dynamic than a person showing you PowerPoint that leads you through the same presentation.
4) Handouts specially designed as handouts more effectively support the presentation than do copies of slides; they also convey detailed information that cannot be easily projected.
5) Although PowerPoint would appear to offer the advantage of making presentations more diverse and the opportunity for greater freedom and creativity, people tend to get stuck in a PowerPoint rut so that presentations become very standardized. PowerPoint tends to impose a particular style of thinking and information that does not always fit the topic well.
6) Focusing on the visual element of visual aids promotes diversity in presentations.
7) Being limited in the number of slides that can be used encourages thoughtfulness with regard to the value and meaning that each slide adds to the presentation.
8) The traditional PowerPoint presentation is easier for the speaker but harder and less entertaining for the audience.
9) Many students are reliant on PowerPoint but do not know it.
10) A few visual aids that are explained thoroughly are more effective than 15 slides, each of which can only be touched on quickly.
11) The most effective visuals illustrate rather than restate.
12) PowerPoint is both the most professional and the most boring means of giving a presentation. (There is an interesting contradiction to be explored here.)
13) PowerPoint encourages procrastination.
14) When a tool is used just for the sake of using a tool, then the tool is no longer useful
15) PowerPoint is a crutch for students to lean on, and when you take the crutch away it’s interesting to see how students respond. They are forced to be more knowledgeable on the topic and pay more attention to logical structure.
16) PowerPoint can limit the creativity a presenter uses.
17) PowerPoint is something of a technical fix in the sense that it substitutes the use of technology for a sound understanding of principles of effective presentation and for a careful consideration of the challenges and opportunities presented by the specific material being presented.

These responses reflect both the students’ experience of making a presentation and of being the audience for roughly 30 other presentations. They articulate the kinds of concepts that skilled users would be expected to know and reflect the mindset associated with intelligent use.

Resistance as a Case Study in Reluctance to Accept New Ideas in Engineering. In discussing his own efforts to get new scientific ideas accepted, the physicist Max Planck (1949) said, “A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.” This somewhat pessimistic view suggests that the only real way to effect change is to wait for the current generation to die. (Anyone who has spent much time in academia can appreciate why Planck took this view.) We believe, however, that a closer look at the sources of resistance to change can provide insight that is useful in promoting positive change and, borrowing Planck’s terms, in helping people “see the light.”
Perhaps the most important conclusion emerging from our analysis is that PowerPoint is—or at least has become—not just projection software but also a mindset and a set of conventional practices for using the software. Although it is theoretically “just a tool,” PowerPoint has been assimilated into professional practice—into people’s ways of thinking and doing things—in a particular way that can be overcome but that can be overcome only with great difficulty. The process by which tools and ways of using them become embedded in human behavior usually begins with what the historian of technology Rosalind Williams (2002) has termed “technological drift,” the tendency to focus on the aspects of problems that are most easily addressed by technology.

Once people have invested in tools and particular ways of using them, the tools and practices acquire what the historian of technology Thomas Hughes (1987) has termed “momentum,” a quality that is “analogous…to inertia of motion.” Williams (2002) argues that technological drift usually causes work to get “reconfigured in technological terms.” Once this reconfiguration happens, the work, in this case the process of planning and delivering presentations, tends to be “profoundly shaped by the logic of the supporting technological system. The rules that govern the technology start to govern everything else.” Eventually, we come to feel that the technology controls us rather than us controlling it. Choice is theoretically possible, but seems practically difficult if not altogether impossible.

At a minimum, tools make it easy for us to do some things and hard to do others. As Corlann G. Bush (1983) expresses it, “Every innovation has both positive and negative consequences that pulse through the social fabric like waves through water.” Tools, Bush argues, are not neutral; they have a valence, ‘a bias or “charge” analogous to that of atoms’ that results in a tendency for “particular tools to be favored in certain situations. . .to perform in a predictable manner in these situations, and . . .to bend other interactions with them. Valence tends to seek out or fit in with certain social norms and to ignore or disturb others.” In the case of PowerPoint, those norms embrace include conformity and speaker convenience. Those ignored or disturbed are creativity, emphasis on visual elements, and interaction between speaker and audience.

Another source of resistance and aspect of this process by which PowerPoint became embedded in professional practice occurs in the symbolic realm, where the technology, in this case PowerPoint and the default format, become symbols of professionalism. As Goldstein (2003) puts it, “Speakers who use it often come across as more competent, knowledgeable, and impressive than speakers without visual aids”—or perhaps than speakers with different kinds of visual aids. Simons (2004) puts this point another way by arguing that “PowerPoint itself has transcended mere software status to become a cultural icon of contemporary communication.”

Understanding these sources of momentum or inertia provides insight into the kinds of forces that advocates of intelligent use must counter in order to effect change. One of the key elements will be to disengage the tool in its most basic sense from the maladaptive practices and misplaced symbolic value that has become associated with those practices.

Conclusions

1. The alternative design we advocate responds to the major criticisms of PowerPoint and is consistent with the consensus of experts about intelligent use of presentation technology. Perhaps more significantly, it also follows established principles of effective presentation.
2. The major sources of resistance to the alternative design are strong adherence to convention (even when convention is misguided) and the effort that it takes to do something more visual, more original, and more responsive to the to the audience’s needs. Some of the most important sources are implicit and have a significant emotional component.

3. Despite its many advantages, the alternative we propose is not a total answer to the challenges individuals and organizations face in presentations and meetings. Moreover, even the alternative is subject to becoming part of an orthodoxy. Students and professors need to be encouraged to think about effectiveness rather than convention.

4. The educational setting provided by undergraduate programs and, to a lesser extent, graduate programs provides a unique opportunity for encouraging students to try new approaches, and, over the long run, provides the best opportunity for changing professional norms. In addition, if we are able to change the presentation styles of engineering professors, we have an even better chance of shaping the styles of students. These facts, combined with the clear advantages of the new approach, make the investments required to overcome resistance worthwhile.

5. Beyond what it can do for our students’ presentation skills and for the audiences with whom they will interact, teaching our students the intelligent use (that is, the skilled user’s approach) to PowerPoint, provides a great opportunity for engaging engineering students in critical thinking about the ways new technology gets integrated into and changes patterns of working and thinking and generates unintended consequences.

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MICHAEL ALLEY is an associate professor in the Department of Engineering Education at Virginia Tech. He is the author of *The Craft of Scientific Presentations* (Springer, 2003) and *The Craft of Scientific Writing* (Springer, 1996). In addition to presentation workshops taught at several universities during the past three years, he has taught presentation workshops at United Technologies, the Environmental Protection Agency, Sandia National Laboratories, Los Alamos National Laboratory, and Simula Research Laboratory in Oslo, Norway.

KATHRYN A. NEELEY is an associate professor in the Department of Science, Technology, and Society in the School of Engineering and Applied Science at the University of Virginia. She is an editor of and a contributing author to *Liberal Education and Twenty-First Century Engineering: Responses to ABET/EC2000* (Peter Lang, 2004; co-editors David Ollis and Heinz Luegenbiehl). She has taught oral and written communication to engineering students and practitioners for over 25 years.