

- **Spotlight**
- **on the**
- **presenter**



**A study into presentations of
conference papers with PowerPoint**

Brigitte Hertz

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with PowerPoint**

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Spotlight on the presenter

A study into presentations of conference papers with PowerPoint

Brigitte Hertz

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A Abstract

1. Introduction

PowerPoint is the most widely used presentation software tool. As of 2012, PowerPoint had more than 200 million presenters worldwide. Presenters all over the world use the program. Some use it for university teaching, others for business meetings and some even use PowerPoint to deliver a sermon. But the program doesn't always seem to be used to the satisfaction of the audience. In many critical articles, presenters are accused of using too many words on their slides and too often looking at the projection instead of keeping eye contact with the audience. Some authors also criticize the program itself for what they see as a negative influence on presentations.

If these critical observations are valid, then PowerPoint presentations don't conform to the advice given in instruction books nor to the outcome of research into human information processing. This advice usually proposes the use of minimal text on slides, and instead using pictures or other graphics. This would help the audience process the information. In addition, the instruction books stress the importance of maintaining eye contact with the audience. It is remarkable that the program is so frequently used, while it is so often criticized for what seem to be valid reasons.

There has been some research into PowerPoint use in the classroom, investigating the effects on student appreciation and grades.

Much of this research does not describe how nor why the program is used in these situations. The critical articles on PowerPoint are mainly based on personal experiences and not on research. So there has not been much empirical evidence that presenters actually do use too many words or that they look too often at the projection, nor has the influence of PowerPoint on the presentation been established. In addition it is not clear why so many presenters don't seem to follow the advice in instruction books, which say to use a minimum amount of text on a slide and which stress the importance of maintaining eye contact with the audience.

This dissertation focuses on the role of the presenter. It investigates how presenters use PowerPoint and if they are guilty of the negative behavior mentioned above. If they are guilty, what are the reasons they use PowerPoint in this way? Some authors have suggested that presenters use PowerPoint not only for the benefit of the audience, but that they also use the words on the slides as speaking notes. In particular, presenters suffering from speaking anxiety might be afraid of being "lost for words" or forgetting the structure of their presentation. They would then be able to turn to the text on the slides as support. This dissertation will investigate the possible role of speaking anxiety and how it affects PowerPoint usage.

The research looks at the use of PowerPoint by scholars presenting conference papers. Conferences play a central role in the network of scientific communication and are important for a researcher's profile. The majority of scholars present their work at conferences several times a year and these presentations can be demanding and challenging. In contrast with writing and publishing a paper, conferences

allow scholars to interact with an audience of their peers who will evaluate their work by posing critical questions.

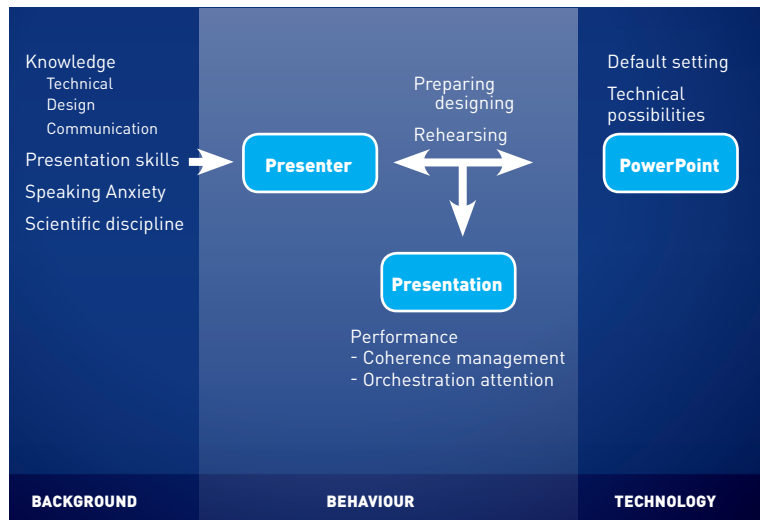
Challenging exposure of this kind might well engender or increase speaking anxiety in the presenter.

Clearly there is a need for empirical research on PowerPoint use, research focused on the program's use in delivering scholarly presentations. Questions to be answered by the research include:

- How do scholars use PowerPoint?
- Why do scholars use PowerPoint in the way that they do?
- Does speaking anxiety influence the way that scholars use Power Point?
- Does PowerPoint influence the quality of presentations?

This thesis studies the use of PowerPoint in a real life setting and looks at presentations as being complex interactions among slides, presenter behavior and audience. An overview of the different elements regarding the presenter, his/her background, the presentation, the presenter's behavior and the PowerPoint program itself can be found in Figure 1.

Figure 1 Elements of PowerPoint presentations



2. Method

There is a literature review and three empirical studies. The literature review compares the program with its predecessors and describes the software, slide design and the user's presentation behavior, focusing on the interaction of these elements. Instruction books and articles on PowerPoint, criticism and empirical research on the topics of slide design, presentation behavior and its effects on audiences are discussed.

In the first empirical study, fifteen scientific presentations of language scientists are analyzed on the use of text and pictures on the slides. The physical and verbal behavior of the presenter has also been studied, specifically investigating how often presenters look at the projection and if they verbally introduce a slide. Furthermore the relation

between the slides and the presenter's behavior has been analyzed.

The second empirical study employs interviews with scholars about their reasons for PowerPoint use. It distinguishes between first-year PhD students (beginners) and advanced, prize winning scholars from different disciplines of science (humanities, physical science, social science and medical science). Special attention is given to the acquisition of PowerPoint skills.

The third study consists of a survey using social scientists and focuses on the influence of speaking anxiety on the use of PowerPoint. It tests if speaking anxiety causes presenters to spend more time on preparing and rehearsing the presentation, and analyzes the possible relationships among speaking anxiety, time spent on preparing and rehearsing a presentation, and the use of words on a slide.

3. Results

Certain characteristics of PowerPoint such as its default-settings and the ability to use slides on the Internet and as handouts may tempt the presenter to increase the amount of text on slides. These choices, however, are not necessary, and are decisions made by the presenter. The scholars in our study used a relatively large number of words when compared to what instruction books advise (a maximum of 20 to 36 words per slide, depending on the author). An average number of 35 (language scientists) and 50 (social scientists) per slide was found. Many of the scholars used a small number of pictures (depending on the scientific discipline).

Presenters look on average 73 times at the projection during their

presentation of 20 minutes (more than three times a minute). Looking at the projection to indicate a new slide or 'new' elements on a slide seems to be characteristic for the use of PowerPoint. Presenters turn away from the audience and break eye contact, something which is considered negative in making presentations. The critics of PowerPoint clearly have a point when they complain about the high number of words on the slides and about presenters looking towards the projection.

There are differences, however, between beginning and advanced presenters. Beginners use more than twice as many words per minute than advanced presenters and only half as many pictures. In maintaining contact with the audience there is also a difference between beginning and advanced scholars. Advanced presenters often like to present without the use of PowerPoint because this allows more contact with their audience.

Some scholars say that they use the text on the slides as speaking notes. Many have also said that they use pictures almost exclusively for the benefit of the audience. Beginners probably use more text and fewer pictures because they suffer more from speaking anxiety than advanced presenters. They might be more concerned with their own performance. Advanced scholars on the other hand have indicated that they have their audience in mind when preparing and delivering a presentation. Speaking anxiety, in an indirect way, also plays a role in the number of words used on the slides. Anxious presenters spend more time rehearsing the presentation; this is related to the number of words used on the slides.

Scholars often seem to lack knowledge about how to use Power-

Point in an appropriate manner. Instead of receiving training in using PowerPoint, they learn to present with the program by experimenting and by observing colleagues and designing slides on the basis of common sense, which is often against the advice in instruction books. Moreover some scholars erroneously think that PowerPoint makes rhetorical skills redundant.

4. Conclusions

The concept of "performance" seems to be appropriate in describing all the elements that matter in the presentation itself: speech, animated slides, working with projections, physical motion and maintaining eye contact with the audience. Presenters need an understanding of how audiences process different sources of information, and they must then be able to orchestrate their presentation skills in appropriate ways. If we look at PowerPoint presentations as performances, we can see that presenters must be designers, actors and directors at the same time.

It is clear that PowerPoint elicits behavior that is not always consistent with what is considered to be good presentation form. This, however, is not the fault of the program. The apparent user friendliness of PowerPoint might disguise the fact that presentations with the program are in fact complex. It is not PowerPoint itself which causes some bad presentations, but the choices and behavior of the presenters who must deal with all the new possibilities and requirements inherent in this program.

Presenters should be educated in appropriate slide design. They

also should be taught how to direct the attention of the audience. It is not sufficient to teach presenters how they should design and present their slides, however, if they aren't helped to learn how to reduce their speaking anxiety in ways other than using the PowerPoint slides as support. This thesis suggests ways of teaching these skills.

S

Samenvatting

1. Introductie

PowerPoint is niet meer weg te denken bij presentaties. Het programma kende wereldwijd meer dan 200 miljoen gebruikers in 2012. Sommigen wenden het aan voor hun colleges, anderen voor zakelijke besprekingen en weer anderen voor de ondersteuning van hun preek. Maar het programma lijkt niet altijd op waardering van het publiek te kunnen rekenen. In veel kritische artikelen over PowerPoint presentaties worden de presentatoren ervan beschuldigd dat zij teveel tekst op hun slides zetten en te vaak naar de projectie kijken waarbij zij het oogcontact met het publiek verbreken. Sommige critici stellen zelfs dat het programma een slechte invloed heeft op presentaties.

Als de observaties van de critici over tekstgebruik en het kijken naar de projectie correct zijn, dan zijn PowerPoint presentaties in ieder geval niet in overeenstemming met de richtlijnen uit instructieboeken voor presenteren of met het onderzoek naar informatieverwerking. Beiden adviseren om weinig tekst op een slide te zetten en in plaats van tekst een beeld te gebruiken om het publiek te helpen de informatie te verwerken. Bovendien benadrukken de instructieboeken het belang van het onderhouden van oogcontact met het publiek. Het is dus opmerkelijk dat het gebruik van het programma zo wijdverbreid is, terwijl het bekritiseerd wordt om, wat lijkt, legitieme redenen.

Er is empirisch onderzoek gedaan naar het gebruik van Power-

Point, maar dat concentreerde zich voornamelijk op de effecten van het gebruik op scholen. Er is geen onderzoek naar hoe het programma wordt gebruikt of waarom het op een dergelijke manier wordt ingezet. De kritische artikelen over PowerPoint zijn vooral gebaseerd op persoonlijke ervaringen en niet op onderzoek. Er is dus nog geen wetenschappelijk bewijs dat presentatoren werkelijk teveel tekst gebruiken en te vaak naar de projectie kijken, noch is de invloed van PowerPoint op presentaties vastgesteld. Bovendien is het niet duidelijk waarom zo weinig presentatoren het advies uit de instructieboeken lijken op te volgen.

Deze dissertatie richt zich op de rol van de presentator. Onderzocht wordt hoe presentatoren PowerPoint gebruiken; of zij zich schuldig maken aan het bovengenoemde gedrag. En als dit het geval is, waarom zij PowerPoint op deze manier gebruiken. Sommige auteurs hebben gesuggereerd dat presentatoren PowerPoint niet alleen ten behoeve van het publiek inzetten, maar dat de woorden op de slide voor de presentator zelf als spiekbrieff dienen. In het bijzonder zou dit kunnen gelden voor presentatoren met spreekangst die bang zijn om de tekst of de structuur van de presentatie te vergeten. De mogelijke rol van spreekangst bij het gebruik van PowerPoint wordt daarom ook betrokken in het onderzoek.

Het onderzoek richt zich op de presentaties van wetenschappers op conferenties. Conferenties spelen een centrale rol in het netwerk van wetenschappelijke communicatie en zijn belangrijk voor het profiel van een wetenschapper. De meerderheid van wetenschappers presenteert hun werk een paar keer per jaar en deze presentaties kunnen uitdagend en veeleisend zijn. In tegenstelling tot het schrijven en publiceren

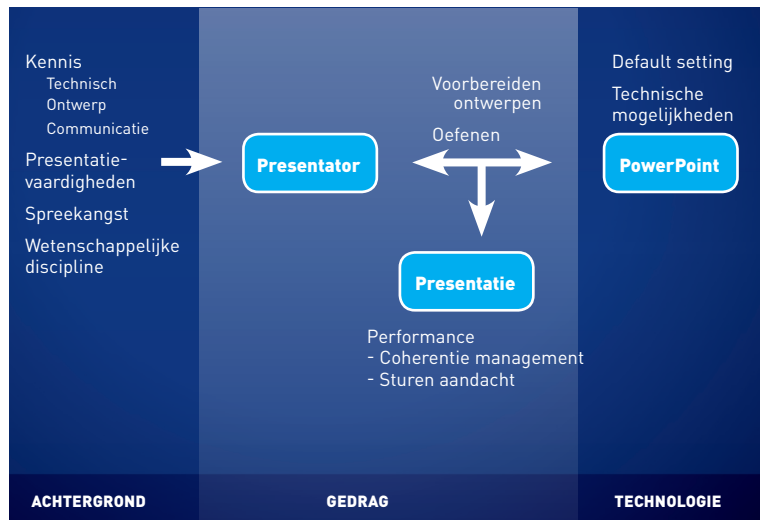
van een artikel, treden wetenschappers op een conferentie direct in contact met hun collega's die kritische vragen kunnen stellen en hun werk beoordelen. Deze confrontatie zou kunnen bijdragen aan spreekangst.

Er is behoefte aan empirisch onderzoek naar het gebruik van PowerPoint. In dit onderzoek worden de volgende vragen beantwoord:

- Hoe gebruiken wetenschappers PowerPoint?
- Waarom gebruiken wetenschappers PowerPoint op deze manier?
- Beïnvloedt spreekangst de manier waarop wetenschappers PowerPoint gebruiken?
- Beïnvloedt PowerPoint de kwaliteit van presentaties?

Het gebruik van PowerPoint in de praktijk wordt bestudeerd en de presentaties worden beschouwd als een complexe interactie tussen slides, presentatorgedrag en publiek. Een overzicht van de verschillende elementen met betrekking tot de presentator, zijn/haar achtergrond, de presentatie, presentatorgedrag en het programma zelf worden in Figuur 1 in kaart gebracht.

Figuur 1 Elementen van PowerPoint presentaties



2. Methode

Een literatuuronderzoek en drie empirische studies zijn uitgevoerd. Het literatuuronderzoek vergelijkt PowerPoint met zijn voorgangers en beschrijft de complexe interactie tussen slideontwerp en presentator-gedrag. Instructieboeken en artikelen over PowerPoint, kritiek en empirisch onderzoek op het gebied van slide ontwerp, presentatie-gedrag en effecten op het publiek worden besproken.

In het eerste empirische onderzoek worden vijftien wetenschappelijke presentaties geanalyseerd op het gebruik van tekst en beelden op de slides, op fysiek en verbaal gedrag van de presentator en de relatie tussen de slides en presentatorgedrag. De tweede empirische studie maakt gebruik van interviews met wetenschappers over hun redenen

om PowerPoint te gebruiken. De studie onderscheidt eerstejaars promovendi (beginners) en gevorderde, prijswinnende wetenschappers uit verschillende wetenschappelijke disciplines (geesteswetenschappen, exacte wetenschappen, sociale wetenschappen en geneeskunde).

Speciale aandacht wordt gegeven aan de verwerving van PowerPoint vaardigheden. De derde empirische studie is een survey onder sociale wetenschappers en focust op de invloed van spreekangst op het gebruik van PowerPoint. De studie test of spreekangst ervoor zorgt dat presentatoren meer tijd besteden aan het voorbereiden en oefenen van een presentatie en analyseert de mogelijke relatie tussen spreekangst, tijd die besteed is aan voorbereiden en oefenen, en het gebruik van de hoeveelheid woorden op een slide.

3. Resultaten

Bepaalde karakteristieken van PowerPoint, zoals de default settings en de mogelijkheid om de slides op het Internet te zetten of te gebruiken als hand-outs kunnen de presentator in de verleiding brengen om veel tekst op de slides te zetten. Dit zijn echter geen verplichtingen, maar keuzes van de presentatoren. De wetenschappers in dit onderzoek gebruikten een relatief hoog aantal woorden op hun slides, vergeleken met wat de instructieboeken voorschrijven (een maximum van 20 tot 36 woorden per slide, afhankelijk van de auteur). We vonden een gemiddelde van 35 (taalwetenschappers) tot 50 (sociaal wetenschappers) woorden per slide. Veel wetenschappers gebruikten een klein aantal beelden (afhankelijk van de wetenschappelijke discipline).

Presentatoren kijken gemiddeld 73 keer naar de projectie in een

presentatie van 20 minuten. Dat is meer dan drie keer per minuut. Nieuwe elementen op de slide, of een nieuwe slide introduceren door naar de projectie te kijken lijkt karakteristiek voor PowerPoint gebruik. Presentatoren wenden zich af van het publiek en verbreken het oogcontact, terwijl het houden van oogcontact juist als een belangrijk onderdeel gezien wordt van een goede presentatie. Critici van PowerPoint hebben dus een punt als ze klagen over de hoeveelheid tekst en het kijken naar de projectie.

Er zijn wel verschillen tussen beginners en gevorderden. Beginners gebruikten meer dan twee keer zoveel woorden per minuut als de gevorderde wetenschappers, en slechts de helft zoveel beelden. Zij verschillen ook in het behouden van contact met het publiek. Gevorderde presentatoren zouden vaak liever zonder PowerPoint presenteren omdat ze hierdoor meer contact met het publiek kunnen maken.

Sommige wetenschappers gebruiken de tekst op de slides als spiekbrieff. Velen gaven aan dat zij de beelden vrijwel uitsluitend ten behoeve van het publiek gebruikten. Beginners gebruiken waarschijnlijk meer tekst en minder beelden omdat zij meer last hebben van spreekangst dan gevorderde presentatoren. De eersten maken zich mogelijk meer zorgen over hun eigen optreden, terwijl gevorderde presentatoren juist aangeven dat zij aan het publiek denken wanneer zij een presentatie voorbereiden en geven. Spreekangst speelt daarbij ook een rol, op een indirecte manier. Presentatoren met meer spreekangst besteden meer tijd aan het oefenen van de presentatie en dit is gerelateerd aan het aantal woorden op de slide; hoe meer men oefent hoe meer woorden men gebruikt.

Wetenschappers blijken weinig kennis te hebben over het juiste

gebruik van PowerPoint. Ze hebben daar geen training in gekregen, maar hebben geleerd te presenteren met PowerPoint door te experimenteren en het observeren van collega's. Ze ontwerpen de slides op basis van common sense. Dat is echter vaak niet conform de richtlijnen van instructieboeken. Sommigen hebben zelfs het idee dat PowerPoint retorische vaardigheden overbodig maakt.

4. Conclusies

Het concept van een 'performance' lijkt goed alle elementen van een PowerPoint presentatie te beschrijven: gesproken woord, (geanimeerde) slides, werken met de projectie, non-verbaal gedrag, en het houden van oogcontact met het publiek. Presentatoren zouden moeten weten hoe het publiek de verschillende informatiebronnen verwerkt en zouden de aandacht van het publiek op de juiste manier moeten weten te dirigeren. Wanneer we een PowerPoint presentatie zien als een performance, dan kun je zeggen dat presentatoren tegelijkertijd ontwerpers, sprekers, en regisseurs moeten zijn.

Het is duidelijk dat PowerPoint gedrag uitlokt dat niet altijd conform de richtlijnen van een goede presentatie is. Dit is echter niet de fout van het programma. Presentatoren zouden onderwijs moeten krijgen in effectief slide ontwerp. De schijnbare gebruikersvriendelijkheid kan het feit verhullen dat presentaties met het programma in feite complex zijn. Het is niet PowerPoint per se dat slechte presentaties veroorzaakt, maar de keuzes en het gedrag van de presentator die met alle nieuwe mogelijkheden en vereisten moet zien om te gaan.

Presentatoren zouden onderwezen moeten worden in het ontwerp

van slides en de manieren om de aandacht van het publiek te sturen. Dit is echter niet voldoende wanneer ze niet tegelijkertijd ook geholpen worden om hun spreekangst te overwinnen op andere manieren dan met tekstslides. In dit proefschrift worden mogelijkheden beschreven om het juiste gebruik van PowerPoint te onderwijzen.

1 Introduction

1. 1. Reasons for research into the use of PowerPoint

This thesis describes research into the use of PowerPoint. One could make the argument that the use of this ubiquitous software needs no further study. The program has become a central part of most presentations and most academics know the basics of its use. Or do they? When observed more closely, interesting aspects of both the program and its use can be identified, aspects that can have an influence on our perception, appreciation and recall of presentations.

PowerPoint is the most widely used presentation software tool. Authors have different ways of estimating the number of PowerPoint users, by market share, number of Microsoft Office users or by the number of presentations made. As of 2012, PowerPoint had captured 95% of the market in presentation graphics, being installed on at least 1 billion computers with more than 200 million presenters worldwide. The frequency of its use in presentations is estimated at around 350 per second globally (Lane and Wright, 2013; Parks, 2012; Thielsch & Perabo, 2012). Gaskins (2012), the inventor of PowerPoint, reports, 25 years after its release, that he could not have expected that PowerPoint would be used for university teaching, children's school reports, church

sermons and supertitles for opera houses.

My interest in the use of PowerPoint originated in my work as a presentation trainer for scholars. Since the 1990's I have trained scholars to present their work at research meetings and conferences and for committees charged with issuing grants. I have worked with beginners as well as advanced presenters, with biologists, as well as psychologists, theologians and physicists. Earlier, presenters were working with overhead transparencies. Now PowerPoint is the overwhelming method of choice.

One of my previous studies demonstrated that when scholars are members of the audience they enjoy enthusiasm, vision and humour in a presentation (Hertz, 2011). Presentations using PowerPoint, however, did not seem to achieve these goals. My early impressions of PowerPoint presentations was expressed by Blokzijl and Naeff (2004) who compared PowerPoint with a magic box of options and the presenter serving as a kind of stagehand.

With the introduction of PowerPoint, an extra training objective became to help presenters to understand that they themselves, and not the PowerPoint slides should be the focus of attention. Another point of concern was how text and pictures were used on the slides. Presenters often use lots of text and relatively few pictures. They often look at the screen and read the words aloud, breaking (eye)contact with the audience. It is remarkable that presenters often exhibit this behavior when they themselves tell me that they find this behavior annoying when part of an audience. It doesn't seem to be an effective way of presenting and I speculated that presenters kept too close to the written text of their papers and did not understand the proper uses of pictures in their presentations, perhaps finding them too frivolous (Hertz, 2006).

The beginnings of my research into PowerPoint (and of this thesis) were prompted when I found empirical studies on the effectiveness of pictures, combined with the spoken word. These were studies by Mayer and his colleagues, describing his cognitive theory of multimedia learning. This puts forward an active process of information processing in which a limited amount of information is selected, organized, and integrated (Mayer, 2009). Mayer proposes two different channels of information processing: an auditive channel for spoken words and a visual channel for pictures and written words. The working memory connects the presented auditive information and the presented visual information. It is this active integration between pictures and spoken words – which he calls the multimedia effect – that causes superior processing and comprehension of the material. Mayer also found that words, projected on a slide as we see in PowerPoint presentations, impair the processing of information because they have to be processed in the visual channel and therefore must compete with pictures for limited processing space. He calls this the “modality effect.” When spoken words were presented simultaneously with text, Mayer found a second detrimental effect at work that impaired the processing of information; he suggests that this is due to the duplication of textual information, called the “verbal redundancy effect.”

One of the consequences of Mayer's findings is that presenters should use pictures on their slides instead of text. My efforts to implement these findings in my training programs, advising presenters to find and use relevant pictures instead of words in their presentations were not really successful. I found that presenters were often reluctant to do so.

The second input for this thesis arose from the numerous papers

expressing criticism on PowerPoint use. These often focused on the slide design (too much text and too many bullet-points) and on the behavior of the presenter (looking too often at the projection) (e.g. Cornelis & Tielens, 2004; Cyphert, 2004; Keller, 2003). Some of these papers also criticized the PowerPoint program itself by saying that “the PowerPoint style routinely disrupts, dominates, and trivializes content (Tufte, 2003, p.2). Critics complained that PowerPoint seduces presenters into using simplified and fragmented topic lists, and encourages dull oral presentations of bullet-points. They say that PowerPoint limits possibilities for improvisation and interaction with the audience (Hanft, 2003; James, Burke, & Hutchins, 2006; Keller, 2003; Vik, 2004).

PowerPoint has not only been accused of causing bad presentations. Some authors feel that the use of PowerPoint had even more far reaching consequences: that the nature of “presentation,” “lecture” and even of “learning” itself are altered (Gabriel, 2008). Kjeldsen (2006) states that the software makes us think and speak in isolated blocks, instead of with coherent narratives and linear reasoning and that it invites a conformity of visual style.

Other writers argue, however, that PowerPoint itself is not the problem, but the way it is used by its presenters. “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” (Shwomm and Keller, 2003, p.2). The idea that the behavior and the underlying motives of the presenter are the most important variables to study became the central element of this thesis.

Most of the articles on PowerPoint and its use are written from personal experiences and mainly cover presentations in a classroom

setting. On the one hand everybody seems to use PowerPoint, and on the other there is much criticism on its use. But how much text and how many pictures do presenters actually use? How often do they look at their projections? If presenters are instructed about the use of text and pictures on their slides (as is the case with my training programs), why are they so reluctant to change their faulty behavior? Scientific studies on presenter behavior with PowerPoint outside the classroom were unfortunately lacking; there is clearly a need for these.

An extra input for this thesis came at a later stage, when the inventor of PowerPoint, Bob Gaskins, published his *Notes about inventing PowerPoint* (2012). In his book he discusses several ways in which presenters don’t use PowerPoint in the way he envisioned its use. Technical developments have influenced the choices of presenters he claims, who use PowerPoint without sufficient knowledge about its purpose or the communication principles behind it.

Before describing the research approach and research questions of this thesis, the history of PowerPoint, its developments and the ideas behind it will be discussed first.

1. 2. The history of PowerPoint and its use

Gaskins started working on a presentation software program in 1984. On its initial release, it was called “Presenter.” In 1987, it was renamed to “PowerPoint,” the idea for the name coming from Gaskins himself. He recalls thinking of the name “PowerPoint” one morning. Later that day a sales representative, returning from a trip, saw the same name out the plane’s window along the runway and mentioned this to Gaskins. Gaskins saw this as a positive omen and decided to

adopt the name. An extra internal upper-case letter, the “P”, was used because PowerPoint was originally a Macintosh computer program and this spelling was required for Macintosh software.

Three pre-computer formats were the original models for PowerPoint: overhead transparencies, 35mm slides, and “multimedia” shows using sequenced and synchronized 35mm projectors. By 1992, PowerPoint made all three different formats easier to prepare. There was still a clear distinction among the uses of different formats for different purposes says Gaskins, because physical media still imposed strict limits. Overheads had to be black-and-white in order to be laser-printed and photocopied onto transparency film. They had the lowest level of finish and were appropriate for internal business meetings, academic talks, and classroom use, as well as for almost any other everyday purpose. Colour 35mm slides, which had a higher degree of finish, took more time and money to prepare, because they were sent away to a special department to be processed. These were appropriate for formal sales presentations or for speeches in front of large audiences. Multimedia shows, with the most polished finish, were delivered by connecting a computer directly to a video projector; these were rarely available. These presentations were appropriate for highly theatrical occasions before large audiences and with entertainment as the main goal.

These distinctions started to fade in the 1990s when the combination of powerful laptops and small, less expensive video projectors displaced previous projection devices. Advanced technical options became available to all presenters who could now mix the features of all three styles. Most presentations had previously used overheads; they now began to add features formerly used only with 35mm slides (such as clip art, or shaded backgrounds), and sound effects - attention-

grabbing transitions between slides, moving text and bullet points formerly used only in multimedia shows. Gaskins was surprised that the technical possibilities seemed to open the doors for presenters to use all options, instead of leading them to carefully consider questions about their suitability.

‘With no constraints from physical media, presenters had no limitation and increasingly no firm intuition as to what was appropriate’ (Gaskins, 2012, p.19).

This was also the time when PowerPoint was included in the Microsoft Office suite of programs, which made it even more popular. (www.kubero.ntfn.org/powerpoint/history.php).

By the end of the 1990s, serious criticisms of the use of clip-art, sound effects and transitions in presentations were expressed. Some of this criticism was directed toward sound - and animation effects and the default setting used with bullet- points. Critics enjoyed using variations on the name of the program to express their discontent. “PowerPointless” was a term popularized by McKenzie (in McDonald 2004, p.160) describing fancy transitions, sounds and other effects with no discernible purpose, or benefit, and “PowerPoint: Shot with its own bullets” was the title of a critical article on the default setting of a PowerPoint slide containing a title and several lines of text preceded by bullet-points (Norvig, 2003).

One former feature of PowerPoint which caused a lot of resistance was the AutoContent wizard. This was a set of pre-written PowerPoint presentations, with a list of general topics from which to choose. The criticism was that the presentations it contained were devoid of meaningful content. Parker (2001) supposes that this wizard was added when Microsoft learned that some presenters found it hard to begin,

presented with a blank PowerPoint page. Parker imagines a Microsoft developer saying: “What we need is some automatic content... Push the button and you’ll have a presentation.”. “Microsoft took the idea and kept the name -- a rare example of a product named in outright mockery of its target customers” (Parker, 2001, ¶ 22).

Gaskin (2012), who had already left the company when the Auto-Content wizard was introduced, thinks that the designers must have imagined that users would understand that they should edit the pre-written general content to make it their own. He learned, however, that many people were using these pre-written work forms unchanged. Similarly, the default slide provided in the program containing a title and several lines of text preceded by bullet-points was used by many people unchanged. Gaskins says that the real mystery to him is “why PowerPoint - including its default presentation style based on traditional business presentations - has been adopted so widely in other contexts” (2012, p. 421). He says that the defaults can easily be changed; he doesn’t understand why the “presentation style”, which was designed for marketing and sales presentations, has been adopted for classroom teaching and other kinds of presentations.

Clearly, then, many presenters were seduced by the technical possibilities of PowerPoint to use the program for purposes for which it wasn’t designed and they interpreted the default settings as the only way of operating the program.

More recent technical developments have once again extended the possible uses of PowerPoint. Yates and Orlikowski (2007) observe that PowerPoint is not only used for the primary function for which it was initially designed, facilitating live presentations, but that PowerPoint slides have been produced and consumed in a wide variety of contexts.

The authors mention the use of PowerPoint slides on the internet in Web-based slideshows and in printed “decks” used as hand-outs during or after the presentation. PowerPoint slides can be saved in a PDF file and sent via email, or posted in that format on the internet (for instance on the website www.slideshare.net). Schoeneborn (2013) suggests another purpose -- as project documentation. One consequence of these new ways of using PowerPoint is that presenters now might use more text on their slides, since the slides can have an extra life outside the presentations, and since the accompanying verbal comments are lacking.

1. 3. Alternative programs

The focus of this thesis is on the use of PowerPoint as a presentation tool. There is other presentation software as well, for example Apple’s Keynote or Google Docs Presentations. These programs work in a fashion similar to PowerPoint. They are used by few people and are not discussed here. A relatively new competitor which is considered by some to be a serious alternative to PowerPoint is Prezi.

Launched in 2009, Prezi is regarded by some as much more dynamic and attractive than PowerPoint and a possible “PowerPoint killer” (e.g. www.frankwatching.com/archive/2010/06/10/prezi-de-powerpoint-killer). The major difference between Prezi and PowerPoint is that the former uses a single infinite canvas, mirroring a whiteboard, on which different elements, such as text blocks or pictures can be designed. The result resembles a mind-map or other type of graphic organizer. Instead of a deck of slides in a fixed order, as is the case with PowerPoint, Prezi allows presenters to move from one element

to another in a non-linear way, thereby leaving room for improvisation. Furthermore, presenters can zoom in and out on elements, making them smaller or larger, thereby creating hierarchy instead of using bullet-points for this purpose (Van Groenendaal, 2010).

There seem to be some disadvantages as well. Designing a Prezi canvas seems more difficult than creating individual PowerPoint slides, and using a Prezi canvas might require more presentation skills than using PowerPoint slides. One must decide in Prezi before and during the presentation which route from one element to another on the canvas to choose. (We have observed that the transfer from one element to another can be an issue, since reactions to Prezi presentations often mention a feeling of “seasickness.”). Moreover, the urge to improvise during the presentation might be small for most presenters.

Much like the use of PowerPoint at its beginning, there are both positive and negative evaluations of Prezi; these are mostly based on personal impressions. Little empirical data on the use of the program and its effects are yet available, apart from the study by Casteleyn, Mottart and Valcke (2013). They found that the use of Prezi in a university course revealed no statistically relevant differences in cognitive load, self-efficacy and knowledge gain by students between the two programs.

The students who received a Prezi lecture in this experiment appreciated the presentation more than the group receiving the PowerPoint lecture. The authors suggest that this perception might be a novelty effect that would soon wear off. They conclude that presentations are a complex kind of communication and that the use of PowerPoint or Prezi is only one of the contributing factors in creating audience appreciation and understanding. This conclusion is in line with the approach

to PowerPoint use, and the emphasis on the role of the presenter in this thesis.

1. 4. Focus

The focus of this thesis emphasizes the behavior of the presenter in one of the main settings in which PowerPoint is used – scientific conferences. This differs from the perspective of other PowerPoint critics who focus on the presentation software, but it is in line with the work of others who maintain that the use of PowerPoint can’t be studied by looking at the slides alone (see for instance Farkas, 2010; Bucher & Niemann, 2012).

1. 4. 1. Presentations at scientific conferences

Many of the studies into the use of PowerPoint deal with the program used in a classroom setting. The focus in this thesis is on presentations of scholars, being the participants in my training programs and important contributors in the dissemination of scientific knowledge. We are looking specifically at presentations of scientific papers at conferences. The use of PowerPoint at conferences is ubiquitous (Hertz, 2011); one can’t image a scientific conference without (Lobin, 2009). The majority of scholars present their work at conferences several times a year, and find such presentations important for their work (Hertz, 2011).

At a conference, scholars present their research results, discuss their findings with their peers and negotiate knowledge claims. Receiving feedback from peers on one’s work is one of the most important objectives for presenters (Hashemi & Hokmabadi, 2011; Webber 2002).

Reasons for those who attend conferences might be to keep up-to-date by learning about research-in-progress and unpublished research results, identification of interesting lines of research, research “dead-ends” to avoid, peer recognition (Clarke, 2009), establishing new contacts, collaborating with other research groups and getting funding (Hashemi & Hokmabadi, 2011).

Conferences play a central role in the network of scientific communication (Rowley-Jolivet, 2002; Shalom, 2002). They also form a crucial element in the development of a researcher’s profile (Ventola, Shalom, & Thompson, 2002) and are considered demanding and challenging (Heino, Tervonen & Tommola, 2002; Ochs & Jacoby, 1997). In contrast with writing and publishing a paper, conferences allow scholars to interact with the audience in a less formalized setting.

Lobin (2009) sees scientific presentations as an attempt to combine the specific advantages of a written text (objectivity and distance) with verbal communication (connection with the audience). Because there is personal input of the presenter (who is speaking), it is, according to Lobin, possible to apply rhetorical strategies. This is a rare moment where scholars have direct contact with their colleagues and competitors, unlike publishing in journals. It is a moment where their peers will be able to directly evaluate their work by posing critical questions. One could say that the presenters’ work, and, indirectly, they themselves, are being tested and such exposure might well cause speaking anxiety.

There are important differences between lectures (most studies on PowerPoint deal with classroom situations) and scientific presentations. A lecture is mainly meant to transfer knowledge; a scientific presentation may have, as has been shown, other objectives as well.

The audience for lectures and scientific presentations may also differ. At a conference the scientist doesn’t meet students, but meets his peers. Peers attend the conference out of interest and free will and invest time and money in doing so. An audience which is so motivated, is probably more critical of the presentations. If we compare the presentations from the point of view of the presenter, we suspect, in view of the different objectives, that for a presenter there is more at stake with presenting at a conference.

Because conferences are so important for scholars and because presenting one’s work to peers might be daunting and a potential cause of speaking anxiety, it is worthwhile to investigate how scholars use PowerPoint at conferences.

1. 4. 2. Delivery

Bucher and Niemann (2012) describe PowerPoint presentations as a multimodal event, or a “performance,” in which all the different elements like speech, text, pictures, design, and pointing activities interact; the presenter has to “orchestrate” the attention of the audience. Schnettler and Knoblauch (2007, p. 20) define performance, as “temporary, bodily and multimedia implementation of communicative actions which can be observed in real-time”. In studying presenter behavior, the most important element during the presentation might be “contact with the audience.” This crucial element of a presentation is in one of the canons of rhetoric; “delivery”.

According to McCroskey (2006), a strong delivery produces more attitude change and a poor delivery tends to inhibit the effect of a verbal message. Good delivery should be natural, he claims, and should not call attention to itself or distract. Lucas (2004) has a similar description

and adds that a good delivery should convey the speaker's ideas clearly, interestingly, and without distracting the audience. McCroskey goes on to say that an important feature of delivery is the interaction with the audience. He describes it as a circular process in which the presenter observes the reaction of the audience, adapts, the audience in turn responds, and the presenter adapts again. Direct eye contact, he says, contributes more to the establishment of a circular response between speaker and audience than does any other element in delivery. Direct eye contact makes the audience feel they are part of the communicative event. Other elements are the effective use of voice, effective bodily action, variety and immediacy. The latter refers to the degree of perceived physical or psychological distance among people in a relationship. Because formal public speaking tends to generate a low level of immediacy, a presenter should make every effort to increase the level, mainly by making eye contact with the audience.

Lucas (2004) says that delivery is mainly a matter of nonverbal communication; it is how you use your voice and body to convey the message expressed by your words. He distinguishes four basic methods of delivering a speech. The first one is reading verbatim from a script without looking at the audience. In doing so, presenters turn away from the audience and we have seen that having such little contact is not considered to be successful in engaging interest. The second method is reciting a memorized text, but, according to Lucas, this has the danger of concentrating too much on the words instead of on the audience.

The third method is impromptu speaking (without preparation or planning), which is difficult for most presenters and probably not applicable to conference presentations. The fourth kind of delivery is to

speak extemporaneously (combining preparation with the spontaneity and enthusiasm of an unrehearsed talk, by planning major speaking points without memorizing the precise language). Lucas believes this is the best method to deliver a verbal presentation.

Both McCroskey and Lucas consider "contact with the audience" and eye contact to be the most important factor for a good delivery. They believe that looking away from the audience, for example to look at the words on a PowerPoint slide, is a bad way of presenting.

McCroskey (2006) couples the delivery of presentations with speaking anxiety. Apart from very experienced presenters and naturally talented speakers, all presenters suffer from this kind of nervousness (Coy & Pias, 2009; Hertz, 2011). McCroskey finds that the reason many people are "bad" presenters is that they are not audience-centered but self-centered, and that this is increased through nervousness. One of the reasons for PowerPoint presenters to use texts on their slides could be that this helps them to control anxiety. The possibility of using words on a slide might have replaced the use of speaking-notes (see also Cornelis & Tielens, 2004 and Farkas, 2005). PowerPoint slides containing the wording and structure of the speech can help presenters who fear they will be lost for words, forget a topic, or present the topics in the wrong order. This thesis will examine whether speaking anxiety indeed plays a role in the use of words on PowerPoint slides.

1. 5. Problem definition and research questions

Presenters in general do not appear to be at their best when presenting with PowerPoint. This impression from the training programs is supported by many articles on the use of the program. There is little

research, however, into this subject, apart from empirical studies in the classroom which unfortunately do not reflect the situations studied in this thesis. The focus is, instead, on scholars presenting at conferences, which are important venues for disseminating scientific knowledge and often critical for their work and careers.

It is hoped that this dissertation will contribute to a better understanding of the use of PowerPoint in presentations by providing valuable empirical data. A better understanding of the actual use of PowerPoint might help to advise presenters how to use PowerPoint more effectively. The dissertation focuses on the following questions:

- How do scholars use PowerPoint?
- Why do scholars use PowerPoint in the way that they do?
- Does speaking anxiety influence the way that scholars use PowerPoint?
- Does PowerPoint influence the quality of presentations?

1. 6. Thesis outline

This thesis comprises a literature review and three empirical studies, which are presented in subsequent chapters. All of these studies have either been published or submitted/accepted for publication. Each chapter is self-contained, with its own abstract, introduction, discussion and reference list.

1 The first chapter presents a review of literature on PowerPoint. It compares the program with its predecessors and describes the

complex interaction between program, slide design and presentation behavior. Instruction books and articles, criticism and empirical research on the topics of slide design, presentation behavior and effects on audiences are discussed. The chapter addresses the question of how PowerPoint influences the quality of presentations.

2 The second chapter describes an empirical study into the use of PowerPoint by scholars presenting at a conference. This study investigates, in a real life setting, if PowerPoint brings a new configuration to presentations. Fifteen scientific presentations were analyzed with attention paid to the use of text and pictures on the slides, on the physical and verbal behavior of the presenter and on the relation between the slides and the presenter's behavior.

3 In chapter three, the interviews which were held with scholars about the reasons for their use of PowerPoint are discussed. Twelve first-year PhD students and twelve advanced, prize winning scholars were interviewed: three in each discipline of science (humanities, physical science, social science and medical science). The questions represented different topics including: acquisition of PowerPoint skills, preparation of a presentation, advantages and disadvantages of PowerPoint use, the purpose of the various slides, and the appreciation of and feelings about PowerPoint presentations when given by others. Implications for the teaching of PowerPoint use are presented.

4 Chapter four describes the empirical study which focuses on the influence of speaking anxiety on the use of PowerPoint. One reason why presenters choose to use words on slides rather than pictures might be that words function as speaking notes and help to reduce speaking anxiety. A survey was conducted amongst social scientists.

Ninety-seven respondents answered the questions on speaking anxiety, preparation and rehearsing and sent in their most recent PowerPoint presentation. The outcomes of the survey were related to the use of words and pictures on PowerPoint slides.

5 Chapter five describes the answers to the research questions and discusses the theoretical and practical implications of the research. Suggestions for improving presentations with PowerPoint are presented.

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2

PowerPoint: from dubious default to detrimental decisions

-a literature review¹

¹ Submitted for publication

In order to assess how PowerPoint influences the quality of presentations, this review compares the characteristics of PowerPoint with its predecessors and describes the complex interactions between the program, slide lay-out and presenters' behavior. Advice given in instruction books, criticisms of the use of PowerPoint, empirical research, presentation behavior and effects on an audience are discussed. PowerPoint may encourage behavior, such as using much text on slides, that was not present to the same extent when using PowerPoint's predecessors. The choices of the presenter however, much more than the characteristics of the presentation software itself, affect the quality of presentations.

2. 1. Introduction

Since the introduction of the blackboard we have seen a succession of instruments for the visual support of presentations. These include 35 mm slides, overhead transparencies and computer programs which generate slides such as Prezi, Keynote and PowerPoint, the latter being the most popular and widespread presentation tool in educational, academic and business settings. Approximately 96% of presenters use PowerPoint (Thielsch & Perabo, 2012). Some ten years ago, the program was heavily criticized in articles with titles that left no doubt about what experts considered its detrimental influence.

See for instance Tufte's often cited website article PowerPoint is evil (2003), or his discussion about the accident with the Columbia Shuttle, which he attributes to a PowerPoint presentation of a technical report in which important information was "hidden" in the 6th sublevel of hierarchy on the slide (Tufte, 2006). Authors offer harsh criticism on the excessive use of texts and bullet-points on slides, on the fragmentation of the presentation by the use of too many slides and on the behavior of presenters who are too preoccupied with technical aspects, are looking at the projection instead of the audience, and are reading the texts out loud (see among others: Cornelis & Tielens, 2004; Cyphert, 2004; Keller, 2003). Tufte (2006, p.3) describes a 'cognitive style of PowerPoint' in which PowerPoint templates weaken reasoning and corrupt statistical analysis. He attributes to the tool 'a smirky commercialism that turns information into a sales pitch and presenters into marketers'. Others, however, agree with Shwom and Keller (2003, p. 2) who argue that bad PowerPoint presentations show 'a failure to employ simple slide design principles, basic communication skills, and -most importantly- fundamental rhetorical techniques'. In other words, PowerPoint itself is not the problem, but rather the way in which it is used.

Nowadays the criticism seems to have mostly disappeared; hardly anyone questions the use of PowerPoint or studies its influence on presentations. We agree with Barrett (2004), however, that PowerPoint is so widespread that it is important to understand how it should and should not be used. This is true especially since it would seem that presenters have little understanding of the rhetorical effects of the program (Craig & Armenic, 2006) and that its use might affect 'not

only the way we present and teach, but also the way we think, learn and understand' (Kjeldsen, 2006, p.1). Nevertheless, evidence-based knowledge on how PowerPoint affects presentations remains scarce and scattered. 'It seems that digital presentations have slipped through the cracks of academic rigor' say Lane and Wright (2013, ¶.2). One reason for this might be that the program is so easily understood that there is no discussion about the medium itself (Stoner, 2007). Another reason might be that, according to Gabriel (2008, p. 255), 'PowerPoint may initially have given the appearance of accomplishing what earlier technologies did (overhead transparencies, slides, chalk and black-board) only more efficiently, more stylishly, but just as the introduction of email changed organizational communication, PowerPoint is having some far reaching consequences'.

What makes it difficult to formulate an opinion about PowerPoint, its use and its influence, is that different authors discuss different parts of the program. Some discuss a single element such as bullet-points, while others condemn the whole program for its 'communication style.' According to Farkas (2006), there is even ambiguity surrounding basic terms such as 'bullet-point' or 'PowerPoint' itself. The latter could refer to the live presentation, the PowerPoint presentation on a website, a handout, or an email attachment in pdf or ppt format (Stark & Paravel, 2008).

In this paper we will examine the relevant available information: the instruction books and articles, the criticism, and above all, the empirical data. We will address the following question: How has PowerPoint influenced the nature and quality of presentations?

In order to provide a balanced overview, we discuss the program

on the detailed level of the slide and its content, as well as on the level of the whole presentation. This consists of the interaction of different elements, including the behavior of the presenter. We will then address the question of how the use of PowerPoint influences the presentation's impact on the audience and the audience's ability to remember the information. We will start by discussing the program on the level of the individual slide.

2. 2. Slide layout

We must first look at the central element of PowerPoint -- a slide with a rectangular form and landscape orientation. Presenters can design the background with different colors and graphic forms or pictures and add texts, pictures, videos or functional website links. The different elements on a PowerPoint slide can be made to appear and disappear from the slide (animation) with different effects, timing and sounds. Animations can be used to make text appear gradually, line by line. Bucher, Krieg and Nieman (2010) differentiate between static slides (the information is shown at once) or dynamic slides (lines of text or pictures are animated). The default PowerPoint slide contains a headline (title), a subtitle and bullet-points to start new lines of text. The bullet-points present a summing up, sometimes with more hierarchical levels. This default setting can be switched off. All the slides together form a 'deck.' Gross and Harmon (2009) feel that the crucial unit of analysis is not the individual slide, but the extent to which the individual slide is integrated into the deck. Characteristics of a deck are the number of slides and its coherence (in subject and in design).

One can compare a PowerPoint slide with an "old" slide, a small piece of film in a frame -- the 35 mm carousel slide. Slides had to be ordered from specialists well in advance. Presenters today design PowerPoint slides on their own computer, make last-minute changes, print the slides as hand-outs and post them on the internet so that anyone, even those who were not present in the audience, can see them. During the presentation, the PowerPoint slides are in a fixed order (like the slides in a carousel), making it difficult to skip slides or improvise (Müller-Prove, 2009).

One can also compare the PowerPoint slide with another predecessor, the overhead transparency. The text on the PowerPoint slide can be typed with all the possible fonts and colors a word processor allows, whereas the first overhead transparencies were hand-written. Later, one could copy or print the text onto the transparency. PowerPoint slides are in a fixed order, while with the use of transparencies presenters could change or correct artifacts during the presentation and improvise with the order of information (Reedy, 2008). Another difference is that with PowerPoint presentations, presenters can indicate certain elements of the projection while turning away from the audience, while with overhead transparencies, one could point at the transparencies themselves and simultaneously keep contact with the audience. Using PowerPoint, presenters can show a new slide by using the keyboard, mouse or a remote device. There are no other differences for the rest of the presentation. The positive characteristics of PowerPoint slides are the ease with which one can produce slides with pictures and animation effects, and the possibility of printing handouts or uploading the slides onto the internet. Negative characteristics are that

the slides are in a fixed order and that the presenter must turn towards the screen in order to point at something.

2. 2. 1. Advice on slides

Instruction books all offer advice on how to design a slide, but, as Durso, Pop, Burnett, and Stearma (2011) observe, many do so on the basis of personal and often professional experience. Advice is seldom based on empirical data. We will discuss suggestions on the amount of text, the use of headlines, pictures, animations, colors and the structure of a deck.

Advice on the optimum number of lines of text differs. Kosslyn (2007) uses the 'rule of four': no more than four bullet-points (preceding a line of text) on a slide. 'Four to five bullet-points' says Shephard (2005). Knispel and Bemelmans (2010) propose a maximum of five bullet-points with a maximum of five words each and the '6 x 6' rule (six lines with six words each) is also often used (Atkinson, 2007). In general, the advice is 'less is better' (Blokzijl & Andeweg, 2005).

Alley and Neeley (2005) focus specifically on the use of headlines and state that whole sentences orient the audience more effectively to the slide's purpose than a short phrase or single word. These headlines allow the presenter to emphasize the most important detail of the slide while still presenting the key assertions and assumptions. The headlines should be supported by visual evidence, rather than by lines of text. The presenter should change typography and the default layout of a PowerPoint slide in order to use headlines correctly. Farkas (2010) suggests that the presenter should convey the slide's central idea verbally as well, rather than have it only be read by the audience. This

might be true for many elements on a slide. We will focus on the verbal and non-verbal behavior of the presenter later in this paper.

Several authors of instruction books discuss the function of pictures in presentations. Kosslyn (2007) for instance advises the use of photos and clipart to define the context, introduce an abstract idea, evoke a specific emotion, and present evidence in order to give the audience a breather and to direct its attention. Hertz (2011) suggests that images can show places, organisms and objects that are hidden from our sight because they are either too small, too big or too far away to observe. Pictures can also be used to organize large amounts of data, and to make complex relationships comprehensible.

Lines of text and other elements on the slide can be animated. Bucher and Nieman (2012) suggest that the dynamic design of a slide (gradually built up) can serve as a means for managing the correspondence between the verbal and the visual mode via synchronization. Some authors advise explicitly against the use of animations for ornamental reasons (e.g. Hilgers & Vriens, 2010), presumably because it is distracting.

When it comes to the use of color, Durso et al. (2011) recommend the use of high-contrast text-to-background combinations with dark text on a light background or vice versa. The general consensus among graphic designers is that the darker the room, the darker the background of the slide (in combination with light text) should be (Flatley, 1996).

Advice on the structure of a deck comes from Farkas (2005), who says that slide titles, texts, bullet-points, and other components of a deck should comprise a logical superstructure of ideas. He describes a

taxonomy with three special-purpose slides: the identification slide, the preview slide (which shows the structure of the presentation), and section slides which identify the following section. He identifies location elements such as slide numbers and a header or footer indicating the section of the deck to which the slide belongs. These help the audience understand the overall organization of the deck and the presenter's current location within it.

2. 2. 2. Criticism regarding slides

The (excessive) use of words and bullet-points is one of the criticized elements in the use of PowerPoint; some critics say that the program seduces presenters into using simplified and fragmented topic lists and a boring reading aloud of bullet-points (e.g., Hanft, 2003; Keller, 2003). Tufte (2006) complains about the breaking up of narratives and data into fragments. Shaw, Brown and Bromiley (1998) say that bullet-point lists rarely reflect deep thought or inspire commitment, and that, instead, telling stories is a more coherent and compelling way to proceed. Farkas (2005) finds that bullet-point lists cause the presenter to follow a certain rhythm, which he calls "sync and launch." Presenters "synch" when they focus the audience's attention on the next bullet point and "launch" when they begin to talk. He finds the same rhythm when the presenter changes slides. It is the rhythm coming from the pauses taking place just before and after the presenter advances to the next slide. Most PowerPoint presentations are "slide paced," says Farkas, while presentations that do not employ PowerPoint or similar forms of visual support are "speaker paced." The pauses of the presenter in the latter presentations are less regular

and 'more organic to the content.'

2. 2. 3. Research on the use of slides

Slides can be categorized according to content (text, pictures or a combination of the two) and animation (static or dynamic). Bucher and Niemann (2012) found that the distribution of text slides and slides with pictures vary in different scientific disciplines. In economic presentations 52% of the slides had pictures, whereas for the natural sciences 65% of the slides contained pictorial material. Hertz, Kerkhof and van Woerkum (2013) found an even bigger difference, with slides from presentations in the medical and hard sciences containing approximately three times as many pictures as those in the social sciences. Bucher and Niemann (2012) describe an overall tendency towards visualization in scientific conference presentations in all disciplines.

Hertz, Kerkhof and van Woerkum (2013) also looked at the distribution of dynamic and static slides in presentations of linguists. As one would expect, the slides of linguists showed relatively more text, since text was their topic of study. The sample was made up of static text slides (56.9%), static text-image slides (20.9%), dynamic text slides (15.7%), dynamic text-image slides (4.9%), and static image slides (1.6%). There were no dynamic image slides. Overall, the 'list and bullet-point' slide, which is a specific kind of text slide, turns out to be the most common category (Hertz, van Woerkum, & Kerkhof, 2013; Pötzsch and Schnettler, 2006; Yates & Orlikowski, 2007; Garner, Alley, Allen, Gaudelli, & Zappe, 2009). Regarding the 'excessive' use of text on a slide, there is the study by Hertz, van Woerkum and Kerkhof (2013) which found that linguists use on average 35 words on a slide, which

is near the highest suggested maximum of six lines with six words on each line.

We will now discuss empirical studies into the effects of the use of certain slide elements: text, headlines, pictures and combinations of text and pictures.

Durso et al. (2011) give advice on the use of text on PowerPoint slides, based on empirical research on the workings of the human memory system. These include the use of a sans serif font of at least 22 point for lines of text, high-contrast text-to-background combinations with dark text on a light background or vice versa, and no more than 4 ± 1 bullets.

In the case of headlines, Alley, Schreiber, Ramsdell and Muffo (2006) found that the sentence headline should best be restricted to no more than two lines, justified in the slide's upper left corner and using a bold sans serif typeface; that is the easiest to read in a large room. The advice to support headlines by visual evidence, as opposed to a bullet list, is supported by a study showing that students remembered more information when presented with slides containing an assertion in the title and a picture, than with slides with the topic in the title and a bullet list (Garner, Alley, Sawarynski, Wolfe & Zappe, 2011; Wolfe, Ally & Sheridan, 2006; Diesel, 2006).

Mayer and colleagues conducted several studies into the processing of texts and pictures, and the combination of the two in installations with animations and spoken words via a computer screen (Mayer, 1997, 2009; Mayer & Anderson, 1992; Mayer, Heiser, & Lonn, 2001; Moreno & Mayer, 2002; Plass, Chun, Mayer, & Leutner, 1998). Their findings support Mayer's "Cognitive Multimedia Theory", which supposes an

active process in which a limited amount of information is selected, organized, and integrated. This theory uses the concept of "cognitive load" (see for instance Sweller, Chandler, Tierney and Cooper, 1990), taking into account the limitations of the human working memory, and proposes two different channels for information processing: an auditive channel for spoken words and a visual channel for pictures and written words. The working memory connects the auditive information and the visual information. This active integration of pictures and spoken words – which Mayer calls the multimedia effect – results in a better processing and comprehension of the material. Mayer also finds that words, projected on a slide, such as we see in PowerPoint presentations, impair the processing of information, because they must be processed in the visual channel and compete with the pictures for limited processing space. He calls this the "modality effect." When spoken words were presented simultaneously with text, Mayer found a second detrimental effect at work that impaired the processing of information; he believes this is due to the duplication of textual information, something he calls the "verbal redundancy effect."

Although Mayer's results appear very useful for the study of PowerPoint, they are based on a specific multimedia installation that differs from a live presentation. Mayer's results don't take into account the behavior of the presenter. If we were to apply his theories to verbal presentations, it would mean that: (a) one can present only a limited amount of information at one time, (b) one should optimize information processing by using the auditive as well as the visual channel, (c) one should not 'pollute' the visual channel with projected words because it might impair the processing of information, (d) one can promote a

better understanding of the material by presenting suitable pictures with spoken words. The use of pictures in presentations seems then to be advisable and the use of projected words should be avoided.

A study by Blokzijl and Andeweg (2007), however, showed that students remembered the content of a lecture better from text slides than from picture slides, although this difference, occurring directly after the presentation, was lost after one week. We don't know of other studies which compared text slides with picture slides.

One can speculate why presenters use lots of text on their slides. Is it because of the default setting of a PowerPoint slide which should be switched off? Is it because presenters do not understand cognitive communication principles? Or do presenters include text because slides can serve the purpose of a hand-out as well as being posted on the internet? And finally, is it because presenters use the texts as speaking notes for themselves?

How the audience reacts to different kinds of slides has been studied by Bucher, Krieg and Niemann (2010), using eye-tracking equipment. They distinguished between the dynamic text slide (with a gradual build-up), the static text slide (where the whole text is presented at one time), the text-image slide, which can also be animated, and the image slide. In the dynamic text-slide they found a permanent shifting of attention between the presenter and the new elements on the slide. The attention of the audience seems to concentrate on the slide only when needed. The static text slide is read all together but, after that, the audience only looks at the presenter. For a text-image slide, Bucher, Krieg and Niemann studied the reaction of the audience to a dynamic graph slide, in which different texts and images are

presented using animation. The presenter only sporadically succeeds in steering the attention of the audience towards the specific elements of the graph he is discussing. With the image slide, the audience looks occasionally at the image, but less than they do at a text slide. The audience then looks at the presenter or at other things in the room until something new is displayed. The authors concluded from their work that the reception and attention distribution depends on the coherent management and the rhetorical skills of the presenter -- elements which, however, weren't included in their study. We will come back to this topic when we discuss presenter behavior.

A study by Wecker (2012) combined the concepts of cognitive load and allocation of attention and found that the retention of oral information in PowerPoint presentations is lower with regular slides (containing many words) than slides with fewer words. He attributes this to a dysfunctional allocation of attention. The results indicate a 'speech suppression effect' of regular slides at the expense of oral information, which in this study could not be explained by cognitive overload but rather by dysfunctional allocation of attention and which can be avoided by using concise slides. According to the "Cognitive Multimedia Theory" of Mayer, the visual channel, provided it is used only for pictures, will enhance the information processing of the audience. From an 'orchestration' point of view, however, the audience might have more elements to consider, making it more difficult for the presenter to direct its attention to the right element. The interesting question is under what circumstances and with what kind of slides (static/dynamic and text/pictures) multimodality complicates or facilitates understanding, and whether the enrichment of a presentation using a visual channel

improves or impairs knowledge transfer (Bucher & Niemann, 2012).

Kosslyn, Kievit, Russell and Shephard (2012) found that principles regarding the presentation of visual information, such as discriminability (patterns should be clearly different from the background and from other patterns) and perceptual organization (people automatically organize elements into groups) are often violated in PowerPoint slide-shows and that respondents in an experiment can be annoyed by these violations. Furthermore, respondents were not accurate in recognizing when particular slides violated a specific psychological rule. Even when the respondents correctly identified the violation, they often could not explain the nature of the problem. According to the authors, the psychological foundations for effective slideshow presentation design are neither obvious nor necessarily intuitive.

2. 2. 4. Conclusion on instruction, criticism and research on slide layout

There are some important differences between PowerPoint and its predecessors. With PowerPoint, presenters can produce text and pictures with animation. The slides can have an extra (and after) life as hand-outs or files which can be posted on the internet. A disadvantage is that presenters have to indicate certain slide elements on the projection behind them, breaking the contact with the audience.

We have seen that presenters use a significant amount of text on slides and that the 'list and bullet' slide is the most used category. This slide layout has been criticized, and instruction books advise the limiting of the amount of text. Research by Mayer and colleagues supports the idea that one should use pictures rather than text to support an

oral presentation. We have seen that there are relevant communication principles, partly based on empirical findings, on how to design a slide, but that presenters do not intuitively know how these should be applied. We have also seen that presenting with PowerPoint places extra demands on the presenter. He/she must steer the attention of the audience to the important aspect of a presentation; this works well with a dynamic text-slide but is less successful with other kind of slides.

In order to assess the effects of certain headlines or animation on attention and comprehension of the audience, one should also take the behavior of the presenter into account. The next section will focus on the verbal and non-verbal behavior of presenters during a presentation.

2. 3. Presenter behavior

Simply looking at the slides doesn't do justice to the complexity of the PowerPoint presentation (see also Farkas, 2010; Bucher & Niemann, 2012). One should also take into account the relationship between the deck and the presenter (Farkas, 2009). In this paragraph we will discuss PowerPoint presentations as a multimodal event, or a 'performance,' in which all the different elements such as speech, text, pictures, design, and pointing activities interact (Bucher and Niemann, 2012). Schnettler and Knoblauch (2007, p. 20) define performance, as 'temporary, bodily and multimedia implementation of communicative actions which can be observed in real-time.' The difficulty for the presenter in this multimodal performance is the problem of how to create

cohesion between the different elements, and how to steer the attention of the audience in the right direction, whether it is a line of text or part of a picture on the slide. We will take a closer look now at verbal (speech) and nonverbal presentation behavior. Again we will discuss the instruction books and articles, the criticism and the empirical data.

2. 3. 1. Advice on presenter behavior

Advice about the presenter's behavior in using PowerPoint is mostly concerned with the contact between the presenter and the audience -- how to create cohesion between speech, slides, and the reading out loud of text. Presentation instruction books all say that eye contact with the audience is an important objective of a presentation (e.g., Kosslyn, 2007; Lucas, 2004, McCroskey, 2006). Looking away from the audience, at the words on a slide or pointing at something is, from a rhetorical point of view, considered a poor way of presenting.

Lobin (2009) describes different ways to create coherence between the projected slide and verbal presentation. One could begin by speaking and then show the slide, or vice versa. One could start speaking, interrupt the speech with the projection, and then resume talking. Lobin finds that, apart from speech, pointing is the most important action in creating cohesion. Bucher and Niemann (2012) also identify gestures and pointing as a means for creating cohesion (see also Bucher, Krieg & Niemann, 2010). They call the directing of the attention of the audience 'orchestration,' and distinguish three different modal domains: the visual domain of the slides, the verbal domain of speech, and the performative domain of gestures and pointing.

Verbally introducing a slide is an important tool for steering the

attention of the audience, according to Andeweg and De Haan (2009), because signaling the transition from one point in a presentation to the next helps the audience to understand the story. The authors believe that, in practice, presenters don't do enough to mark the transitions from one slide to another. They often just continue their speaking, repeat a word, or occasionally just nod in the direction of the slides.

Most instruction books explicitly state that one should not read the text on the slides out loud (Shephard, 2005; Knispel & Bemelmans, 2010; Pluymaekers, 2011).

2. 3. 2. Criticism regarding presentation behavior

Rotating in the direction of the projection and looking at the projection are characteristic behaviors of PowerPoint presenters, and are criticized by many authors (Shwom & Keller, 2003; Hanft, 2003; Cornelis & Tielens, 2004). Presenting with PowerPoint breaks the connection with the audience, says Hrachovec (2009); instead of directly communicating with the audience, both the presenter and the audience are now connected to the projection. Charles and Ventola (2002) point out that the relationship between the presenter and the audience has changed, because the presenter and the audience together view the slides, whereas before the presenter was the authority creating the experience for the audience through his or her statements.

Another issue is that, according to some authors, PowerPoint seduces the presenters into using simplified and fragmented topic lists and a dull reading out loud of slides and bullet-points (see amongst others: Hanft, 2003; Thompson (in Barrett, 2004); Keller, 2003).

The last criticized element of behavior which we described before as being typical for PowerPoint presentations is what Farkas (2009) calls a 'synch and launch' rhythm (focusing the audience's attention on the next bullet and then beginning to read or paraphrase the text). This does not resemble the 'normal' intonation and rhythm of a presenter.

Hertz, van Woerkum and Kerkhof (2013) found that presenters on average look at the screen three times per minute, with substantial differences between presenters. They look less to the screen when showing a static slide than with a dynamic slide, indicating perhaps that they are pointing out a new element. Anthony, Orr and Yamazaki (2007) found that presenters do not introduce slides verbally, but signal transitions using nonverbal techniques, such as pausing, pressing the 'next' button on their computer, or looking in a different direction -- for example, switching from the audience to the screen. Presenters can turn towards the projection without a gesture of the hand or arm (Knoblauch, 2007, Schnettler & Knoblauch, 2007).

Although some authors state that PowerPoint elicits in its users typical verbal presentation behavior, such as reading texts aloud in a typical rhythm, there is scarce evidence of this in research data. The study by Hertz, van Woerkum and Kerkhof (2013) found that presenters on average read half of the slides out loud, with significant differences between individual presenters. A study by Andeweg and De Haan (2009) on the timing of a verbal introduction to a slide showed that when presenters verbally signaled a transition to the next slide, before clicking on it, the audience found the presentation better structured, than when the slide was shown first.

2. 3. 3. Conclusion on presenter behavior

To complete the depiction of a PowerPoint presentation, one must look at it as a performance, with a presenter who must create cohesion between different elements and control as much as possible the attention of the audience. Presenters introduce slides or indicate elements on a slide by looking at the projection instead of verbally doing the introduction and/or explanations. Some presenters look at the projection to read the texts aloud. Using different means of presentations, this kind of behavior might not have been present to that extent. With presentations using overhead transparencies, the presenter could point to different elements on the transparency for the audience to see, without having to turn to the projection.

PowerPoint may well elicit certain presentation behaviors that are ineffective. This gives rise to the question whether or not PowerPoint presentations can be made effective, given the right behavior of the presenter. The next section will address this question.

2. 4. Effects of using PowerPoint in presentations

Given that the use of PowerPoint is so ubiquitous, there is surprisingly little research on the effects of the presentation software, apart from several studies about its use in a classroom situation. PowerPoint was created in the mid 90's as an intriguing new technique for lecturing. Instructors shared their experiences with their peers in papers that were testimonial in nature (e.g., Quible, 2002). There were also studies that compared lectures using PowerPoint to lectures using

transparencies, blackboards or no classroom media at all. The purpose of these studies could be summarized by the title of Szabo and Hastings' (2000) paper: 'Should we replace the blackboard with PowerPoint?' The studies focus on student appreciation of the new technique the effect on classroom attendance, classroom interaction and on students' grades.

2. 4. 1. Student appreciation

The most extensive body of research centers on student reactions to the use of PowerPoint (Levasseur & Sawyer, 2006). The studies show that most students respond positively and that most of them prefer the use of PowerPoint over other forms of classroom media, such as a blackboard or overhead transparencies (see for instance Frey & Birnbaum, 2002; Blokzijl & Naeff, 2004). Students have indicated that slides help improve the organization of the course and their own notes (Frey & Birnbaum, 2002; Susskind, 2005, 2008; Szabo & Hastings, 2000), that they can learn the course material more effectively (Atkins-Sayre, Hopkins, Mohundro & Sayre, 1998; Bartsch & Cobern, 2003; Harknett & Cobane, 1997; Susskind, 2005, 2008; Szabo & Hastings, 2000) and that the visual images helped them remember the course content for their exams (Frey & Birnbaum, 2002; Harknett & Cobane, 1997). They liked the use of key phrase outlines, pictures and graphs, dynamic slides and colored backgrounds (Apperson, Laws & Scepansky, 2008) and modest layout (Blokzijl & Naeff, 2004). Students reported higher self-efficacy and more positive attitudes toward classes with computer-generated slides (Susskind, 2005, 2008). They found classes more interesting and entertaining (Frey &

Birnbaum, 2002; Susskind, 2005, 2008; Szabo & Hastings, 2000) and believed them to be more organized, clear and interesting (Frey & Birnbaum, 2002).

Students even had a more positive attitude towards the professor when the class was taught using PowerPoint (Atkins-Sayre, Hopkins, Mohundro & Sayre, 1998; Nouri & Shahid, 2005). They also responded more favorably to professorial behaviors such as assigning tasks requiring critical or creative thought (Apperson, Laws & Scepansky, 2008). Finally, students believed that the new method is more attention-capturing than the traditional method of lecturing (Szabo & Hastings, 2000).

Students also disliked some aspects of PowerPoint use in the classroom. Compared to graduate students, significantly more undergraduate students reported that their instructors read directly from slides and presented information on the slide that was directly copied from the textbook (Yilmazel-Sahin, 2009). They reported experiencing PowerPoint overload due to overfull presentations and the rapid pace of instruction (Shalcross & Harrison, 2007), complaining that their instructors rendered them 'passive victims of PowerPoint overload' (Burke & James, 2008), while they preferred their instructors to use PowerPoint 'as a stimulus for elaboration, explanation, and discussion in classrooms' (Apperson, Laws and Scepansky, 2008, p. 153).

Roehling and Trent-Brown (2011) found that instructors indeed presented students with a great deal of content in the lower classes, while in the upper-level classes they relied more on discussion, and made PowerPoint notes available to students. Hill, Arford, Lubitow and Smolin (2012) believe that classroom slideshows may negatively

influence learning by encouraging mindless copying of slides and discouraging questions and participation.

Szabo and Hastings (2000) speculate that the attention-capturing power of the PowerPoint method could be expected to fade away once the novelty effect disappears. This might be reinforced by the rapid developments in the availability of visual material and, as a result, the higher expectations of the students. Indeed, years later, only a minority of students perceived PowerPoint as interesting and fresh (Burke & James, 2008), and PowerPoint slides were the biggest teaching factor contributing to student boredom (Mann & Robinson, 2009). Burke and James (2008) showed that the degree of “newness” is associated with students’ perceptions of the impact of PowerPoint on learning and classroom interaction. Students who did not perceive PowerPoint as novel considered lectures without PowerPoint to be more effective in facilitating social interaction and class discussion.

We have seen that students have indicated that slides help to improve the organization of their own notes. One may question whether the availability of the slides outside the classroom results in more or less attendance. Various studies show that making the notes available to the students does not keep them from coming to the lectures (see for instance Szabo and Hasting, 2000; Frey and Birnbaum, 2002; James, Burke & Hutchins, 2006; Susskind, 2008; Babb, 2009).

2. 4. 2. Classroom interaction

One major criticism of the use of PowerPoint in the classroom is the perceived lack of interaction between instructors and students (see for instance Cyphert, 2004, Hanft 2003, McDonald, 2004). Craig and

Armenic (2006) think that in classes without PowerPoint, the relationship of teachers and students was less structured and that there was more “immediacy behavior” such as eye contact and vocal expressiveness. With PowerPoint presentations, because of the darker classroom, the instructor cannot see the faces of students. PowerPoint reduced the role of the presenter to that of a stagehand, according to Blokzijl and Naeff (2004). In the same vein is the observation of Levasseur and Sawyer (2006), that the technology lowers the quality of student-teacher interactions.

Some studies indeed found a preference for the traditional lecture because of the possible interaction with the instructor (Nowaczyk, Santos, and Patton in James, Burke & Hutchins, 1998), or found that students feel ignored when the instructor is focusing on the PowerPoint presentation and not paying attention to them (Voss, 2004). Students have a significantly less favorable overall view of PowerPoint’s influence on classroom interaction than faculty members who use the software (James, Burke & Hutchins, 2006).

2. 4. 3. Improving student grades

Although students in general like to be taught using PowerPoint and think that it helps them to learn and recall subject matter, a majority of studies show that use of PowerPoint is not associated with a significant improvement in student grades (see for instance Amare, 2006; Nouri & Shahid, 2005; Cladellas Pros, Castelló Tarrida, Badia Martin, Cirera Amores, 2013; Rankin & Hoaas, 2001; Savoy, Proctor, & Salvendy, 2009; Susskind, 2008; Szabo & Hastings 2000). Babb (2009) did not find a difference in grades between classes that had slides made available to

them and those that did not (see also Bowman, 2009). Lowry (1999) did show that student marks improved after the introduction of the PowerPoint presentation, but he attributes this to the novelty effect.

Levasseur and Sawyer (2006) looked into differences between studies which did find a learning increase (Jensen & Sandlin, in Levasseur & Sawyer (2006); Szabo & Hastings, 2000) and those which did not, and found that in the latter studies instructors did not give students access, either in or out of class, to copies of lecture slides. Consequently, the positive learning effects may simply stem from students having copies of a thorough and organized set of class notes. Without such access, students engage in a 'frenzied note-taking effort to transfer everything from the screen to their notes' (Levasseur & Sawyer, 2006, p.112).

Another reason, according to Levasseur and Sawyer (2006), why teaching with PowerPoint has failed to support positive learning, is, say researchers, that the technology has often been misused by the use of slides with too much text or too much irrelevant visuals. This is in line with the results of Bartsch and Cobern (2003), who found that students performed worse on quizzes when PowerPoint presentations included unrelated pictures, sounds and effects, and with the studies on multimedia and cognitive load that show that unrelated items interfere with learning (e.g. Harp & Mayer, 1997).

Levasseur and Sawyer say that in studies uncovering no discernible learning benefits from computer-generated slides, it is difficult to tell exactly how educators utilized this technology, because the research has generally failed to specify the exact nature of the slides.

Looking closer at precisely what kind of information is presented and tested could contribute to a better understanding of the effect of

using PowerPoint on student grades. In a study by Savoy, Proctor and Salvendy (2009) students' quiz scores were differentiated into auditory, graphic, and alphanumeric scores.

The authors conclude that if students are expected to retain complex graphics, animation, and figures, PowerPoint presentations may have an advantage. If students are expected to retain alphanumeric information (using letters and numbers), using PowerPoint did not make a noticeable difference. If students are expected to retain information and/or concepts that are best conveyed through dialogue or verbal explanation (it is not precisely clear to what kind of information the authors refer), traditional presentations without PowerPoint appear to be superior. This is because students would otherwise tend to pay attention to what is presented on the slides instead as to what is verbalized.

Two variables may have been overlooked in explaining why PowerPoint lectures fail to lead to better student grades. First, students might adjust their behavior in order to attain the same level of test results. When the learning process is helped by PowerPoint notes, students might decide to work less hard, which may explain why exam scores do not rise as a result of using PowerPoint. Second, students might be less able to master the subject matter when copying text from slides without having to 'organize' their own note taking and to distinguish between essentials and un-essentials (see also Meo, Shahabuddin, Al Masri, Ahmed, Aqil, Anwer, Al-Drees, 2013). Whether or not PowerPoint presentations should replace the blackboard in the classroom is a difficult question to answer. The software does not appear to improve student grades in general, but its use, at least

initially, was favored by students because of its attention-capturing power through its visuals and because it helped them to organize their notes. Students generally dislike overfull presentations, the rapid pace of instruction and a lack of interaction with the instructor. By now, the use of PowerPoint in the classroom is well established. What remain relevant are the questions of how teachers should use the program and to what purpose.

2. 5. Studies of PowerPoint effects outside the classroom

Other than the study by Bucher, Krieg and Niemann (2012) dealing with the directing of audience attention, we know of two studies that looked at the effects of PowerPoint outside the classroom situation. Buchko, Buchko, and Meyer (2012) studied the use of PowerPoint in religious sermons, and showed that its use did not have a significant effect on subjects' ability to recall information. Park and Feigenson (2012) found that in the courtroom the use of PowerPoint by the plaintiffs increased the recall of evidence, which in turn increased perceptions of the defendant's responsibility.

The low number of studies outside the classroom is striking since the use of PowerPoint is ubiquitous in settings as varied as scientific conferences, governmental organizations, and businesses. We can only speculate that these audiences find PowerPoint slides appealing and entertaining, that they prefer a modest layout and that, for these audiences as well, the novelty effect of PowerPoint slides has somewhat faded as it has for audiences in a classroom situation. The

complaints about the presenter losing contact with the audience might also hold true for these presentations. There may be other differences as well, since the main objective of a classroom lecture is to transfer knowledge while other presentations may have other objectives, such as testing one's theories or methods, influencing discourse, or promoting one's organization or product.

2. 6. Conclusion and discussion

Adams (2007) is concerned that one underestimates how educational technologies can and do affect teaching. He suggests that PowerPoint introduces many pedagogical changes that are not yet well understood. Pence (1997) is of a similar opinion when he notes that it is probably easier to learn the technology itself than to discover how best to use it for learning. There is a need for more precise studies regarding the different kinds of information that are presented with PowerPoint. In order to realistically assess the influence of PowerPoint on audience reactions and behavior one would have to give the same presentation with and without PowerPoint and compare results. This would require an experimental set-up with the same person, presenting in exactly the same way the same content to two comparable groups. This might be difficult to accomplish, since slides might influence the behavior of the presenter.

Since PowerPoint has been accused by some educators of being "evil," but on the other hand is used in a majority of presentations in a variety of settings, the question arises of how the use of the software affects presentations.

We have taken into account the behavior of the presenter and looked at the presentation as a whole, as a performance, where critics of PowerPoint only looked at certain characteristics of the slides, discussed the behavior of the presenter, or condemned the program, without looking at the interaction between these different elements.

By using PowerPoint, presenters are confronted with many choices regarding the design of the slides. Certain characteristics of PowerPoint, such as the default-settings and the ability to use the slides on the internet and as handouts, may tempt the presenter to increase the amount of words on slides. Slides with text, however, combined with speech, can have a detrimental effect on the information processing of the audience. Is the excessive use of text on slides a detrimental feature of PowerPoint? There are three ways to address this question. First, it is not necessary to use text on a slide; the option to use only pictures might be advisable in many instances. Second, we have seen that existing design principles are not intuitively understood, and are often violated. Third, the use and quantity of text differs amongst presenters. It must be concluded that the use of text is a choice of the presenter, not a direct result of the use of the PowerPoint program.

During a presentation, there needs to be cohesion between speech and different elements on a slide. This was the same with PowerPoint's predecessors -- overhead transparencies and even the blackboard. The difference is that with PowerPoint projections, the presenter turns away from the audience, breaking eye contact to introduce a slide or to point at something on the screen. Breaking eye contact is seen by some as a major negative effect of PowerPoint use. It is not necessary, however, to break this contact when using PowerPoint; introducing

slides or focusing the attention of the audience on certain aspects of the slide can be done verbally as well. Once again we must conclude that PowerPoint has no detrimental influence per se.

Why is presentation behavior not always in line with communication principles? We have seen that presenters do not intuitively know how to apply communication principles. Some of them might use the text on slides for their own benefit, perhaps as speaking notes. The program itself is not to be blamed for being used in this way. Presenters make conscious or unconscious decisions on slide design and their own behavior which might not be effective or appreciated.

Is PowerPoint an effective tool for presentations? When used according to cognitive communication principles described by Kosslyn et al. (2012) and Mayer (2009) there is no reason to doubt its overall usefulness, although we still don't know much about the effects of some of its aspects. It would be interesting to study the influence of certain kinds of slides (static and dynamic, or with and without pictures) combined with certain types of presentation behavior (verbal and nonverbal) on the appreciation and recall of the audience. Until now, almost all studies which deal with the workings of PowerPoint were done with student audiences.

Since PowerPoint is also used in many other environments (e.g. businesses, churches, conferences), the studies should be taken out of the classroom and into these environments as well. It is remarkable, since it is so ubiquitous and has come under so much criticism, that there is so little research on many aspects of PowerPoint presentations. It is clear, however, that the program elicits certain behaviors that were not present to the same extent with the use of its predecessors.

sors, including behaviors that were probably not appreciated by the audience nor effective.

PowerPoint as a program doesn't appear to have a detrimental influence on presentation behavior as some authors suggest. It is the presenter who makes dubious decisions. If presenters changed their questionable methods we might have more appreciated and more effective presentations in a great many workplaces.

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3

Presentations of conference papers with PowerPoint. Detrimental software or bad presenters?

Empirical data for an on-going debate.²

3. 1. Introduction

Scholars often use PowerPoint to present a conference paper. At the same time many authors have offered harsh criticism regarding its use. Some argue that PowerPoint brings on a new and detrimental form of presentation, others say that the quality of a presentation is a matter of rhetoric. This study investigates in a real life setting if PowerPoint is bringing a new configuration to presentations. Fifteen scientific presentations were analysed with regard to the use of text and pictures on the slides, on the physical and verbal behavior of the presenter and the relation between the slides and the behavior of the presenter. It was found that PowerPoint requires new presentation behavior, but that the often criticized aspects, such as the large amount of text, reading aloud and looking at the projection seem to be choices of the presenter and are not caused by the presentation tool.

Presentation software has become a standard tool for scholars to present their work. Everyone uses computer slides nowadays to present a conference paper and most scientists use the software tool PowerPoint. At the same time many academic authors have offered harsh criticism regarding the use of PowerPoint. Some authors even argue that PowerPoint brings on a new and detrimental form of presentation. Others say that the quality of a presentation is only a matter

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of rhetoric. The problem with this debate is that most of the publications are based on anecdotal evidence only. We have studied the use of PowerPoint in presentations of conference papers and would like to offer empirical data as new input for this debate.

Most scientists present their findings a couple of times a year, and they consider the presentations to be important for their work (Hertz, 2011). According to Kress and van Leeuwen (in Rowley-Jolivet, 2004, p. 145), conference presentations are 'one of the most serious, the most highly valued kinds of speech; they form an important stage in the construction of scientific facts and in the network of scientific communication.' Conferences are sites for publishing research results and an open ground for confrontation, discussion, and the ratification of meaning, according to Bijker (in Räisänen, 2002) and Shalom (2002). They play a central role in the network of scientific communication and in the negotiating of knowledge claims and provide a fast track to information on the latest developments in the field (Rowley-Jolivet, 2002). They also form a crucial element in the development of a researcher's profile (Ventola, Shalom, & Thompson, 2002).

The use of PowerPoint, however, also suffers from a considerable amount of criticism (Atkins-Sayre et al., 1998; Guernsey, 2001; Keller, 2003; James, Burke & Hutchins, 2006; Blokzijl & Naeff, 2004; Cyphert, 2004; Kjeldsen, 2006). The authors offer harsh criticism on the use of texts and bullet-points on slides and on the behavior of the presenter (too preoccupied with technical aspects, looking at the projection and reading the texts out loud). Cyphert nicely sums it up: "They speak in the dark, turn their backs to the audience, and read the hand-outs, which are projected at full size and in full colour but are nothing more

than an outline of the speech" (2004, p. 81). Most famous is the website article of Tufte called 'PowerPoint is evil' (2003) and his description of a "cognitive style of PowerPoint" in which 'the popular PowerPoint templates (ready-made designs) usually weaken verbal and spatial reasoning and almost always corrupt statistical analysis.' He attributes to the tool 'a smirky commercialism that turns information into a sales pitch and presenters into marketers' (Tufte, 2006, p. 4).

Others (e.g. Shwom & Keller, 2003) argue that there is nothing wrong with the program and that bad presentations are caused by the behavior of the presenters. In a blog Bucher (2009) states it boldly: 'Bad presenters have bad speeches with bad PowerPoint slides (...). It is not PowerPoint itself who does the damage, but our failing rhetoric.' Even though all authors have strong opinions about PowerPoint, they offer little research data to support their observations.

Our research will try to fill this void by investigating presentations of conference papers with PowerPoint. Our aim is threefold: To describe the main characteristics of the use of PowerPoint, to investigate these characteristics in a real life setting and to conclude if these characteristics are influencing presentations. In this way we hope to contribute to the debate on PowerPoint, whether PowerPoint is bringing a new and detrimental configuration to presentations or whether bad presentations are merely the result of the rhetorical behavior by the presenter. Our focus will be on the use of text and pictures and the physical and verbal behavior of the presenter. We will discuss these first.

3. 2. Use of text and pictures

The fact that PowerPoint forces the presenter to prepare for a presentation (one needs to make slides) is seen as an advantage of the program (Coy & Pias, 2009). One can produce professional looking slides with texts, pictures, or a combination with relative ease. The default setting is a headline with bullet-points for the subtexts. This use of texts and bullet-points is being criticized however. Presentation instruction books advise to limit this use, although there is no consensus on the maximum number of bullet-points or words. Kosslyn (2007) uses the “rule of four”; no more than four bullet-points on a slide. ‘Four to five bullet-points’ says Shephard (2005). Knispel and Bemelmans (2010) propose a maximum of five bullets with a maximum of five words each. Atkinson (2008) mentions the fact that the “6 x 6” rule (six lines with six words each) is often used but that there is no empirical data to support this rule. In the latter case 36 words on a slide seems to be the absolute maximum.

To limit the number of words is in line with the research of Mayer et al. (1997, 2001, 2009) on the effect of combinations of images and text on comprehension. Mayer and colleagues conducted several studies into the processing of texts and pictures, and the combination of the two. Their findings support Mayer’s *cognitive theory of multimedia learning*, which supposes an active process of information processing in which a limited amount of information is selected, organized, and integrated. Mayer proposes two different channels for information processing, an auditive channel for spoken words and a visual channel for pictures and written words. The working memory connects the

presented auditive information and the presented visual information. It is this active integration between pictures and spoken words – which he calls *the multimedia effect* – that causes a better processing and comprehension of the material. He also found that words, projected on a slide, as we see in PowerPoint presentations, impair the processing of information, because they have to be processed in the visual channel and therefore have to compete with pictures for the limited processing space. Thus one should not “pollute” the visual channel with projected words because it might impair the processing of information, and one can enhance a better understanding of the material by presenting suitable pictures with the oral words.

Although the use of pictures on a slide might be advisable in theory, in practice this could be influenced by the availability of pictures, which might be different for different scientific disciplines. For instance, several authors have emphasized the importance of pictures for the hard sciences, in particular empirical and life sciences (e.g. Van Woerkum, 2007). Trumbo (2000) also stresses the point of instruments in taking the view that, in the last ten years, the life sciences in particular have made excellent use of technology to visually represent medical progress. Arsenault et al. (2006) were able to confirm their *visuality hypothesis* by showing that hard sciences and social sciences differ in their use of visuals in scientific articles. They showed that the hard sciences not only use more graphs, but also more other visual instruments, such as diagrams, photographs, drawings, and maps in scientific articles. This was independent of the availability of numerical data. Hertz (2012) looked into the differences of disciplines in the use of pictures on PowerPoint slides and found that slides from presentations

in the medical and hard sciences contain approximately three times as many pictures as in social sciences, confirming the visual hypothesis also for the use of slides. One might find difference thus between the hard, medical and social sciences because the harder sciences seem to have more pictures at their disposal and seem to use pictures more often.

PowerPoint offers different possible combinations of text and images. Pötzsch and Schnettler (2006) looked into 58 presentations and conclude on the basis of that, that PowerPoint is used for more than just a doubling of the text of a speech and that the elements on a slide have many more different forms than is usually acknowledged. They found different kind of images such as ornamental or metaphorical as well as collages of different elements. They proposed a classification of slides, with the following categories: Text slides (which made up 40% of their sample), text-image combination (17%) and images only (43%). The 'list and bullet point' slide (a subcategory of text-slides) is the one that is often criticized and turns out to be the most used subcategory (29%) (see also Yates & Orlikowski, 2007).

If we look at the way the slides are presented we find another characteristic of PowerPoint, namely the fact that presenters can program an element of animation into the slides (Bucher, Krieg & Niemann, 2010). One can show the slide at once (static) or animate the content so that different parts (lines of text or pictures) are shown gradually (dynamic). The last characteristic we would like to discuss here is that information can be linear (spoken texts and lines of text on a slide in a sequence) or non-linear (co-existence of pictures on the slide).

Bucher, Krieg and Niemann (2010) state that the audience has to decide to which aspect it is going to pay attention; to the linear sequencing of the speech and the slides or to the possible non-linear information. They distinguish between the dynamic text slide which is animated, the static text slide (the information is shown at once), the text-image slide which has a non-linear combination and can be animated as well and the image slide with only an image on it. With the dynamic text-slide they find a permanent shifting of the attention between the presenter and the new elements on the slide. It thus seems to work to steer the attention of the audience towards the slide only when it is needed. The static text slide is read in one go and after that, the audience only looks at the presenter. In the case of a dynamic text-image slide the presenter only sporadically succeeds in steering the attention of the audience towards the elements of the image the presenter is talking about.

When presented with an image slide, the audience member looks at the image for some time and looks at the presenter or at other things in the room until something new is shown. Communication is in the case of a dynamic text-image slide treated by the audience as non-linear, the authors say. The pattern of reception should in this case be orchestrated by the presenter through extra actions, such as speech (references, repetition) and/or indicating with gestures according to the authors. Bucher et al. (2010) conclude that reception and attention distribution depend on the coherence management (bringing together the different elements of a presentation) and the rhetorical qualities of the presenter.

So we do not only see that PowerPoint has some characteristics

such as the different possible combinations of texts and pictures, the possibility to animate the content of a slide, we also see that the use of different types of PowerPoint slides require different types of behavior of the presenter. We will investigate the use of different types of slides in our research and relate them to the behavior of the presenter. A further description of physical and verbal behavior will be presented now.

Physical behavior

Schnettler and Knoblauch (2007) have suggested that the use of PowerPoint brings on a new kind of behavior. They use the term *performance*, indicating that they are not looking into the isolated design of slides or the technical aspects of the medium, but into a new classification of the presentation as a whole. Performance, they define as: temporary, bodily and multi-medial implementation of communicative actions which can be observed in real-time. Their concept of performance thus takes the bodily aspects of the presentation into account as well. The movement of the body to point out something on the projection screen ties together different other aspects of the performance and seems to be a distinguishing character for PowerPoint presentations (Knoblauch, 2007, Schnettler & Knoblauch, 2007). The authors find indicating to be an important action; a rotating point between speech, the audience and the visualized texts. When presenters point at the screen, the rest of the body rotates and turns away from the audience. This turning is also used without a gesture of the hand or arm, they observe.

Interestingly, what is seen as typical and important behavior to orchestrate a PowerPoint presentation by Schnettler and Knoblauch is

seen by others as irritating because the presenter is occupied with the projection and turns away from the audience (Shwom & Keller, 2003; Hanft, 2003; Cornelis & Tielens, 2004). Interaction with the audience in general is seen as important and making contact is seen as the first objective of a presentation (Kosslyn, 2007) and the most important condition for a successful presentation (Hilgers & Vriens, 2010). Presenting with PowerPoint breaks the connection with the audience though, says Hrachovec (2009), because instead of directly communicating with the audience both the presenter and the audience are now connected to the projection. Charles and Ventola (2002) point out that the relationship between the presenter and the audience changed. 'As a result of the new code, the semiotic experience moves closer to being a shared one, as the presenter and the audience together view the slides; whereas before the presenter is simply an authority who creates the experience for the audience through his statements.'

PowerPoint might thus elicit a new kind of physical behavior needed to steer the attention of the audience to certain elements of a slide. At the same time, looking at the projection might irritate the audience, because the presenter turns away and breaks the contact. It might even influence the authority of the presenter. In our study we included pointing at the projection and looking at it, since so far there are no quantitative data concerning this behavior. We will relate this behavior to the different categories of slides.

3. 3. Verbal presenter behavior

Presenters do not need to limit their actions to physical behavior

though to steer the attention, they can also point out certain elements by making a remark. Verbally introducing a slide is seen as an important tool for steering the attention of the audience (Andeweg & De Haan, 2009). In their experiment Andeweg and De Haan found that the audience found a presentation with introductory sentences better structured than one without. The authors think that in practice though presenters don't do much to mark the transitions from one slide to the other. Presenters will just continue their speech, repeat a word or maybe just nod in the direction of the slides. Anthony, Orr & Yamazaki (2007) found that presenters signalled transitions using nonverbal techniques, such as pausing, pressing the "next" button on their computer, or looking in a different direction, for example, switching from the audience to the screen. This is the physical behavior we discussed above.

Another important issue concerning the verbal behavior is the reading aloud of the projected texts, which, if we believe the critics, is a standard procedure. According to some authors, PowerPoint seduces the presenters into using simplified and fragmented topic lists and a dull reading aloud of too many slides and bullet points (see amongst others: Hanft, 2003; Cornelis & Tielens, 2004; Thompson (in Barrett, 2004); Keller, 2003). According to the redundancy principle of Mayer (2009) reading aloud projected texts also harms the information processing of the audience (see also Sweller, 2005). There are no empirical data though on the reading aloud of slides yet.

Since presenters are criticized for their preoccupation with technical aspects it is interesting to investigate if this is reflected in their speech as well, seeing that the actual handling in using a remote

control or the keyboard of a computer might not be much more distracting for an audience than the handling of transparencies was before the arrival of PowerPoint. Introducing a slide, making technical remarks and reading aloud will be included in our research. The relationship between reading aloud and the category of slides will be investigated as well.

3. 4. Research questions

Having identified the main characteristics of the use of PowerPoint, this brings us to our research questions. We will focus on the use of text and pictures of the slides, the physical behavior and verbal behavior of the presenter. We will also investigate a possible relationship between the type of slide and this behavior to see if there is a possible influence of PowerPoint. We expect a positive relationship between the number of items (words and/or pictures on a slide, the number of slides) and the number of actions of the presenter (looking at the screen or laptop, indicating something on the screen, pointing at the screen and reading aloud). The idea being that more items on the projection would need more steering from the presenter. We also expected a positive relation between the number of dynamic slides and the number of actions of the presenter for the same reason, namely that the presenter needs to steer the attention of the audience. Our research questions are:

1. What is the use of text and pictures?

- How much text do presenters use on a slide?

- How many pictures do presenters use on a slide?
- What kind of combinations of text and image are used on a slide?
- What type of slides are used (dynamic or static)?
- How many slides are used?

2. What is the physical behavior of the presenter?

- Do they point at the screen or at some element(s) on the screen?
- Do they indicate something on the screen?
- Do they look at the projection
- Do they look at the laptop?

3. What is the verbal behavior of the presenter?

- Do they introduce a slide?
- Do they read the projected texts out loud (double the information)?
- Can we tell that they are preoccupied with the technical aspects by their remarks about it?

4. Is there a relation between the type of slide and the behavior of the presenter?

- Is there a relation between the type of slide and the physical behavior?
- Is there a relation between the type of slide and the verbal behavior?

5. Do the results suggest that PowerPoint is causing a new configuration of presentations?

- If so, is that a detrimental influence?

3. 5. Method

At a scientific conference about the Mastery of Language 18 out of 34 presentations of 20 minutes (in 9 parallel sessions) were filmed and the PowerPoint slides were collected³. The selection was made beforehand in such a way that presenters of various seniority were included and that all the presentations in one session could be recorded. The speeches were recorded separately with audio equipment and transcribed literally from these recordings⁴. The presentations were analyzed on the type of slides as well as the physical and verbal behavior. These analyses will be discussed here more in detail. Three presentations were left out of the analysis because they were given by more than one presenter.

3. 5. 1. Use of text and pictures and types of slide

The slides have been analyzed with regard to the following characteristics: number of slides per minute, average number of words per slide, number of pictures (graphs, diagrams/models, maps, photographs) per slide and number of bullet-points per slide. We computed an indicator for the mean number of words by averaging the number of words on the third and fifth slide. The slides were categorized as static text-slides, dynamic text-slides, static text-image slides, dynamic text-image slides, static image slides and dynamic image slides.

3. 5. 2. Physical behavior

The filmed presentations were observed by two observers who scored the following four kinds of actions per presentation: pointing at

³ VIOT, Mastery of language. The next level. Amsterdam, December 17 – 19, 2008

⁴ Thanks go to: Frederique van Breugel and Bianca Ströhmeijer

the screen (or at some element(s) on the screen), indicating something on the screen, looking at the screen, and looking at the laptop. Their mean score was calculated and used. The inter-rater reliability was high (0.762, $p < .0001$).

3. 5. 3. Verbal behavior

In the transcriptions of the presentations it was marked when the presenter transferred to a new slide and if they introduced this slide before the transition. Remarks about the technical aspects such as the handling of the laptop were noted as well. The extent to which the presenter read the slides out loud was scored per presentation. As far as we know this has not been measured before. A score was computed as the percentage of text on a slide that is read out loud. When the speech was paraphrasing the projected text (for instance because there were extra words between the words of a slide in the speech or because the words were spoken in a slightly different order) it was counted as reading aloud. The score was computed for slide number three (the first slide often being the title slide and the second one often being the contents slide). In one case, slide three was an image only slide with a title (which in this case appeared on every slide) and only the words in the title were counted. To check if slide number three was a representative slide, the data were compared to slide number eight with a paired sample t-test, the only significant differences were that the number of words per slide were higher on slide eight ($t = 2.23$, $p = .039$), but not the score for reading aloud. It was decided to use the data of slide three only.

3. 5. 4. Relation between type of slide and behavior

The number of slides, number of words per slide, number of pictures per slide and the different categories of slides (static text-slides, dynamic text-slides, static text-image slides, dynamic text-image slides, static image slides and dynamic image slides) were related to the different actions of the presenter (pointing at the screen [or at some element(s) on the screen], indicating something on the screen, looking at the screen and looking at the laptop).

3. 6. Results

3. 6. 1. Type of slide

In the 15 presentations 306 slides were used in total. The most used category was static text slides (56,9%), followed by static text-image slides (20,9%), dynamic text slides (15,7%), dynamic text-image slides (4,9%), and static image slides (1,6%). The 'list and bullet point' slide is the most used subcategory (47.38%). There were no dynamic image slides. Slides with 'text only' made up 72,6% of the total amount, slides with 'images only' 1,6% and slides with a combination of text and images 25,8%. 79,4% of the slides were static and 20,6% dynamic. Table 3.1 shows the use of slides, texts, pictures and bullet-points. We see that presenters use on average 35 words on a slide (with one presenter using 155 words per slide). They use on average one slide per minute, one picture every three slides and two bullet points per slide.

Table 3.1 Mean, standard deviation, minimum and maximum of the use of slides, texts, pictures and bullet points.

MEASURE	MIN.	MAX.	M	SD
Slides per minute	.60	3.00	1.15	.58
Words per slide	5.50	155.00	34.83	36.34
Pictures per slide	.00	.71	.33	.23
Bulletpoints per slide	.00	3.60	2.03	1.01

3. 6. 2. Physical behavior

The scores of the physical behavior are reported in Table 3. 2. We see that on average presenters point almost ten times at the screen and indicate on average almost eight times something on the screen in their 20 minutes presentation. They look on average 73 times at the projection during this time (more than three times a minute) and almost 46 times at the laptop. Some presenters never point to the screen or hardly look at it, but one of the presenters looks at the projection as much as 218 times, which is almost once every five seconds.

Table 3.2 Behavior: Pointing at the screen or at some element(s) on the screen, indicating something on the screen, looking at the screen, and looking at the laptop.

BEHAVIOR	MIN.	MAX.	M	SD
Point	.00	26.00	9.43	8.11
Indicate	.00	36.00	7.80	11.88
Look at projection	5.00	219.00	73.30	65.89
Look at laptop	3.00	156.00	45.77	42.49

3. 6. 3. Verbal behavior

For the 306 slides in total, 31 introductions to a slide were found (10% of the slides are introduced). Examples were: 'you see an example of this..', 'to give you an idea of', 'let's have a look at...', 'this one will take 30 seconds'. Often there were no introductions in the stricter sense of the word, but mainly announcing the topic, such as "Results". In total there were ten remarks about technical aspects of PowerPoint. On average, a little more than half of the words of a slide were being read out loud (56,5%). We found that there are big differences between presenters, with two presenters not reading aloud at all, four presenters reading aloud everything (100%) and the rest varying from 4.8% - 89,5%.

3. 6. 4. Relationship between the use of text and pictures, type of slide and physical and verbal behavior

The number of slides, number of words and pictures per slide and the type of slide (static text-slides, dynamic text-slides, static text-image slides, dynamic text-image slides, static image slides and dynamic image slides), the characteristics of the slide in short, were related to the different actions of the presenter (pointing at the screen (or at some element(s) on the screen), indicating something on the screen, looking at the screen and looking at the laptop).

We did find significant relations for characteristics of the slide and looking at the projection. The number of pictures per slide was positively related to looking at the projection, $r = .45$, $p < .05$ (one-tailed), as well as the number of static image slides, $r = .49$, $p < .05$, while the total number of static text slides was negatively related to looking at the projection, $r = -.44$, $p < .05$.

We also found significant relations for 'looking at the laptop' and

the number of words per slide, $r = .75$, $p < .001$, the number of bullet-points, $r = .70$, $p < .005$, the number of static text slides, $r = .74$, $p < .005$ and the total number of static slides, $r = .65$, $p < .005$. Pointing at the screen or indicating something on the screen was not significantly related to the characteristics of the slides.

We did not find significant relations between any of the characteristics of the slides and the verbal behavior (reading aloud).

3. 7. Discussion

In this study we investigated the use of PowerPoint for the presentation of conference papers, identifying the characteristics of the presentation tool, focusing on the use of text and pictures on the slides and the physical and verbal behavior of the presenter in relation to these. In this way we would like to make a contribution to the debate whether PowerPoint is causing bad presentations or whether these are merely a question of the rhetorical behavior by the presenter.

We found an average number of 35 words per slide and an average use of one picture per three slides. This is not in line with the guidelines of Mayer's multimedia theory (Mayer et al., 1997, 2001, 2009a,b), which advocates to use a picture on a slide to combine with the spoken words and to limit the use of words on a slide because it impairs the processing of information. The number of words is relatively high when compared to what instruction books advise (a maximum of 20 to 36 words per slide, depending on the author). Thus the critics do have a point, when they complain about the amount of text on the slides. We must take into account though that in this particular case texts them-

selves are the subjects of language scientists. The results are in line with the visuality hypothesis of Arsenault et al. (2006) which predicts a higher use of pictures in the hard sciences than in the social sciences (and probably in the humanities). The use of a picture on a slide is probably a less obvious choice in language studies. We did find different combinations of text and pictures on slides and agree with Pötzsch and Schnettler (2006) that there is more to the type of slide of a PowerPoint slide than is usually acknowledged. Even though the default setting is a text slide with bullet-points (which is so often criticized) more variations such as texts combined with pictures and slides with pictures were used, either programmed to show in a dynamic or in a static way. But the text slide with bullet-points was indeed the most used subcategory. Our conclusion is that while the default setting of PowerPoint and the scientific discipline tend to steer a presenter into the use of words on a slide, it is still up to the presenter to decide on the amount of text and bullet-points.

The projection seems to be a distinguishing characteristic of PowerPoint presentations and presenters need to steer the audience towards (different elements on) the projected slides when it is needed. This seems to be done primarily by looking at the projection which was done frequently. It supports the ideas and findings of Andeweg and De Haan (2009) and Anthony, Orr and Yamazaki (2007) that looking at the projection replaces the introducing of a slide verbally. Presenters turn to the projection less often with static text slides, but instead look at the laptop more often when there are more words on a slide and when presenting static text slides. This could indicate that they use the laptop as a speaking note and that they do not turn to the projection

again because there are no new elements to show. It is not clear why presenters look at the projection more when presenting static image slides. It might have been that there are more pictures on one slide or different aspects of a picture which need to be introduced separately. We can conclude that that looking at the projection to indicate a new slide or 'new' elements on a slide seems to be characteristic for the use of PowerPoint and that the behavior of the presenter is influenced by the different categories of slides. This behavior is considered irritating because the presenter loses contact with the audience by turning away from them. It is not clear why presenters choose to look at the projection instead of verbally directing the attention of the audience towards the (different elements on) slides.

Regarding the reading aloud of the texts we found substantial differences between presenters but we found no relation to the type of slide. It seems thus that reading aloud is therefore not influenced by PowerPoint, but a choice of the presenter. It is interesting to further research why some presenters read their texts out loud and others do not.

Is PowerPoint bringing a new configuration causing bad presentations or is it just a matter of failing rhetoric? PowerPoint is indeed bringing a new configuration because it influences the presentation behavior. On the other hand it seems a choice of the presenter to use many words, to introduce slides by looking at them or to read texts out loud. With the introduction of PowerPoint presenters have more options, but also more concerns.

Working with PowerPoint may be helpful and easy while preparing a presentation, it requires extra skills in giving the presentation. The

concept of performance seems to be an apt one to describe all the elements that matter: Speech, using (animated) slides, working with a projection, bodily movements and interacting with the audience. Presenters need an understanding of how the audience processes different sources of information and then being able to orchestrate their attention in an appropriate way. The choices some presenters make in doing this are considered irritating by some.

If we look at PowerPoint presentations as performances, presenters can now be seen as having to be designers, speakers and directors at the same time. It is not PowerPoint per se which causes some bad presentations, but the choices and behavior of the presenters dealing with all the new possibilities and requirement.

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4 Why do scholars use PowerPoint the way they do?

An empirical study of reasons behind ineffective use of PowerPoint¹

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PowerPoint has received much criticism regarding excessive use of text and lack of contact with the audience. Why presenters use PowerPoint in this way has not been studied so far. Our study with interviews among beginning and advanced presenters shows that some use the program as speaking notes or as a means to draw the attention away from themselves. Some think that PowerPoint can replace rhetorical skills. Slides are mainly designed on the basis of common sense, instead of guidelines based on human information processing. A three step method for the teaching of PowerPoint use in business communication is presented.

4. 1. Introduction

In the last fifteen years the use of the presentation software PowerPoint and similar programs such as Keynote or Prezi have become more popular. Many people use the program because it is easy as well as available as an integral part of Microsoft's Office suite of programs. One can incorporate pictures, animations, films and text on a PowerPoint slide with very little training. The slides can be made attractive without much effort, and are easy to display during presentations. They can also be made available (as handouts or posted on the internet) for students and professionals to use after the presentation.

Despite its popularity as a presentation tool, the use of PowerPoint

suffers a considerable amount of criticism. The most famous examples of this are the satirical video “Life after Death by PowerPoint” (McMillan, 2012), the article “PowerPoint: shot with its own bullets” (Norvig, 2003) and Tufte’s often-cited attack on the program titled “PowerPoint is evil”, in which he states that “The PowerPoint style routinely disrupts, dominates, and trivializes content (2003, ¶.2).” Somewhat less dramatic are the complaints of numerous authors who feel that presenters use too many slides, with too much text and too many bullet-points. They say that PowerPoint seduces presenters to use simplified and fragmented topic lists and encourages dull oral presentations of bullet-points, while the presenters themselves look at the projection. The critics complain that PowerPoint limits possibilities for improvisation and interaction with the audience (e.g., Hanft, 2003; James, Burke, & Hutchins, 2006; Keller, 2003; Vik, 2004), and that the presentation program reduces the role of the presenter to that of a stagehand (Blokzijl & Naeff, 2003). Cyphert (2004, p.81) sums up the criticism in her observation of students’ presentation behavior: “They speak in the dark, turn their backs to the audience, and read the hand-outs.”

Now, more than ten years since Tufte’s attack, the criticism of PowerPoint has mostly died away, but, presumably, not because its practitioners have changed the ways they use the software. Hertz (2013) for instance found that scholars from a variety of disciplines use 55 words per slide on average. Compared to the proposed maximum numbers in instruction books, this average exceeds even the highest proposed maximum number of 36 (Hilgers & Vriens, 2010) by 50%. The scholars looked on average 73 times at the projection during their 20

minutes presentation time (more than three times a minute). The criticism on at least these two aspects still seems to hold. Yet, despite the widespread use of PowerPoint and the criticism on the way it is used, little is really known about why presenters use the program in the ways they do. It is not because of a lack of guidelines for presenting with PowerPoint. In this paper we will first discuss these guidelines. Second, we will present our study into the motives for using the program.

4. 1. 1. Guidelines for effective PowerPoint presentations

Instruction books do provide useful guidelines for working with PowerPoint. They state that making (eye) contact is the most important factor for a good delivery, while looking away from the audience (for example to look at the words on a PowerPoint slide) is considered a poor way of presenting (see: Lucas, 2004; Malmfors, Gansworthy & Grossman 2004; McCroskey, 2006; Shephard, 2005; Zanders & Mecload, 2010). Research into the perception of auditory speech supports this position by suggesting that perception of speech is improved when the audience sees the speaker’s facial articulatory movements (Wassenhove, Grant, & Poeppel, 2005).

Presentation instructional books also advocate a limit to the number of slides, bullet-points and words on a slide (see for instance Knispel and Bemelmans, 2010, and Shephard, 2005), and writers have advised presenters to minimize slide density in favor of more visuals instead of text (Dufrene & Lehman, 2004). Earnest (2013, p. 22) states that “PowerPoint is not a word processor but a visual medium.” There is no agreement, however, on an optimal number of words. Suggestions

vary from “No more than four lines with four words” to “a maximum of six lines with six words,” resulting in a maximum of 36 words per slide. Writers also mention that pictures can enhance the processing of information by the audience and enable a better retention of the presentation (Atkinson, 2008; Lucas, 2004; Malmfors, Gansworthy & Grossman, 2004; Shephard, 2005).

Scientific evidence for the advice to use pictures over text can be found in the experimental studies of Mayer (2009). His Cognitive Theory of Multimedia Learning focuses on the combination of words and pictures, and supposes an active process of information processing in which a limited amount of information is selected, organized, and integrated. Mayer proposes two different channels for information processing: an auditive channel for spoken words, and a visual channel for pictures and written words. The working memory connects the presented auditive information and the presented visual information. This active integration between pictures and spoken words – which Mayer calls the multimedia effect – creates increased processing and better comprehension of the material. People learn better from text and pictures than from text alone. That is the central hypothesis and first principle of Multimedia Learning. The second principle, the modality principle, states that combining the visual mode (for instance pictures on a slide) with the auditory mode (spoken text) enhances learning (Low & Sweller, 2005). When text is projected on a slide it has to compete with pictures for the limited processing space in the visual channel. When spoken words are presented simultaneously with text in an animation, there is a third and detrimental effect at work, called the redundancy principle (Sweller, 2005), that impairs the processing of

information due to the duplication of textual information.

Mayer et al. have conducted numerous studies on this subject, which were published in a book (2009) and many articles (e.g. Mayer & Moreno, 1998; Mayer, & Moreno, 2002; Mayer, & Johnson, 2008). Others have also demonstrated these principles, see, for instance, Downs, Boyson, Alley and Bloom (2011), who found a modality effect in the use of MP3 players in the classroom, and Wecker (2012) who studied the retention of oral information in PowerPoint presentations and found that retention was lower with slides containing many words than slides with fewer. Atkinson and Mayer (2004) demonstrated how Mayer’s principles can be applied to PowerPoint slides and Burke (2007) showed how they can be used in designing educational presentations.

Given the guidelines for the use of text and pictures on the slides, the question why presenters would use PowerPoint with many text slides becomes more pressing. Are presenters not aware of these guidelines, or is there something inherently wrong with the program itself, as, for instance, Tufte (2003) suggests in his blog “PowerPoint is evil?” Worley and Dyrud (2004) state that the fault is not with the software but with the user (see also Bucher and Niemann, 2012; Farkas, 2010; Shwom & Keller, 2003). One explanation for the way PowerPoint is often used could be that presenters employ a common sense approach that is not in line with scientifically established principles of human information processing. Kosslyn, Kievit, Russel and Shepard (2012) state that the “psychological foundations for effective slideshow presentation design are neither obvious nor necessarily intuitive.” For this reason, Hentz (2006) advocates a more contemporary and multimodal literacy; knowledge about how “written, oral, visual, and

electronic modes of communication inform one another to generate meaning (p.426).”

Cornelis and Tielens (2004) provide yet another explanation for presenters’ violation of Mayer’s principles: most presenters are using PowerPoint as a tool for themselves, to structure their presentation, instead of using it to communicate with the audience. Farkas (2005) argues that presenters use many words on their slides out of “performance anxiety”: out of fear of forgetting to mention certain subjects, they include them all as a reminder. Little is known about the reasons why presenters use PowerPoint in the way they do. Feelings of speaking anxiety, easy to use default settings, and support focused at the presenter rather than at the audience may all be reasons why presenters use PowerPoint the way they do. In our study we have asked beginning and advanced presenters about the way they use PowerPoint, and their motives for this kind of usage. In addition, we have asked these presenters how they learned to present and work with PowerPoint. Given presenters’ apparent ignorance about guidelines that deal with the use of PowerPoint slides (Kosslyn et al., 2012), the way presenters have mastered (to their own satisfaction) the use of the program may provide an important explanation for the way they use it.

We have conducted our study among academic scholars. We are specifically interested in their use of PowerPoint during their presentations at conferences, since these presentations are important for their work (Hertz, 2011) and form an important stage in the construction of scientific facts and in the network of scientific communication (Kress & van Leeuwe in Rowley-Jolivet, 2004, p.145).

These are the research questions this article will address:

1. Why do scholars use PowerPoint in the way that they do?
 - a. For what purposes do scholars use pictures and text on their slides?
 - b. How do scholars learn to present and use PowerPoint?
 - c. Are there differences between beginners and advanced scholars?

Because we have not yet found any data on this subject, we intend to explore the reasons behind PowerPoint use by interviewing scholars. We will collect a broad overview of ideas using in-depth interviews and present the results as a qualitative study.

4. 2. Method

In our study we distinguish between beginners and advanced presenters. Scholars at the beginning of a possible scientific career might suffer more from speaking anxiety and therefore use more words on their slides than those who are more advanced and successful. In addition, these scholars, who were born in the 80’s, might have never presented with any other supporting tool. Their habits and ideas might differ from those of an older generation who can compare the use of PowerPoint to the use of transparencies, single slides for a projector, or a blackboard, and who can remember presenting without PowerPoint. Scholars, at the beginning of their careers, may have different ideas on using pictures since they have grown up in a time in which images are easier to find, produce and share. We interviewed 24 scholars in total: 12 first-year PhD students and 12 advanced, prize

winning scholars. The PhD students consisted of eight participants in a course on “Effective PhD Management” from VU University Amsterdam (VUA), (a general course for all first year PhD students). The rest were added from a list of first year PhD students in the physical sciences and the humanities from VUA and from the University of Amsterdam. The group of PhD students was made up of nine women and three men with an average age of approximately 25 years. The category of “advanced presenters” was almost entirely made up of Spinoza prize winners (the most prestigious Dutch award in science for “outstanding, pioneering and inspiring scientific work”). We approached one person at a time from the list of 52 winners until we had three respondents in each category of science (humanities, physical science, social science and medical science). By selecting subjects from these categories we strived for a complete representation of scientific disciplines. We found two social scientists willing to participate in this study (there were only four in total) and the third social scientist we included was an “Academy Professor” (a prize awarded to researchers “for exceptional achievement throughout the course of their careers”). The group of advanced presenters was made up of four women and eight men. They came from six different Dutch universities and their average age was 56. Each of them presented at least once a year as a keynote speaker at international conferences. We had six respondents (three PhD students and three advanced presenters) in each category.

Semi-structured interviews of approximately an hour were held with all respondents conducted by the same interviewer. (See appendix 1 for the questionnaire). The interviews were recorded and processed from the notes of the interviewer, with the recordings as a back-up to

consult if necessary. We used the PowerPoint slides of the most recent relevant scientific presentation of the interviewee to discuss the use of PowerPoint and the slides containing pictures and texts. This not only made it easier for the respondent to remember the presentation, but also for the interviewer to check their remarks or to inquire after topics that were not discussed without being prompted. The time allotted for the presentation was noted. The number of words and pictures on the slides were counted, and the average number of words per slide, pictures per slide, number of slides, words and pictures per minute were computed. The Mean and Standard deviation for beginning and advanced presenters on these variables were also computed and compared.

The transcripts of the interviews were sent to the respondents for comments; these comments, if present, were then processed.

The questions in the questionnaire represented different topics including: acquisition of PowerPoint skills, preparation of a presentation, advantages and disadvantages of PowerPoint use, the purpose of the various slides and the appreciation of and feelings about PowerPoint when used by others. In analyzing and coding the interview data, the first step was to organize the answers to the different questions into a scheme.

In the second step, additional topics were coded. All topics were then organized in a new scheme. Also in this step, the differences were marked among scholars from different scientific disciplines, as well as those differences between the groups of beginning and advanced presenters. This was done by two independent coders: the interviewer, plus an additional coder, who was taught how to perform this task. The

coders were both professional psychologists, trained in interviewing and interpreting interview data. Whenever differences in coding occurred, they were discussed until consensus was reached. Relevant quotes were marked within the text. In the third step, through a process of axial coding, relating new categories to the original categories in the questionnaire and finally relating the categories to each other [Glaser & Strauss, 1967], the final categories and subcategories were established.

4. 3. Results

In this section we will report the results regarding the reasons for the use of PowerPoint, the advantages scholars see in using the tool, the alternatives they perceive they have when having to present without PowerPoint, and their use of pictures and text on the slides. We will also describe the perceived disadvantages of using PowerPoint, and the ways scholars have learned to present and use the program. Differences between beginners and advanced presenters are mentioned whenever they apply.

4. 3. 1. Reasons for using PowerPoint

All respondents used PowerPoint, though some of them also used a blackboard or a flip-over for their lectures. The reasons for using PowerPoint and its advantages can be categorized as:

1. Support for one's memory
2. Diverting the attention of the audience
3. Support for the audience

4. Entertainment
5. Practical reasons
6. Conforming to the audiences' expectations

- 1 First, beginners as well as advanced presenters used PowerPoint as a prompt, a memory aid for themselves, helping them with the structure of their presentation: "PowerPoint offers structure", "it is like a track which you can lay out beforehand", "I use the items on the slide as a frame to build my story around". Many respondents would otherwise have used speaking notes, but they thought that the audience would rather watch a PowerPoint slide than someone reading from a piece of paper (an argument which takes the audience into account as well).
- 2 Second, some beginning presenters liked PowerPoint because the direct (eye) contact with the audience is interrupted. One presenter felt she would have to have charisma to sustain this contact, something she felt she lacked. Others stated that "without PowerPoint it feels scary having all eyes focused on me without a distraction," or they say that "without PowerPoint I have to look at the audience all the time and that feels awkward."
- 3 Third, most presenters also used PowerPoint for the benefit of the audience, to enable them to process and remember the information. A comment was that it allows the audience to "hear and read at the same time." One respondent felt his English pronunciation was not adequate, and that the audience could at least read the slides to get meaning.
- 4 Fourth, some presenters used PowerPoint for entertainment: presentations with PowerPoint are more fun was one comment. One

respondent used Power-Point “to draw the attention of the audience and to entertain and challenge them, because otherwise they will fall asleep” was how he put it. Some respondents in particular mentioned the use of pictures: “it adds something extra for the audience, which loves visuals.” The use of pictures will be discussed in depth later in this article.

5 Fifth, the technical and practical possibilities of PowerPoint were often mentioned. Using (moving) pictures, including other media, and the possibility to animate items were seen as advantages of PowerPoint, as well as the fact that the slides can be altered at the last moment. The presentation can also, with changes made so easily, be passed along to someone else. Respondents found the PowerPoint format more practical than a collection of separate transparencies; they appreciated the fact that one could upload the presentation online, that it works faster than using a blackboard, and that it is easier to use than writing something on speaking notes.

6 Finally, some respondents (beginners and advanced presenters alike) said that they use PowerPoint simply because audiences expect it to be part of their presentation.

Regarding the reasons for using PowerPoint, we did not find major differences between beginners and advanced presenters, apart from the fact that some beginners liked to use it to divert attention from themselves.

4. 3. 2. Presenting without PowerPoint

In order to get a better understanding of the importance of PowerPoint, we asked the respondents what they would do if it were not pos-

sible to present with the program. Some people felt that presenting without PowerPoint was not an option; others said that it would be possible and, in fact, some would even prefer it. Most respondents said that presenting without using PowerPoint would cause them to adjust their presentation. One way of adjusting, respondents say, would be to use another tool: the blackboard. But that could lead to “pictures that have a less long lasting effect, because they were not prepared that well,” or being “more messy.” Some presenters, if not able to use PowerPoint, would adjust the presentation’s rhetorical aspects. They would, they told the interviewer, present more conclusions, give more examples, more descriptions, tell more anecdotes, invite the audience to think about subjects, and improvise more. Some would adjust their voice to maintain the audience’s attention and to emphasize structure, or would adjust their articulation or vocabulary.

Two respondents would prepare their presentation differently: “it would force you to prepare well”, “It would take more time in preparing”, “I would practice more”, “I would write the presentation down”, “I would think about what I would like to say with keywords.” Respondents saw different and sometimes opposite effects on audiences when presenting without PowerPoint: “an advantage would be that the audience would learn better and remember better” said one respondent. Others felt that the presentation would be harder to follow and less understandable without pictures; the audience would retain less information. “PowerPoint is a memory aid for the audience” said one respondent. One person said PowerPoint makes it easier to involve the audience, while others felt that it makes a presentation more pleasurable.

When asked about presenting without PowerPoint, most of the enthusiastic reactions were from advanced presenters: “fantastic, very relaxed”, “nice challenge”, “I would feel more free, I am stuck to text now”, “it will create more discussion.” One advanced presenter remembered the time when one couldn’t use visual projections and there weren’t any blackboards in bigger auditoriums. It was a challenge to talk about mathematics. “One had to possess didactic skills, because every word counted, (but rethinking his remark), actually it still does.” One response identified differences between disciplines: “it is all very well for historians to just stand and talk but that does not work for physicists; the audience needs to see the subjects.” Another respondent also mentioned a difference, pointing out a distinction within Language studies where theorists present without PowerPoint, while linguists with a social scientific background do use PowerPoint to present the results of their experiments.

4. 3. 3. Use of pictures

We found five reasons why presenters use pictures in their PowerPoint presentations. These can be categorized as:

1. Explanation
2. Audience support
3. As a non-informative bridge
4. Creating a pleasant atmosphere
5. Support for the presenter

1 Almost all respondents said they used pictures to explain concepts. Some used the phrase “a picture is worth a 1000 words” or a similar expression. Respondents used pictures to “show how something

functions”, “to sketch the context”, “to trace a line of thought (using an animated flowchart)”, “to symbolize.”

2 Second, presenters felt that the audience would better understand the presentation when there were pictures, because: “people think visually” or “one remembers better when information is presented in two different forms.”

3 Third, many respondents used pictures, not to transfer information, but to do the opposite: “to give people a chance to process information before going on to more data, or to create moments of recognition”, “as a way for the audience to move from concentration to relaxation”, “as something contrasting from text”, or “as a bridge to a new subject”.

4 Fourth, pictures were used to make, or sustain, connections with the audience, to establish a positive mood, when presenters use pictures “as a fancy decoration”, “as a joke”, “to look cheerful”, “to evoke a nice atmosphere” or to “liven up the presentation and make it less dull.” Some advanced presenters said that “one can explain and illustrate in a more attractive way with pictures”.

5 Finally, although respondents had the audience mainly in mind with their comments, some of them said that they liked to present with the help of pictures because doing so gave them support in knowing what to talk about: “it provides support and at the same time it gives me more freedom than the projection of words. They are like anchors.”

Some respondents felt, however, that one should only use pictures when they added something to the story. One respondent felt strongly that, if she was a member of the audience, she would not want to be manipulated by a slick presentation, and another used the term “psychological trick” regarding the use of pictures. One respondent claimed

she does not use pictures at all because she finds them childish.

Some advanced presenters said their use of pictures depended on the audience they were presenting to: "I use very visual material for students - like diagrams, maps, photographs and other pictures. The less educated the audience the more pictures. This level of audience needs to be entertained." Another responder differentiated among three sorts of presentations: (a) "cinema" for a broad audience with many pictures and little explanation, (b) mathematical formulas for presenting at a conference, and (c) "real time" animations for a small group of peers, drawing on the blackboard for more schematic sketches at a much slower speed. This is the best way of presenting, he felt, because one sees the building up of a drawing, which brings the audience into the thought process, while merely presenting clever pictures might draw their attention away. Advanced presenters in general used almost twice as many pictures as beginners.

Looking at differences between disciplines, we found that one physicist and all three medical scientists amongst the advanced scholars found the use of pictures a necessity in giving a presentation: "an illness has to be shown." Advanced presenters from the physical sciences felt that they had a lot to offer regarding the visual aspects of PowerPoint. We have "an enormous visual tool kit," said one of them. A physicist colleague thought that the international community of physicists had developed a method of explaining the most difficult concepts in a colorful way. According to him, the arrival of PowerPoint was a great revolution, since it allowed for heavy use of pictures (in contrast to the scribbles on a transparency). "One creates a kind of MTV atmosphere, in which you create a story by showing clips in rapid order."

It might seem that other disciplines are following suit, since another advanced presenter said that historians also use more pictures in their PowerPoint presentations as well as in their publications.

4. 3. 4. Use of text

Although we did not specifically ask about the reasons for using text on PowerPoint slides, this topic was often addressed when discussing what respondents disliked about PowerPoint presentations. Many said that they disliked the use of too much text on a slide and said that they don't use too many words themselves: "One still wants to respond to the audience and the atmosphere." "Too many words on a slide constrict the presenter." "In this presentation I have one core message on each slide." "PowerPoint is for support; it does not make sense to read aloud what the audience themselves can read." Many respondents also said that they like presenters who don't read from their slides. They liked it when "someone talks freely," when the audience can listen to the story and "feel the passion of the presenter."

One presenter justified using lots of text by saying: "I usually put the most important points on the slide. On this slide, that calls for a lot of text [...] If I just told the audience the main points, why would I use PowerPoint in the first place? [...] A listener can't be focused all the time, and when you miss something there is no other way to catch up with it." Both beginners and advanced presenters used on average 29 words per slide. Beginners used more than twice as many words per minute as advanced presenters (see also Table 4.1). We did not find differences among presenters of different disciplines in their likes or dislikes of the use of text.

Table 4.1 Mean and standard deviation of the average number of words and pictures per slide, number of slides, words, and pictures per minute.

	PhD		Spinoza	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Average words/slide	29.33	15.98	28.88	14.62
Pictures/slide	0.67	0.54	1.01	0.87
Words/min	1.72	1.36	0.82	0.65
Pictures/min	0.68	0.51	1.25	1.34
Slides/min	1.10	0.48	1.03	0.58

Note: PhD, *n* = 12; Spinoza, *n* = 12.

4. 3. 5. Disadvantages of using PowerPoint

Many respondents also saw disadvantages in the use of PowerPoint. These can be categorized as:

1. Loss of contact with the audience
2. Use of too much text
3. Presentation of previously made graphics
4. Fragmentation of the narrative
5. Lack of passion

1 First of all, some respondents mentioned that using PowerPoint can lead to losing contact with the audience, because the audience frequently looks at the pictures on the projection, or is busy copying the text from the slides. Or they lose contact because the presenter too frequently looks at the projection and not at the audience. It is hard for

an audience to listen and read at the same time, said one respondent.

2 A second disadvantage is that the presenter uses too much text on a slide, which can lead to information overload, can be confusing and can “convert the presenter into a reading-out loud machine.”

3 A third problem comes from a pedagogic point of view. Some advanced presenters said that presentations with PowerPoint move too fast for the processing of the information. Students must be able to follow the ideas behind presented graphics, and this takes time. It is often better to write on a blackboard to explain concepts, instead of presenting them ready-made on slides.

4 A fourth problem concerns the method of storytelling, which, some people said, is hindered by the fixed order in which PowerPoint slides are usually presented. Respondents said the program often prevents the ability for the presenter to improvise.

5 Finally, the last disadvantage some mentioned was that a PowerPoint presentation can lack passion, because it is simply read out from the slides.

No differences were observed between beginners and advanced presenters, nor among scholars of different disciplines regarding the disadvantages of PowerPoint use.

Learning to present and use PowerPoint

In order to see if scholars are aware of guidelines regarding the use of PowerPoint, we asked them how they learned to present using the program. Most respondents had no training in the use of PowerPoint; they simply learned to present by experimenting and by observing colleagues (“copying and borrowing”).

A difference between beginners and advanced presenters is that most beginners had to present when they were students. However, they don't remember much useful feedback on their presentations from these sessions. Advanced presenters don't mention that they had to give presentations as a student. Some of them offer anecdotes about how they were thrown in "at the deep end" at the beginning of their career.

Another difference between the two groups is that some advanced presenters mentioned that they possess skills that are related to the audience - such as "adapting to the audience", "engaging the audience", "appealing to the audience" and "assessing the right level of knowledge of the audience." Again, we did not find differences among the different disciplines.

4. 4. Discussion

What are the reasons that scholars use PowerPoint the way they do, when these presentations are so often criticized and might not be effective either? This is the central question of our paper which we will discuss here. Scholars agree with the critics that presenters use too much text on their slides. We found a difference between beginners and advanced presenters in their use of text. The latter group used only half the number of words. We did not, however, find differences in opinion between the two groups about the use of text. If we combine some findings, we might be able to offer an explanation for the fact that beginners, perhaps unknowingly, do in fact use more text. The beginning presenters in our study had little experience in presenting

their research, compared to the advanced presenters; they probably suffered more from speaking anxiety. We also found that presenters use PowerPoint for their own support - to keep themselves on track of their presentation. We can therefore speculate that beginners require more words on their slides to help them overcome their anxiety and to support them through their talk. They may be less aware of their use of a relatively large number of words, because they probably have seen many presentations of their peers who use similar quantities of text. Conversely, they may not have seen and heard too many presentations of award winning keynote speakers who, we can assume, would use much less textual material.

Regarding the use of pictures on PowerPoint slides we found a similar difference between beginners and advanced presenters. The latter group used almost twice as many pictures as the beginners. While we did not find any clear differences in statements about picture-use between the two groups of scholars, we do think that these differences are related to experience. Scholars have said that they use pictures almost exclusively for the benefit of the audience. Beginners, having less experience and greater speaking anxiety, might be more concerned with their own performance, while advanced scholars have indicated that they have their audience in mind when preparing and giving a presentation.

An important criticism of PowerPoint use is that presenters lose contact with their audience (Hanft, 2003; James, Burke, & Hutchins, 2006; Keller, 2003). This is a criticism that is shared by the presenters we interviewed in this study, as well as those in the study of Shephard (2005). Instruction books advocate eye contact between the presenter

and audience and suggest the presenter avoid looking at the slides. We understand that using PowerPoint as a memory aid, helping them to remember the structure of the presentation, can make presenters look at the projection (or computer screen) instead of at their audience. When scholars use PowerPoint to explain an idea or to entertain their audience, they lose eye contact as well, because the audience is also looking at the screen. Some beginners, in fact, indicated that they preferred the audience to look at the projection rather than at them. In maintaining contact with the audience there is again a difference between beginning and advanced scholars. Advanced presenters might often like to present without the use of PowerPoint because this would allow more contact with their audience. Unlike beginning scholars, advanced scholars mention skills like “engaging the audience.” It appears, then, that advanced presenters are more skilful presenters in this aspect as well, but that their (what they perceive as obligatory) use of PowerPoint puts limits on how they make their presentations.

It is interesting to see that PowerPoint use also seems to influence presentation behavior in other ways. When presenters were not able to use PowerPoint, they might give more examples, encourage the audience to give more consideration to particular subjects and allow themselves more opportunities to improvise. Some would adjust their voice, their volume and articulation, or otherwise control their use of language. They would, in general, employ more rhetorical skills. Some presenters would spend more effort in preparing and rehearsing their presentation. It is striking that these scholars believe that the use of PowerPoint makes speaking skills superfluous, and that one needs to spend less time on preparations for a presentation. These supposed

advantages might explain why some presenters prefer to use PowerPoint. Using the program as a substitute for presentation skills and preparation, however, can result in poor presentations with too many words on the slides and a lack of eye contact between presenter and audience.

The group of advanced presenters we interviewed for this study is not representative of the total population. They are a small and highly selective group. They are scholars who were rewarded for their outstanding scientific work and often invited as keynote speakers at conferences and meetings. It is probably safe to say that their efforts are better than those of the average presenter. We feel that the group of beginning presenters, however, does not differ much from groups of other students or beginning presenters and that the practical implications we present are applicable to all students of business communication.

Presenters in our study lacked specific training in the use of PowerPoint; they learned to present with it by experimenting and by observing colleagues. Some seemed to think that the use of PowerPoint could replace rhetorical skills, such as the proper use of voice and articulation. The fact that presenters are able to make slides without any previous training can be a double-edged sword: with no training, presenters are unaware of some basic communication principles. They, like the presenters in the study by Kosslyn, Kievit, Russel and Shepard (2012), design their slides based on what can be considered to be “common sense.” But we have also seen that this “common sense” might lead to outcomes that are inconsistent with the guidelines for slide design.

4. 5. Practical implications for the teaching of business communication

We agree with Hentz (2006) that more multimedia knowledge is called for. Users of PowerPoint should know how the use of text and pictures on the slides interacts with speech and how this use influences the information processing of the audience. Effective slideshow design is not obvious or intuitive (Kosslyn, Kievit, Russel and Shepard, 2012), and this is something presenters should understand. We advocate a three step method for teaching PowerPoint. The distinguishing factor of our approach is the order we recommend that students should be taught presentation skills. They should not start presenting with PowerPoint, but should first, without the program, practice rhetorical skills in their presentation. This should increase their mastery of techniques for structuring the presentation and contribute to maintaining eye contact with the audience. This approach should also diminish speaking anxiety. Second, they should be taught how to design slides. Only with the third step should students be taught how to present with PowerPoint.

4. 5. 1. Teaching rhetoric skills

We agree with Lucas (2004) in believing that the best method for presenting is not to read verbatim from a script, reciting a memorized text or improvising completely, but to speak freely and discuss major points which have been previously considered, without memorizing precise terminology. The challenge at this stage would be to explain principles of rhetoric and to teach students to speak freely, perhaps

with the help of prepared written keywords. The presenters in our study would spend more time and effort in preparing and rehearsing their subject if they were not allowed to use PowerPoint. Learning how to present without this tool would mean that students would have to memorize key topics and spend more time rehearsing.

Speaking freely without PowerPoint would also encourage one of the most important aspects of a presentation -- making "eye contact with the audience" (e.g. Lucas, 2004; McCroskey, 2006). We know that this can be daunting for beginners, and that PowerPoint slides might provide some support in drawing the attention of the audience away from the speaker. It is important in this first phase to diminish the speaking anxiety of students and increase their sense of mastery (Bandura, 1989; De Grez, Valcke & Roozen, 2009). This can be done by providing them with a series of small exercises, increasing in difficulty, while giving positive feedback and emphasizing success. The importance of rehearsing should be stressed, not only for the quality of the presentation, but also to diminish speaking anxiety. In a classroom with international students this is even more important, since non-native speakers, having to present in English, might be even more anxious.

Once students master the ability to speak freely in public, PowerPoint can be used as a complement to such oral presentation, not as a memory aid or to distract listeners, but to enhance the information processing of the audience.

4. 5. 2. Designing slides

A separate assignment, should be the design of the PowerPoint slides. Slides should be critiqued by the teacher and improved as necessary by the student before the actual presentation. Cyphert (2004)

believes that the first task at this stage is to mitigate the damage that has already been done; students have likely been exposed to many poorly designed and ineptly delivered presentations by the time they arrive in the classroom.

Guidelines for slide design should be discussed and demonstrated. Techniques are supplied by Kosslyn (2007), Atkinson and Mayer (2004) and Earnest (2013).

Attention should be given especially to the amount of text on a slide. Simple instructions to limit the amount of text might not be sufficient. It would be more productive to show that the presenter's speaking, simultaneously with text projected on a slide, interfere with each other, and that text should be used only if it clearly benefits the audience. The function of pictures in general and different kinds of pictures (such as graphs, diagrams and cartoons) in particular should be explained and demonstrated.

4. 5. 3. Presenting with PowerPoint

The third step in the three step method for teaching PowerPoint involves students presenting with the PowerPoint slides they have designed. The role of positive feedback should not be underestimated. In addition, one could ask for feedback by fellow students. Presenters, sitting in the audience, are likely better at identifying negative examples of a PowerPoint presentation than they would be as presenters themselves. This perspective might help them look more critically at their own presentations.

4. 6. Concluding remarks

The innovative aspect of our study is the fact that we have looked into the underlying motives of PowerPoint use. The advantages for presenters often do not coincide with the advantages for the audience. Using PowerPoint as speaking notes for instance, might be convenient for the presenter but detrimental to information processing by the audience. Directing the attention of the audience towards the screen instead of at the presenter might somewhat reduce anxiety, but also results in a lack of eye contact. Our results show that in order to improve PowerPoint presentations it is not enough to teach guidelines about the design of slides. Reasons for the use of PowerPoint by the presenter should be taken into account as well. Overcoming speaking anxiety and enforcing the ability to memorize the structure and content of a presentation need to be addressed first. Therefore, we have proposed a three step method where the important first step involves practicing presentations without the use of PowerPoint.

We realize that our suggestions involve longer periods of teaching and practicing communication skills with the intensive involvement of students and teachers. This, we think, would be time well spent. Presentations with PowerPoint are important in the professional workplace, and a good knowledge of this technique certainly has the potential to enhance the understanding of an audience.

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5 PowerPoint slides as speaking notes: The influence of speaking anxiety on the use of text on slides.

PowerPoint is often criticized for hindering rather than helping get the message of the presentation across. In a study among 97 academic scholars, we found that presenters used substantially more text on their slides than is advised. We found that speaking anxiety is related to the time spent on preparing and rehearsing, and that time spent on rehearsing is related to the number of words on the slides. There is reason to believe that anxious presenters use PowerPoint slides not only for the benefit of the audience, but as speaking notes for themselves, thereby hindering the information processing of the audience. Presenters should be trained to overcome their speaker anxiety by means other than the use of words on their slides.

5. 1. Introduction

In the last fifteen years PowerPoint has become by far the most popular presentation support in educational, academic and business settings. Its use, however, has caused many authors to criticize the program in articles with titles such as 'Death by PowerPoint,' 'Powerful or pointless' (James, Burke, & Hutchins, 2006) or 'PowerPoint is evil' (Tufte, 2003). Much of this criticism focuses on slide design: too much text and too many bullet-points, coupled with unintelligible texts and graphs, hinder rather than help the audience to understand the central message the presenter aims to communicate (see for

instance: Cyphert, 2004; Keller, 2003; Tufte, 2006).

The heavy use of text on slides is problematic for two reasons. First, using slides as speaking notes might cause presenters to turn towards the projection to read the words. This is not necessary, since they can read the words from the computer screen as well. Rotating in the direction of the projection seems to be characteristic behavior of PowerPoint presenters (Shwom & Keller, 2003; Hanft, 2003; Cornelis & Tielens, 2004). Presenters thereby break eye contact with the audience, an important component of a presentation (e.g., Kosslyn, 2007; Lucas, 2004, McCroskey, 2006). Looking away from the audience at the words on a slide or to point at something, is, from a rhetorical point of view, considered a poor way of presenting. While helpful for the presenter, the heavy use of text on slides might directly and indirectly impair the quality of the presentation.

Another reason that too much text on PowerPoint slides is problematic is that text on slides interferes with the spoken words of the presenter. Research by Mayer (2009) has shown that the use of words on a slide might hinder the information processing of the audience, whereas pictures combined with spoken words improve it. Mayer proposes two different channels for information processing: an auditive channel for spoken words and a visual channel for pictures and written words. The working memory connects the presented auditive information and the presented visual information. It is this active integration between pictures and spoken words – which he calls the multimedia effect – that causes better processing and comprehension of the material.

Instruction books advocate the limiting of the number of words but differ in their suggested numbers, which range from four lines with

four words (maximum of 16 words), up to six lines with six words (a maximum number of 36 words) (Atkinson, 2007; Knispel and Bemelmans, 2010; Kosslyn, 2007; Shephard, 2005). Studies show that many presenters far exceed the norms presented in instruction books (Hertz, 2011).

The central question in the current research is on the role of speaking anxiety and preparation practices as a reason why presenters don't adhere to guidelines regarding the use of text on slides. It has been suggested by several authors that presenters use many words on a slide because they use them as speaking-notes (e.g., Cornelis & Tielens, 2004; Farkas, 2005). Presenters who fear they will be lost for words, forget a topic, or are afraid they will present the topics in the wrong order, know that PowerPoint slides containing the wording and structure of their speech could prove to be helpful. These fears might be especially strong for presenters suffering from speaking anxiety. In the following we will discuss the literature on speaking anxiety, and how speaking anxiety might be related to the way presenters prepare for presentations and design their PowerPoint slides.

5. 2. Speaking anxiety

Speaking anxiety is a concept that has been well studied, indicating that it is a distinct subtype, qualitatively and quantitatively different from other subtypes of social phobia (Blöte, Kint, Miers, & Westenberg, 2009). We will use the term in the non-clinical way, referring to the feelings of anxiety many presenters experience when having to present in front of an audience. This anxiety manifests itself differently in three

significant episodes of the public speaking performance: (a) preceding the presentation, just before speaking; (b) during the presentation; and (c) immediately following the presentation (Sawyer & Behnke, 1999, in Lucchetti 2003). Anticipating giving a presentation produces even more anxiety than actually giving the presentation (Behnke & Sawyer 2000).

The presence of an audience and the fear of negative evaluation are the most prominent causes of speaking anxiety (Rapee & Lim 1992). According to Westenberg et al. (2009), public speaking forms a social-evaluation threat that occurs in situations in which a person's most valued attributes are, or could be, negatively judged by others. These potential threats are, according to Taylor et al. (2010), one's appearance, demeanor, verbal competence and intellectual ability. Taylor et al. (2010) tested the differences among (a) an unsupportive audience, (b) a supportive audience, or (c) no audience. Both audience conditions produced significantly more stress related reactions than the no-audience control, indicating that the mere presence of the audience is sufficient to cause speaking anxiety.

Speaking anxiety is a psychological state that presenters can experience in a direct, physiological way, with physical reactions like increased heart-rate, heightened blood pressure and cortisol responses (e.g., Pörhölä, 2002; Vogel, 1999; Westenberg et al., 2009). These reactions might influence the presentation in a negative way directly, but also indirectly, by making the presenter painfully aware of his/her speaking anxiety, which might then set negative thoughts about failure into action. It was found for instance that anxious communicators have a tendency to interpret their physiological arousal as fear or anxiety, whereas non-anxious individuals label a similar kind of

arousal as enthusiasm or excitement (Pörhölä, 2002; Behnke & Beatty, 1981). Anxious communicators tend to pay less attention to their environments and have more negative, self-focused feelings about their performances than low anxiety speakers. This increase in attention to self is correlated with poorer speaking performance and lower self-evaluations (Daly et al. 1989).

One of the reasons behind the popularity of PowerPoint might be that presenters use it to reduce their speaking anxiety. Ayres (1991) found a relation between speaking anxiety and the use of visual aids. Presenters who used visual aids reported lower anxiety than those who did not. This was before the introduction of PowerPoint and we have not found any more recent academic studies into this subject. There are various ways in which presenters use PowerPoint to reduce their speaking anxiety. The preparation of the slides, easy to accomplish, may give presenters a sense of mastery. Presenters also structure their presentation by putting slides in a certain order. Because of the fixed succession of slides during their presentation, presenters will be certain not to forget about subjects, or to present them in the wrong order. In addition, the default setting of PowerPoint with bullet-point lists on a slide further adds to the creation of structure. In addition, by using words on the projected slides, and by looking at them during the presentation, presenters are prevented from being "lost for words." The slide has become a projected speaking note. Being able to transfer the attention of the audience from speaker to slides might also be a reason why anxious presenters like to work with PowerPoint. The use of PowerPoint thus offers assurance, not only during the presentation, but also during the preparation phase in which speaking anxiety tends

to be the highest (Behnke & Sawyer 2000). The words on the slides function as speaking notes for the presenter during the presentation, even while they may hinder the information processing by the audience.

There is reason to believe that speaking anxiety is related to the length of time presenters spend on preparing and rehearsing their presentation. Ayres (1996) found that presenters with more speaking anxiety (“communication apprehension” in his words) spend more time on their total preparation, mainly making speaking notes and employing visual aids (activities similar to making PowerPoint slides), and that presenters with less speaking anxiety spend less total time on preparing and more time proportionally on analyzing the audience and rehearsing text. This form of rehearsing produces better results than not rehearsing the presentation (Menzel & Carell, 1994). According to Ayres (1996), presenters with high speaking anxiety approach speech preparation with the same communication-avoidance pattern they routinely use, namely to avoid communication-oriented preparation activities such as rehearsing out loud. These findings probably are applicable to presentations using PowerPoint as well; presenters with more speaking anxiety probably spend more time on preparing their presentation, for instance on making slides. Anxious presenters can use these slides as speaking notes. Anxious presenters also likely spend proportionally less time on rehearsing their presentation. It is our expectation that more time spent on preparing leads to more words on the slides, and more time spent on rehearsing leads to fewer words, since presenters don’t need the words as a speaking note if they rehearsed well.

5. 3. Study overview

In this study we test our predictions that (a) speaking anxiety causes presenters to spend more time on preparing the presentation than speakers with low speaking anxiety, (b) that speakers with high speaking anxiety spend proportionally less time on rehearsing than speakers with low speaking anxiety and (c) that speaking anxiety, through the way presenters prepare their presentation, is related to more text on their slides. Furthermore, we study the possible relations between time spent on preparing and rehearsing a presentation with PowerPoint and the use of words on a slide.

We test the predictions and study the relations among a sample of academic scholars and their latest conference presentations. Given the characteristics of speaking anxiety described above, we may expect the level of speaking anxiety of scholars presenting their work at a conference to be high, especially among junior presenters. Conferences are sites for presenting research results and an open ground for confrontation, discussion, and the ratification of meaning, according to Shalom (2002). They play a central role in the network of scientific communication and in the negotiating of knowledge claims (Rowley-Jolivet 2002) and are a challenge for presenters (Ochs & Jacoby, 1997). A conference presentation is a rare moment where scholars have direct contact with their colleagues and competitors, as opposed to publishing in journals. It is a moment where their peers will directly evaluate their work by posing critical questions. One could say that their work, and indirectly the scholars themselves are tested. Negative evaluation by the public, the main cause for speaking anxiety, is a realistic threat and might

cause high anxiety levels. The fact that non-native English speakers often have to present in English, may add to this anxiety.

We chose to do research among social scientists, who work in disciplines in which presenters often have the choice of using pictures or words on a slide (for instance graphs for their numerical data), but usually won't have an abundance of pictures from their data as, for example, medical researchers or physicists often have. Nor do they study texts themselves, such as linguists might do, which then might lead to slides with examples of the texts they studied.

5. 4. Method

A questionnaire with questions concerning speaking anxiety, time spent on preparation and time spent on rehearsing was created with eXamine (Roelofsma, Bottema & Smeets, 2005). It was directly emailed to networks of social scientists of three Dutch universities (VU University Amsterdam, Rijksuniversiteit Groningen, Wageningen University) and also emailed to the secretaries of three academic departments of other universities with the request to forward the mail to their colleagues. Respondents were asked to upload their most recent conference presentation with PowerPoint. 174 respondents filled in the questionnaire (an estimated response percentage of 30%) of which 97 sent in their PowerPoint presentation. Only their data were used for the analysis.

59 % of the respondents were female and 41% were male. The distribution in academic functions were: PhD student (42.3%), postdoc (27.8%), assistant professor (13.4%), associate professor (6.2%), full

professor (6.4%), other (4.1%). The respondents had one year of experience (8.3%), two- to five years of experience (53.2%) or more than five years of experience (38.5%).

5. 4. 1. Measures

The *number of words* was taken from the word count function of PowerPoint. To control for the length of a presentation and for the fact that presenters can either put many words on one slide, or fewer words on many slides, we included the length of the presentation (number of minutes) in our analyses.

To measure *Speaking Anxiety*, we selected five statements from the original 35-item 'Personal Report of Public Speaking Anxiety' of McCroskey (2006) which were both applicable to a non-clinical setting and reflected worries of presenters of conference papers that were found in an earlier study (Hertz, 2011). We changed the word 'speech' into 'scientific presentation' and changed the present tense into the past. The items were: *During the preparation of my last scientific presentation, I felt tense and nervous. I was looking forward to giving/to preparing my last scientific presentation. During the preparation of my last scientific presentation, I was worried that I would forget to say what I had prepared. During the preparation of my last scientific presentation, I was worried that someone would ask me something regarding my topic that I don't know. During the preparation of my last scientific presentation, I faced my upcoming presentation with confidence.* Respondents could select their answer from a five point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). The items were clustered in a mean index of Speaking anxiety and showed suf-

ficient internal consistency ($M = 2.10$, $SD = 1.02$, Cronbach's $\alpha = .71$).

Two questions measured the time the respondents spent on preparing and rehearsing: *How many hours have you spent on the preparation of your last scientific presentation? (indication in minutes please)* and *How many hours have you spent on rehearsing your last scientific presentation? (indication in minutes please)*. The proportion of time spent on rehearsing in relation to time spent on preparing was computed.

5. 5. Results

The mean length of the presentations was 20.51 minutes ($SD = 13.04$), 17.5% lasted less than 15 minutes, 29.9% lasted 15 minutes, 35.1% lasted 20 minutes and 17.5% lasted longer than 20 minutes. The mean time preparing was 272.44 minutes (4 hours and 33 minutes), ($SD = 204.68$). The mean time spent on rehearsing was 37.24 minutes ($SD = 36.36$) which is 13.7% of the total preparation. The mean number of slides per minute was 1.1 ($SD = .59$). The mean number of words per slide was 54.51 ($SD = 41.18$). The mean number of pictures per slide was .05 ($SD = .07$).

Table 5.1 shows the correlations between the variables. We found a significant negative correlation between years of experience in presenting scientific research and speaking anxiety, $r = -.56$, $p < .01$. Furthermore, we found significant positive correlations between speaking anxiety and the time to prepare, $r = .41$, $p < .001$ and speaking anxiety and the time to rehearse, $r = .32$, $p < .01$. There was a positive correlation between time spent preparing and time spent rehearsing,

$r = .30$, $p < .01$. We also found a positive correlation between time to rehearse and the number of words, $r = .27$, $p < .01$, but no significant relation between time spent on preparing and the number of words. There were significant negative correlations between the number of years of academic experience and rehearsing, $r = -.29$, $p < .01$ and the number of years of academic experience and the number of words on the slides, $r = -.21$, $p < .05$.

Table 5.1 Pearson correlations between speaking anxiety, time spent on preparing and rehearsing, number of words, length of presentation and academic experience.

	1	2	3	4	5
1. Speaking anxiety	--				
2. Preparing	.41***				
3. Rehearsing	.32**	.30**			
4. Number of words	.07	.07	.27**		
5. Length of presentation	-.19(*)	.11	.08	.37***	
6. Academic experience (years)	-.56**	-.05	-.29**	-.21*	.07

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

To test whether speaking anxiety affects the number of words used in a PowerPoint presentation through time spent on rehearsing and/or preparing, we used the PROCESS macro for SPSS (Hayes, 2012). PROCESS is a tool for path analysis that estimates direct and indirect effects and constructs bootstrap confidence intervals for these effects (see also Preacher & Hayes, 2004). PROCESS allows for multiple mediators and makes no assumptions about the normality of data, which is important

given the non-normal distribution of most of our data.

In the model we tested we controlled for academic experience and the length of the presentation. Table 5.2 shows the results of the analyses. In the first step, speaking anxiety, length of presentation and academic experience all predict time spent on preparing (be it only marginally significant for length of the presentation). The time spent on preparing is higher for longer presentations, for experienced academics, and for high speaking anxiety. Together, these variables account for 24% of the variance in the time spent on preparing. Time spent on rehearsing is predicted only by speaking anxiety: high speaking anxiety is positively related to more time for rehearsal. The model explains 16% of the variance in the time on rehearsing.

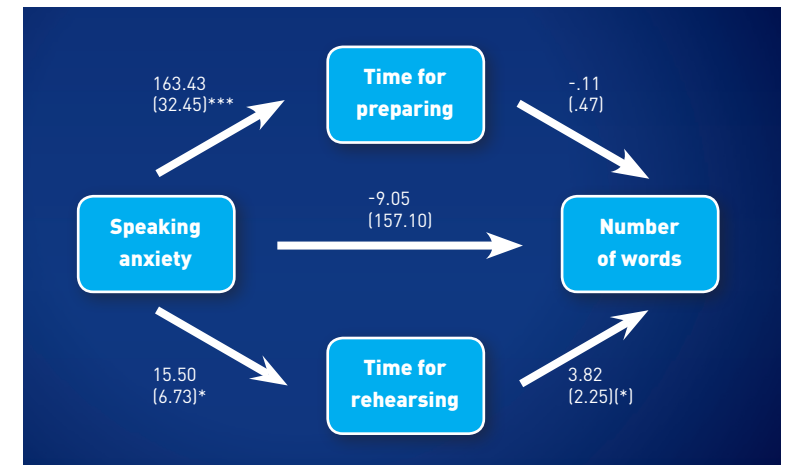
Table 5.2 Analysis of direct and indirect effects (unstandardized regression coefficients and standard errors).

	TIME FOR PREPARING	TIME FOR REHEARSAL	NUMBER OF WORDS
Constant	-236.23 [115.48]*	11.53 [23.95]	855.96 [502.12](*)
Academic experience	25.40 [12.69]*	-3.39 [2.63]	-86.18 [55.78]
Length of presentation	2.42 [1.37](*)	.42 [0.28]	20.70 [5.92]***
Speaking anxiety	163.43 [32.45]***	15.50 [6.73]*	-9.05 [157.10]
Time for preparing			-.11 [.47]
Time for rehearsal			3.82 [2.25](*)
R ²	.24	.16	.22
F	8.98***	5.27**	4.59***
df	3,86	3,86	5,84
Indirect effect (time for practice)	40.78 [82.83]	95% CI: -199.40 –126.03	
Indirect effect (time for rehearsal)	59.14 [42.04]	95% CI: 3.59 –193.05	

Note: (*) $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

The results show that the model explains 22% of the number of words in the PowerPoint presentations. The main predictor is the length of the presentation: lengthy presentations lead to more words in the PowerPoint slides. Only the time spent on rehearsing is positively (be it marginally, $p < .10$) significantly related to the number of words used on the slides. Speaking anxiety is not directly related to the number of words used on the PowerPoint slides, but the results show that there is an indirect relation between speaking anxiety and the number of words through time spent on rehearsal. The higher the speaking anxiety, the more time is spent on rehearsing and the more time is spent on rehearsing, the more words are used on the slides (see Figure 5.1 for a graphical representation of the relations between the main variables).

Figure 5.1 Direct and indirect effects of speaking anxiety on number of words. Controlled for academic experience and length of presentation.



Note: (*) $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

5. 6. Discussion

We have seen that although PowerPoint is a very popular presentation tool, there is much criticism concerning the excessive use of words on the slides. Instruction books advocate limiting the number of words and, more importantly, research by Mayer (2009) has shown that the use of words on a slide might hinder the information processing by the audience, whereas pictures combined with spoken words improve this information processing.

Our study amongst social scientists shows that presenters do indeed use more words per slide than is typically advised in instruction books. We found a mean of 55 words per slide. Compared to the different proposed maximum numbers in instruction books, this average exceeds the highest proposed maximum number of 36 by 50%.

The goal of this study was to establish the relation between speaking anxiety and the number of words on PowerPoint slides. The results show that presenters with fewer years of academic experience suffered more from speaking anxiety than those with more experience. We expected, in line with the findings of Ayres (1996), that speaking anxiety would cause presenters to spend more time on preparing the presentation than speakers with low speaking anxiety. Speaking anxiety in our study indeed proved to be a reliable predictor of the time presenters spent on preparation. We also found that presenters with higher speaking anxiety spend more time rehearsing and that more experienced presenters spent less time on rehearsing. This did not conform with our expectations, or agree with the findings of Ayres (1996), who found that presenters with more speaking anxiety spend

proportionally less time on rehearsing text. Perhaps the difference in the subjects of both studies can explain this difference. The students in Ayres' study might have given in to their speaker anxiety by avoiding communication-oriented preparation activities, as Ayres supposes, while the scholars in our study might have a more 'professional' attitude and rehearsed regardless of their speaker anxiety.

We found no relation between the time spent on preparing and the number of words. This might be explained by the fact that it takes relatively little time to type words on the slides, compared to other activities during preparation (e.g. thinking about the structure or preparing a graph). We did find that the more time presenters spend on rehearsing the presentation, the more words they used on the slides. We also found an indirect relation between speaker-anxiety and the number of words through the length of time spent on rehearsal, and a positive relation between years of academic experience and the number of words. More experienced presenters have less speaker anxiety and use fewer words on their slides. This is consistent with the findings of Hertz, Kerkhof and Van Woerkum (2015). We assume that anxious presenters use the PowerPoint slides as speaking notes while rehearsing, using the words as prompts, and that they keep the words on their slides as a speaking note during their presentation.

5. 6. 1. Limitations and further research

A limitation of our study was that we tested our predictions among a sample of social scientists. Is our group representative of all scientists? Although it was found that the hard and medical sciences as a group tend to use more pictures and fewer words than social scientists

(Hertz, 2011), there is no indication that they differ with regard to issues of speaking anxiety. To verify this, future studies should add other academic disciplines in order to test for possible deviations from the finding in our paper.

In this findings we only focused on the time spend on preparing and rehearsing. We didn't study the specific activities presenters undertake while preparing and rehearsing their presentation. Furthermore, we don't know if presenters themselves have the intention of using PowerPoint slides as speaking notes, or if they do it unconsciously. We suggest to further study the activities of presenters and interview them about their motives for using PowerPoint in general and the use of words in particular.

Another interesting line of inquiry would be the possible use of pictures on slides to help presenters memorize their presentation and thereby help them to overcome speaking anxiety. In ancient Greece, speakers used to picture important subjects of their speech along a familiar route in order to remember them in the right order (This specific imagery mnemonics technique is called the method of loci). Using pictures instead of text on the slides would improve the information processing of the audience.

5. 7. Conclusion

The problem we addressed in our study is the fact that many presenters seem to use PowerPoint slides with too many words. It appears that this is also the case for scholars presenting at conferences. Based on our findings we would like to suggest some possible solutions to help improve these presentations. First, the findings of Mayer (2009),

which suggest using PowerPoint slides to project pictures instead of words (see also Atkinson, 2007), deserve a more prominent place in instruction books and should be explained in presentation trainings, not only for students, but also for professionals. The practice of using words on the slides might be difficult to change however if presenters believe that the words help them to reduce their speaker anxiety. This will be especially true for presenters with fewer years of academic experience. The challenge will be to help presenters overcome their speaker anxiety by means other than the use of words on their slides. This subject should be addressed in presentation training. Finally, although rehearsing in general improves a presentation and is to be advised, presenters should remove most of the words from the slides afterwards in order to enhance the quality of their presentation.

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6

Conclusion and discussion: PowerPoint, the double-edged sword

6. 1. Introduction

Since the 1990s scholars have used the presentation software program PowerPoint to present their research at conferences. PowerPoint was originally developed for business purposes, but was soon adopted by presenters from the hard sciences (physics, mathematics, and chemistry) and later by presenters from the arts and social sciences (DenBeste, 2003). Most scholars present conference papers at conferences several times each year; they find this is important for their work (Hertz, 2011). In contrast with writing a paper to be published in a journal, presenting conference papers allows scholars to interact with peers who can evaluate their work by asking critical questions.

Both audience and presenter can benefit from the use of PowerPoint. The presenter can more easily produce attractive slides with PowerPoint, compared to its predecessors, the overhead slide and the 35 mm slide. With PowerPoint, presenters can use different fonts and colored backgrounds, animations and sound effects which before PowerPoint could only be produced by professionals and projected using high-tech equipment. The audience appears to enjoy pictures and animated slides (Apperson, Laws & Scepansky, 2008). Even for people who are not present at the conference, the use of PowerPoint might have benefits: the slides can be and often are posted on a website and viewed afterwards.

But despite these positive attributes of the software, many articles on PowerPoint have been published containing criticism amongst others on slide design (mainly the excessive use of text) or on the behavior of the presenter (mainly looking too often at the projection). Is this criticism justified? Most of these critical articles were based on personal experience; there is limited empirical research into presentations using PowerPoint. Our research intends make a contribution in filling this gap.

6. 2. Research focus

There are different ways to study PowerPoint and its use, and they address elements of the question (after Lasswell 1948): Who is using it, how and why, in which setting, for what purposes, and with what effect? Regarding the 'Who', we can say that almost all presenters use PowerPoint (Thielsch & Perabo, 2012). It has been used as visual support for scientific presentations for many years; one can't image a scientific conference without PowerPoint presentations (Lobin, 2009).

While there is no question about who is using PowerPoint and while there is research on the effects of its use in the classroom on student appreciation and grades, the 'how and why' of this use is yet to be studied. This thesis focuses on the behavior of the 'sender' of the communication. How is the program used and why do presenters use it that way? The studies were conducted in real-life settings, studying the behavior of scholars presenting at conferences. Our methodology, therefore, is different from most studies and publications in a number of ways.

First, we did not rely on personal experiences, but conducted empirical studies on the use of PowerPoint. Second, we focused on the conference setting, a real life setting which differs from the classroom setting, in which most of the other research was done. Third, where most studies are restricted to just one element of PowerPoint use; (the design of the slides, or the effects on student grades, for example), we used the perspective of a 'performance' (Schnettler, Knoblauch, & Pösch, 2007). This perspective includes the behavior of the presenter, the text and pictures on the slides, the information processing of the audience and the interactions between these elements. We focused on the speech and the non-verbal behavior of the presenter and observed this behavior in relation to the design of the slides (Bucher & Niemann, 2012; Zhao, Djonov & van Leeuwen, 2014). We related our findings to the guidelines from instruction books on presenting, and to the empirical findings of Mayer (2009) who studied the use of texts and pictures on information processing. Fourth, we introduced a psychological perspective to find underlying motives for PowerPoint use and slide design, and looked at the possible role of speaking anxiety in relation to the use of words on slides. By taking all related presentation aspects into account, our findings can contribute to the discussion on the influence of PowerPoint on presentations. In addition, possibilities for improvement can be identified.

The dissertation focused on the following questions:

- How do scholars use PowerPoint?
- Why do scholars use PowerPoint in the way that they do?
- Does speaking anxiety influence the way that scholars use PowerPoint?
- Does PowerPoint influence the quality of presentations?

The findings are presented in chapters two to five of this dissertation. The main findings are presented here.

6. 3. Main findings

6. 3. 1. How do scholars present with PowerPoint?

Critics are correct, when they complain about the amount of text on the slides. First, the scholars in our study used a relatively high number of words when compared to what instruction books advise. An average numbers of 35 (language scientists) and 50 words (social scientists) per slide was found, while instruction books advise a maximum of 20 to 36 words per slide, depending on the author.

Second, many of the scholars used a small number of pictures. An average number of .33 (language scientists) and .05 pictures (social scientists) per slide was found. In addition, both outcomes are not in agreement with the guidelines of Mayer's Cognitive Multimedia Theory (2009), which advocates combining the spoken words with pictures on slides and limiting the use of words on a slide because it impairs the processing of information.

Presenters need to steer the audience attention towards (different elements on) the projected slides when this is needed (Bucher, Krieg & Niemann, 2010). This was mainly done, not by verbally introducing elements on the slide, but by looking at the projection. Presenters look on average 73 times at the projection during their presentation (more than three times a minute). Looking at the projection to indicate a new slide or new elements on a slide, while turning away from the audience and breaking eye contact, seems to be typical for PowerPoint users.

However, eye contact is considered important (Lucas, 2004) and breaking this link with the audience is considered a poor way of presenting. (Shwom & Keller, 2003; Hanft, 2003; Cornelis & Tielens, 2004).

6. 3. 2. Why do presenters use PowerPoint in this way?

It is interesting that presenters use many words on their slides and turn towards the projection, while we found that they themselves say that this is one of the disadvantages of the use of PowerPoint. Using our studies, we will discuss possible reasons for this phenomenon.

One reason why presenters use many words on their slides and turn towards the projection, might be, as some authors have suggested, that presenters use PowerPoint as a speaking note (Cornelis & Tielens, 2004; Farkas, 2005). So as not to forget the content and structure of their presentation, they put the text on the slides. We have found that some presenters indeed say that they use text on the slides as a support for their memory, while they also say that they use pictures for the benefit of the audience (e.g. for entertainment and explanation).

We assumed that presenters who suffer from speaking anxiety use the words on the slides for support during their talk. We found that less experienced presenters suffer more from speaking anxiety and that they indeed use more words and fewer pictures on their slides than advanced presenters. Furthermore, we found an indirect relation between speaking anxiety and the number of words on slides. The more presenters suffer from speaking anxiety, the more time they spend on rehearsing, and the more time they spend on rehearsing, the more words they use on the slides. Thus, speaking anxiety plays a role in the number of words used on the slides, be it in an indirect way.

Another reason for less than successful presentations might be that presenters lack knowledge about how to use PowerPoint in an appropriate manner. Some basic operational knowledge about the working of the program is needed, but making a PowerPoint presentation with slides is relatively easy. The program is part of Microsoft Windows Office and works in ways similar to other Windows programs. We have seen that presenters in our study did not receive any training in using PowerPoint. They learned instead to present with the program by experimenting and by observing colleagues.

Designing slides is not the same as being able to fill blank slides with words and pictures though. Kosslyn, Kievit, Russell and Shephard (2012) showed that “the psychological foundations for effective slide-show presentation design are neither obvious nor necessarily intuitive” and that designing slides based on “common sense,” which the presenters in our study seemed to do, can lead to outcomes inconsistent with the guidelines for slide design. Presenters should be educated in appropriate slide design. Furthermore, users of PowerPoint should know how the use of text and pictures on the slides interacts with speech and how this use influences the information processing of the audience. More multimedia knowledge is called for (Hentz, 2006).

6. 3. 3. Does PowerPoint influence presentations in a detrimental way?

It has been said that PowerPoint influences presentations in a detrimental way (Tufte, 2006). We would like to offer a more complete observation. PowerPoint in itself does not influence presentations in a positive or negative way, no more than a word processor influences

a novel. It is the way the program is used that influences the quality of the presentation.

PowerPoint invites presenters, by its default setting, to use slides with a title and bullet-points with text. Presenters should change this setting, in order to design slides according to the guidelines which advise the use of pictures instead of lots of text. PowerPoint has many other options, such as the use of animation. Presenters need not use these effects however. They were designed for “highly theatrical occasions with large audiences where entertainment was the main goal” (Gaskins, 2012, p. 18) and not for scientific presentations.

Presenters should think about the purpose of their presentation and design their slides accordingly. This demands knowledge of multimedia and conscious decisions while preparing and presenting. Furthermore, presenters mistakenly think that they can use PowerPoint not only for the benefit of the audience, but for their own benefit as well. They think they can use the slides as speaking-notes, or that PowerPoint can replace presentation skills.

Our research shows that the opposite is true. PowerPoint introduces an extra variable, in addition to audience and presenter, and the use of this variable requires additional presentation skills. Looking at PowerPoint presentations as a “performance,” it is clear that the role of the presenter is to create cohesion among speaking, pictures and text on slides.

6. 4. Discussion

This research has brought three important characteristics of PowerPoint use to light. First, by focusing on the motives and behavior

of the presenter, reasons for the less than optimal use of PowerPoint were found. Second, it became clear that presentations are complex interactions among presenter behavior, types of slides, and reactions of the audience and that presenters who use PowerPoint have difficult tasks to perform. Third, although creating PowerPoint slides is relatively simple, presenters usually require training in how to use them in an appropriate manner. Speaking anxiety should be taken into account during this training. These topics are discussed below as well as the limitations of the research, suggestions for future investigation and new developments.

6. 4. 1. Motives and behavior of the presenter

Criticism of presentations with PowerPoint has mainly focused on what has been generally believed to be the negative characteristics of the program. But in order to understand why PowerPoint is often used in a non-optimal manner, one should not look only at the program, but at the motives and behavior of the presenters. By focusing on the presenter, we found important reasons why PowerPoint presentations often are not consistent with guidelines from instruction books or with research findings on human information processing. Apart from lacking knowledge of multi-media, presenters often suffer from speaking anxiety. They design slides with many words and use this text as speaking notes during their presentation. But besides letting them keep to the structure of the talk and ensuring that they are not at a loss for words, this behavior also has two important negative consequences.

First, the use of so much text on the slides interferes with the information processing by the audience. The use of pictures instead of text

in combination with fewer spoken words by the presenter would result in better information processing by the audience than would the combination of text on the slide and more spoken words. Second, because of their speaking notes, presenters turn and look at the projection to read the words, thereby breaking eye contact with the audience. This has the effect of lowering the quality of the presentation. Since the design of the slides is clearly the choice of the presenters, critics of PowerPoint should not hold the program itself responsible for a poor outcome.

6. 4. 2. Complex interaction

By looking at a presentation as an interaction between the presenter, slides and audience, it is clear that presenting has become more complex since the introduction of PowerPoint. While it is easy to prepare a presentation using PowerPoint slides, there are many more choices to make for presenters, not only in the use of text and pictures but also in choosing dynamic or static slides. During their presentation, they have at least two centers of attention -- establishing and maintaining contact with the audience and displaying the slides. Most presenters also need to look at the projection or at the computer screen. At the same time, presenters must orchestrate the attention of the audience towards different elements on the slide or on their narrative.

Presenters have to know how the audience processes speech, and how members process the combination of speech and information on the slides. Audiences will react differently to a static text slide than to a dynamic text-picture slide. In addition, presenters must be aware how their body movements can influence this process. They should be able

to support information processing by steering the attention of the audience through appropriate presentation behavior, and this needs to vary for different kind of slides. In the case of a static text slide where the information is presented at one time, the information is similarly read by the audience at one time; it might in fact be useful in such instances to stop speaking until the audience is finished reading what is on the slide. With the dynamic text-slide in which the information is presented gradually, the attention of the audience needs to shift between the presenter and the new elements on the slide. This new element of “orchestrating the performance” requires not only new knowledge on how text and pictures on slides interact with speech and how this use influences the information processing of the audience, but also new presentation skills.

6. 4. 3. Need for training

We have seen that presenters do not receive sufficient training in using PowerPoint, so it is not surprising that many of them design their slides based only on common sense which often is not in line with guidelines and present in ways that are not always helpful for the information processing of the audience. Introducing slide design and appropriate presentation behavior in the education of presenters seems a logical step. We agree with Wagman and Newman (2011), who see the production of visual materials and the use of PowerPoint as a craft, requiring substantial learning and practice.

The “new” skills needed to steer and control the attention of the audience, and to combine speech with the projection of information should especially be taught and practiced. The role of speaking anxiety

--the reason why many presenters prefer lots of text on their slides must also be taken into account. Presentation skills should be taught in a setting in which presenters learn skills at the same time as they can overcome their speaking anxiety.

- 1 First, many presentation skills can be taught separately from presenting itself. Body posture and use of voice and tone, and how to make eye contact can be practiced in playful settings that are not as frightening as when giving a presentation. Once presenters feel they have improved on these skills, giving a presentation becomes less daunting. Practicing in a small group of supportive peers is also advisable. Unsuccessful role models instead of successful ones appear to be more helpful for apprehensive speakers (Beatty, 1988).
- 2 Second, one of the concerns of presenters which often causes speaking anxiety and the overuse of text on slides is that the structure of the presentation or specific topics or words might be forgotten during the presentation. For this reason it would be helpful to practice other ways of memorizing the presentation. Because the use of pictures on slides is preferable to using words alone, presenters might try to use these pictures as prompts for their memory. Another suggestion is to use the words on the slides only in the first rounds of rehearsing, but remove them later for the presentation itself. In addition, the presenter might use the old-fashioned method of speaking notes on paper, or use the technique of looking at notes on the computer screen which cannot be seen by the audience.
- 3 Third, it is important for presenters to acquire a greater sense of belief in their abilities to present; to heighten their self-efficacy (Bandura, 1986; de Grez et al., 2009) and thereby lower their speaking

anxiety (Gecas, 1989; Multon et al. 1991; Ornstein & Manning, 1985). Self-efficacy can be changed through learning, experience and feedback (Gist & Mitchell, 2001). The feedback should focus on achieved progress and personal capabilities, instead of shortfalls and personal deficiencies (Bandura, 1993).

4 Anxious presenters must overcome the tendency to place a negative interpretation on their physiological arousal by labeling it as fear or anxiety (Pörhölä, 2002). Showing them videos of their presentations can be helpful, because they erroneously infer that they look as anxious as they feel. Many physical feelings of anxiety are not evident so presenters might experience feelings of relief (see also Mansell & Clark (1999).

5 Finally, once presenters master important presentation skills and suffer less from speaking anxiety, practicing presentations with PowerPoint is useful. In presenting with PowerPoint the skill of “orchestrating the performance” is needed and should be practiced as well. Our study indicates that the education of presenters should not be limited to students, since some scholars working at a university could also improve their skills with PowerPoint.

6. 4. 4. Limitations and future research

A limitation of the research is that PowerPoint usage is studied in one setting only -- that of scientific presentations at conferences. Since the most important objective of these presentations is the sharing of information, our findings might be true for comparable situations, but not for all of them. Since PowerPoint is used in many settings, from business meetings to opera, it is important to study its use in different

circumstances as well. Since the objectives of the presenters in these settings might differ, the requirements of slide-design could be different, and so might the requirements of presenter behavior.

Another limitation of our study relates to our subjects. Although we have interviewed scholars of different disciplines from the arts, from science, medical science and social sciences, our observations of presenting behavior were limited to linguists. Presenters from different disciplines may well display different behavior. This applies even more strongly to those with other than scholarly professional backgrounds. We believe, however, that the results we found on ways of presenting are applicable to a larger group of presenters, since they are in line with the behavior described in the many articles on PowerPoint use that have thus far been published. Our suggestions to improve the teaching of PowerPoint might be applicable not only to scholars, but to a large group of presenters as well, since we advocate learning more about general communication principles and the need to practice general rhetorical skills before starting to use the program.

We have shown the importance of the role of the presenter in PowerPoint use. The effects of certain elements of PowerPoint presentations on the audience have not been studied. It would be interesting to study the influence of certain kinds of slides (for instance static versus dynamic, with pictures versus without) combined with certain kinds of presenter behavior (verbal versus nonverbal) on the appreciation, comprehension and recall of the audience. Slide design and presenter behavior must be studied in combination and not separately.

It is interesting that some of the subjects in this study said that without PowerPoint they would give more examples, adjust their voice,

their volume and articulation; they would, in general, employ more rhetorical skills. It may be that PowerPoint use influences presentation behavior in the ways that presenters consciously or unconsciously adjust their rhetorical behavior. An experimental set up could test whether presenters use their voice differently when presenting with- or without PowerPoint. A group of presenters could be randomly assigned either to present a certain subject with PowerPoint, or to present the same subject without the program. The use of voice could be scored by the audience for both conditions.

In this thesis the emphasis has been on the use of text. We have not studied the possible influence of different kinds of pictures. These could be categorized, for example, by function -- explanation, diversion, decoration, and proof -- or type -- photograph, cartoon, and graph. We suggest studying which kind of picture requires which kind of presenter behavior for optimal understanding and recall.

The last suggestion deals with the method of teaching presenters how to use PowerPoint. We believe that the education of presenters in PowerPoint can be improved and we have presented a three step method. We suggest testing this method in an experiment, in which one group of presenters is taught using this three step method, allowing them to use PowerPoint only in the last step, when rhetorical skills and slide design are already practiced, another group is taught how to present using PowerPoint right from the start, and a third group is not taught how to present. The subjects in each group could then be asked to present for an audience, after which the audience can be asked about their appreciation of the presentation and tested on comprehension and recall.

6. 5. New developments

This thesis discusses PowerPoint only as a support for live presentations. In recent years, however, PowerPoint use hasn't been limited to presentations. Slides can later be posted on the Internet or used for project documentation (Schoeneborn, 2013). These new applications will likely influence the use of words on the slides. When live explanation by a presenter is missing, the slides may need extra words in order to be understood by the reader. When the presenter is using the same deck of slides for the presentation as well as for the Internet, the presence of the extra words will probably negatively affect the quality of the presentation.

Other developments concern the arrival of alternative programs such as Prezi. Prezi uses an infinite canvas which enables presenters to move from one topic to another in a non-linear way, and to improvise the order of topics. Research by Casteleyn, Mottart and Valcke (2013) has shown that there are no relevant differences between the effects of a lecture with Prezi or with PowerPoint, but that students appreciated the presentation with Prezi more than the group receiving the PowerPoint lecture. The authors suggest that this might be just a novelty effect that could wear off. Another of their conclusions is that presentations are complex and that the use of PowerPoint or Prezi is only one contributing factor.

Recently, PowerPoint itself has undergone some changes. Microsoft launched its new presentation app "Sway" which might, in the future, replace PowerPoint. It allows the presenter to drag and drop photos and videos into the presentation, from social media for instance, and

can also be used, via an app, on a smart phone. Microsoft advertises the program with a feature it calls “change my mood” which lets the presenter choose a layout, background, and fonts. There is also a built-in design engine which can do this for you, formatting the various pieces of content and integrating them into a cohesive layout. The presenter can then “easily adjust the design to create a look and feel that reflects your unique style” (<https://sway.com>).

We can say that presenters probably always will be tempted to use all the new technical possibilities or applications of a program, whether or not they are appropriate for the setting. Like the “Auto-Content wizard,” the set of pre-written PowerPoint presentations, the new built-in designer of “Sway” might produce presentations in a style that is not tailored to a particular audience. Presenters might not think about the demands of the new technical possibilities on their presentation behavior or the effects they will have on the audience. This thesis has shown that in order to evaluate new technologies, a presentation should be seen as a performance, and one should study how presenters are using the technology. This should determine for which purposes they design their slides and how they interact with the slides during the presentation.

6. 6. Concluding remarks

It is clear that PowerPoint elicits presentation behavior that is not in line with guidelines from instruction books or research on information processing. PowerPoint doesn’t have a detrimental influence on presentations directly. The choices made by presenters in designing

slides, and their behavior during the presentations lead to presentations that are less than optimal. These choices and this behavior are, at least to some extent, influenced both by lack of knowledge on using the program and by speaking anxiety. The apparent user friendliness (the fact that presenters who lack any previous training are able to create PowerPoint slides), disguises the fact that presentations with the program are in fact complex interactions between slides, presenter behavior and audience which require new skills and knowledge. The program is a double-edged sword.

6. 7. References

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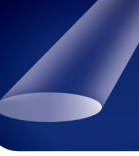
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