TECHNISCHE UNIVERSITÄT DRESDEN

Accessible Documents

How to create accessible PDF documents with PowerPoint

Dresden, 2020

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Download the brochure in PDF format at:
https://tu-dresden.de/agsbs/dokumente

Imprint

Publisher:	Technische Universität Dresden Faculty of Computer Science
Editors:	Christin Engel, David Gollasch, Emma Müller
Translator:	Caroline Meißner
Layout:	Sybill Friese, Emma Müller

SACHSEN

This measure is co-financed by tax funds on the basis of the budget approved by the Saxon State Parliament.

Dresden, 2020

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2 Introduction

Nowadays, universal and unrestricted access to documents has become commonplace. In particular, PDF documents can be created quickly and easily, they look the same everywhere and can be read by any device. Whether for the distribution of printed material or forms: PDF documents are used extensively everywhere to provide various contents.

Not everyone can benefit from this natural access. Especially people with disabilities are often confronted with inaccessible PDF documents. An example: without appropriate precautions, a blind person cannot read a scanned copy, even if it has been converted into PDF format.

With the Act on Equal Opportunities for People with Disabilities[1] and the BITV 2.0[2], respectively, public bodies are also legally obliged to make digital offerings accessible.

On the following pages we would like to give you instructions on how to make your documents accessible to more people. Furthermore, your work should become more effective and efficient in the long term.

The instructions focus on *PowerPoint 2016* on Windows, *PowerPoint 2019* on Windows and macOS. A guide for *PowerPoint 2013* and *2007* can be found in previous editions of this brochure[3]. Of course, you can use the concepts, support and tips presented here regardless of which version of *PowerPoint* you are using.

[1] Act on the Equality of People with Disabilities (German)

[2] Accessible Information Technology Regulation (as of 2019) (German)

[3] Instructions for the Accessible Design of Documents

3 Basic Principles

First, we will look at some basic aspects of accessibility. You can skip this section and go directly to the guide (page 19 ,onwards) if you are already familiar with the basics. The guide is deliberately kept clear and simple with examples and pictures.

3.1 Visual Barriers

Documents that cause problems for people with visual or other disabilities are quickly created without appropriate knowledge. However, in this guide we are talking primarily about blind people or people with visual impairments. The latter is not only the most common limitation when working with a computer, but also the one with the most varied characteristics. What both groups have in common is that purely visual information cannot be perceived or can only be partially perceived.

Sighted people distinguish headings from other text visually, blind people purely structurally by being informed that it is a heading. This is also the case with many other text elements, such as paragraphs, lists, references, tables and directories. Moreover, blind people explore a document sequentially, so the reading order must be logical.

People with a visual impairment can usually only perceive information visually to a limited extent. They often need support in the form of enlargement or increased contrast.

3.2 Introduction of PDF/UA

Digital documents can be distributed and spread easily, reliably and in original form with the *Portable Document Format* (PDF). Originally, the format was designed to preserve the print-like, visual impression rather than to preserve the meaning and structure of the underlying content. This creates barriers for readers, who are dependent on digital accessibility of the content.

The document's contents can be structured, completed or extended in the PDF by means of appropriate labelling. This enables readers who are not or not exclusively interested in visual expression to fully understand the content and use it independently.

This is done by inserting so-called tags into the document. These are standard elements - such as headings, lists or paragraphs - which provide an indication of the included content or its function. These tags can then be used by assistive technologies, e. g., screen readers, to output and prepare the document content.

In order to give unrestricted access to PDF documents to as many people as possible, the global standard ISO 14289-1, better known as PDF/UA, was developed in 2012. UA stands for *Universal Accessibility*.

The standard focuses on the technical aspects and does not contain any instructions for the practical application of the required measures and possibilities. The support of the standard is supposed to ensure that PDF - creating programs can create partly accessible or even accessible documents without requiring special knowledge of the users.

The following conditions for PDF/UA compliant documents are defined:

- Significant content must be separated from decorative elements (artifacts) and must be marked as such.
- The meaningful elements must be arranged in a structure tree and reflect the relationships to each other (e. g. groupings, etc.).
- This structure tree should reflect the logical reading order of the document.
- Information must not only be conveyed by purely visual characteristics. Therefore, pictures and graphics must also be provided with alternative textual descriptions.
- Navigation within the document must be made possible.

The PDF/A standard, which many applications support, has nothing to do with *Accessibility*, but stands for *PDF Archive* and is supposed to enable the long-term storage of documents. The so-called *Tagged PDF* can be seen as a previous version of PDF, which itself is not an ISO standard.

4 Structure of PowerPoint

The PowerPoint application window is divided into six areas: the ribbon, two sidebars (Navigation pane and Toolbar pane), the slide view, the notes area and the status bar. In macOS the menu bar is also relevant. The actual structure and naming of the areas in Windows can be seen in Figure 1. Figure 2 shows the structure in macOS. With the key F6 the focus can be changed between the areas.

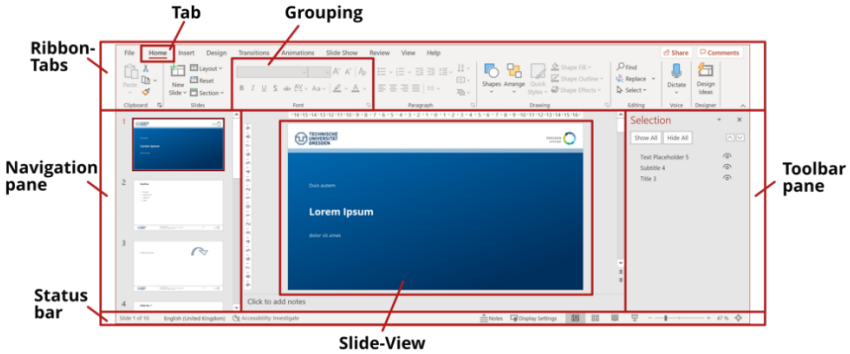

Figure 1 Structure of the PowerPoint application window on Windows.

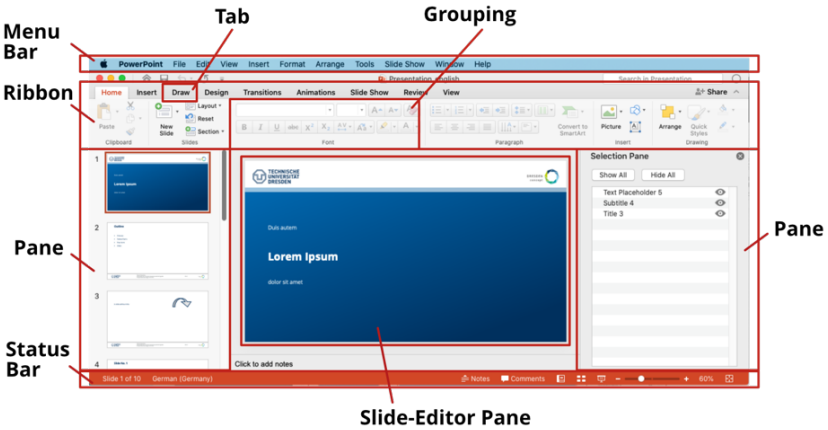

Figure 2 Structure of the PowerPoint application window on macOS

4.1 Ribbon and Menu Bar

The **ribbon** includes the tabs Home, Insert, Design, Transitions, Animation, Slide Show, Review, View and Help. In Windows, there is also a File tab, which can be found in the **menu bar** in macOS. Additional tabs also appear when tables, objects or images are selected. Depending on your settings and installed Add-ins, additional tabs may be available.

Below the horizontally listed tabs you will find the submenu of the active tab. In Figure 1 and Figure 2, the submenu of the active **Home** tab is shown. The menu items are arranged in **groups**.

4.2 Status Bar

The **status bar** displays information such as the current slide and the total number of slides in the document. The language can also be changed here.

4.3 Sidebars

The *PowerPoint* window has two side bars. The left sidebar, the **navigation pane**, is used to navigate between the slides. Depending on which operating system you use, the content of the right sidebar, which displays various tools, is called either **toolbar pane** (Windows) or simply **pane** (macOS). The term **toolbar** is used in these instructions. In contrast to the ribbon and the status bar, the side bars must be opened actively.

4.4 Context Menu

Some *PowerPoint* functions can be accessed via the **context menu** of a marked object. You can open it by **right-clicking** on a word, picture or table. Alternatively, you can select the corresponding object and open the context menu by pressing the Shift key ⇧ and F10 simultaneously.

4.5 Keyboard Control

In general, *PowerPoint* can also be operated with the keyboard only. Therefore, in some places in this guideline, possible key combinations are suggested to you as an alternative way of controlling *PowerPoint*. The key combinations in Windows differ from those in macOS.

Press the specified keys simultaneously. The symbol of the operating system (Windows: , macOS:) next to the key combination indicates to which operating system it belongs. However, these symbols primarily show that the described procedure belongs to the operating system

5 Structure of the Document

In the introduction it has become clear that when creating documents, content should not only be prepared in a purely visual way, but a semantic meaning should also be assigned to the individual elements. With *PowerPoint* you have to work with **slide layouts** to structure the presentation. These are predetermined layout patterns for the arrangement of elements on a slide. The actual content then only needs to be inserted into the placeholders provided. By using slide layouts, you make sure that the individual slides are uniformly designed, and you can also avoid leaving empty text fields etc. on a slide.

Texts that are inserted in the placeholder for the slide title are given a uniform appearance throughout the presentation. This means that when using the slide layouts, the titles on each slide look the same, are always in the same position and also have the appropriate meaning, which can be read by users of assistive technologies.

In order to use predefined structures, you should use and adapt the standard basic elements of the slides - i. e. title and content area. However, they should not be replaced by your own elements.

If you use slide layouts for all slides of your presentation, the basis for your accessible and consistently designed document is already given. To assign a specific layout to a slide, proceed as follows.

Tab **Home** ⟶ **Slides** ⟶ **Layout**

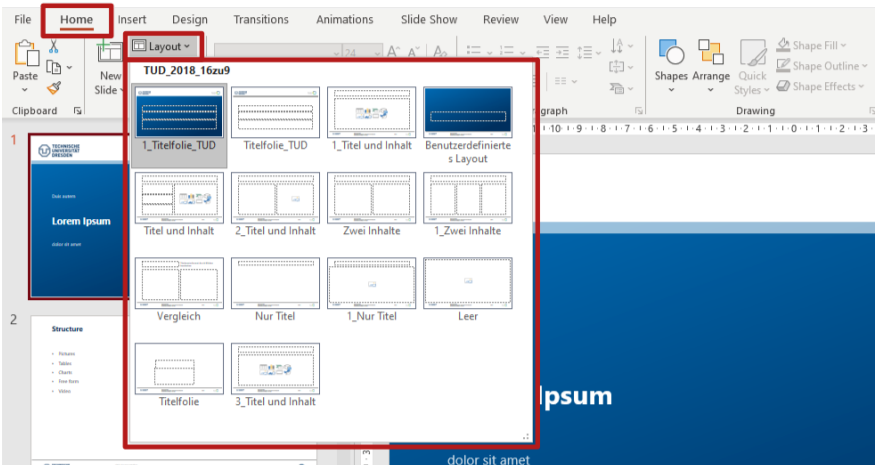

Figure 3 Change the Slide Layout via the ribbon

5.1 Customizing the Slide View

Every *PowerPoint* presentation has standard templates for slide layouts, which you can adapt individually to your visual requirements. For global changes to the slide layouts, which are automatically adopted by all slides with the same slide layout, you should use the slide master (Figure 4).

In the slide master view, the optical properties of the individual elements and the standard content to be displayed on all slides can be set. The settings of the upper slide master (top slide of the tree in the navigation bar) are inherited by the individual slide layouts (Figure 5). However, the formatting can also be overwritten in the slide layouts[4].

5.1.1 Footers

Recurring slide contents, such as the page number or the always same footer, should be designed in a way that assistive technologies do not read them out at the beginning of each slide. Footer elements can be inserted in PowerPoint in various ways: as text fields or as master layout placeholders.

Option 1: Insert footers as text fields in the slide master

If you insert a text field into the slide master, it will appear on every slide and cannot be edited in the normal view. These text fields are not read out again on each slide in the normal view. However, during the *Office* internal conversion into a PDF document, they are marked as paragraphs and thus read out at the beginning of each page of the PDF document, which is particularly annoying with complex footers. Therefore, this procedure is very well suited for the creation of an accessible PowerPoint presentation, but not for PDF export.

Option 2: Insert a footer as master layout placeholder

Alternatively, you can insert master layout placeholders, e. g. the page number, in the slide master (Figure 6). These can be changed in PowerPoint in the normal view and are read out again on each slide. When converting to a PDF document, however, these elements are marked as artifacts, as desired, and thus ignored by assistive technologies. If your presentation is only to be published as a PDF, we therefore recommend this procedure.

[4] For more information about a slide master, see:
Customize a Slide Master

Tab **View** ⟶ **Master Views** ⟶ **Slide Master**

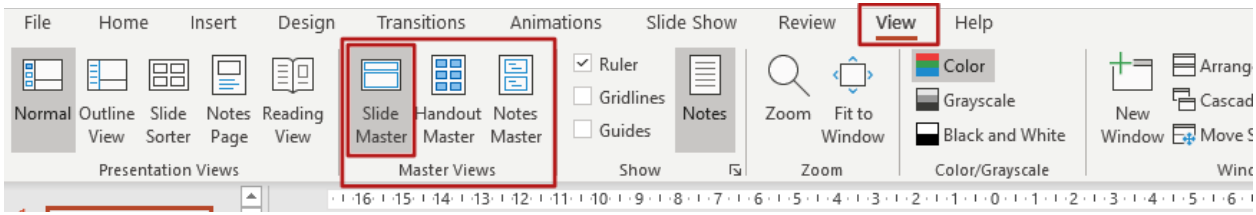

Figure 4 Open the Slide Master.

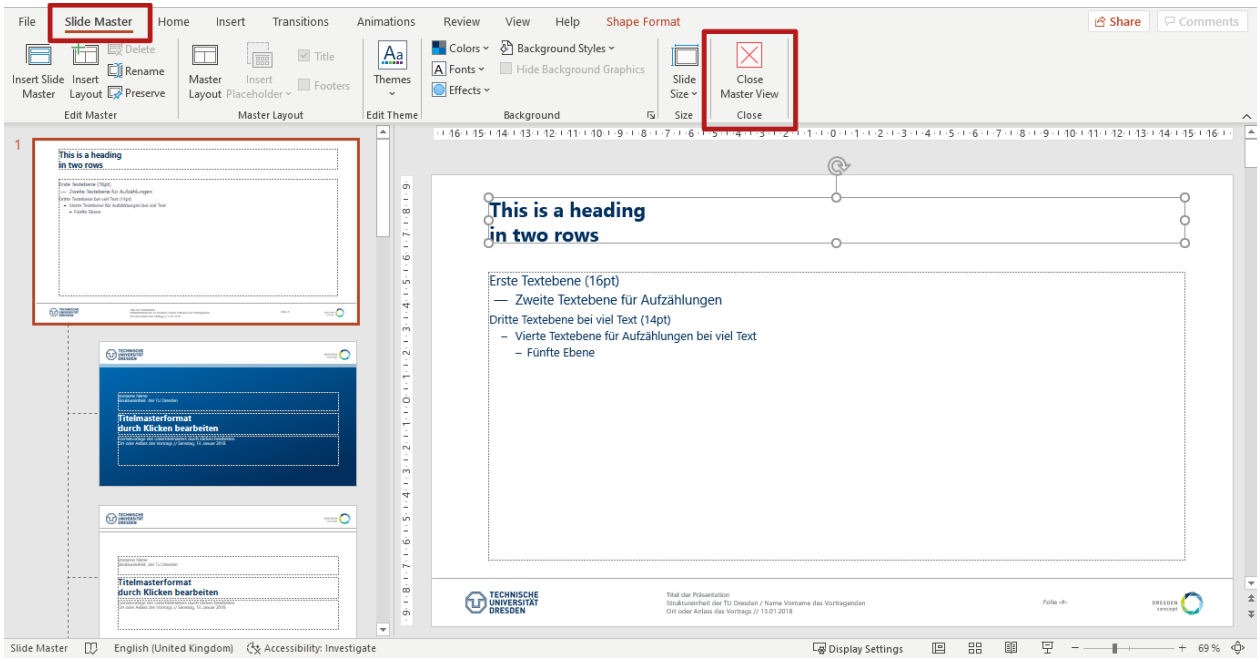

Figure 5 Slide Master View

Select top Slide Master ⟶ **Slide Master** Tab ⟶ Grouping **Master Layout** ⟶ **Master Layout** ⟶ Select Placeholders

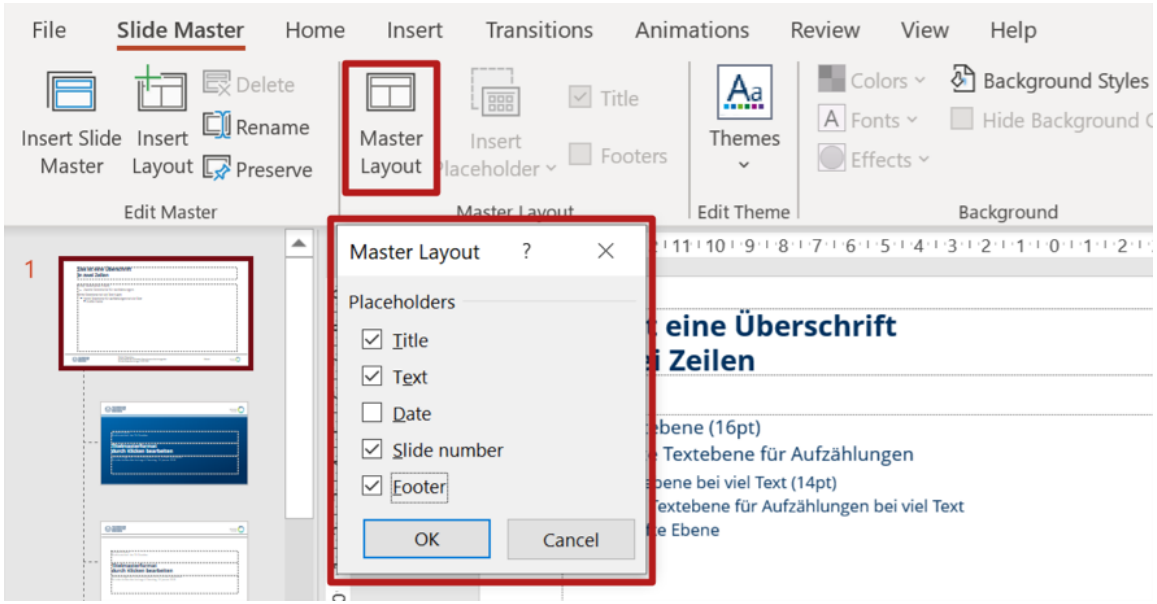

Figure 6 Insert Placeholders in Master Layout

Note: In the best case, all elements of the slide master, e. g. filled text fields, images and page numbers, are ignored by assistive technologies both in *PowerPoint* and in the *PDF* document. Therefore, you should use text fields (option 1) and use Adobe's *PDFMaker* to convert them into a PDF document. This will mark all elements of the top slide master as artifacts.

Attention: Do not include relevant information, e. g. contact details, in the footer only, as this information may be lost when converting to a PDF document. We recommend you to write such information additionally on an extra slide.

Close the slide master view to return to normal view (Figure 5).

Tab **Slide Master** ⟶ Grouping **Close** ⟶ **Close Master View**

Tab **View** ⟶ **Master Views** ⟶ **Slide Master**

5.2 Views

In addition to the **Slide Master**, *PowerPoint* also offers other views and tools to help you improve the accessibility of your presentation. Using the **View** Tab, you can switch between different views in the navigation bar. Apart from the **Normal** view, which is selected by default, the **Outline View** can also be helpful for you (Figure 7).

The normal view is provided for creating and editing your presentation, with the navigation bar showing all slides in thumbnail size (Figure 8).

If you switch to **Outline View**, instead of the slide thumbnails, the navigation bar shows the slide texts of your document in outline form.

Tab **View** ⟶ **Presentation Views** ⟶ **Normal**

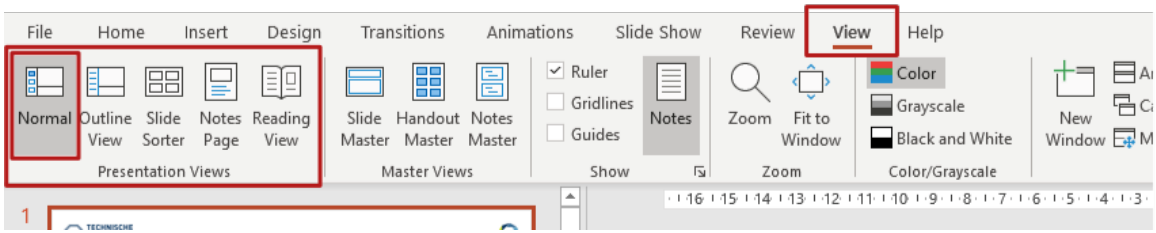

Figure 7 Activate Normal View

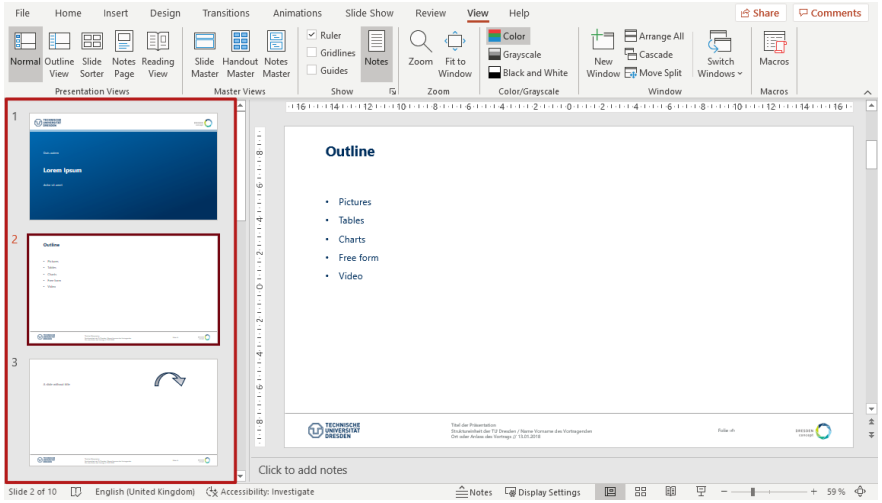

Figure 8 PowerPoint Slides in Normal View.

Tab View ⟶ Grouping **Presentation Views** ⟶ **Outline View**

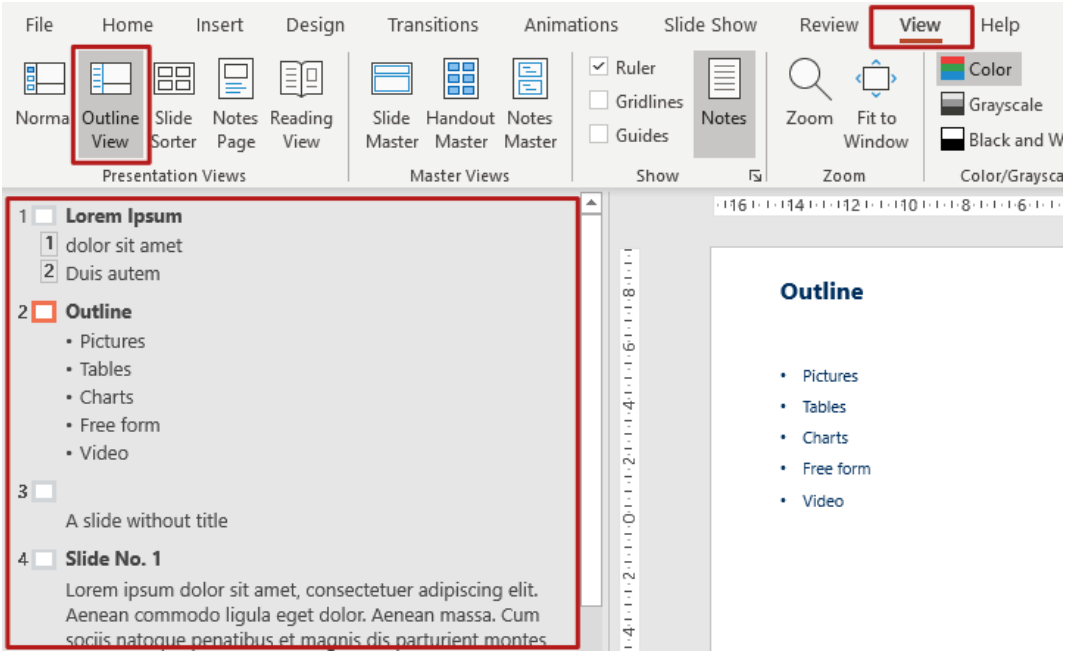

Figure 9 Outline View

Here you can check what is primarily relevant for your accessible presentation: the structural organisation of your slide contents. The slide title text is displayed in bold next to the slide number in the navigation bar.

In Figure 9, the presentation starts on the first slide with a slide title followed by a small section of text. On the second slide, the title is also shown first, followed by an outline list consisting of six elements.

Knowing about this structure helps blind people to recognise the context and meaning of the texts in the document – i. e. what sighted people can perceive purely visually, for example through the font size or highlights.

Note: In the navigation bar of the outline view, you can also make changes to the lists and formatting, which will be applied to the slide itself. Unfortunately, *PowerPoint* does not support accessible editing in the navigation bar of the outline view (as of October 2020).

6 Guideline

In this section you will find practical guidelines on how to turn your *PowerPoint* document into an accessible PDF. The guideline covers essential steps that you should follow when creating an accessible document: Set **Document Properties**, **Creating a Presentation**, add **Image Description**, **Creating a PDF-Document** and **review** it.

Following the guideline does not automatically guarantee a PDF document that is accessible in any case. This requires further specific checks, e. g. with *Adobe Acrobat DC*. Moreover, the quality of your documents is highly dependent on the conversion tool used – some tools respect the PDF/UA standard better than others. However, with this guide you will learn the necessary steps to prepare accessible documents in *PowerPoin*t and to create presentations as accessible as possible.

General Note: *PowerPoint* adjusts the display and positioning of individual menu items to the size of your monitor or the set window size. It is therefore possible that the functions described are located in other positions than those shown here or that you must first actively "open" an additional area before you can find the function.

Currently, no accessible PDF files can be exported with *PowerPoint* for macOS alone. This requires an add-in such as the *PDFMaker* from *Adobe*. Nevertheless, with these instructions you can create an almost accessible *PowerPoint* presentation.

If there are differences in the process between *PowerPoint* on Windows and *PowerPoint* on macOS, these are described separately. Otherwise, the described procedure applies to both operating systems. This is also indicated by the corresponding symbols: for Windows and for macOS.

This guideline addresses everyone who wants to create accessible PDF documents with *PowerPoint*. This also includes people with physical disabilities, which is why the alternative texts of the operating system symbols often show an alternative way of controlling the functions via the keyboard. For visually unrestricted readers, the alternative texts can be seen when the mouse pointer is placed over a graphic or symbol (tooltip).

6.1 Document Properties

The first step for an accessible document is to describe it more detailed with general characteristics. Add a document title to your presentation and check the document language.

6.1.1 Document Title

If your document has a title, it will later appear as the window title of your PDF document. People who use voice output will have the window title read out and therefore know which document it is. Setting the document title is different on Windows compared to macOS. Figure 10 and Figure 11 show you how to set the title in Windows, Figure 12 and Figure 13 show you the procedure in macOS.

Tab **File** ⟶ **Info** ⟶ **Properties** ⟶ **Title**

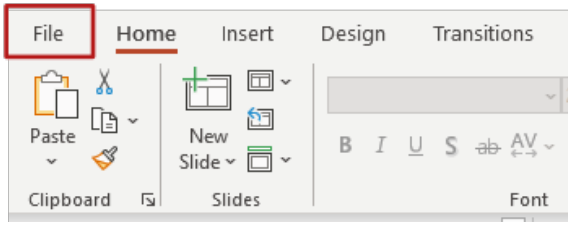

Figure 10 Position of the File tab on the ribbon in Windows

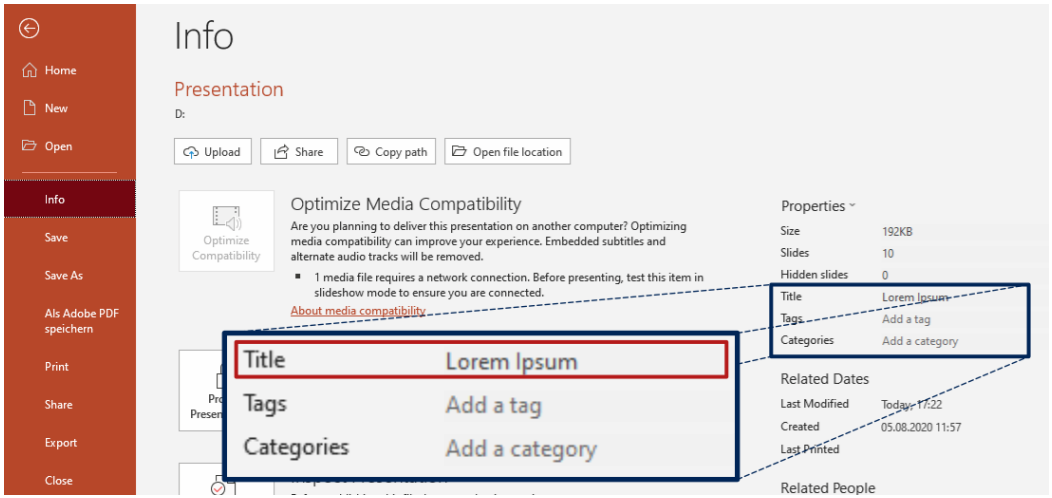

Figure 11 Set a title in the document properties in Windows

Menu bar **File** ⟶ **Properties**⟶ **Summary**

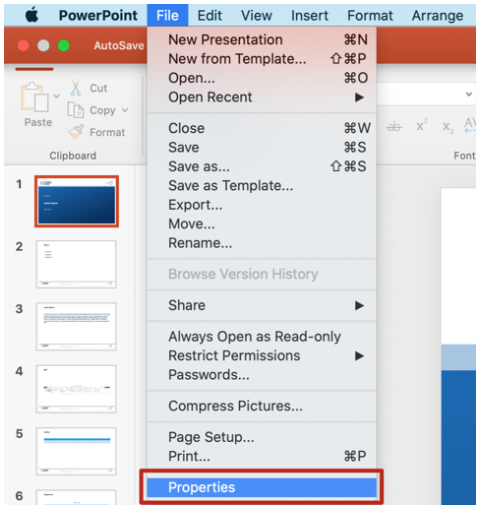

Figure 12 Position of the menu item Properties in the Menu Bar of PowerPoint in macOS

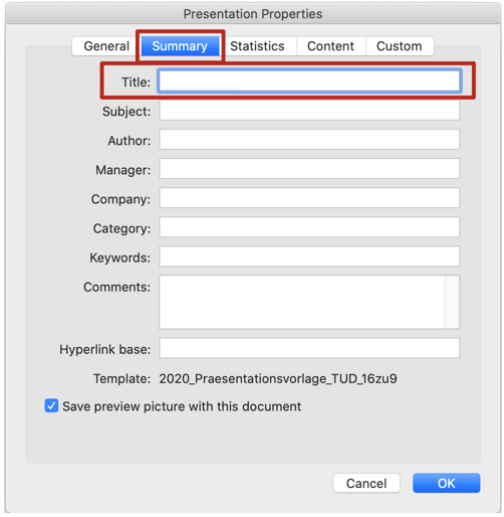

Figure 13 Set a Title in the Document Properties in macOS

6.1.2 Document Language

For each *PowerPoint* presentation, you can define a default language in which it is written. The specification of a document language is necessary not only for spell checking, but, in addition, also for the correct pronunciation of the slide contents of a voice output. In *PowerPoint* you can check and change the language of the document via the status bar (Figure 14).

If your document has sections or individual words that differ from the default language, you should adjust the language setting for these elements, otherwise they cannot be correctly reproduced by the speech output. This can be done by marking the desired text and following the instructions described above.

6.2 Creating a Presentation

After these preparations you can get down to the real work: creating the content.

6.2.1 Notes on Design

All visual characteristics of texts (font size, font colour, positioning and number of placeholders, etc.) should be organised with a slide master. Avoid using spaces and lines to position text.

Suppose you insert several blank lines between two lines of text in a text placeholder to make room for a graphic that is to appear between the two lines. For people who use speech output, each blank line inserted in this way is read out as "blank".

Avoid manual or automatic word division in your document. When converting your presentation into a PDF document, these are usually not converted correctly.

We recommend you to implement several columns using the slide layouts provided instead of inserting your own text fields in the slide. When inserting your own text fields, you must then check the reading order (see 1.1.1 on page 26).

Tab **Review** ⟶ Grouping **Language** ⟶ **Language** ⟶ **Set Proofing Language**

Alternatively: Status Bar⟶ **Language**

Figure 14 Language Setting in the Status Bar

Tab **Home** ⟶ Grouping **Slides** ⟶ **Layout** ⟶ **Two Content**

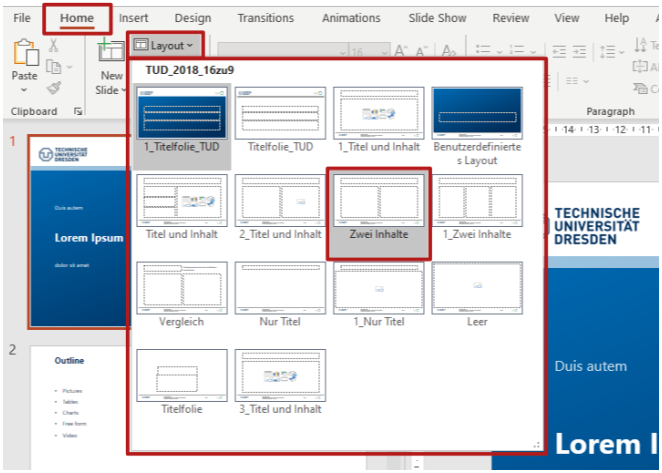

Figure 15 Two Content Layout

Design your slides by deliberately using different layouts defined in the slide master. The placeholders provided in the slides should be used correctly to ensure that the elements are correctly marked when converted to the PDF document:

- Slide Title
- Bulleted Lists
- Links and Cross References
- Tables
- Pictures, graphics and diagrams
- Groupings
- Videos

6.2.2 Slide Title

Slide titles are used to name the contents of a single slide briefly and concisely. You should make sure that all slides have a unique title, as the titles are used for navigation by people who use speech output. Furthermore, they form the basis for the outline view of the presentation. The slide title should therefore be different for each slide.

Create a slide title always using the **placeholder** provided instead of a simple text box (Figure 10). Proceed as described on page 13: Select the slide and assign the desired slide layout. You can then insert the title in the appropriate placeholder on the slide (Figure 16). This will ensure that your presentation has a complete table of contents and structure.

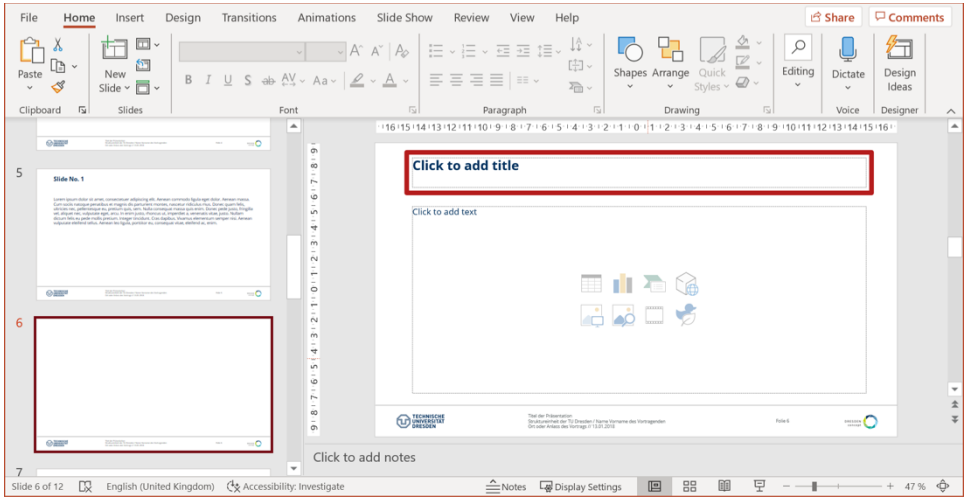

Figure 16 Insert the Slide Title in the corresponding placeholder

Tab **View** ⟶ Grouping **Presentation Views** ⟶ **Outline View**

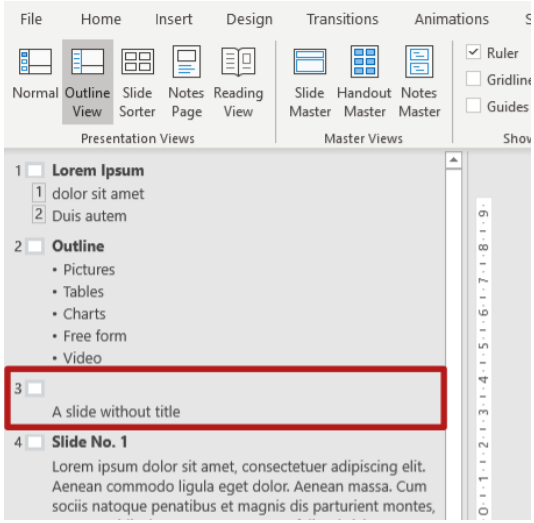

Figure 17 A Slide without title

In the **Outline View** you can check if you have applied the slide titles correctly (Figure 17).

In Figure 17, the titles for the first and second slide are applied correctly (in bold, to the right of the slide number). On the third slide, however, no text appears next to the slide icon (white rectangle), i. e. the placeholder for the title has not been filled with content.

6.2.3 Hiding Elements on Slides

In some cases, you may not want the slide title to be visible, e. g. if only one graphic is to be displayed on the slide. Then you should at least create an **invisible title**. Therefore, you can hide the title by using the toolbar **Selection** (Figure 18).

In the toolbar, select the eye icon to the right of the relevant content identifier to change its visibility.

Ctrl + ⇧ + S + ⊞ +

In this way, the title is displayed correctly in the outline view, but is no longer visible on the slide itself.

Attention: The hidden elements are also removed from the exported PDF document.

Tab **Home** ⟶ Grouping **Drawing**→ **Arrange** ⟶ **Selection** Pane... ⟶ Toolbar **Selection** Alt + F10 + ⊞ +

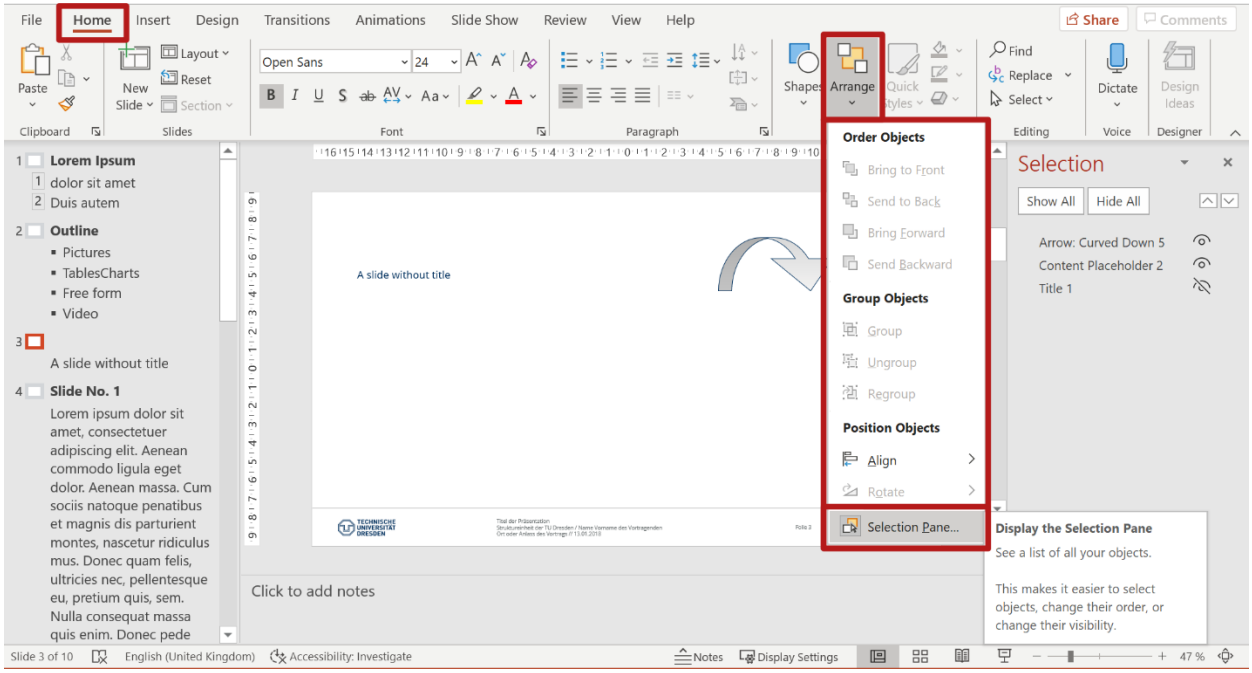

Figure 18 Open the Selection Pane

6.2.4 Setting the Reading Order of the Elements

Blind readers access the content of a document in a linearised way, i. e. one element after the other is read aloud by the speech output. If elements are arranged next to each other, the logical **reading order** of the slide is not obvious. Here the reading sequence must be specified. Especially with additionally inserted elements that have been added to the selected slide layout, the reading sequence is usually incorrect. *PowerPoint* does not determine the reading order of the elements by the position of the elements on the slide, but by the time they were inserted. For example, if you insert a text box into an existing slide layout, it will automatically be the last element in the reading order, regardless of whether it was placed at the top or bottom of the slide. Therefore, after you have specified all the contents of a slide, you should check the reading order.

Just like the showing and hiding of slide elements, the reading order can be checked and adjusted in the toolbar **Selection** (Figure 19).

Attention: The lower element in the selection area is read out first, the upper element last! In the example in Figure 19, the title would be read out first, followed by the content and image.

Tab **Home** ⟶ Grouping **Drawing**→ **Arrange** ⟶ **Selection Pane...** ⟶ Toolbar **Selection**

Toolbar **Selection** ⟶ **Selecting Element** ⟶ **drag to the desired position while holding down the left mouse button**

Moving up selection: Ctrl ⇧ F | ⌘ ⌥ ⇧ F

Moving down selection: Ctrl ⇧ B | ⌘ ⌥ ⇧ B

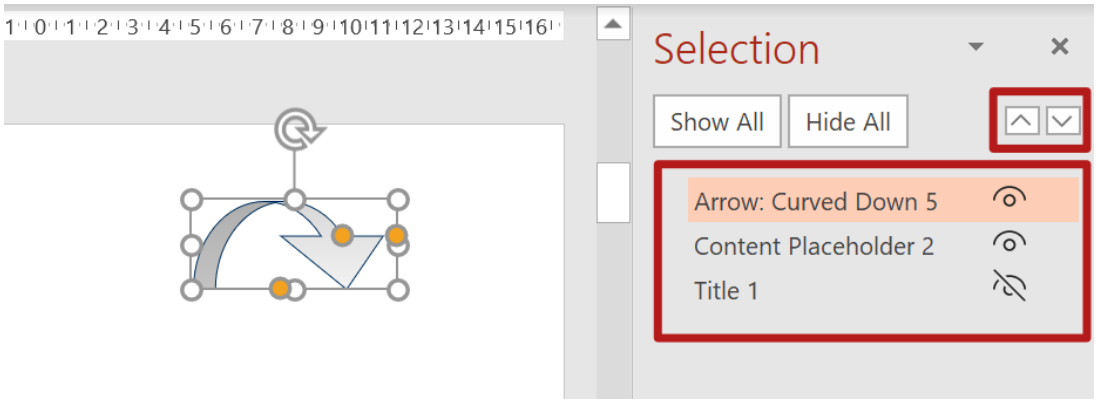

Figure 19 Toolbar Selection

6.2.5 Bullets

You should always insert your slide contents into the provided **placeholders** (Figure 20) of the selected slide layout. For lists you should use the Bullets tools of *PowerPoint* (Figure 21).

Although the type of bullets is not reproduced by speech output, it is of secondary importance for accessibility, as the various types of bullet are usually insignificant in terms of content and only serve decorative purposes. However, you should pay attention to the outline structure, i. e. you should sensibly structure your content with the help of the different **List Levels**. In this context, it is important that the indents characterising the list levels are not created by spaces but are increased and decreased by using the Tab key or the tools offered by *PowerPoint.* Therefore, place the mouse pointer in the respective bullet point and select the button **Increase List Level** for right indentation, or the button **Decrease List Level** for left indentation (Figure 22).

Thus, indentations are not only visually displayed, but also semantically marked accordingly. In this case, the PDF export usually also includes a correct conversion.

Tab **Home** ⟶ Grouping **Paragraph** ⟶ **Bullets**

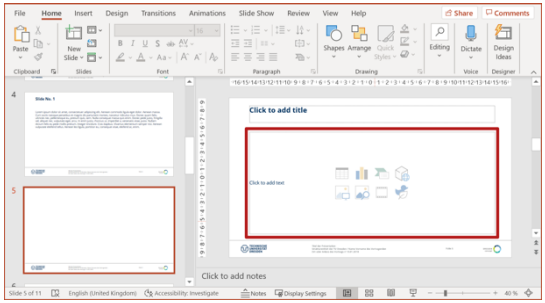

Figure 20 Content Placeholder

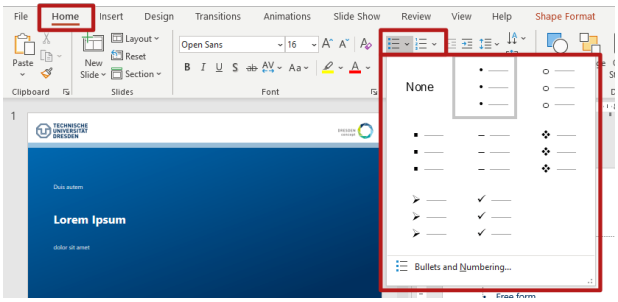

Figure 21 Bullets

Tab **Home** ⟶ Grouping **Paragraph** ⟶ **Increase List Level** or **Decrease List Level**
Tab **Home** ⟶ Grouping **Paragraph** ⟶ **Indent More** or **Indent Less**

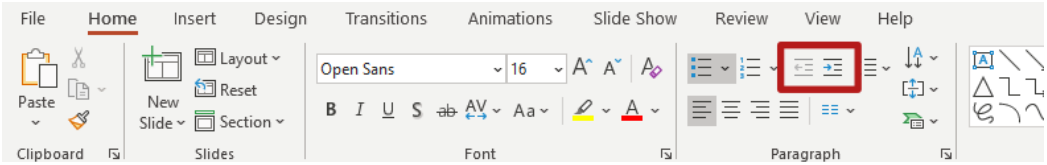

Figure 22 Increase/Decrease List Level

6.2.6 Links and Cross References

Links or cross references in the presentation should be active shortcuts. When your slides are played as a slide show, such elements can be activated with a mouse click and lead to the linking element (e. g. another slide, a web page).

With the *AutoFormat* function activated by default in PowerPoint, entered external links, e. g. www.tu-dresden.de, are automatically recognised as such and converted into active links. The address of the link corresponds to the displayed text. This can be adjusted in the context menu under **Edit link**. Alternatively, a link can also be inserted via the context menu. Therefore, place the mouse pointer at the desired insertion position of the link or mark the text to be linked and open the context menu. Via the entry **Link** or **Hyperlink,** you open the dialogue **Insert Link** as shown in Figure 23 and Figure 24. Set the alternative text of the hyperlink, e.g., the title of the website, via **ScreenTip...**.

The **Insert Link** dialogue window allows you to insert the following types of links:

- Link to files or websites
- References to new documents
- References to E-Mail-Addresses
- References to a slide/heading of the current document (requires a good document structure and the use of slide layouts)

Mark object ⟶ Open **Context Menu** ⟶ **Link**

Ctrl K ⌘ K

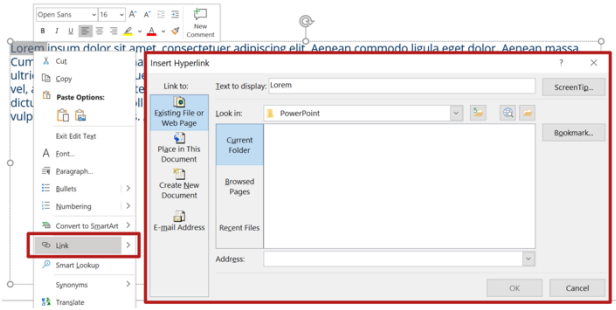

Figure 23 Dialogue "Insert Link" in PowerPoint on Windows

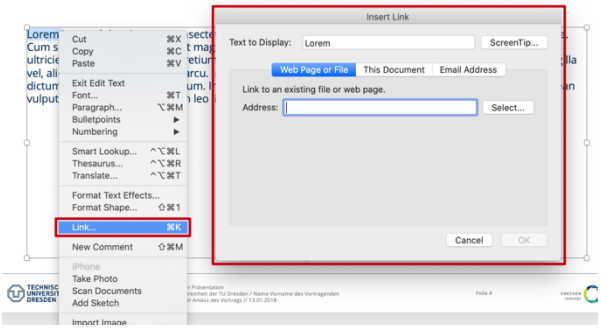

Figure 24 Dialogue window "Insert Link" on macOS

6.2.7 Tables

If a slide should contain tables, it is particularly important to ensure that these are logically structured.

When is a table logically structured?

Even blind people can read and understand tables. In the simplest case, they navigate from cell to cell using the keyboard and have the contents read out to them. Thereby they can recognise which cells are heading cells and thus understand the meaning of the individual information in the cells - provided that the table has the necessary structure and has not been brought into table form only visually. Figure 25 shows how a simple, logically structured table in PDF is presented to blind people.

The table is introduced with `<Table>`. Rows are marked with `<TR>`, columns with `<TD>` or with `<TH>` for headings.

Pseudo tables, which are simulated in PowerPoint using tabs and spaces, should be avoided at all costs. To create well-structured tables in PowerPoint, the **table tool** should always be used.

Step 1: Create a Table

There are several ways to insert tables:

1) Use the **Insert table** symbol in the **placeholder for the slide content** and set the desired number of columns and rows in the **Insert table** dialogue (Figure 26).
2) Insert the table via the **ribbon**. Therefore, select the content placeholder in the slide in which the table is to be inserted (Figure 27).

Using the second way, there are four ways to insert a table in PowerPoint:

- Insert Table via Matrix
- Insert table entering number of rows and columns and other options for the width of the table
- Draw Table
- Excel Spreadsheet

Avoid *Excel-Spreadsheets*. These are not supported by the export option presented here and require manual marking and revision afterwards.

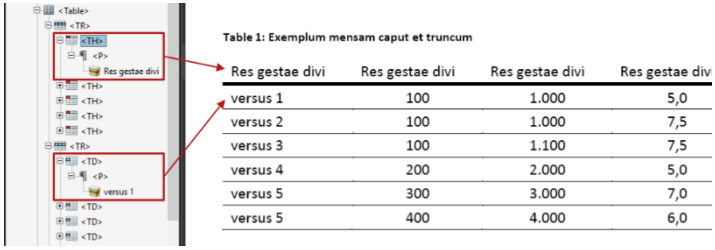

Figure 25 Logical Structure of a table in PDF in the Adobe-Acrobat Tag-Editor (left)

Step 2: Mark Headings

Regardless of which option you use to create the table, the second step is to mark the header row or the first column of the table as a heading. Proceed as follows:

When the **Header Row** option is enabled in the **Table Style Options** grouping of the **Table Design** tab (Figure 28), the header row is visually distinguished from the other cells. Since *PowerPoint 2019*, the table header has also been structurally marked during PDF export. The same applies if the option **First column** with the first table column is selected. With older versions of *PowerPoint,* the header cells are unfortunately not correctly marked during PDF export and must then be marked manually with a PDF editing program such as *Adobe Acrobat DC*.

Tab **Insert** ⟶ Grouping **Table** ⟶ **Table** ⟶ **select the desired number of columns and rows with the mouse pointer or the arrow keys**

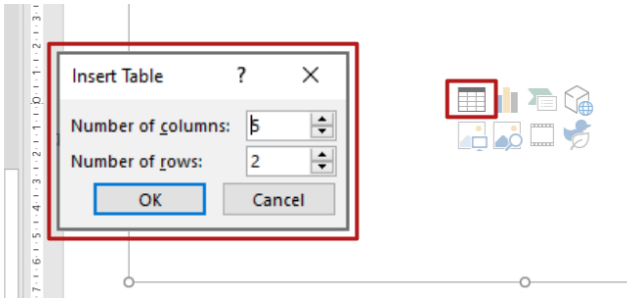

Figure 26 Insert a table via Placeholder for the Slide Content

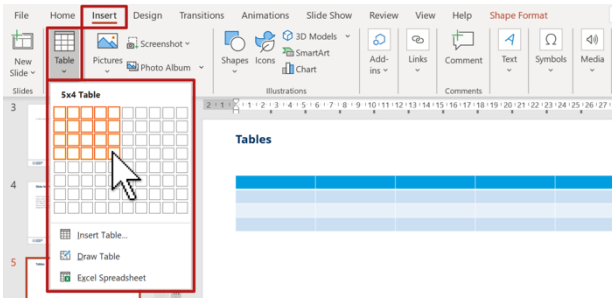

Figure 27 Insert a table via Matrix

Select table ⟶ Tab **Table Design** ⟶ Grouping **Table Style Options** ⟶ select **Header Row/First Column**

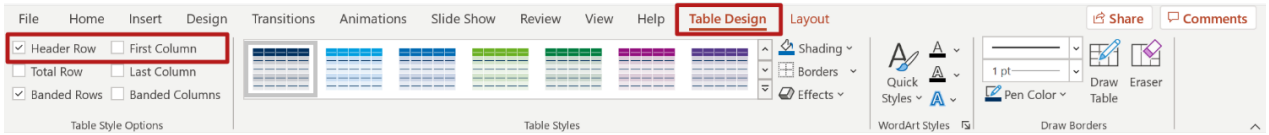

Figure 28 Table Design

Step 3: Summary

A summary is especially important for complex and large tables or tables where visual highlighting has been done. The summary should make explicit reference to the purpose and in particular to the highlighted features. It can also explain the structure of complex tables in summary form, which can increase understanding of the relationships presented, especially for people with speech output who cannot see the whole picture of the table. The summary can be set as an **alternative text** to the table (Figure 29).

Note: Complex, multidimensional, nested tables are difficult or impossible for blind people to read. If possible, complex tables should be divided into several simple tables to ensure legibility and accessibility. Alternatively, you should include a meaningful description of the table in the alternative text.

When choosing colours for the table, you should pay particular attention to the needs of people with visual impairment or colour vision problems. Therefore, you should make sure that there is sufficient contrast between the text and the background, and that the information is understandable without colour.

Select table ⟶ open **Context Menu** ⟶ **Edit Alt Text...** ⟶ Toolbar **Alt Text** ⟶ Input field for Alt Text

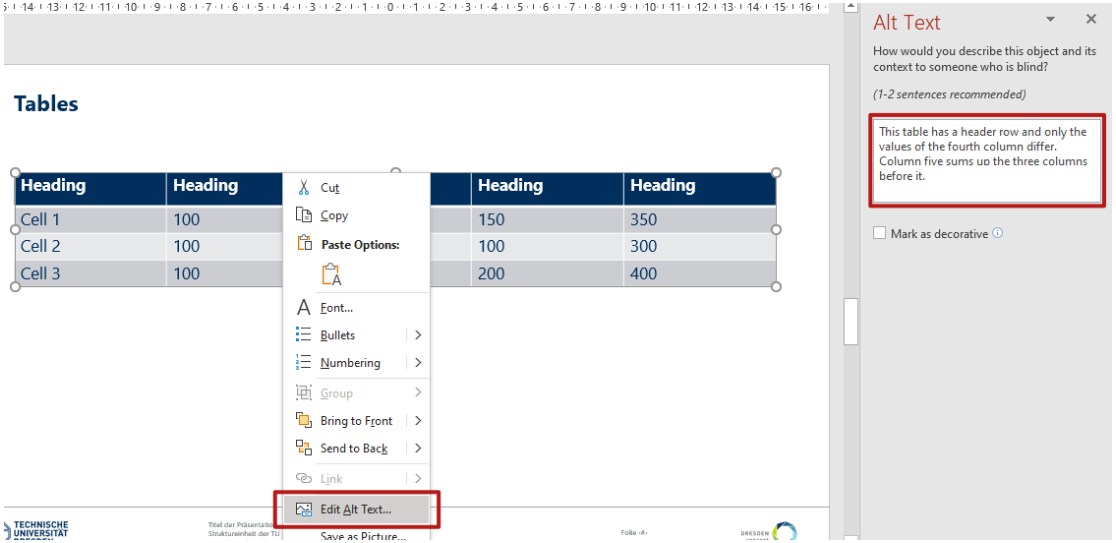

Figure 29 Add an Alt Text to a table

6.2.8 Images, Graphics and Charts

In this section we explain what you need to consider when working with pictures and graphics (illustrations) in order to integrate different types of graphics using the possibilities available in *PowerPoint*. At this point, please note that you must always give an alternative text to an illustration. The following section **Image Description** (page 36) deals with what you should bear in mind when working with alternative texts.

Charts

To insert a diagram into PowerPoint, you can either select the **diagram icon** in an empty content placeholder on the slide or you can insert the diagram using the **Insert** tab (Figure 30).

After selecting the desired chart type, a new window appears in which you can enter your data in a table. When the chart is selected, the two tabs **Chart Design** and **Format** are now available (Figure 31). Using the tab **Chart Design,** you can choose one of the predefined **Chart Styles** (Figure 32).

When choosing colours, you should also pay special attention to the needs of people with visual impairment or colour vision problems. This means that when making your choice, you should ensure that there is sufficient contrast between the data series and that the information is understandable even without colour.

To manually adjust the individual colours, you can select an element of the relevant data series and define the filling effect as shown in Figure 33.

You should also give your chart a meaningful title.

Note: As with a normal graphic, enter a meaningful alternative text for the chart. (page 42).

Tab **Insert** ⟶ Grouping **Illustrations** ⟶ **Chart**

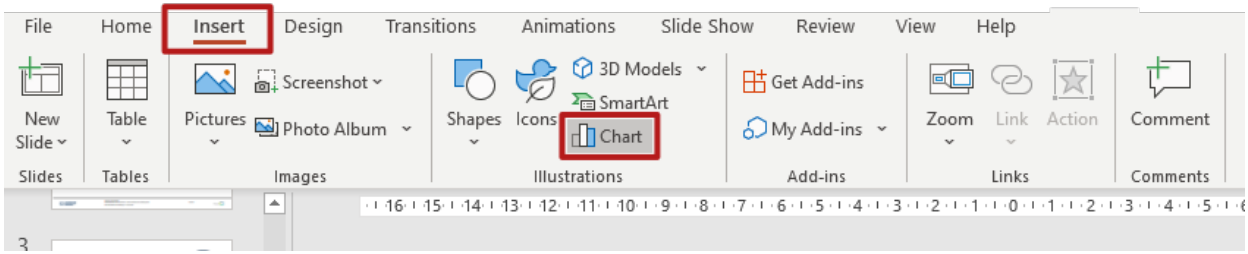

Figure 30 Insert a chart

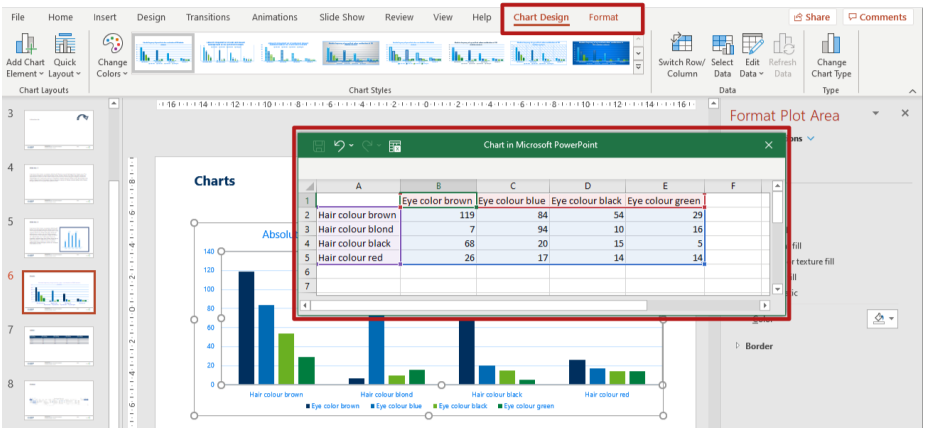

Figure 31 Chart Design and edit chart data

Tab **Chart Design** ⟶ Grouping **Chart Styles**

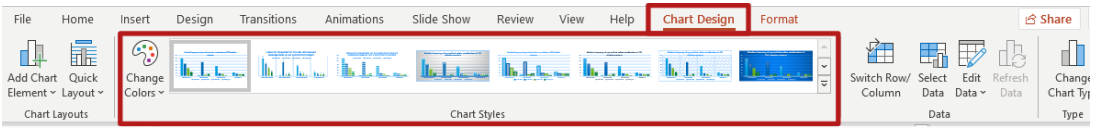

Figure 32 Tab Chart Design with Chart Styles

Select Element → Tab **Home** ⟶ Grouping **Drawing** ⟶ **Shape Fill**

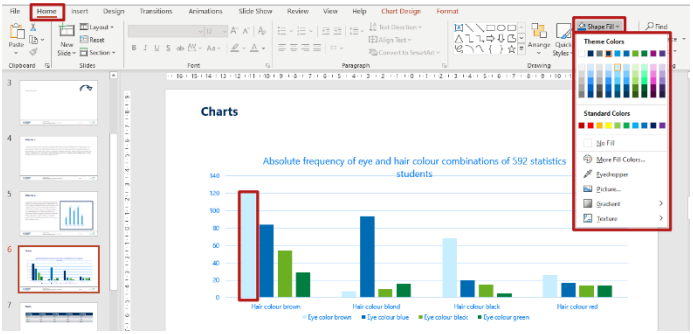

Figure 33 Change colours of chart elements

Free forms and Groupings

Other illustrations should be created in the same way as charts using PowerPoint tools, rather than inserting individual images. Compared to purely visual images, more semantic information is available and can be reproduced by assistive technology.

If you want to draw your own illustrations within your presentation using **free forms**, you should assign an alternative text to each element that does not contain text, as shown in Figure 34. For shapes that contain text, the text is automatically taken as the alternative text of the shape after conversion to a PDF document. You should make sure that the reading order is correct (page 26).

Furthermore, you should combine the individual forms into a **grouping**. This allows you to define figures that consist of several shapes, e. g. a bicycle created from two circles and several rectangles. The advantage of grouping is not only that elements defined as belonging together can be moved together, but also that only one alternative text needs to be created for the whole group when the document is viewed in PowerPoint. For conversion into a PDF document, however, it is advisable to provide an alternative text for the individual elements, as the grouping can be lost during export.

To group several elements, you must first select each element individually while holding down the **Shift key**. Then you can group the selected elements using the **context menu**. Then add an alternative text to your grouping that describes the structure of the grouped elements in a meaningful way. This can be done, as with other graphical elements, via the toolbar **Alt Text** (page 38).

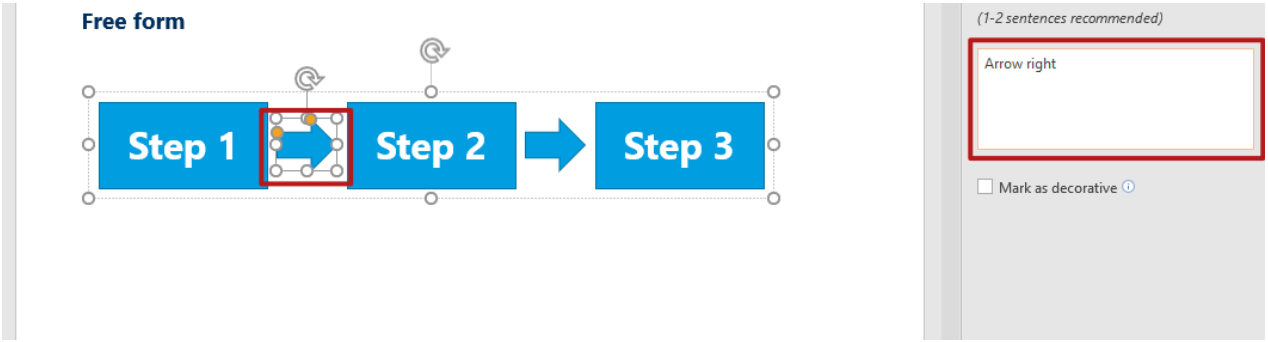

Figure 34 Alt Text of a Free Form

Context Menu ⟶ **Grouping** ⟶ **Grouping**

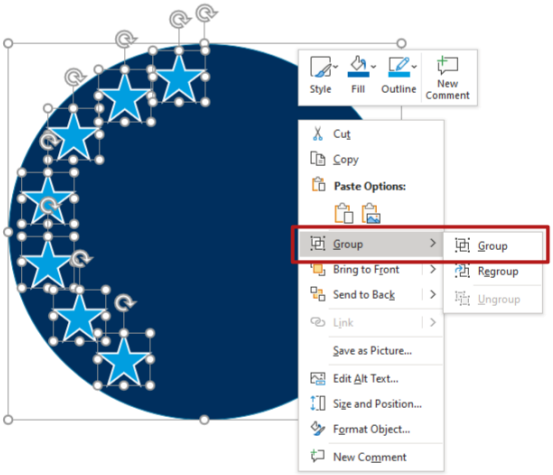

Figure 35 Grouping shapes

Note: If necessary, groupings can be split up again into their individual elements using the context menu item **Ungroup**. Elements of a group can still be easily selected within the group to edit and move them without ungrouping.

Note: In *PowerPoint*, groupings are not exported to PDF format and the alternative text is also lost. Therefore, after PDF export, Groupings must be manually reunited and the alternative text must be inserted again.

Tip: For PDF export, you can save the entire shape group on the slide using the context menu **Save as graphic...**, then replace the shape group with a single image and set the **alternative text** accordingly.

In this case the alternative text is also available in the exported PDF.

SmartArts

For **SmartArts**, also enter a meaningful alternative text in which you provide a textual explanation of the displayed information. Up to the current version of *PowerPoint*, the alternative text of *SmartArts* is not always retained when exporting to a PDF document (as of October 2020). We therefore recommend that, before exporting, you **convert the SmartArt into shapes using the context menu** and proceed as described for free forms.

Select SmartArt ⟶ **context menu** ⟶ **Convert to Shapes**

Videos

Videos, like images and charts, can be inserted using the corresponding **Insert Video** button of an empty content placeholder. Alternatively, a video or sound file can also be placed using the **ribbon** (Figure 36 and Figure 37).

Videos should also have an alternative text describing what happens in the video and summarising the intention. This can be entered again via the **Alt Text** toolbar.

Dynamic content cannot be reproduced in PDF files. A visible image description must be provided for the video content, which is also accessible to sighted readers who do not have direct access to the alternative description.

In addition to the image description, the link to the source should be visibly indicated - if it is an online medium. This ensures that the video content can also be accessed from a static PDF document or a printout on paper. You can also link to this address (Page 27). The easiest way to do this is to enter the web address for the video in an additional text field, which you can then place anywhere on the slide and arrange in the reading order after the video.

Accessible videos have to include both **subtitles**, for people with impaired hearing or deafness, and an audio **transcript** for people with visual impairment or blindness. In addition to the spoken word, the audio transcript has to describe both the spoken and non-verbal content of the video. Subtitles should also take into account relevant background noise.

Tab **Insert** ⟶ Grouping **Media** ⟶ **Video** ⟶ **Online Video...** or **Video on my PC...**

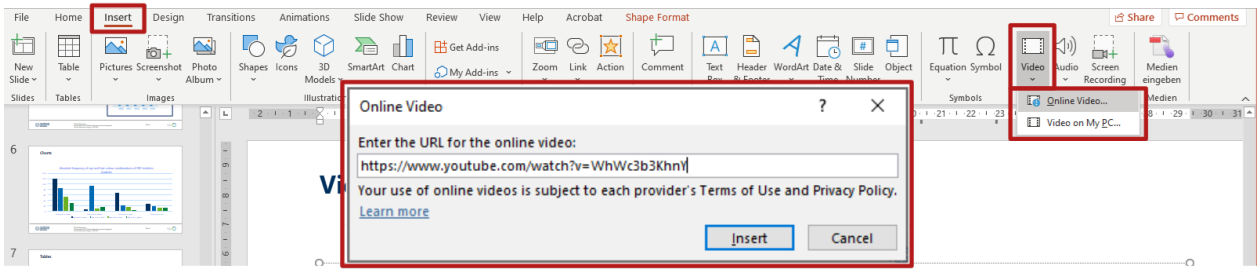

Figure 36 Insert a Video in Windows

Tab **Insert** ⟶ Grouping **Media** ⟶ **Video** ⟶**Video Browser...** or **Video from File...** or **Online Film ...**

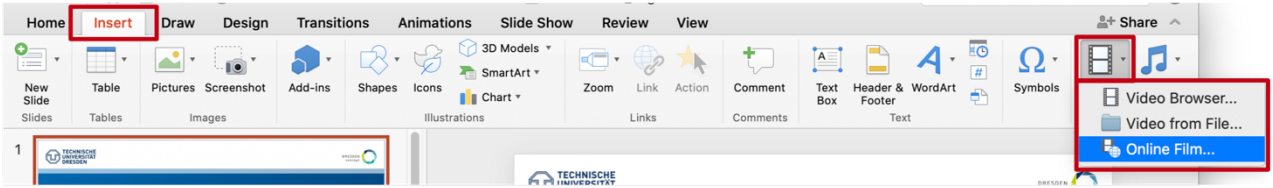

Figure 37 Insert a Video in macOS

Tab **Insert** ⟶ Grouping **Illustrations** ⟶ **Shapes** ⟶ Group **Basic Shapes** ⟶ **Text Box**

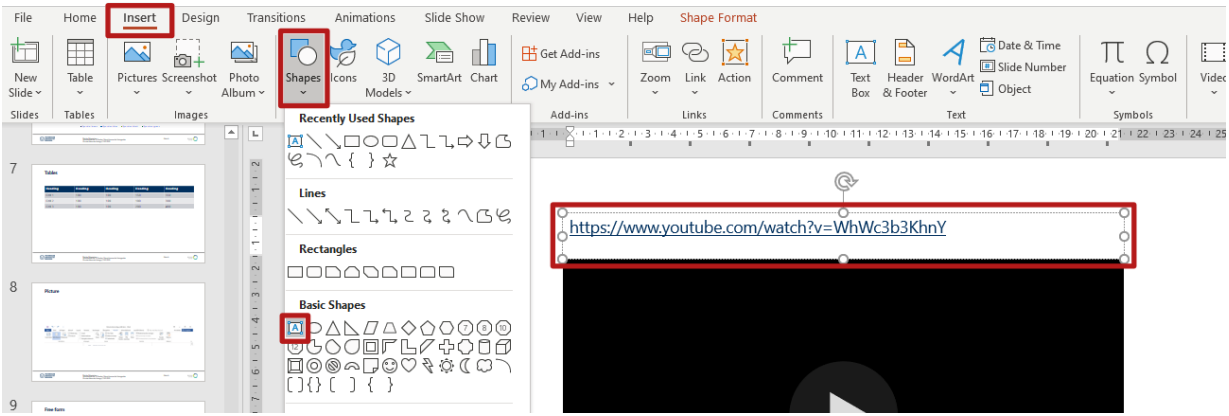

Figure 38 Insert a Text Box

Animations

PowerPoint provides you with a wide range of options for animating your presentation, for example, to show or hide individual objects or entire slides. However, they cannot be converted into a PDF document or on paper.

For this reason, you should create an animation-free presentation for PDF export and emphasise your content in other ways which everyone can benefit from. However, if you don't want to do without animations, they should at least become visible only through user input (e. g. keystroke) to ensure manual control of the content. In this guideline, animations are not dealt with in any more detail.

6.3 Image Description

Please note that pictures and graphics require a meaningful alternative description in order to be accessible to blind people.

6.3.1 Degression: Image Description

Blind people cannot understand images, graphics or diagrams without help. They need an explanation of the contents, a so-called alternative description.

A good image description should have the following characteristics:

- Objectivity (do not introduce your own interpretation)
- Comprehensibility (taking into account the target group)
- Meaningfulness (the description must make sense both without and within the context)
- Clarity and compliance with didactic knowledge
- Effectiveness (keep information complete, but as brief and concise as possible)

The image description should be consistent and structured in a strict order according to the type of graphic. The internal reading flow of the graphic should also be taken into account. When describing the image, you should begin with a rough and general description and move on to more detailed and specific information.

An image description should enable the non-visual reader to obtain all the necessary information according to the purpose of the graphic.

The description should include the following information depending on the context and purpose of the image:

- Intention and purpose of the picture
- Place depicted
- Objects, buildings, people
- Emotions, atmosphere
- What happens in the picture?
- Colours (however, in diagrams the description of visual attributes is only necessary if it provides additional information)

Only include information that is not accessible in any other way, e. g. you should not simply repeat the caption.

6.3.2 Defining Alt Text for images

Since *PowerPoint* 2019 there is the toolbar **Alt Text,** which allows you to add an alternative description to an image. It can be opened via the context menu (Figure 39).

Decorative graphics without any relevant information can be marked as decorative at this point. In this case they will be ignored by assistive technologies.

Toolbar **Alt Text** ⟶ **Mark as decorative**

Since *PowerPoint 2019* the possibility of generating an alternative text for images has also been available. Currently, however, these alternative texts are not very meaningful, so it is not recommended to rely on this function).

In older versions of *PowerPoint,* you can enter an alternative text under **Size and Properties** in the **Format Picture** Toolbar (Figure 40).

Select Image ⟶ Open **Context Menu** ⟶ **Edit Alt Text...**

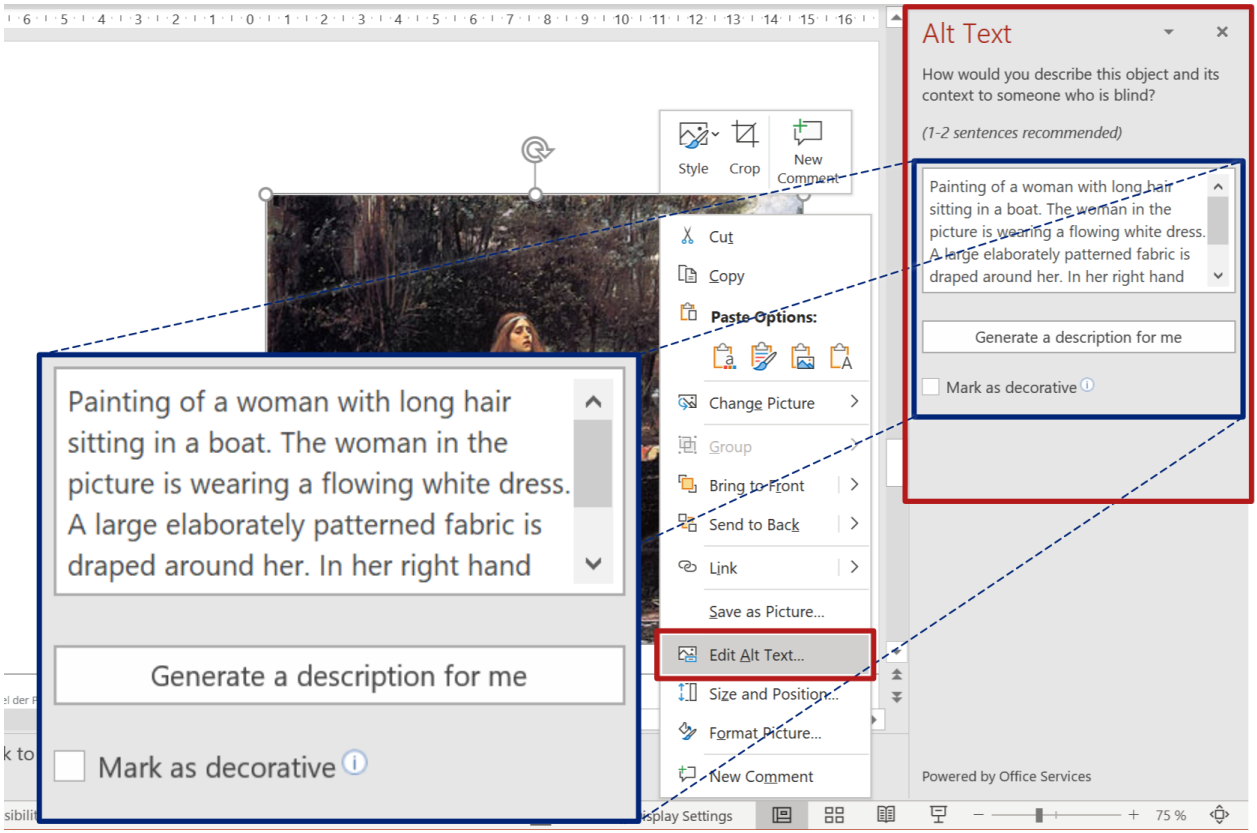

Figure 39 Insert Alt Text

Select Picture ⟶ Open **Context Menu** ⟶ **Format Picture …** ⟶ **Size & Properties** ⟶ **Alt Text**

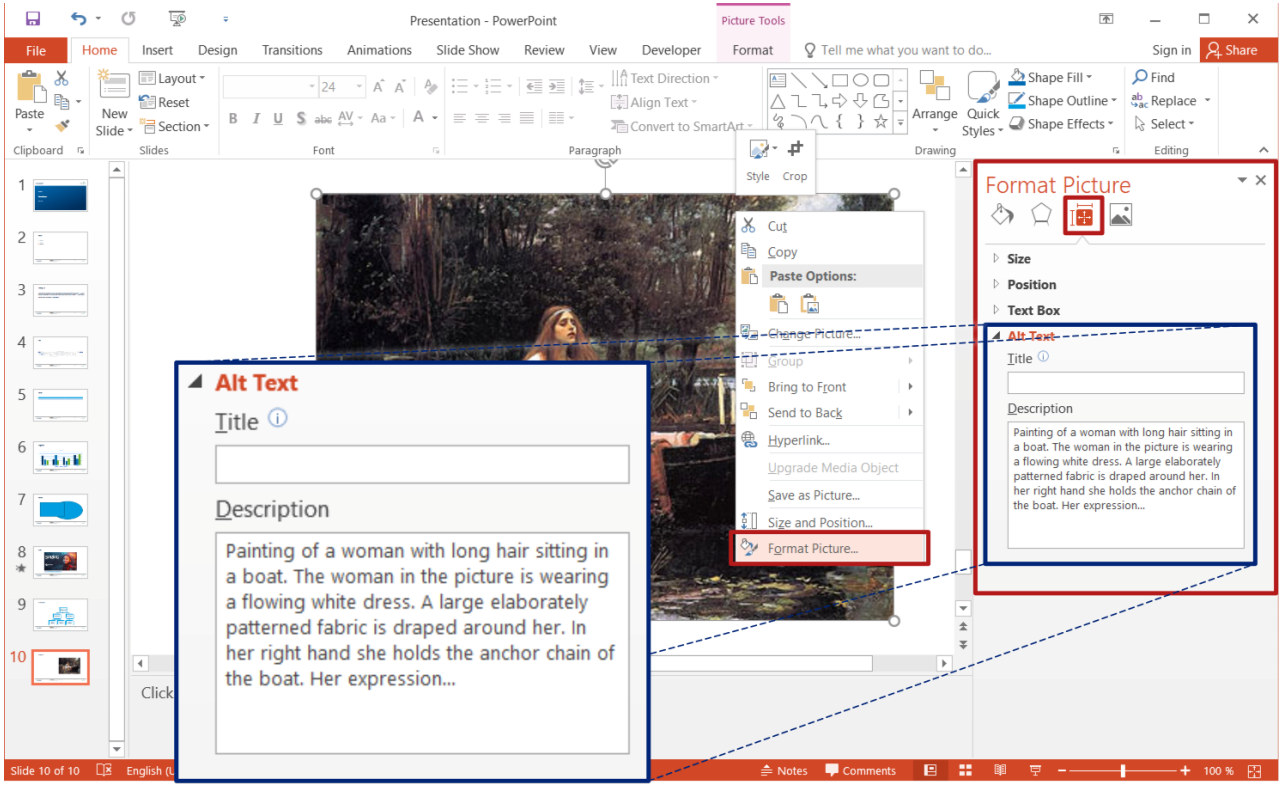

Figure 40 Insert Alt Text in PowerPoint 2016 and older

6.3.3 Examples for Alternative Descriptions

There are different types of pictures, graphics and diagrams. If you have no experience with the textual description of your graphic content, the following examples can help you[5]. Please note that different information may be relevant depending on the context of the graphic.

Decorative Pictures (Decorative Graphics)

Backgrounds or other graphic decorative elements and placeholders in your document, which do not contain any information relevant to the content, do not require an extra alternative description. They must be marked as decorative via the **Alt Text** Toolbar. In older versions of *Word*, where this function does not exist, decorative graphics must be manually marked as artifacts in the final PDF document. Alternatively, you should consider removing purely decorative images from the document.

Figure 41 Example: Decorative Picture

Pictures with Text

With advertising, logos, etc. the alternative text should contain the text of the graphic. In the example in Figure 43 the alternative text should be as follows:

Font graphics: Blindtext weiss

Figure 42 Example: Picture with Text

Content Relevant Pictures

The image refers to the content but is not described in detail in the text. In this case, under certain circumstances the description of the image can be very complex. Therefore, as an alternative, a link to the detailed image description can be provided, which is located elsewhere (e. g. on another slide or in an extra document). A possible alternative description of Figure 43 is:

Painting of a woman with long hair sitting in a boat. The woman in the picture is wearing a flowing white dress. A large elaborately patterned fabric is draped around her. In her right hand she holds the anchor chain of the boat. Her expression ...

[5] The examples are based on the recommendations of the Practical Guide for the Creation of Text-based Alternatives for Graphics (German) of the DVBS (The German Association of Blind and Visually Impaired Students and Professionals)

Figure 43 Example: Painting

Charts

For a chart description you should keep to the following structure:

1) **Overview**: Title, chart type, general content, special features such as alignment
2) **Axes**: arrangement, labelling, unit, scale (range of values, intervals), intersection point of the axes
3) **Data**, depending on the type of chart, for example: number of data series, name and arrangement of data, description of rough progressions, actual data values (tabular, if possible)

Depending on the purpose of the chart and the description, you can also integrate subjective statements into the chart description, regarding the chart content. However, you must mark these as interpretations or your own interpretations.

A possible alternative text for Figure 44 is:

Expenses of the last years. Bar chart. Above the columns you will find the respective values of the vertical axis.

The horizontal axis is a time axis with the years 2000 to 2004. The vertical axis is not shown and has the unit millions.

A data series is shown. The values for the years 2000 and 2004 are significantly smaller than the values for the years 2001 to 2003.

Data values: 2000: 5,7 Mio., 2001: 22,6 Mio., 2002: 21,9 Mio., 2003: 22,6 Mio., 2004: 6,7 Mio.

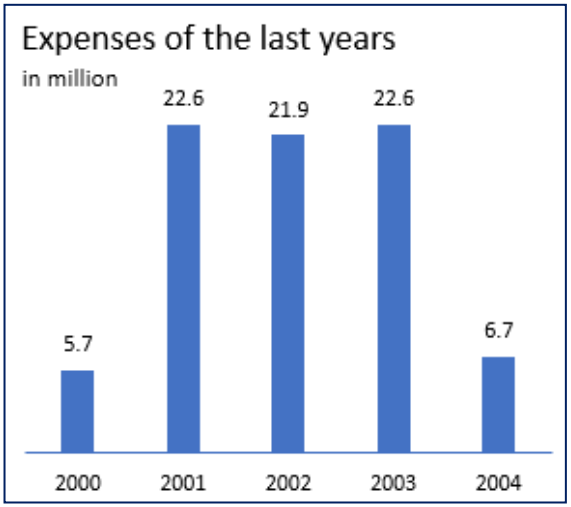

Figure 44 Example: Chart

Formulas

If you use pictures in your document that contain mathematical representations such as formulas or special characters, the alternative text should contain a textual version of this formula.

If possible, do not insert formulas via *Word*, as they are often not accessible. You can save the formula as an image using a screenshot, in Windows for example with the *Snipping Tool*[6], in macOS with the app *Screenshot*[7] . You can insert this image into the document and set an alternative text.

When describing formulas, ensure that they are clear. If your document has many formulas, you should use *LaTeX* or *MathML* notation in the alternative text to make your graphical formula representations accessible. You can find more information on this topic in the corresponding literature[8].

The alternative text of the illustrated formula in LaTeX notation in Figure 45 is

*Equation: \ [a = b + 2 * k * \pi \]*

Or written out in text form:

Equation: a equals b plus 2 k times Pi

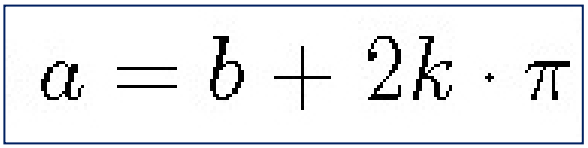

Figure 45 Example: Formula

For further examples of alternative descriptions we recommend the Practical Guide for the Creation of Text-based Alternatives for Graphics (German) of the DVBS.

[6] Taking a Screenshot by Means of the Snipping Tools on Windows

[7] Taking Screenshots or Screen Recording on the Mac

[8] Wikibooks, Library of free textbooks, non-fiction and specialist books: Compendium LaTeX: For Mathematicians

5.4 Accessibility Check with Office

Before you export a *Word* document to PDF and then have to make elaborate improvements to the PDF document, it is worthwhile having an internal *Office* check for accessibility problems first.

Note: With the steps described here you create an accessible *Word* document. However, problems resolved in *Office* will not prevent problems from appearing in the exported PDF document because, as explained at the beginning of the chapter, not all export tools comply with all guidelines of the PDF/UA standard.

Since *Office* 2010 an integrated accessibility check is available in all *Office* applications. Since *PowerPoint* 2019 a new menu item has been available in the **Review** tab of the ribbon. With older versions the check is started via the file information.

The Accessibility toolbar opens in the right sidebar (Figure 48). At the top of the toolbar there is a list of **errors** and warnings grouped by type. Clicking on an error or warning immediately selects the affected element so that you do not have to search for.

Below the list there is an area that provides more detailed information about the selected error. It also contains reasons for the need to correct the error and information on how to correct it.

Correct the errors and warnings, and then check the document again. Only export the presentation when there are no more errors left.

In the example shown in Figure 48, it is noted, among other things, that the chart created in PowerPoint does not include any alternative text.

Tab **Review** ⟶ Grouping **Accessibility** ⟶ **Check Accessibility**

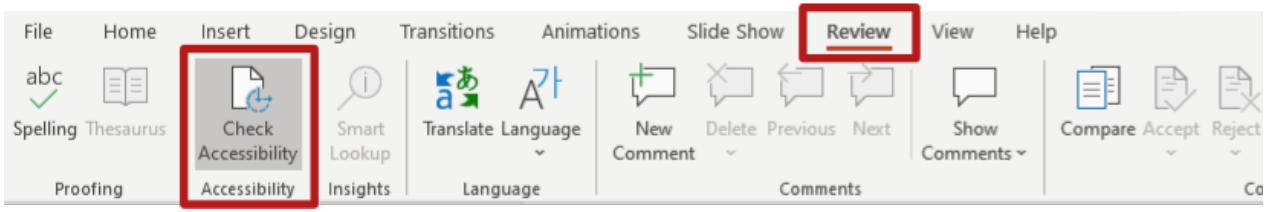

Figure 46 Check Accessibility

Tab **File** ⟶ **Info** ⟶ Button **Check for Issues** ⟶ **Check Accessibility**

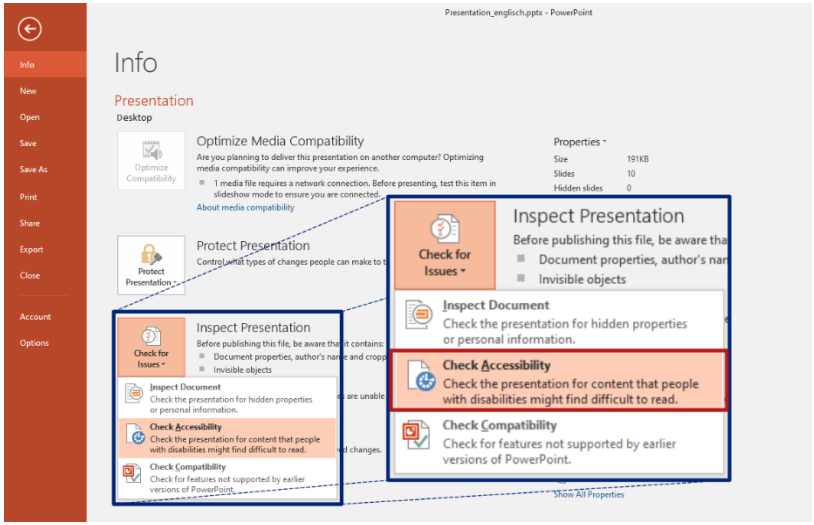

Figure 47 Accessibility Check in PowerPoint 2016 and older versions

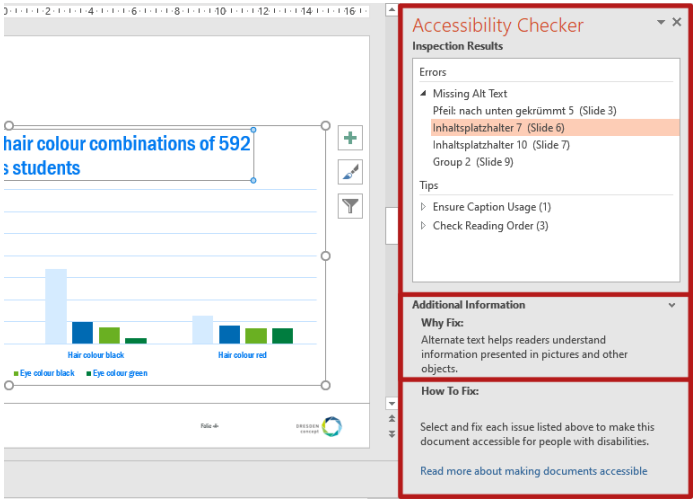

Figure 48 Results of the Accessibility Check

6.4 Creating a PDF-Document

You have structured your document as simply as possible and with the help of Style Sheets? Have you provided images with alternative texts and checked your links and references for up-to-dateness? Does your document have a title? Then you have gotten closer to creating your accessible PDF document. Now you only have to export your document as PDF.

There are of course many more ways to create PDFs, as there are numerous programs and extensions for conversion. Not all of these programs will maintain the logical structure of your document. The option recommended here will adopt a large part of the preparations correctly.

It is not advisable to use a so-called PDF printer, as it does not export the logical structure.

6.4.1 Exporting as PDF with Office

Microsoft Office provides a standard module for exporting to PDF. If it had to be manually installed in earlier versions, it is already pre-installed in Office versions > 2010.

In the **Publish as PDF or XPS** dialogue window (Figure 50), the file name, type and location for final publication can be specified. You can also open this dialogue with the button F12 as an alternative to the steps just described. Then, however, you must still select **PDF** as the **file type**.

Use the **Options** button in the dialogue to specify settings for PDF export. Set the following options as shown in Figure 51:

- Option **Document properties**: adds information to the PDF, such as the document title.
- Option **Document structure tags for accessibility**: all structure information is added to the PDF.
- Disable **Bitmap text [...]:** This would cause text contents to be saved as image information, making them unreadable for non-visual users.

Confirm by clicking the **OK** button and save the document with the **Publish** button.

Attention: In *macOS* no accessible PDF documents can be created from PowerPoint. This requires add-ins, such as the *PDFMaker* from *Adobe*.

Note: No bookmarks are exported from PowerPoint to PDF. The *PDFMaker* add-in from Adobe however supports this feature.

Tab **File** ⟶ **Export** ⟶ **Create PDF/XPS-Document**

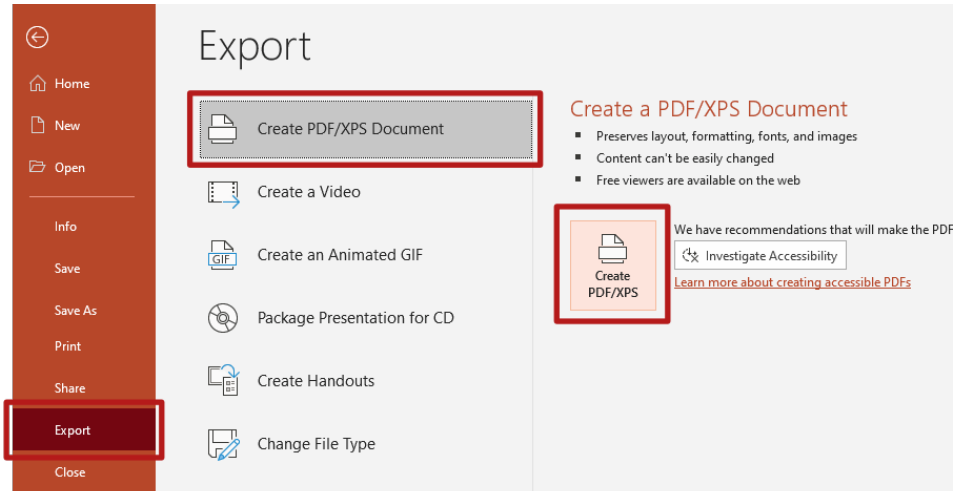

Figure 49 Export as PDF-Document

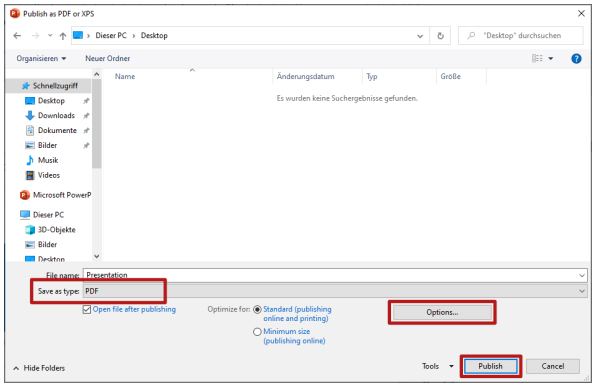

Figure 50 Dialogue Window to Save

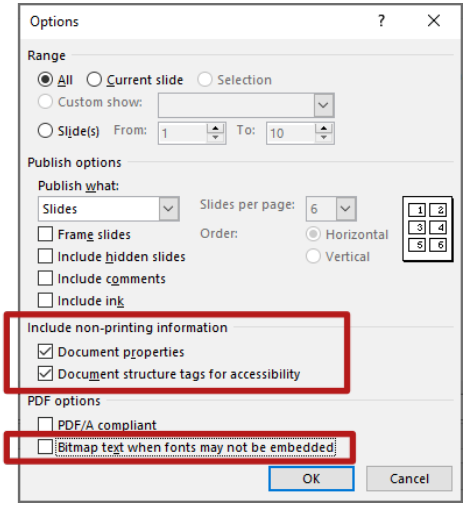

Figure 51 Dialogue window: Options to Save as PDF-Document

Why are bookmarks so important?

Bookmarks are an important element for navigating and orienting yourself in documents. When you view a document that contains bookmarks, they are displayed in the left sidebar. If you click on a bookmark, the focus in the document jumps directly to the corresponding content. This is a helpful feature, especially for long documents.

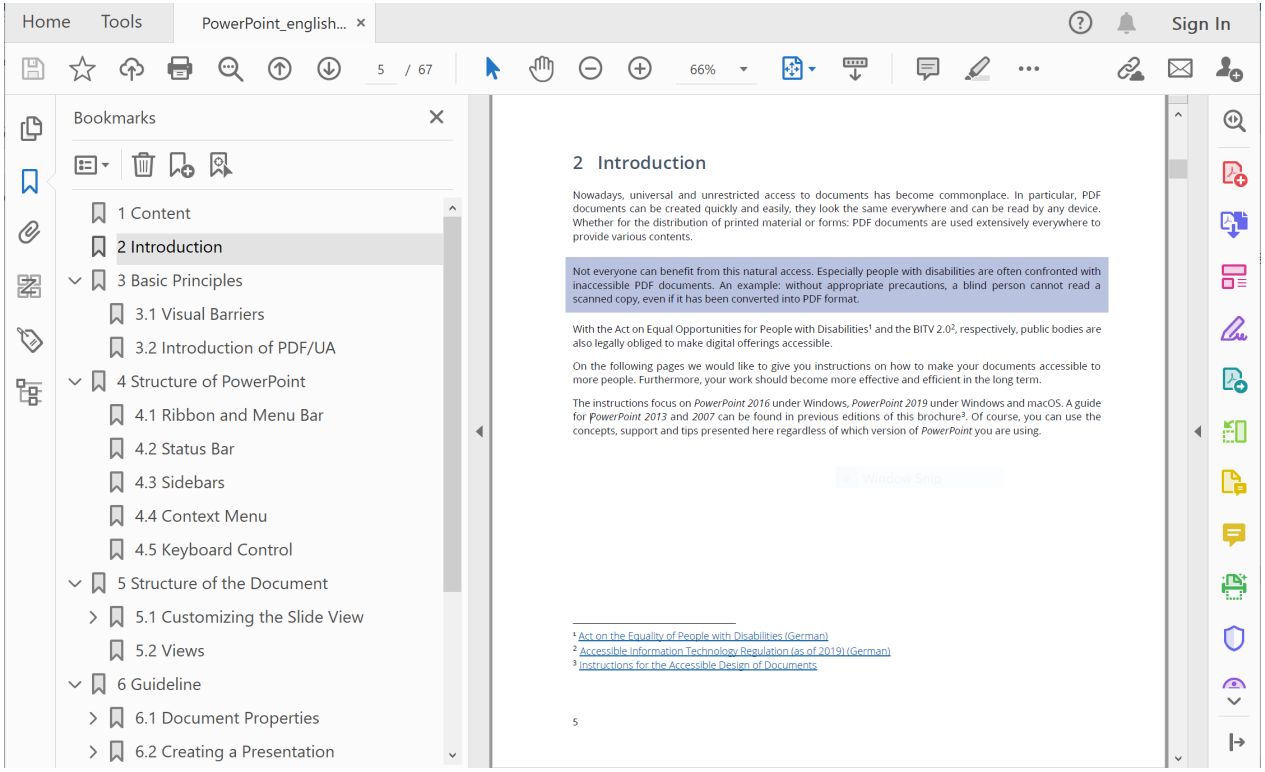

Figure 52 Bookmark List of a PDF-Document in Adobe Acrobat

6.5 Checking PDF Documents for Accessibility

There are many ways to review and improve the accessibility of PDF documents. Possible tools for automatic and manual checking and correction are described below.

It should be noted that an automatic test method cannot be used to check the sense of the reading sequence, table structure and alternative texts. These must therefore be checked manually. The same applies to maintaining the minimum contrast between text and background, for which programmes such as the *Colour Contrast Analyser* can be used.

The *Colour Contrast Analyser* can be downloaded via Colour Contrast Analyser.

Figure 53 PAC 3 application window

6.5.1 Checking Accessibility with PAC 3

The *Free PDF Accessibility Checker (PAC 3)* is a program used to check for compliance with the required guidelines of the PDF/UA standard. The program itself does not need to be installed, but is only available for Windows operating systems. It provides a detailed inspection report on any problems found in the document (Figure 54) and offers a preview of what the document would look like with an assistive technology. This allows the reading order and nesting to be checked.

The programme can be downloaded from the website PDF Accessibility Checker (PAC 3).

The programme *PAC 3* itself cannot automatically solve any problems and does not offer any editing options. After the test and on the basis of the test report, any problems found must be corrected with another programme (e. g. *Adobe Acrobat DC, axesPDF QuickFix)*.

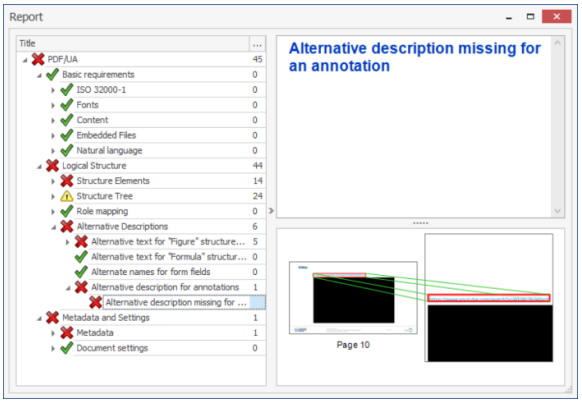

Figure 54 PAC 3 Detailed inspection report of PAC 3 with preview

6.5.2 Checking and Improving Accessibility with Adobe Acrobat DC

Adobe Acrobat DC is a fee-based programme for editing PDF documents. It offers both the possibility to check PDF documents for compliance with the PDF/UA standard and to correct errors. In contrast to *PAC 3* and *axesPDF QuickFix*, it is not only available for Windows but also for macOS.

Many functions of *Acrobat DC* are accessible via the context menu of an element. You can open this menu with the right mouse button or by pressing the Shift key ⇧ and F10.

As shown in Figure 55, the display of the open PDF document is located in the centre of the *Acrobat DC* window. Some **tools** are listed in the right sidebar where you can also search for tools. In the left sidebar - the navigation area - other views of the document are available, including lists of bookmarks and **tags**. Use F6 to switch the focus between the areas.

Using the **Preflight** window shown in Figure 56, the opened PDF document can be checked for compliance with the PDF/UA standards. The window can be searched and opened via the input field of the tool sidebar. In the **Preflight** window under the **Profiles** tab, choose **PDF/UA** and then select **Verify compliance with PDF/UA-1**. Pressing the **Analyze** button at the bottom of the window starts the checking process. If you cannot find the profile on your computer, enter **PDF/UA** in the **search field**.

After the checking, the **Results** tab opens and lists any errors (Figure 57). Some errors, such as a missing PDF/UA mark or a missing document title, can be corrected directly in the Preflight window. Therefore, again under the tab **Profiles** open the view **Select Single Fixups** (spanner symbol). Depending on the selected library, various correction options are listed here.

To check and edit the reading order and structure, the view of the **tags** can be found in the Acrobat DC sidebar. Here the document structure is visible in a nested list of tags, with the actual elements of the document marked with a box symbol. By selecting a list entry, the corresponding elements are marked in the document preview. The reading order and nesting can be changed by dragging the individual tags. Alternatively, a tag can be cut out and inserted after another selected tag.

Cut: Ctrl X Paste: Ctrl V

Cut: ⌘ X Paste: ⌘ V

Attention: In *Adobe Acrobat DC* there is a sidebar called *Order*. Use this sidebar to set the reading order in the Acrobat reflow view. Currently (as of October 2020), however, the reading order specified there is independent of the tag order used by assistive technologies such as screen readers. Therefore, we would like to emphasise here that editing the reading order must be done in the view Tags, so that the document is understandable for all users.

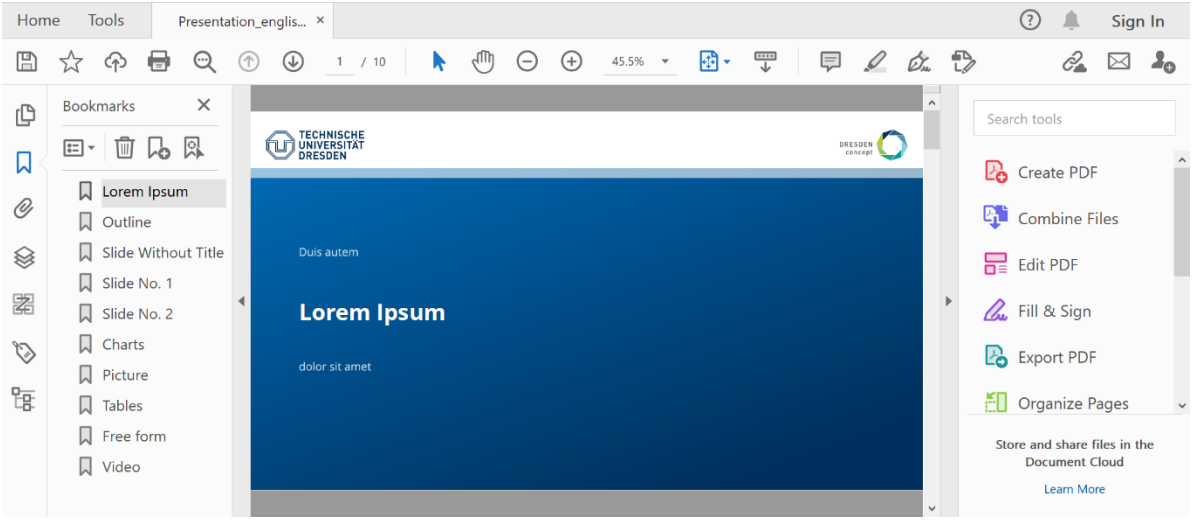

Figure 55 Adobe Acrobat DC window

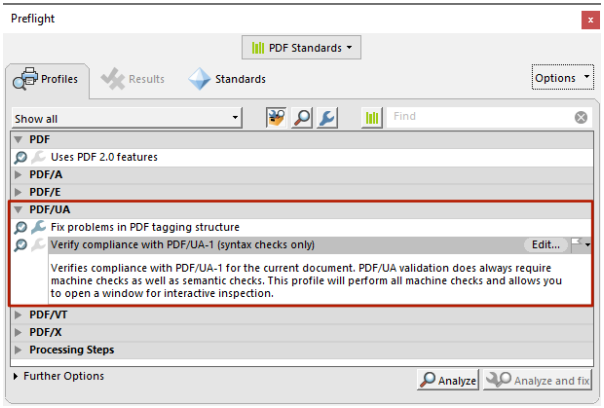

Figure 56 Acrobat DC *PDF/UA Inspection in Preflight window*

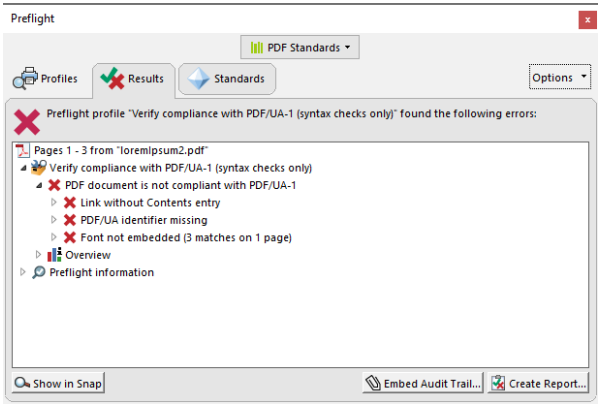

Figure 57 Acrobat DC *PDF/UA Inspection Results Preflight window*

The view **Tags** also shows whether the elements in the document are correctly tagged, e. g. whether headings have been marked as such. Opening the **context menu** of a tag and selecting **Properties…** opens the **Object Properties** window as shown in Figure 58 and Figure 59. Information such as the tag type, the language and the alternative text can be changed here. For example, if a second level heading is marked as `<P>` instead of `<H2>`, the tag type can be changed in the properties window using a checkbox.

If your document has no tags, open the **Accessibility** tool and select **Tag Document Automatically**. Acrobat will then automatically tag elements. You can then change the tags in the list of tags and add alternative texts. Using the **Reading Order** window (Figure 64) of the **Accessibility** tool, you can also tag elements manually, as described later.

Purely decorative elements in the document, which do not offer any added value in terms of content, must be marked as such so that they are ignored by assistive technologies. To do this, you have to open the **context menu** for the corresponding element in the tag window and select **Change tag to extra-textual element…** This marks the element as artifact and it will not be displayed in the tag window.

Caution: If you delete an element from the tag tree, it is not automatically marked as an artifact, but is considered an *untagged element* in the document, which leads to errors when checking for PDF/UA.

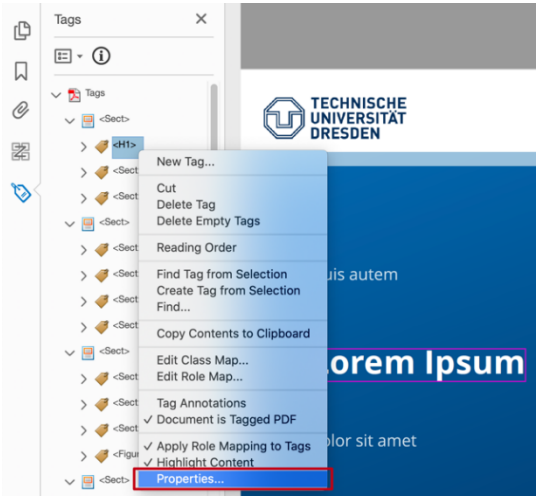

Figure 58 Open Acrobat DC *Object Properties via the context menu of a tag*

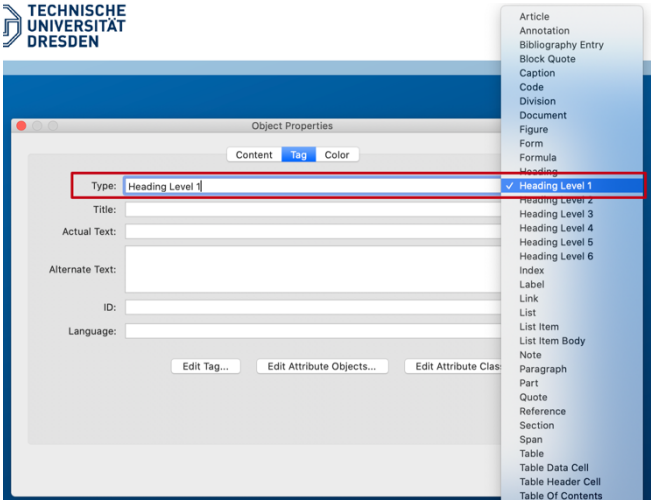

Figure 59 Acrobat DC *Object Properties window*

Complex tables are a major obstacle in creating accessible documents. *Acrobat DC* offers a **table editor** that can be used to add information to the table cells. The **table editor** can be started via the **context menu** of the `<Table>` tag in the tag window (Figure 60). Now the corresponding window is opened via **the context menu** of a cell and by selecting the **Table Cell Properties...** (Figure 61).

Here, a cell must be marked as a header or data cell. For header cells you can also specify whether they refer to columns, rows or both (Figure 62). Data cells must also be assigned to the corresponding header cells, which is also possible in this window (Figure 63). For **Assigned Header Cell IDs**, a corresponding header can be selected and added by clicking the button that is labelled with a plus symbol.

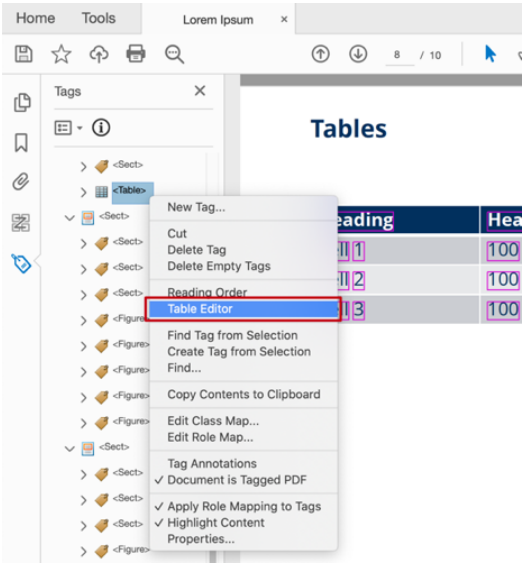

Figure 60 Open Table Editor via context menu of <Table>-tag

If your table has linked cells that extend over several columns or rows, then this must be set explicitly in the table cell properties. There are two input fields for the number of columns and rows over which the cell extends.

If your table has borders, these may need to be manually marked as artifacts. If the corresponding path elements are already in the tag view, you can proceed as described for the decorative elements before. Otherwise, you must manually mark the individual path objects as **Background/Artifact** using the **Reading Order** tool, as shown in Figure 63. Therefore, select the path object by dragging the mouse pointer over it while pressing the left mouse button. Then select the **Background/Artifact** button in the **Reading Order** window.

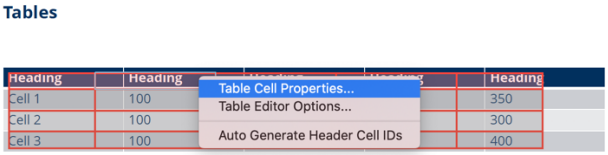

Figure 61 Context menu of a table cell

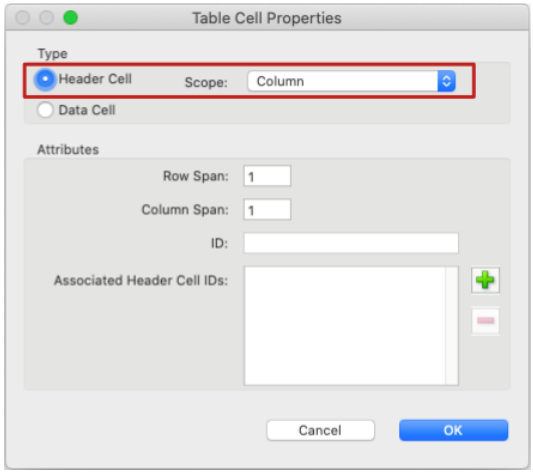

Figure 62 Table Cell Properties window of a Header Cell

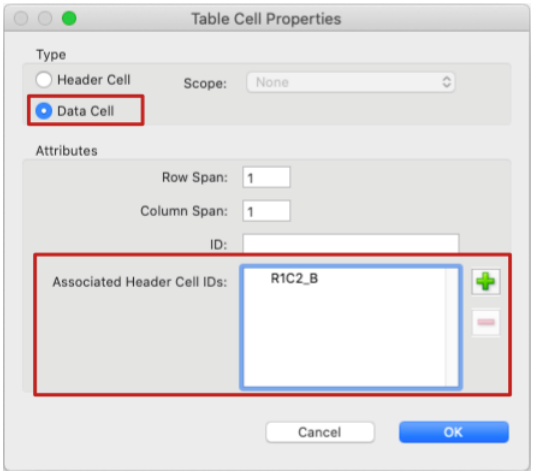

Figure 63 Table Cell Properties window of a Data Cell

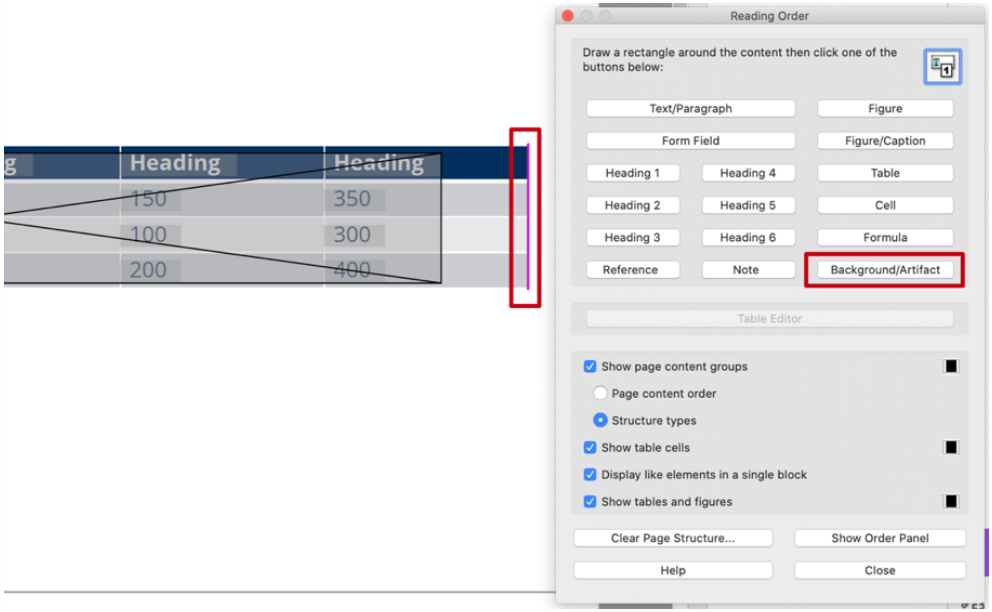

Figure 64 Label the table border as Artifact using the Reading Order Tool.

6.5.3 Checking and Improving Accessibility with axesPDF QuickFix

With the fee-based programme *axesPDF QuickFix*, PDF documents can be checked for compliance with the PDF/UA standard and WCAG 2. It also allows the correction of some errors. The programme is available for Windows and can be downloaded from the website:

axesPDF QuickFix

As shown in Figure 65, the **logical structure** is shown in a tree view in the left sidebar. Here you can check the reading order and the correct labelling of the elements. On the right side of the application window, there are various tools for checking and editing the document. Via the **Checker** tab in the right sidebar, a PDF/UA standard check of the document can be performed with the results displayed in a tree view. Click the **Refresh** button to start the check.

The **Properties** tab of the right sidebar displays the properties of the selected item. This is where, e. g. the label (structure type) can be changed or an alternative text can be set.

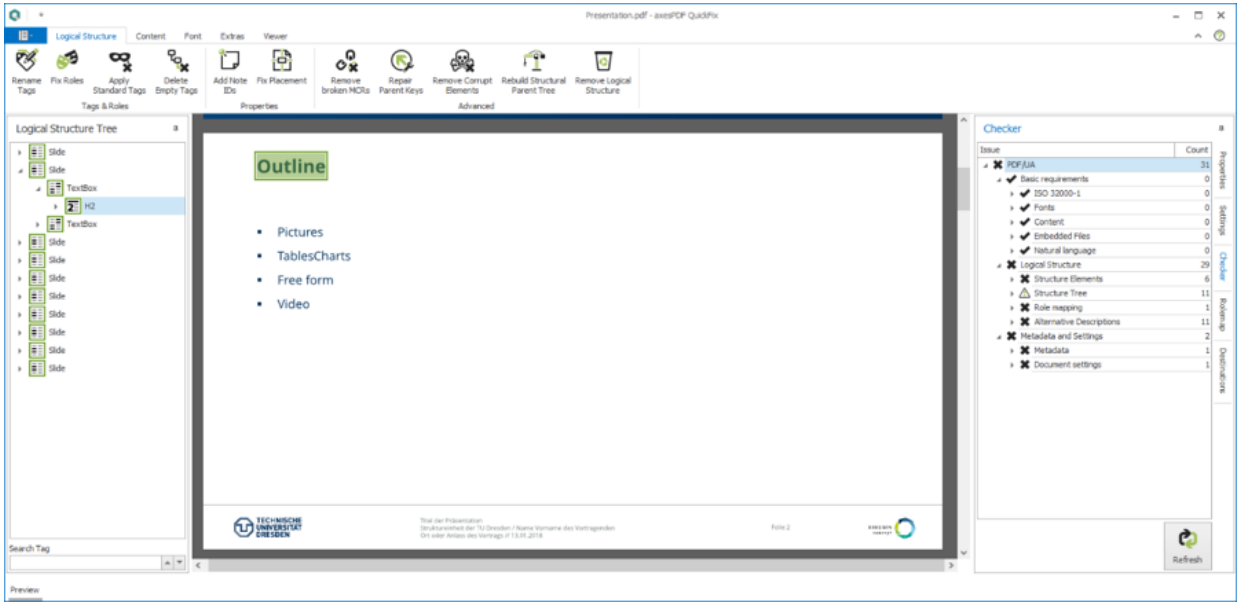

Figure 65 Application window of axesPDF QuickFix

In the **Settings** tab of the right sidebar, you can change such settings as the document language and title.

AxesPDF QuickFix is particularly suitable for marking up complex tables. With the **Table tool**, which is activated via the **Viewer** tab of the ribbon, cells can be assigned to the corresponding header cells by dragging them. In the **Properties** tab of the right sidebar you can also adjust the size of connected cells. As shown in Figure 66, the corresponding header cells can also be set here.

With *QuickFix,* you can re-mark already marked elements, but it is not possible to label unmarked elements or tag them as artifacts.

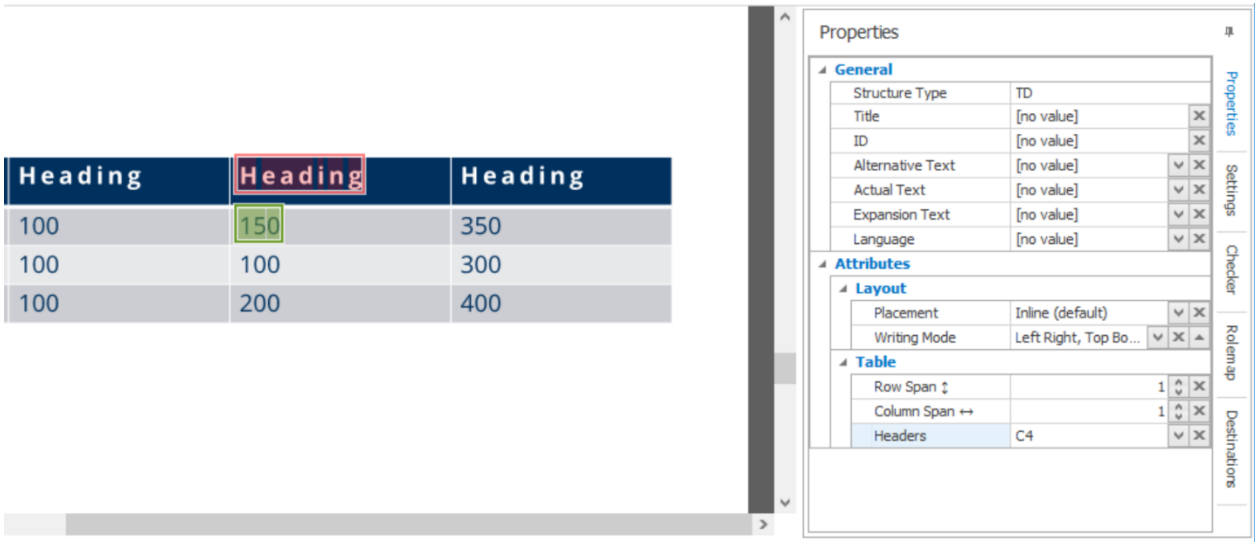

Figure 66 axesPDF QuickFix Properties of connected cells

6.6 Online Validation and Fixing With PAVE

Online tools for checking and improving the accessibility of PDF documents have the advantage that they can be used regardless of the operating system. On the other hand, you must first upload your PDF document to a website. It is not always clear what the website operator will do with the document, for example, whether it will be saved permanently or deleted after editing. Before using the online tool, you should therefore make sure that uploading your document is safe from a data protection perspective.

PAVE is an online platform that allows you to upload a PDF document, have it checked online and at the same time manually edit[9] any problems that are found but not automatically resolved.
The project can be accessed via the PAVE website.

Using the editing functions, the stored document information can be subsequently checked and modified and the document structure and element properties can be influenced.

Even if no error is displayed in the document properties, it is still worth checking them again via the **Properties** tab, as shown in Figure 68 .

In the **Reading Order** tab (Figure 69) you can check and change the document structure and nesting of items. Use the pencil icon at the end of a list item to edit the selected item. Therefore, the **Tagging** view, as shown in Figure 70, opens. In this view you can, i. a., adjust the alternative text and the type of the element. For purely decorative elements, you must select **Not relevant (will not be read out)** for the element type here.

Complex changes are not possible with *PAVE*. Significant, extensive changes, such as subsequent grouping etc., can be carried out with the fee-based *Adobe Acrobat DC*, for example.

[9] Video Tutorial: Introduction to PAVE v2.0

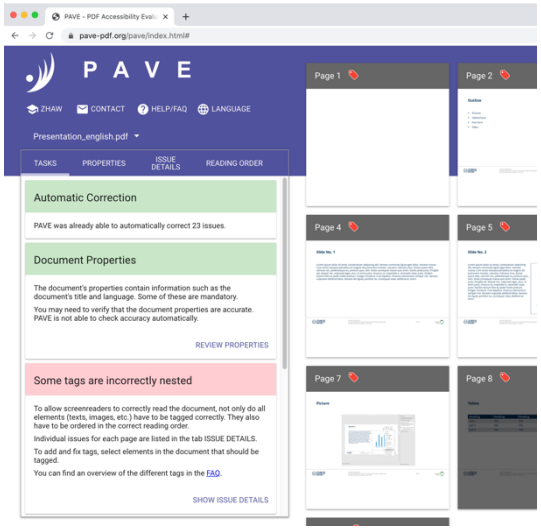

Figure 67 PAVE Tasks View

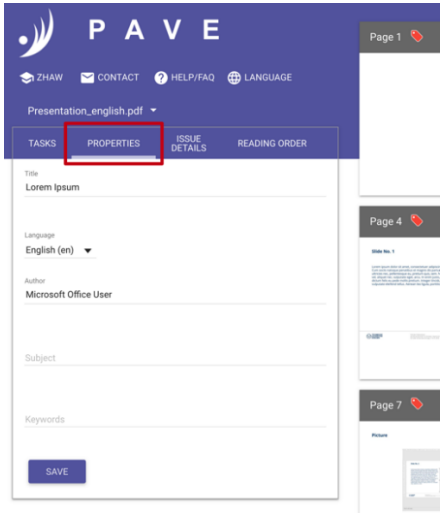

Figure 68 Document Properties in PAVE

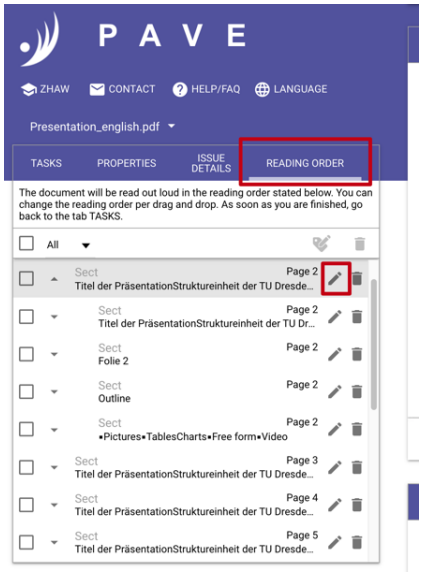

Figure 69 Reading Order in PAVE

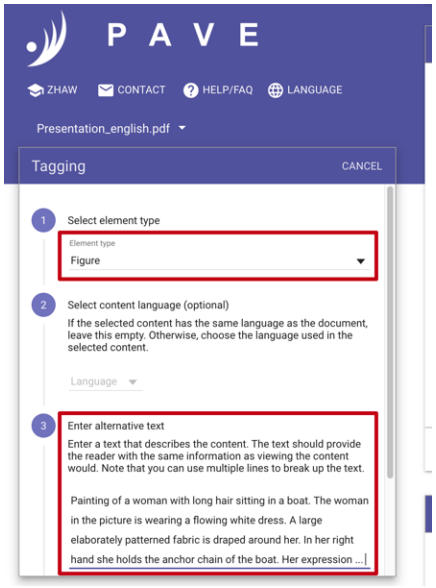

Figure 70 PAVE Tagging View to Edit Tags

7 Further Literature

A useful overview of further steps can be found, for example, on the websites of the *Aktion Mensch* Initiative for an Accessible Internet [1]. *Adobe* provides a detailed manual for creating accessible PDF documents with *Acrobat* [2]. *axesPDF QuickFix* also has detailed instructions [3]. Since *Office* 2010, *Microsoft* has integrated an accessibility check into the *Word, Excel* and *PowerPoint* products [4].

[1] Easy For All: PDF-Documents - Readable For All. Part 3 (German)

[2] Adobe: Manual for Creating Accessible PDF

[3] axesPDF: axesPDF QuickFix – QuickStart-Guide

[4] Microsoft Office: Improve Accessibility With the Accessibility Checker

Download the brochure in PDF format at:

https://tu-dresden.de/agsbs/dokumente