PrepaCare^{xr}

Design Guidelines
Basic Fundamentals for Communication Design

PREPACARE[XR] IS AN ERASMUS+ KA2 INTERNATIONAL
PROJECT BETWEEN 5 INSTITUTIONS:

FH TECHNIKUM WIEN (AUSTRIA)
UNIVERSITA' DEGLI STUDI DI BERGAMO (ITALY)
LAPLAND UNIVERSITY OF APPLIED SCIENCES (FINLAND)
UNIVERSIDADE DE TRAS-OS-MONTES E ALTO DOURO (PORTUGAL)
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The PrepaCare[XR] project aims at creating advanced technological and pedagogical training solutions for healthcare professionals and students to enable experiential and safe learning opportunities. In the project, the multidisciplinary and international group of experts in healthcare, medicine, engineering, and design and visualization collaborated in order to produce these advanced solutions. Based on the application and products, PrepaCare[XR] enables the shift of healthcare training to be blended, global and more experiential. This leads to a new way of educating current and future healthcare professionals in order to improve the efficiency and competitiveness of the European healthcare sector.

Read more about the project

1. Introduction

Communication design has always been associated with the appearance and configuration of how text, shapes appear, but communication design has many aspects that must be considered. The binomial form/function is and will always be allied to the concept of design. The functionality is associated with the need, with the solution of the problem, which can be a communication problem. It is easy to understand that there is a concern with issues of functionality, but in opposition to the form (or often understood as aesthetics) it is understood that it is a minor concern. There is a heuristic called "Aesthetic-Usability Effect" that reinforces the importance of appearance, stating that often the perceive aesthetically pleasing design as design that's more usable. [1] As well as using correctly (depending on what we want to communicate) graphic instruments such as color, different types of typographies, shapes, the composition itself will influence the reading and understanding of the message. This design instruments can have a big impact on how we perceive what we see (easier or with more difficulty).

The design guidelines serve as set of recommendations towards good practice in design in the frame of PrepaCare[XR] . A design guideline is placed in between a principle in design and a standard or rule for implementing it. The standard developed is intended to provide clear instructions to all consortium members. Once the information guidelines and procedures are available online, the target group will be addressed on regional, national, and international level. Transferability potential is hence ensured, which marks the basis for a shared language providing the basics for common values between the consortium members. Everyone who develops content will be able to adopt specific principles, such as intuitiveness, accessibility, usability, learnability, efficiency, sustainability and consistency. Instead of dictating conventions, design guidelines provide helpful advice on how to achieve a design principle that can be platform-specific or cross platform. These guidelines will enhance user experience and thus improve media literacy among all users. To empower the pedagogical effectiveness, guidelines are needed to standardize all the content (for all intended platforms, like oral presentations, electronic handbooks, videos, etc.). In this way, all consortium members will find the same previously defined logical structure of the content.

2. Generic Guidelines

This document aims to present guidelines for unified and improved communication in some supports like oral presentations; videos, such as online courses or other educational multimedia resources; electronic handbooks; publication and poster templates to increase the success of the experience. These Guidelines will address some generic topics considered important such as: **Gestalt laws** (They are principles that describe how people perceive visual stimuli as organized patterns and wholes, rather than as individual elements); **Heuristics** (general principles or guidelines that can be used to evaluate the usability of a user interface that can help users recognize, diagnose, and recover from errors); **Cognitive Bias** (are systematic patterns of deviation from norm or rationality in judgment and can affect the way people perceive, interpret, and remember information, and can lead to inaccurate judgments and decisions.); **White Space** (important design element that can have a significant impact on the look and feel of a design); **Visual Hierarchy** (is the arrangement of visual elements in a way that indicates their importance or priority); **Grid System** (is a framework used to organize content, helps to create a sense of order and structure, improve alignment and balance, facilitate the use of white space, and facilitate responsive design); **Icons** (are a small visual representation of an object, concept, or action facilitate the recognition and can be quickly understood); **Photography** (some principles to maintain unity with the use of photography) and last the **Typography** (is the art and technique of arranging type to make written language legible, readable, and appealing when displayed and it plays a central role in how a design is perceived and understood).

2.1 Gestalt Laws

The Gestalt laws of perception are principles that describe how people perceive visual stimuli as organized patterns and wholes, rather than as individual elements. These laws can help to explain how people perceive and organize visual information and can be used to design more effective and visually appealing graphics, layouts, and interfaces.

There are several Gestalt laws of perception [2], including:

Law of Proximity: Objects that are close together are perceived as being part of the same group.

Law of Similarity: Objects that are similar to one another are perceived as being part of the same group.

Law of Closure: When there is an incomplete or partially obscured figure, people tend to perceive it as a complete whole.

Law of Symmetry: People tend to perceive symmetrical figures as more stable and organized.

Law of Common Fate: Objects that move in the same direction are perceived as being related to one another.

Law of Continuation: People tend to perceive lines and curves as continuing in the same direction, even if they are interrupted or obscured.

Law of Figure-Ground: People tend to perceive objects as either figures (foreground elements) or background elements, depending on how they are surrounded by other objects.

1. Law of Proximity
2. Law of Similarity
3. Law of Closure
4. Law of Symmetry
5. Law of Common Fate
6. Law of Continuation
7. Law of Figure-Ground
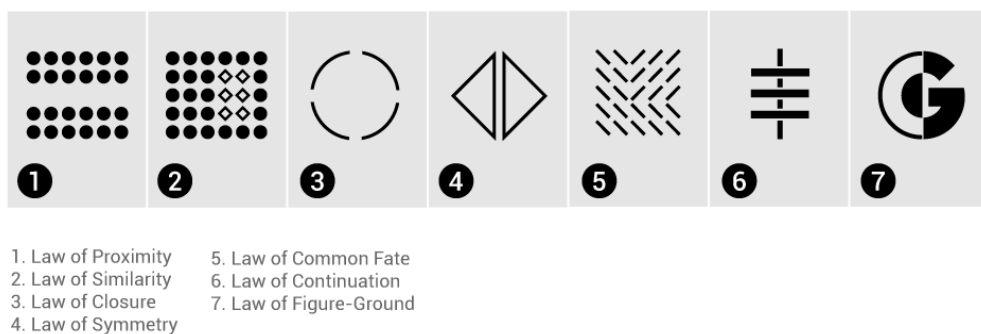
These laws are not absolute, and people can perceive visual stimuli in different ways based on individual differences and context. However, understanding these laws can help designers create more effective and visually appealing designs.

2.2 Heuristics

Heuristics are general principles or guidelines that can be used to evaluate the usability of a user interface (UI). They are a set of best practices that designers can use to ensure that their designs are effective and easy to use. Some common heuristics for UI/UX design [1] include:

Visibility of system status: The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

Match between system and the real world: The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

User control and freedom: Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

Consistency and standards: Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

Error prevention: Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

Recognition rather than recall: Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

Flexibility and efficiency of use: Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

Aesthetic and minimalist design: Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

Help users recognize, diagnose, and recover from errors: Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

2.3 Cognitive Bias

Cognitive biases are systematic patterns of deviation from norm or rationality in judgment, whereby inferences about other people and situations may be drawn in an illogical fashion. These biases are often a result of the brain's attempt to simplify information processing. Cognitive biases can affect the way people perceive, interpret, and remember information, and can lead to inaccurate judgments and decisions.

In the context of UI/UX design, cognitive biases can impact the way users interact with and perceive a product. For example, the confirmation bias can lead users to seek out information that confirms their preexisting beliefs, while the sunk cost fallacy can lead them to continue using a product they may not be satisfied with simply because they have invested time or resources into it.

Designers should be aware of cognitive biases and strive to design interfaces that minimize their influence on users' decisions and behaviors. This can involve using clear and

consistent language, providing users with all relevant information, and avoiding potentially misleading design elements. [1]

Peak-End Rule: People judge an experience largely based on how they felt at its peak and at its end, rather than the total sum or average every moment of the experience. (*)

Serial Position Effect: Users have a propensity to best remember the first and last items in a series. (*)

Von Restorff Effect: The Von Restorff effect, also know as the Isolation Effect, predicts that when multiple similar objects are present, the one that differs from the rest is most likely to be remembered. (*)

Zeigarnik Effect: People remember uncompleted or interrupted tasks better than completed tasks. (*)

1. Peak-End Rule
2. Serial Position Effect
3. Von Restorff Effect
4. Zeigarnik Effect
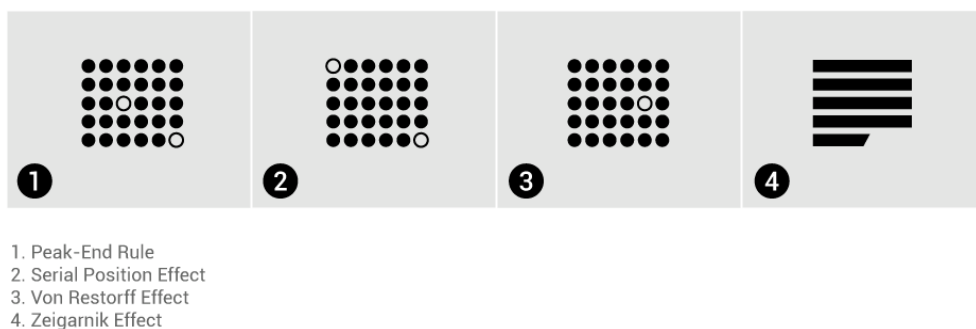
2.4 White Space

White space, also known as negative space, is the area around and between the elements of a design. It is an important design element that can have a significant impact on the look and feel of a design. [2]

In graphic design, white space serves several important functions:

It helps to create balance and hierarchy: By carefully positioning elements within a design and leaving sufficient white space around them, designers can create a sense of balance and hierarchy that guides the viewer's eye through the design.

It helps to focus attention: By isolating individual elements within a design with white space, designers can direct the viewer's attention to specific areas and help to emphasize important information.

It helps to reduce clutter and improve readability: When a design is cluttered or crowded, it can be difficult for viewers to process and understand the information being

presented. White space helps to break up a design and make it easier for viewers to read and understand.

It adds visual interest: White space can add a sense of visual interest and sophistication to a design, helping to make it more appealing and aesthetically pleasing.

Overall, white space is an important design element that should be carefully considered in any graphic design project. It helps to create balance, focus attention, reduce clutter, and improve readability, all of which are essential for effective communication and a successful design.

1. No white-space
2. With white-space
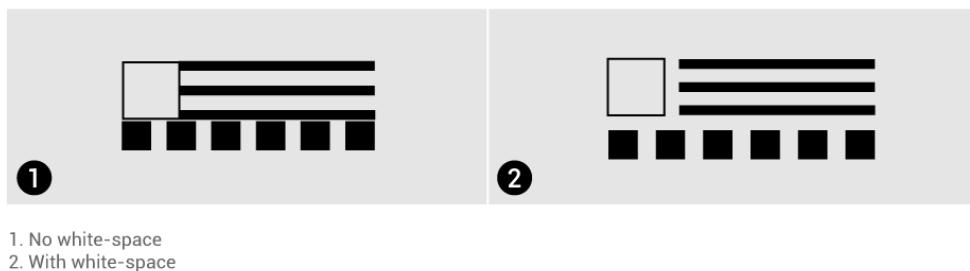
2.5 Visual Hierarchy

Visual hierarchy is the arrangement of visual elements in a way that indicates their importance or priority. It helps to guide the viewer's eye through a design and allows them to understand the relationships between different elements. In graphic design, visual hierarchy is important because it helps to:

Emphasize the most important information: By using techniques such as size, color, and placement to give certain elements more emphasis, designers can help the viewer to understand which information is the most important.

Guide the viewer's attention: By using visual hierarchy, designers can control the order in which the viewer processes information, leading them through the design in a logical and intuitive way.

Improve readability: When a design is well-organized and has a clear visual hierarchy, it is easier for the viewer to read and understand the information being presented.

Create a cohesive and coherent design: By using visual hierarchy to establish a clear structure and organization for a design, designers can help to create a cohesive and coherent overall look and feel. [3]

1. No Visual Hierarchy
2. With Visual Hierarchy
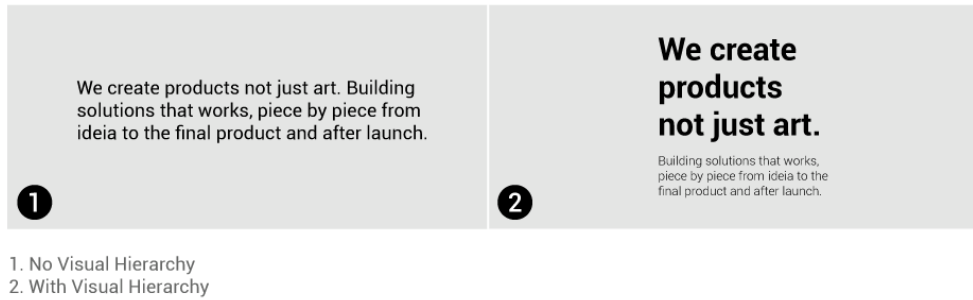
Overall, creating a strong visual hierarchy is an important aspect of effective graphic design. It helps to emphasize the most important information, guide the viewer's attention, improve readability, and create a cohesive and coherent design.

2.6 Grid System

A grid system is a framework used to organize content in a design. It consists of a series of horizontal and vertical lines that intersect to create a series of cells, which can be used to position elements in a consistent and structured way. In graphic design, the grid system is important because it helps to:

Create a sense of order and structure: The grid system provides a clear and consistent structure for a design, helping to create a sense of order and organization.

Improve alignment and balance: By positioning elements within the grid system, designers can ensure that they are aligned and balanced, which helps to create a cohesive and professional-looking design.

Facilitate the use of white space: The grid system helps designers to effectively use white space within a design, which can improve readability and create a sense of balance and harmony.

Facilitate responsive design: The grid system can also be used to create designs that are responsive, meaning that they adjust and adapt to different screen sizes and devices.

Overall, the grid system is an important tool for graphic designers, as it helps to create a sense of order and structure, improve alignment and balance, facilitate the use of white space, and facilitate responsive design. [4]
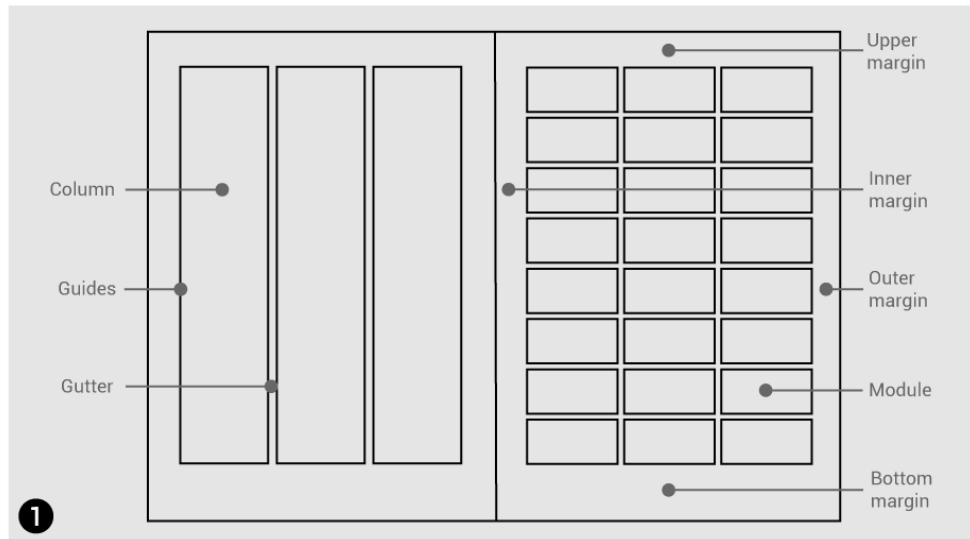
1. Grid System Anatomy

2.7 Icons

An icon is a small graphic symbol or visual representation of an object, concept, or action. Icons are commonly used in user interfaces, such as on websites and mobile apps, to help users navigate and interact with the interface. Icons are typically simple, easily recognizable symbols that can be quickly understood. Icons can be used to represent a wide range of objects, concepts, and actions, such as a folder for storing files, a trash for deleting items, or a heart for indicating favouritism. Icons are an important design element because they help to make interfaces more intuitive and user-friendly. By using recognizable and meaningful symbols, designers can help users understand and navigate an interface more easily and efficiently.

There are several principles or "laws" [5] that designers can follow when creating icons in graphic design:

Keep it simple: Icons should be simple and easily recognizable, using minimal lines and shapes to convey their meaning.

Use consistent styles: All icons in a set should use the same style and visual language, to create a cohesive and consistent look.

Use clear, recognizable imagery: Icons should use clear and recognizable imagery that is easy for the viewer to understand.

Use meaningful symbolism: Icons should use meaningful symbolism that accurately represents the concept they are meant to represent.

Consider context: The context in which an icon will be used should be taken into consideration when designing it, to ensure that it is appropriate and effective.

1. Bad set of Icons
2. Good set of Icons
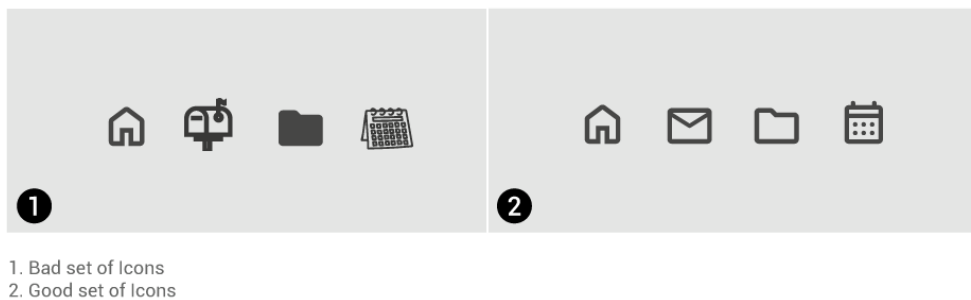
Overall, these principles can help designers create effective and clear icons that are easy for the viewer to understand and use.

2.8 Photography

Photography involves creating a composition, setting up lighting and other technical elements, and then capturing an image using a camera. The resulting photograph can then be processed and edited to achieve the desired look and feel. Here are some principles you can use in graphic design to maintain unity using photography:

Use consistent lighting: When using multiple photographs in a design, try to ensure that the lighting is consistent across all the images. This will help to create a cohesive look and feel for the design.

Choose similar angles: Using photographs taken from similar angles can help to create a sense of unity in the design. For example, if you are using photographs of people, try to use images that are taken from a similar height and distance.

Use consistent cropping: When using photographs in a design, try to maintain consistent cropping. This means using similar framing and composition techniques across all the images.

Use consistent color palettes: Choose a consistent color palette for the photographs in your design. This could include using a similar color scheme or tonal range across all the images.

Use consistent filters: If you are using filters or adjustments to alter the appearance of the photographs in your design, try to use similar techniques and settings across all the images.

By following these principles, you can help to create a cohesive and unified look in your graphic design using photography.

2.9 Typography

Typography is the art and technique of arranging type to make written language legible, readable, and appealing when displayed. It is an important element of graphic design because it plays a central role in how a design is perceived and understood. A typeface is a collection of letters. While each letter is unique, certain shapes are shared across letters. A typeface represents shared patterns across a collection of letters. Typefaces that are selected for their style, legibility, and readability are most effective when following the fundamental principles of typographic design [3][4]. In graphic design, typography is important because it helps to:

Convey meaning and message: Typography is an important way of communicating information and ideas in a design. The typeface, size, color, and spacing of the text all contribute to the meaning and message of the design.

Create a visual hierarchy: Typography can be used to create a visual hierarchy, emphasizing the most important information and guiding the viewer's eye through the design.

Set the tone and mood: The typeface and style of typography can also help to set the tone and mood of a design, influencing the way it is perceived by the viewer.

Enhance the aesthetic appeal: Typography can also be used to enhance the overall aesthetic appeal of a design, making it more visually appealing and attractive.

Overall, typography is an essential element of graphic design, playing a key role in how a design is perceived, understood, and remembered.

Type classification

Typography has several classifications. For this document will be considered, the most used in print documents and for digital purpose, namely Sans serif, serif and handwriting.[5]

A) Serif

A serif is a small shape or projection that appears at the beginning or end of a stroke on a letter. Typefaces with serifs are called serif typefaces. Serif fonts are classified as one of the following:

Old-Style serifs resemble writing in ink, with:

- Low contrast between thick and thin strokes
- Diagonal stress in the strokes
- Slanted serifs on lower-case ascenders

Transitional serifs have:

- High contrast between thick and thin strokes
- Medium-High x-height
- Vertical stress in the strokes
- Bracketed serifs

Didone or neoclassical serifs have:

- Very high contrast between thick and thin strokes
- Vertical stress in the strokes
- "Ball" terminal strokes.

Slab serifs have:

- Heavy serifs with imperceptible differences between the stroke weight
- Minimal or no bracketing

1. Old-Style Serif
2. Transitional Serif
3. Neoclassical Serif
4. Slab Serif

B) Sans Serif

A typeface without serifs is called a sans serif typeface, from the French word "sans" that means "without." Sans serifs can be classified as one of the following:

- **Grotesque:** Low contrast between thick and thin strokes, vertical or no observable stress
- **Humanist:** Medium contrast between thick and thin strokes, slanted stress
- **Geometric:** Low contrast between thick and thin strokes, with vertical stress, and circular round forms

1. Grotesque Sans Serif
2. Humanist Sans Serif
3. Geometric Sans Serif

C) Handwriting

Handwriting typefaces are unconventional with a natural, handwritten feel. They come in the following forms:

- **Black letter:** High contrast, narrow, with straight lines and angular curves
- **Script:** Replication of calligraphic styles of writing (more formal)
- **Handwriting:** Replication of handwriting (less formal)
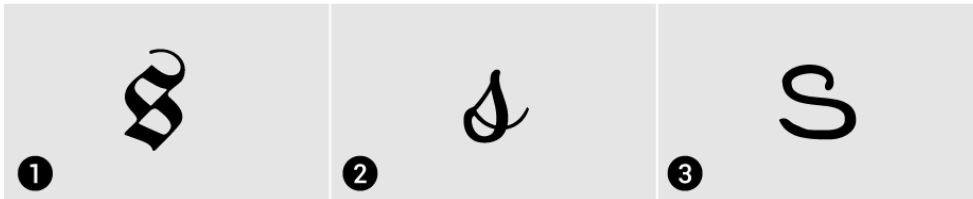
1. Black Letter
2. Script
3. Handwriting

Font size units

The following units are used to express font size on Android, iOS, and the web.

Platform	Android	iOS	Web
Font size unit	sp	pt	rem
Conversion ratio	1.0	1.0	0.0625

Line length

Line lengths for body text are usually between 40 to 60 characters. In areas with wider line lengths, such as desktop, longer lines that contain up to 120 characters will need an increased line height from 20sp to 24sp. [5]
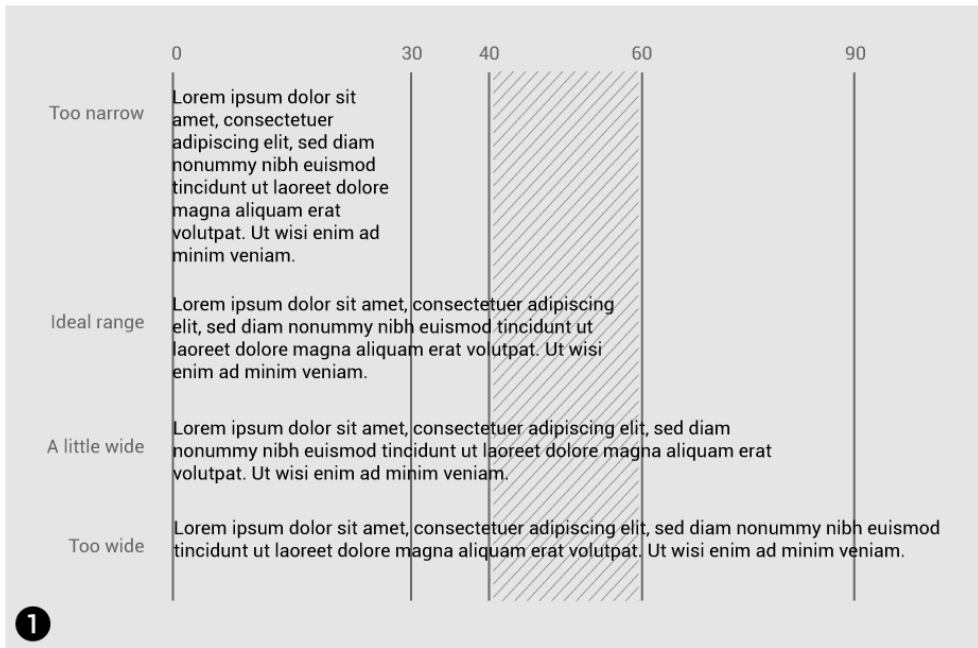
1. Ideal line lenght

Type alignment

Type alignment controls how text aligns in the space it appears. The most common alignments text types are:

Left-aligned: when text is aligned to the left margin. Use whenever possible. This type of alignment is the most accessible in terms of legibility and readability.

Right-aligned: when text is aligned to the right margin. Avoid whenever possible.

Centered: when text is aligned to the center of the area it is set in. This type of alignment creates a cohesive and highly structured block of text but makes wrapping more difficult.

2.10 Color Systems

Color theory explains how humans perceive color; and the visual effects of how colors mix, match, or contrast with each other. Color theory also involves the messages colors communicate; and the methods used to replicate color. In color theory, colors are organized on a color wheel and grouped into 3 categories: primary colors, secondary colors and tertiary colors.

Hue, shade, tint and tone: Color is the general term we use to describe every hue, tint, tone or shade we see. White, Black and Gray are often referred to as a color. A HUE refers to the dominant Color Family of the specific color we're looking at. White, Black and Grey are never referred to as a Hue. Tints, tones and shades are variations of hues, or colors, on the color wheel.

Overall, Hue is a pure pigment; Tone is a pure pigment with just grey added; Tint is a pure pigment with just white added and a Shade is a pure pigment with just black added.

Color Models: Color models are mathematical models that allow us to define, create, and manipulate colors with a high degree of accuracy and precision. Through these models, we can easily capture and reproduce colors for a wide variety of applications, from printed documents to digital media. The RGB color mode is used if the project is to be displayed on any screen. RGB color scheme is used in electronic displays such as LCD, CRT, cameras, scanners, etc. This color scheme is an additive type mode that combines the colors: - red, green, and blue, in various degrees which creates a variety of different colors. CMYK mode stands for Cyan Magenta Yellow Key (Black). It is the color scheme used for projects including printed materials. This color mode uses the colors cyan, magenta, yellow and black as primary colors which are combined in different extents to get different colors.

The color wheel: The color wheel consists of three primary colors (red, yellow, blue), three secondary colors (colors created when primary colors are mixed: green, orange, purple) and six tertiary colors (colors made from primary and secondary colors, such as blue-green or red-violet). [2][3]

Color schemes:

Color Schemes Table				
Color Schemes	Description	Ambience	Example	
Monochromatic	Tints and shades of a single hue	Unified, Harmonious and professional	White, light blue, medium blue, dark blue	
Analogous	Several colors adjacent to each other on the color wheel	Harmonious, Stylish and pleasing	Yellow, blue and red	
Complementary	Two colors opposing each other on the traditional color wheel.	Vibrant, jarring and attention-getting	Orange and blue	
Triad	Three evenly spaced colors around the traditional color wheel	Bold, vibrant, potentially jarring	Yellow, blue and red	

Warm	Variations of yellow, orange and red	Warm, energy, cozy and inviting	Yellow, orange and red	
Cold	Variations of greens, blues and purples	Slick, peace, serenity sophisticated and professional	Green, blue and purple	

1. Monochromatic   4. Triad
2. Analogous   5. Warm
3. Complementary   6. Cold

Limitations:

According to the Blindness and Vision Impairment Collaborators & Vision Loss Expert Group of the Global Burden of Disease Study, approximately 8% of men and 0.5% of women worldwide have deficiencies in color vision. [6] This translates to approximately 300 million people worldwide. Therefore, it is recommended that especially complementary colors, such as red and green or yellow and blue, are not used to separate information. For people with color vision deficiencies there might still be a visible highlighting effect, but other information will be lost.

2.11 Designing for Different Outputs

Before starting to design outputs, you must understand the platform that you'll use to optimize its visualization and subsequent handling. There are some considerations to take for:

Printed outputs:

- CYMK color mode – optimize the color mode for posters, flyers, printed pdfs, etc.
- File size and image quality – For print PDF artwork, image quality must match print quality (normally 300 dots per inch) otherwise it probably will get pixelated.

Digital outputs:

- RGB color mode – optimize your documents to this color mode if you are designing multimedia presentations, videos, digital pdf, websites, etc.

- File size and image quality – For digital PDFs should match screen quality (typically 72 to c. 160 pixels per inch), otherwise they will be heavy and take more time to download.

3. Application on Specific PrepaCare^{XR} Outputs

The PrepaCare^{XR} project defines a framework to design medical simulations using XR (Extended Reality) technology and deliver it through a set of documentation and platforms. The end users, facilitators, and students can largely benefit from a set of design guidelines to make the learning curve more quick and more efficient in a very demanding environment as in the case of a hospital.

Therefore, an effort must be made to format all the relevant documentation/platforms according to the design guidelines presented in the last sections. The phases where the use of a proper design is of major importance are the simulation's pre-activities, i.e. the introductory and briefing made by the facilitators. Since these materials can be diverse, we present just a few examples of how those guidelines should be applied to the simulation artifacts.

3.1 Color Coding System

PrepaCare^{XR} deals with the very valuable but complex topic of clinical scenarios – partially correlated with high risk – in the hospital context and aims to support education and training in this field. In order to visualize the formal and serious context, the cold color scheme was chosen as design basis. The project therefore sought to adhere to the different color aspects of the following three chosen primary colors:

- Resolution blue – RGB: 37, 61, 135
- Spray – RGB: 138, 208, 219
- Mantis – RGB: 134, 197, 71

3.2 Example of Application of the Design Guidelines on the Course Structure

- Alignments and Grid System – use grid system to structure the content, center information which is important for structure, left-align other informative content of lower hierarchy, such as explanations and labels or captions
- Hierarchy – select settings of design techniques such as size, color and placement for putting headlines and important information into focus
- Proximity – information belonging to the same or a similar topic should be positioned close to each other

- White/negative space – use space to focus attention on the different parts of the course
- Color – headers or important information may be highlighted by using different text color, however, an overload by usage of multiple colors within the same structural object and extensive coloring must be avoided
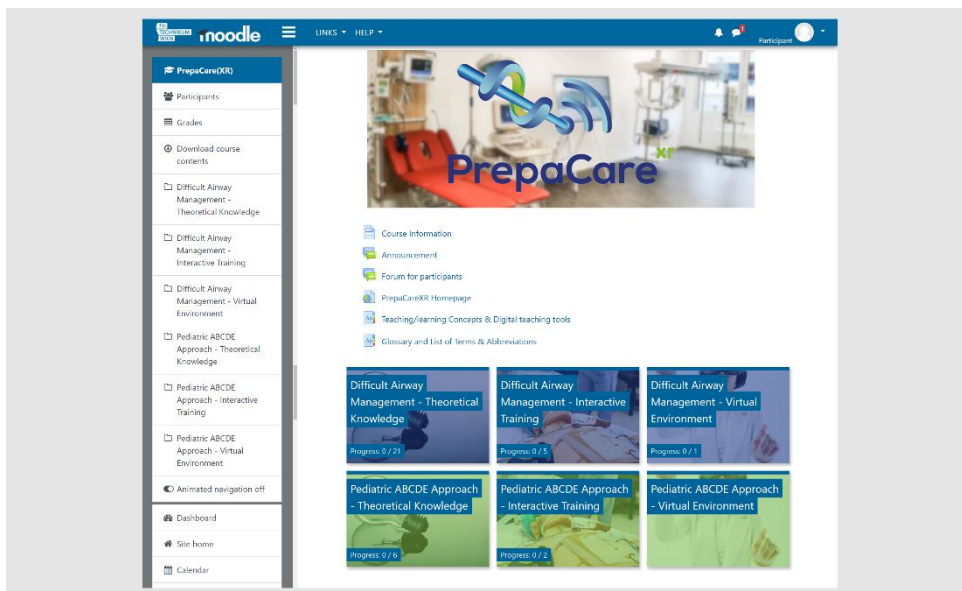

Layout for the e-learning (Moodle) course

3.3 Example of the Use of Design Guidelines to Create Layouts

- Alignments and Grid System – create spatial relationships, create a sense of order and structure, and facilitate the implementation (in case of digital approach the implementation of responsive design)
- Hierarchy information – provide the right relationship and importance of the displayed information.
- Gestalt laws – Proximity (group the information with the same topic, like "patient data" or "indications")
- Negative space – proper use of white/negative space helps to create balance, improve hierarchy understanding and helps to focus attention.
- Colors – use a color scheme which supports the message of the text and avoid imbalanced color appearance and overstimulation by excessive color application

1. Possible layout
2. Possible layout using the Design Guidelines
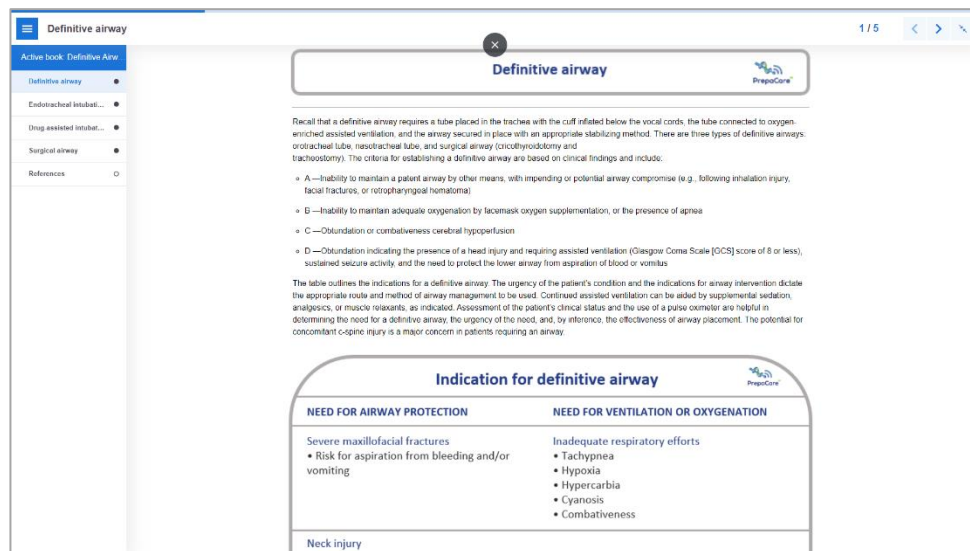
Layout for the interactive handbook

3.4 Example of the Use of Design Guidelines to Images

- Gestalt laws – Proximity (arrange the labeling of thematically related components closer together and keep more distance to other/different thematic groups)

- Negative space – use the white space to separate different parts of the image

- Color – use high contrast color for labels and a content-supporting color scheme for graphical visualization (e.g. complementary color for different tissue type), still allowing to distinguish between the components
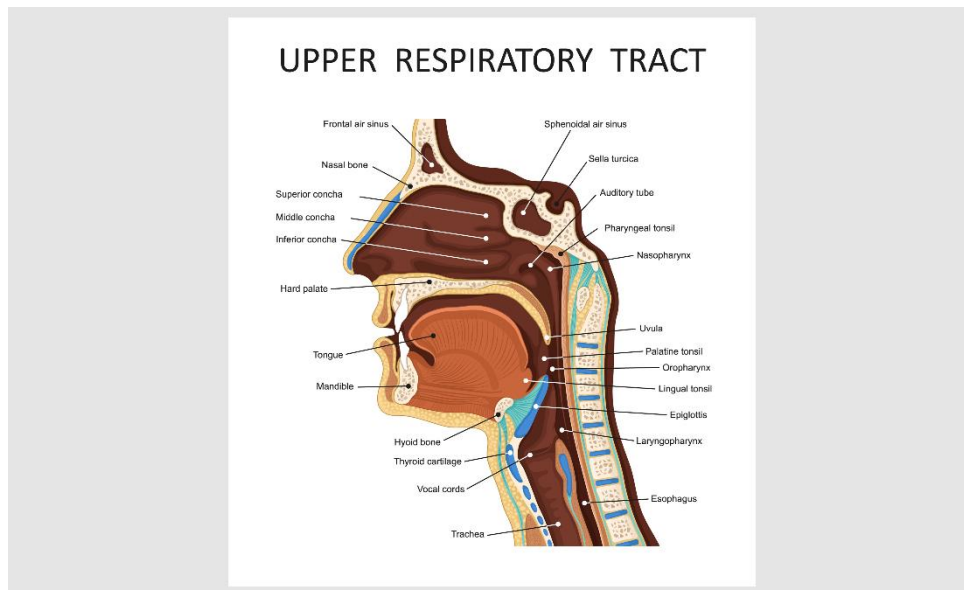
Layout for explanatory images

3.5 Example of Application of Guidelines on PDF Activities Sheet

- Alignments and Grid System – create spatial relationships, create a sense of order and structure.

- Gestalt laws – Proximity

- Negative space – proper use helps to create balance, improve hierarchy understanding and helps to focus attention.

- Photography / images – Create a cohesive and unified look and if the images do not help the message, they are superfluous.

- Icons – remove any type of icons that could lead to a wrong action (arrow)

1. Possible PDF layout

2. Possible PDF layout using the Design Guidelines

References

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[3] Lupton, E., & Cole Phillips, J. (2015). *Graphic Design: The New Basics.* Princeton Architectural Press.

[4] Müller-Brockmann , J. (1996). *Grid systems in graphic design: A visual communication manual for graphic designers, typographers and three dimensional designers.* Niggli Verlag.

[5] Google (n.d.). *Material Design.* Material Design. Retrieved December 14, 2022, from https://m3.material.io/

[6] GBD 2019 Blindness and Vision Impairment Collaborators, & Vision Loss Expert Group of the Global Burden of Disease Study (2021). *Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight: an analysis for the Global Burden of Disease Study.* The Lancet. Global health, 9(2), e144–e160. https://doi.org/10.1016/S2214-109X(20)30489-7