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Faculty Perceptions and Use of PowerPoint

Renu Gupta, Ph.D.

Abstract

Educational institutions expect faculty to use presentation software, such as PowerPoint, for class lectures and conferences. Although studies have examined audience reactions to such presentations (in terms of interest and retention), faculty perceptions and use of such software are missing. This paper examines the attitudes of computer science and mathematics faculty to the use of PowerPoint along two dimensions: the physical affordances and the structural limitations of PowerPoint. The data indicate that while PowerPoint is adequate for packaged material at the undergraduate level, overhead transparencies offer greater flexibility during teaching and the presentation of complex arguments.

“Now that you’ve finished your PowerPoint presentation, can you start teaching us?”

Student to a university professor during class

1. Introduction

As part of the push towards using technology in educational settings, university faculty are encouraged and expected to prepare and use PowerPoint presentations in their lectures. At academic conferences, the use of PowerPoint is even more prevalent and often it is difficult to obtain alternate presentation modes such as a projector for overhead transparencies (OHT) or a whiteboard. PowerPoint, which was originally developed for

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use in business and corporate settings to allow people to make succinct presentations to teams, supervisors, and clients, has come into the academic sphere where it is increasingly equated with being ‘technologically literate’.

Although the use of presentation software like PowerPoint is now taken for granted, it is not clear whether it is effective and, if so, how it helps. Here we need to distinguish between two features of such presentation programs: the digital feature and the structural features. The digital feature allows files to be stored on a computer and shared with colleagues and students; graphics and animation can be inserted, and the custom animation allows the presenter to control text display. Since considerable planning goes into preparing and creating the slides, the side effect is that such presentations are better organized than lectures where instructors can ‘wing it’. At the same time, since these are finished products, text or data cannot be added during the presentation and the speaker/author has to resort to other display modes, such as whiteboards.

The second feature of such programs is their structure, namely, the physical layout of the slides or the ‘real estate’. This has come in for some extremely sharp criticism by Tufte (2003). He argues that the Landscape format of the slides (versus the Portrait orientation of an A4 page) along with the use of bullet points and large fonts (for easy viewing) force the author to condense the information, often omitting information that is critical but does not fit onto one slide; in fact, he attributes the accident to the Columbia space shuttle in 2003 to the omission of crucial information in a PowerPoint presentation (cf. Dumont, 2005; Shwom and Keller, 2003). The structure of information in PowerPoint has been further examined by Farkas (2005a, 2005b, 2006). Farkas (2009) points to three effects that flow from the design of PowerPoint slides. The first effect, i.e., cutting information to fit the slide, has been extensively discussed in Tufte (2003), while the other two effects are possible distortions in the hierarchical structure of information. One, if there is too much content for one slide, the author may allow the content to run into the next slide, which is overflow distortion. Two, since all the slides have the same visual appearance, the structure is obscured; this is slide flattening. These two effects—overflow distortion and slide flattening—can confuse the audience, which expects a clear map for the presentation.

In terms of research, a small number of studies have examined different aspects of the effectiveness of PowerPoint presentations. One set of studies looks at audience reactions to PowerPoint presentations in terms of interest and retention. Studies find that PowerPoint presentations have a positive effect on student attitude (Amare, 2006; Susskind, 2005). However, the effects on retention and performance are more ambiguous. Susskind (2005) found no effects on student performance, whereas Amare (2006) found that students in the traditional-format classroom performed better. Some of these effects can be attributed to the use of graphics in PowerPoint, which requires students to integrate multiple modes of representation, namely, both text and graphics. So, Blokzijl and Andeweg (2007) found that text slides are better than visualizations and Bartasch and Cobern (2003) found that when the graphics are irrelevant, retention of information is

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poor. The integration issue is highlighted by Blokzijl and Andeweg (2005), whose Dutch subjects performed well on PowerPoint lectures; the Dutch are used to integrating multiple sources of information because TV channels carry sub-titles. These results are explained by Robert and Dennis (2005) who use a cognitive model to argue that rich media increases motivation but decreases attention and, hence, learning. The results indicate that the effects of PowerPoint presentations on learning and retention are complex, because they implicate multiple cognitive processes.

The studies above do not examine the use of presentation software in specific disciplines, which the second set of studies does. In an extensive study, Rowley-Jolivet (2004) compared the kinds of material used in three disciplines: geology, medicine, and physics. The four types of material are textual, numerical (such as equations), figurative (such as photographs), and graphical (such as graphs and schematics), and the analysis showed differences in the type and amount of material used across the three disciplines as well as in the type of visual aid used. In medicine which relies on photographs, most of the visual aids are slides (99.6%), whereas in physics which is mainly textual and graphical, all the visual aids were transparencies (100%).

Thus, certain disciplines benefit from the features available in digital presentation software, whereas they remain peripheral in other disciplines. In economics courses that require simulations and graphs, PowerPoint has a positive effect on student attitude (Sousa and Mirmirani, 2005) as well as performance (Blalock and Montgomery, 2005). In mathematics, Krishna Rao (n.d.) found that PowerPoint enhances student performance and faculty like using it. This indicates that presentation software is more effective in certain disciplines, but this has not been researched in much depth.

Few studies have examined author perceptions about presentation packages such as PowerPoint. In one study, Yates and Orlikowski (2006) examined author perceptions in the workplace, but there is a dearth of studies on academics' perceptions. Given the increasing use of PowerPoint in educational settings, it is important to examine teachers' perceptions of such packages. Informal discussions with academics indicate that they are not entirely enthusiastic about the software, claiming that it 'dumbs down' the material; this could be partially attributed to their disciplines (social sciences) or lack of practice with computer literacy.

Hence, I decided to examine faculty perceptions about the use of presentation packages, specifically PowerPoint, in a discipline where knowledge of computer software forms an integral part of the work of both teachers and students. This exploratory study examines the use of PowerPoint by computer science faculty in their teaching and conference/seminar presentations. The objective of the study was to identify the reasons underlying the use or avoidance of presentation software by university faculty.

2. Data Collection

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The data was collected at a bilingual university in Japan where students major in computer science and engineering. To support these subjects, the operating system used by the university is UNIX. The TeX program is used for word processing, since it was originally designed to handle the mathematical equations required in computer science and engineering. The IT department has also installed OpenOffice, which is an open-source suite similar to Microsoft products, but it is rarely used and, if so, only by students for simple text documents.

The participants were associate professors and full professors at the university, where they taught subjects such as mathematics, programming, and databases. The faculty were of different nationalities; two of them taught in Japanese, while three taught in English. In the discussion below, I refer to them as Professors A, B, C, D and E.

Three types of data were collected and analyzed, which are described in the sections below: (a) the analysis of .one PowerPoint presentation by a faculty member, which allows us to see the features of the software; (b) semi-structured interviews with five faculty members at the university about the type of visual aids they use in teaching and conferences; and (c) the analysis of one video of a university seminar, where the presenter used overhead transparencies, which allows us to see the features of an alternative medium.

3. Using PowerPoint to Teach

To get an idea of what a PowerPoint file can accomplish, Professor A's file is described below. This respondent was the most enthusiastic about the use of PowerPoint and uses it successfully to teach introductory courses in computer networking to undergraduate Japanese students.

The digital nature of the file enables certain functions that would not be possible with transparencies or printouts. First, it facilitates the *repository* function. The instructor prepares the files at the beginning of the semester and uploads them on the course website; students can access and print out the files before class, thus providing a ready reference. Second, the *display* is better. The file contains several color images that have been scanned from books; in a transparency, the colors would not have been as rich. Third, *data exchange* is easy. Although the file is in English, it contains explanations in simple Japanese; since the instructor is non-Japanese, he obtains these explanations from Japanese colleagues and inserts their Japanese text into the files. Fourth, the file contains *animations* to illustrate concepts. Figures 1 and 2 show how an abstract concept is illustrated through the analogy of cars moving past toll booths. The animation is not central, but is interesting; this would not be possible in the print mode.

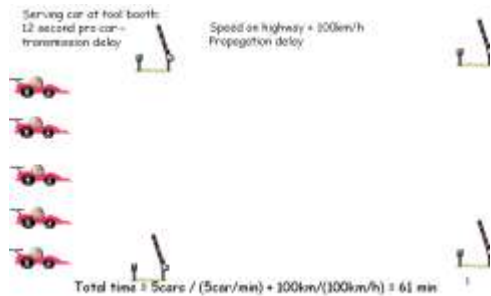


Figure 1. Start of animation

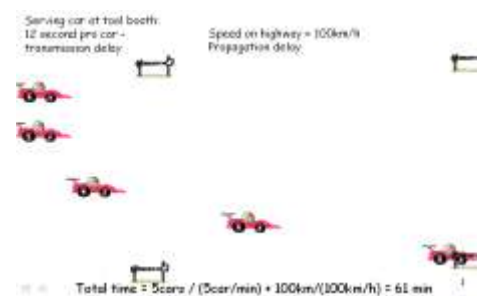


Figure 2. Animation continued

Figures 3 and 4 show how a more central concept is illustrated, namely, data flow which occurs frequently in computer science. Although this could be shown on a transparency, once the lines are marked on the transparency, it has to be re-printed for the next class.

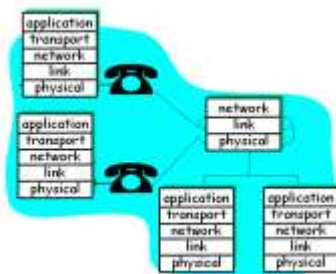


Figure 3. Step 1 of data flow

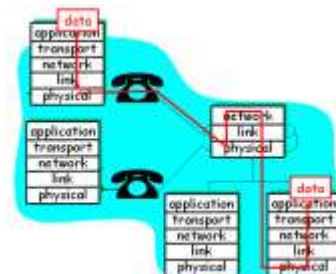


Figure 4. Final step of data flow

The file contains only one equation, which was created in Microsoft Equation Editor; however, since it does not use special mathematical symbols, it could just as easily have been created using the Format (subscript) feature in PowerPoint. This point is discussed in greater detail in Section 4(b).

$$d_{end-end} = N * (d_{proc} + d_{trans} + d_{prop}) ;$$

Figure 5. Equation created in Microsoft Equation Editor.

A few points are worth noting here. This file is used in an introductory course, where the content is fairly narrow and predictable. In addition, the content does not use complex equations, since the students are just starting out in computer science. The interviews below show that as the material becomes more complex, the use of PowerPoint seems to decrease.

4. Interviews with Faculty

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Instead of using a questionnaire, I interviewed five faculty members about what visual aids they used in different settings and the reasons for the choice. The question was loosely framed as follows:

Which of the following do you use in (a) teaching, (b) conference presentations, and (c) presentations before research committees? Why?

The choices were PowerPoint, overhead transparencies, and web-based presentations.

Each interview lasted approximately 30 minutes. Of the five respondents, two were enthusiastic about PowerPoint (Professors A and B), while three were critical of it (Professors C, D, and E). Professor D, on principle, objects to Microsoft products but he raised other concerns as well. Their responses have been organized into various categories below.

a) Convenience

The PowerPoint file described in Section 3 describes several activities that are possible in PowerPoint due to its digital form. During the interviews, two respondents (Professor A and B) referred to the convenience of inserting images and animations in their presentation material, although Professor A admitted that it is time-consuming to prepare animations. They elaborated on the conveniences offered by PowerPoint: the digital format of PowerPoint simplified their preparation of material; they could prepare the presentation on their way to a conference and changes were a simple matter. In contrast, if changes have to be made to a transparency, it has to be re-printed on-site, where the requisite facilities may not be available. The digital format also allowed them to include graphics and animation, where the quality of the images and color is higher than in transparencies. Presentation is simpler, because transparencies take up space on the table and can get mixed up. Professor A summed it up by saying, “In other words, if I have to use transparencies, I have a lot of trouble.” The informants admitted that there can be technical glitches, so Professor A carries his own projector, while Professor B carries printouts as a back-up.

In contrast, Professor C said that he found transparencies more convenient than PowerPoint. He uses numerous graphs in his presentations; graphs can be easily photocopied and printed on transparencies, whereas they have to be scanned as a digital image for a PowerPoint file.

b) Creating equations

All the informants taught subjects that involve equations. In introductory courses, the equations are simple (see Figure 5) and do not require special notation, but at advanced levels the equations involve Greek symbols, operators, etc. Although these symbols can

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be inserted individually using the Symbol feature in Microsoft Word or through the Equation Editor in PowerPoint, the process is tedious and time-consuming, especially where the equations are long. Professor D merely write out the equations by hand, both for teaching and conference presentations. He argued that he could create an equation in LaTeX, convert it into a jpeg file, and then import it as an image into PowerPoint, but “transparencies are time efficient”.

Professor B, who appeared to be positive about PowerPoint (Section 4a above), does not use PowerPoint when he teaches graduate students. At this level, he has to use numerous equations, which are difficult to create in PowerPoint. Instead, he uses TeX to create the equations and prints them on overhead transparencies for the class.

c) Structure

In their responses, two informants referred to the structural limitations of PowerPoint. Professor C did this explicitly, saying that in transparencies one can “pack lots of information into one page” and “related information is on one page”. His examples were long tables that need to fit on one page or long equations, such as the Reynolds number. When the information is too long to fit on even a transparency, Professor D uses two transparencies that he places side-by-side so that students can see the link between them; a PowerPoint presentation would require separate computers and screens for the two files.

d) Adding information

Of the five informants, four pointed out that during teaching they often need to add information to the prepared material; the exception was Professor A, who teaches undergraduate students. Professor E said, “In a small class, one can prepare perfect OHTs but with 150 students, despite anticipating every question, you never know who will ask what because of the differences in their academic levels.” If students do not understand the material, the instructor has to provide additional explanations or information and, sometimes, instructors suddenly remember a point while teaching. Prepared presentations do not permit this flexibility, so professors avoid using PowerPoint; instead, they use transparencies. As Professor E said, “I have freedom with the plastic sheet.” Even transparencies are frequently too rigid for teaching; so, Professors B and E move to the whiteboard for explanations.

Sometimes there are errors in the material; Professor D said that if he spots an error in his material, he can use a pen to correct it on a transparency but this cannot be done during a PowerPoint presentation.

The second reason why instructors use alternatives to PowerPoint comes from the need to **teach** rather than present material; this is in contrast to the PowerPoint file described in Section 2 that was used for an introductory course. Professor E said, “Transparencies are

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interactive; you can draw students' attention to different points and 'grab their attention'". He adds figures and underlines sections of the transparency so that students can see what is happening during the explanation. Professor B uses the whiteboard for a similar purpose. For example, while teaching an algorithm on sorting, he draws the items and then shows changes by erasing, lengthening, etc., so that students can watch the steps in the flow. He said that it would take time to create this in a PowerPoint file, but, more importantly, it would not help students understand the concept of sorting.

In sum, some respondents found PowerPoint a convenient tool for conference presentations and undergraduate teaching because of its digital features. However, most of the respondents avoided its use in teaching, particularly in graduate courses that required complex equations. A critical point that arose during the interviews is that teaching involves step-by-step explanations and interaction with the students; a PowerPoint presentation does not allow this as it is designed for summarizing completed work.

5. Video

As the material becomes more complex, faculty seem to focus on developing or revealing an argument, and depend less on prepared aids. This section, which analyzes a video of a visiting professor presenting his ongoing research at the university, identifies how the presenter uses the visual aid during the presentation.

The presenter was a Japanese professor at a university in the US speaking about a specialized area (Engineering Economic Systems). The audience consisted of academics who were familiar with the area. The presentation lasted for 49:42 minutes, including the introduction of the speaker and the Q&A session.

During the talk, the presenter used 15 transparencies. The first one was typed, but even this had handwritten additions. The remaining transparencies combined photocopied images (such as graphs, trees and matrices) along with handwritten equations and text.

List of transparencies

Type of medium	Slide No.	Total
Typed + handwritten	1	1
Printed	8	1
Printed + handwritten	3, 9, 10	3
Handwritten	2, 4, 5, 6, 7, 11, 12, 13, 14, 15	10

Description of the transparencies

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The transparencies contained different types of content.

- **Typed with handwritten additions.** The introductory slide was typed, but additions had been written in by hand [Three sources of macroeconomic sluggishness (*Policy Ineffectiveness*)]. This is possibly an old slide that had been updated for the presentation.
- **Printed.** This transparency consisted of graphs photocopied from a book. This supports the observation by Professor C that it is easier to photocopy graphs for a transparency than create a digital file for PowerPoint.
- **Printed + handwritten.** The three transparencies contained graphs, tree diagrams, matrices, or a combination of these images that had been photocopied. In addition, text and equations had been written in by hand. For instance, Transparency 9 contains three trees and matrices along with handwritten equations and notes; all this was related information that had to be displayed on a single page. The A4 size of a transparency can accommodate this amount of information, but the Landscape orientation of a PowerPoint file cannot.
- **Handwritten.** The largest number of transparencies (10) was handwritten for numerous reasons. Some contained diagrams that are easier to draw by hand than through the Draw tool in a program; examples are rough graphs (2), arrows and boxes (1), and trees (1). Others contained equations (6) that are easier to write by hand than through an Equation Editor; in fact, one entire transparency was devoted to a single equation.

Using the medium

The presenter used the transparencies to build and explain a complex argument. In this, he used a sheet of paper to slowly uncover sections of the transparencies, so that the audience could focus on the point at hand; in PowerPoint, this could be done through the Custom animation tool. He also drew attention to variables in an equation, sections of a graph, and to track movement in a hierarchical tree; again, this is possible in presentation software by using a laser pointer.

However, some interactions are not possible with PowerPoint, but are easily done with transparencies. The presenter frequently wrote on the transparencies, during the presentation. These were not simple corrections of errors, but additions to guide the audience through the argument. This can be seen when he discusses Transparency 12, which contains text references and a hand-drawn tree.

P: Now what's interesting is this notion about using trees...[draws a tree]. You have the trees. So, what you want to look at is this [points to tree]. So, let's call this...up to n [adds notation to tree]. So, what you want to look at is this [writes equation on the side]. In other words, you want to introduce some shocks to one of the nodes [darkens a node in the tree]. So, let's call it 1. So [points to part of

the equation] P of 1 is going to be 1. All the other nodes [points to sections of the equation and the tree] are going to be...

Here, the presenter slowly builds up the information to lead the audience through the argument. This resembles the comments by Professors B and E in Section 4d about teaching graduate students, where they present the material step-by-step.

Further in the talk, the presenter does the following with Transparency 12:

P: You do that and this thing [boxes part of equation] and also there's another thing to look at [writes equation above equation]...the average. So, this [points to the new equation] is the distance that the disturbance will propagate through the hierarchical tree. That's one measure [points to new equation] and another measure is to look at $P_1(t)$ [points to boxed equation] ...how quickly this goes down to zero.

In this interaction, the presenter is working with one equation, but suddenly realizes that the audience may be confused. So, he adds a second equation, explains it, and returns to his main equation.

The video validates several points made by faculty in their interviews. Transparencies provide more 'real estate' than PowerPoint by allowing related information to appear on the same screen. When the presentation involves non-text material, such as equations, graphs, boxes, matrices, and trees, it is simpler to photocopy or write out the material on a transparency/ whiteboard than to attempt it in PowerPoint. Finally, in teaching and complex argumentation, transparencies permit the presenter to build up and reveal an argument and allow the audience to follow the argument step-by-step.

6. Conclusion

This study examined faculty perceptions of presentation software, such as PowerPoint. It found that faculty prefer to use transparencies or the whiteboard, especially when it involved teaching or presenting complex material, because these allow them the flexibility to highlight or add material. Further, these media offer more space to show links across related concepts and structures.

The study is exploratory and has several shortcomings, notably the small number of respondents and the concentration on a single discipline, namely, computer science and engineering. However, it suggests that faculty resistance to PowerPoint may be valid, though not articulated strongly. The most interesting finding that emerges does not have to do with either the digital aspect or the structural aspect of PowerPoint, but with the fact that it does not support teaching. If PowerPoint files of courseware are freely available on the Internet, it raises the question of why one needs a teacher. This is where one distinguishes between 'capsules of information' that can be captured in a digital file and

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the explanation that students or non-experts require to understand and learn. Capsules suggest to students that knowledge can be packaged neatly, memorized and regurgitated; explanations, instead, show students that learning is a process that is untidy, open-ended and raises more questions than it answers.

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References

- Amare, N. (2006). To slideware or not to slideware: Students' experiences with PowerPoint vs. lecture. *Journal of Technical Writing and Communication*, 36, 3, 297-308.
- Bartsch, R.A. & Cobern, K.M. (2003). Effectiveness of PowerPoint presentations in lectures. *Computers and Education*, 41, 77-86.
- Blalock, M.G. & Montgomery, R.D. (2005). The effect of PowerPoint on student performance in principles of economics: An exploratory study. *Journal for Economics Educators*, 5,3, 1-7.
- Blokzijl, W. & Andeweg, B. (2005). The effects of text slide format and presentational quality on learning in college lectures. *2005 IEEE International Professional Communication Conference Proceedings*. (pp. 288-299).
- Blokzijl, W. & Andeweg, B. (2007). The effect of text slides compared to visualizations on learning and appreciation in lectures. *2007 IEEE International Professional Communication Conference Proceedings* (pp.1-9).
- Dumont, J-L. (2005). The cognitive style of PowerPoint: Slides are not all evil. *Technical Communication*, 52, 1, 64-70.
- Farkas, D.K. (2005). Understanding and using PowerPoint. *STC Annual Conference Proceedings* (pp. 313-320).
- Farkas, D.K. (2005). Explicit structure in print and on-screen documents, *Technical Communication Quarterly*, 14, 1, 9-30.

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- Farkas, D.K. (2006). Toward a better understanding of PowerPoint deck design, *IDJ+DD (Information Design Journal + Document Design)*, 14, 2, 162-71.
- Farkas, D.K. (2009). Managing three mediation effects that influence PowerPoint deck authoring. *Technical Communication*, 56, 1, 28-38.
- Krishna Rao, M.R.K. (n.d.). An appropriate blend of tradition and technology in discrete mathematics course. http://faculty.kfupm.edu.sa/ICS/mkrishna/Tradition_tech.pdf Accessed June 23, 2010.
- Manning, A. & Amare, N. (2005). Using Visual Rhetoric to avoid PowerPoint pitfalls. *2005 IEEE International Professional Communication Conference Proceedings*. (pp. 281-287).
- Robert, L.P. & Dennis, A.R. (2005). Paradox of richness: a cognitive model of media choice. *IEEE Transactions on Professional Communication*, 48, 1, 10-21.
- Rowley-Jolivet, E. (2004). Different visions, different visuals: a social semiotic analysis of field-specific visual composition in scientific conference presentations. *Visual Communication*, 3, 2, 145-175.
- Susskind, J.E. (2005). PowerPoint's power in the classroom: enhancing students' self-efficacy and attitudes. *Computers and Education*, 45, 203-215.
- Shwom, B.L. and Keller, K.P. (2003). "The great man has spoken. Now what do I do?" A response to Edward R. Tufte's "The cognitive style of PowerPoint". www.communicationpartners.com.
- Sousa, K.J. and Mirmirani, S. (2005). The impact of technology in teaching freshman economics: A quantitative approach. *Journal of College Teaching & Learning*, 2, 12, 17-24.
- Tufte, E.R. (2003). *The cognitive style of PowerPoint*. Cheshire, CT: Graphics Press.
- Yates, J., and. Orlikowski, W. J. (2006). The PowerPoint presentation and its corollaries: How genres shape communicative action in Organizations. In M. Zachry and C. Thralls (Eds.), *Communicative Practices in Workplaces and the Professions: Cultural Perspectives on the Regulation of Discourse and Organizations*. Amityville, NY: Baywood Publishing.

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