Chapter I: Software Quality and Human factores

• The quality of software is defined by its ability to satisfy user needs. It is defined by ANSI as "the set of attributes and characteristics of a product or service that relate to its ability to satisfy given needs".

• The quality model presented in the first part of the standard, ISO/IEC 9126-1, classifies software quality in a structured set of characteristics and subcharacteristics as follows:

- **1. Functionality**: "A set of attributes that bear on the existence of a set of functions and their specified properties. The functions are those that satisfy stated or implied needs."
 - Suitability
 - Accuracy
 - Interoperability
 - Security
 - Functionality compliance

- **2. Reliability**: "A set of attributes that bear on the capability of software to maintain its level of performance under stated conditions for a stated period of time."
 - Maturity
 - Fault tolerance
 - Recoverability

3. Efficiency: "A set of attributes that bear on the relationship between the level of performance of the software and the amount of resources used, under stated conditions." ✓ Time behaviour ✓ Resource utilization
4. Maintainability: "A set of attributes that bear on the effort needed to make specified modifications."
 ✓ Analyzability ✓ Changeability ✓ Stability

5. Portability - "A set of attributes that bear on the ability of software to be transferred from one environment to another."

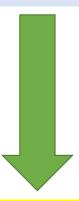
√ Adaptability

√ Testability

- ✓ Installability
- **✓** Co-existence
- ✓ Replaceability

6. Usability: "A set of attributes that bear on the effort needed for use, and on the individual assessment of such use, by a stated or implied set of users."

- ✓ Understandability
- ✓ Learnability
- ✓ Operability



Computer ergonomics (Usability engineering)

Ergonomics (HFE)

The word *ergonomics* —"the science of work" — is derived from the Greek *ergon* (work) and *nomos* (laws). The terms *ergonomics* and *human factors* are often used interchangeably or as a unit (e.g., human factors / ergonomics — HFE or EHF) a practice that is adopted by the IEA. The definition of ergonomics (or human factors) adopted by the IEA in 2000 is: *The scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and methods to design in order to optimize human well-being and overall system performance.*

Computer ergonomics

(or interface ergonomics) is a branch of ergonomics, which aims to improve human-machine interactions, ease of use and learning of interactive products. This practice seeks to design or modify interfaces so that they are in line with the physiological, perceptual and cognitive characteristics of their potential users. It relies on different design and evaluation methods to obtain the software or website best suited to the intended users.

Web ergonomics

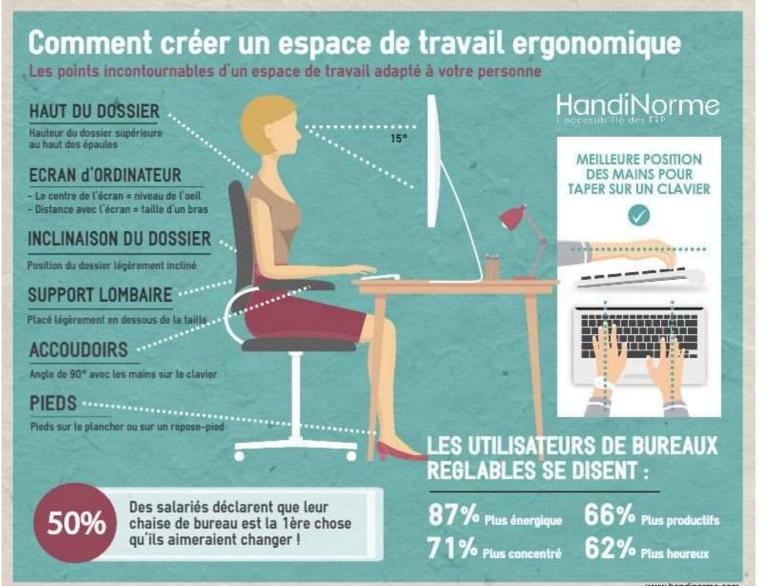
The ergonomics of a web product (also called usability) represents all the aspects of the interface in question allowing efficient, pleasant, easy use, etc. The ultimate goal of web ergonomics is ultimately to facilitate the interaction between the website and the user.

Types of ergonomics

- Physical / physiological ergonomics
- Organizational ergonomics
- Cognitive ergonomics

1.Physical ergonomics

Is concerned with human anatomical, anthropometric, physiological and biomechanical characteristics as they relate to physical activity.



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Adapting to device

There are multiple viewing and input devices. A desktop computer has a larger screen and multiple input devices like keyboard and mouse. The tablet and the smartphone are touch devices.

Périphériques et ergonomie physique



dsgn.fr

- It is important to take into account the grip and the size of the screen of a smartphone or tablet to design a suitable interface.
- The layout, placement of navigation elements, and overall interactions will be different on these devices.
- visual accessibility is a fundamental issue for public service websites since they are aimed at as many people as possible.
- We must allow access to the content in the best conditions by offering a contrasting version or the possibility of increasing the size of the body of the text, etc.



Troubles visuels

Troubles musculo-squelettiques

Visual disturbances

Disturbance musculo-squelettiques



2. Organizational ergonomics

Organizational ergonomics considers the structures, policies and processes of any organization. The goal of organizational ergonomics is to achieve a harmonized system, taking into consideration the consequences of technology on human relationships, processes and organizations. Examples of organizational ergonomics include:

- Teamwork.
- Communication.
- Quality management.
- Crew resource management.
- Introduction of new work paradigms.
- Design of working times/duration.
- Work design and flow.
- Telework.

3. Cognitive ergonomics

Cognitive ergonomics focuses on mental processes such as perception, memory, information processing, reasoning, and motor response as they affect interactions among humans and other elements of a system. (Vicente, 1999; Hollnagel, 2003; Diaper and Stanton, 2004).

Cognitive ergonomics is the major aspect of HMI ergonomics

Cognitive sciences study the functioning of the human mind by referring to the studies of other disciplines, such as neuroscience or psychology.

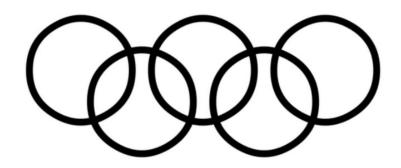
Example

THE 6 LAWS OF GESTALT

#1 law of good form (Prägnanz)

Our brain tries to recognize simple and stable shapes that are familiar to it. Our perception of the elements will be done in a global way, by seeking to group together elements that go together. You surely know the illusion that explains this law: you can see here either a rabbit or a duck but never both at the same time. Your brain is trying to recognize a shape it knows and can easily interpret.





C'est une loi principale dont les autres découlent

It is a main law from which the others derive

Prägnanz **CNN** Travel You've Got Updated 2117 pm 831, July 28, 3014 U.E. ands fored proof fight fam. A tense wash for all treatmen. Senter, MA (SOE) When details on regar treatment of the details on regar treatment and the sentence of the sentence of the sentence for the sentence of the Work details on major US arports a

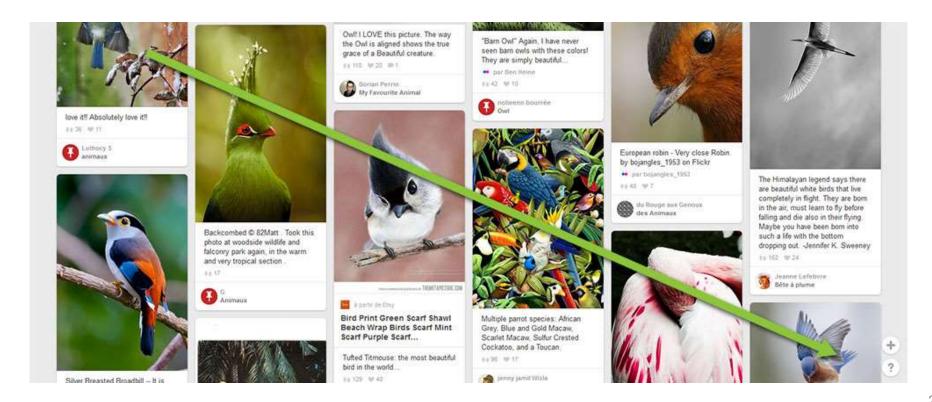
#2 law of continuity

Our eye perceives the close elements as part of the same whole. This encourages the gaze to follow a path. For example: loaders. They are made up of circles of different colors that alternate. We come to interpret them as advancing circles.





Pinterest uses this principle tactfully. Image strips are staged in such a way that we tend to link an image to its next door neighbour. Thus, in addition to scanning the entire screen, due to the offset of the images between them, we are invited to scroll ever lower in order to follow this infinite form.



#3 law of proximity

The closest similar items are grouped together. To avoid confusing associations, separation between elements that could be grouped together is essential.

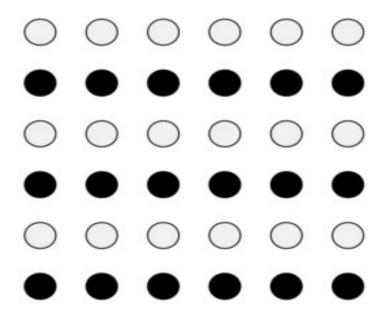
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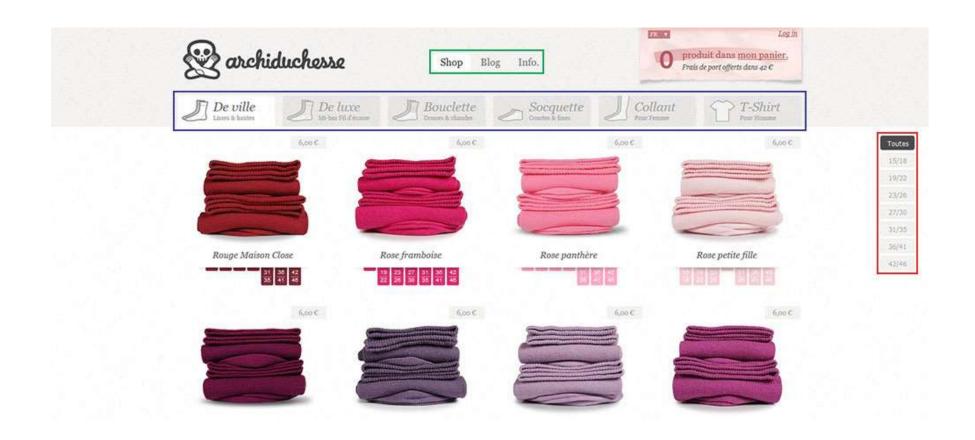


In this example of the e-commerce site, the proximity law is not respected (confusion between the link, the products and the price)

4 Law of similarity

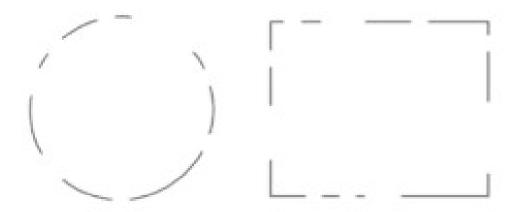
If our brain cannot use distance to group things together, it will look for shapes that are similar. Associations can be made by shape, color, orientation or other criteria. It is this link that allows us to better understand the difference between the labels of an e-commerce.

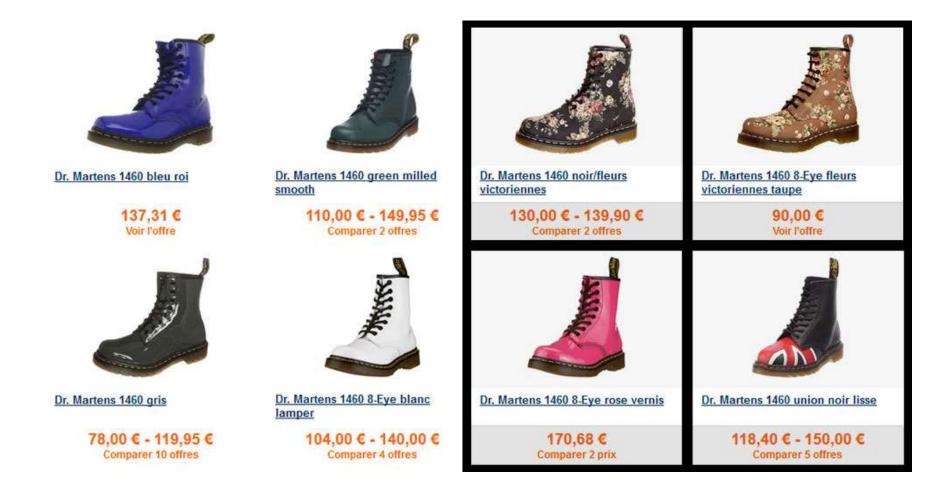




#5 Closing Law

Our brain seeks to interpret the elements perceived as a coherent whole and will complete the forms seen partially. A series of curved lines will be interpreted as a circle.

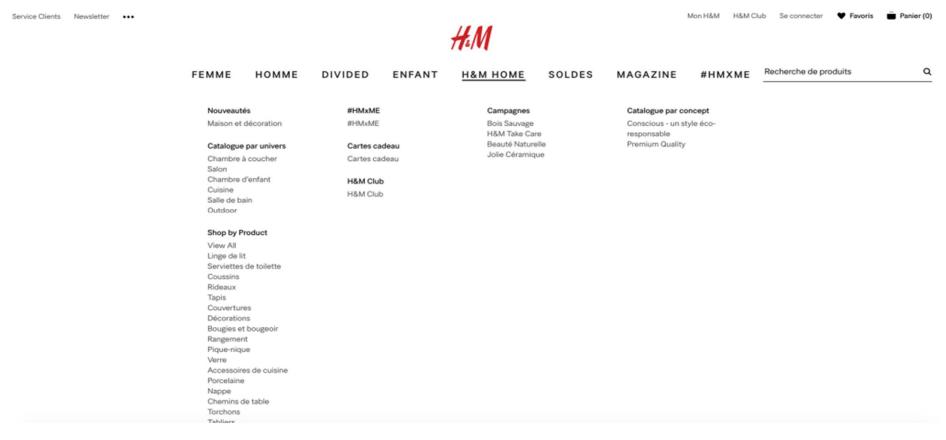


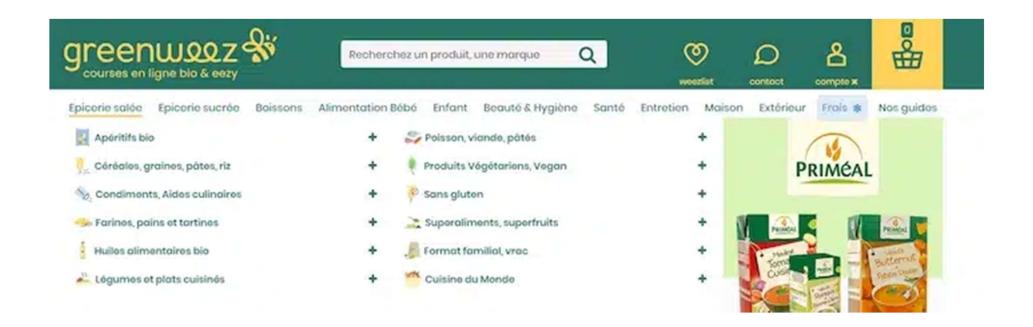


To return to our precedent example: we understand more easily, here, the organization of the table on the right than the one on the left, because the area allocated to each element is clearly delimited and defined.

#6 law of common destiny

Elements going in the same direction will be assimilated, as belonging to the same group. Equivalent movement indicates a relationship between objects.

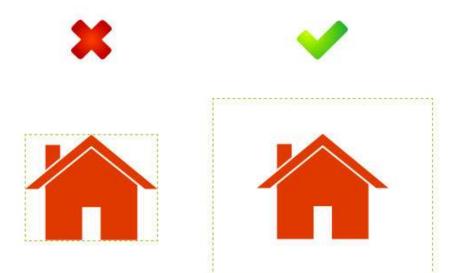




on the Greenweez site, the animation of the menus is the same for each category. In addition, the selected rang is underlined in yellow.

Fitts' law

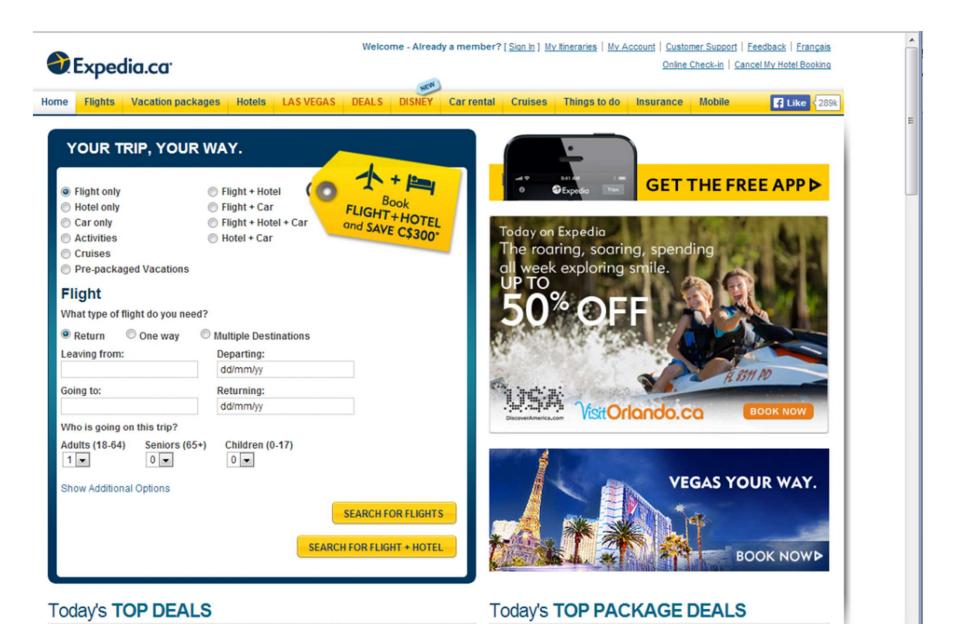
Fitts' law states that the time required to reach a target is proportional to the size of the object as well as the distance at which it is located. Thus, the larger and closer a target is, the faster it is to hit.

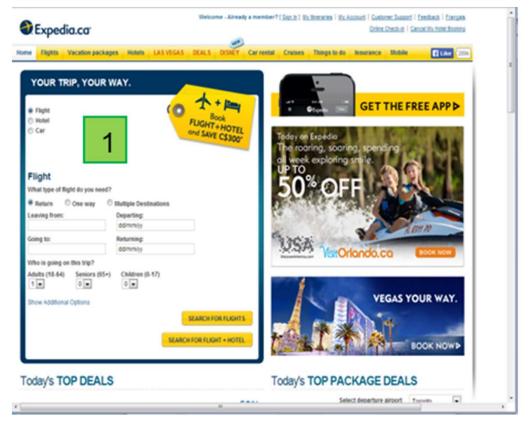


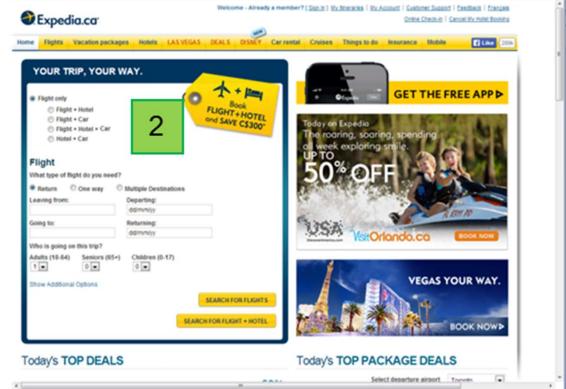
On a website, when creating an image link for example, it may be wise to expand the clickable field beyond the image itself (if the design allows it) in order to facilitate the user action.

Hick's law

Hick's law states that the time needed to make a decision increases with the number of possible alternatives. That is, the more varied and greater the choice, the longer the decision-making time. In short, on an e-commerce site, for example, if the list of products offered is too large, it may be interesting to help the user to target his request, thus making it possible to reduce the number of results displayed: by offering options to tick in order to specify his request in particular (colors, sizes, brands, etc.) or by offering him a display sort (by price, by popularity, etc.).







Miller's magic numbers

"Human beings can retain about 7 items at a time in short-term memory, plus or minus two items". More recent studies have, in fact, established that this number is 4. Thus, when setting up a list or a set of elements of the same nature, it may be interesting to group them into subgroups so as to identify only 2 to 4 large groups.



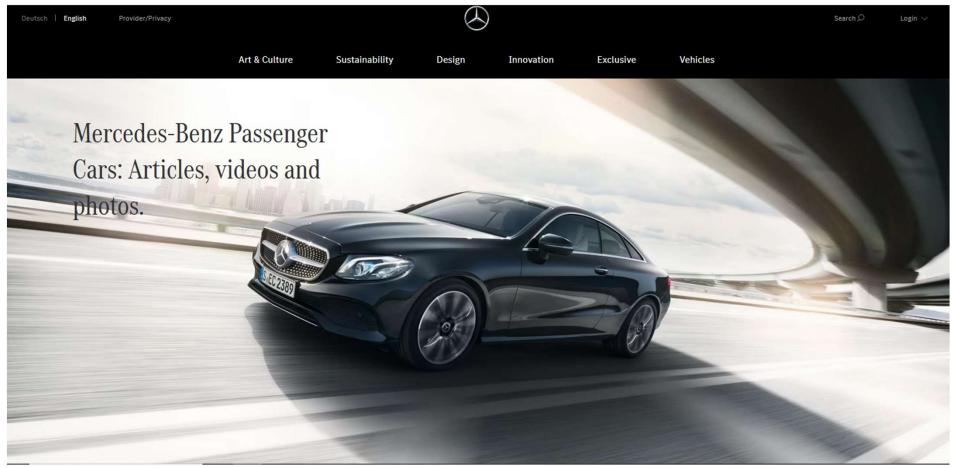
In this example, the options for possible actions offered by gmail are presented to us in 2 groups of 3 instead of 6 groups. In this way, the reading of the options is facilitated.

Color psychology

Our memory determines what a color means to us and how colors affect our thoughts and feelings. Colors determine the experience of our self and the environment. They influence our behavior and control our actions, even though we rarely recognize the causes

Rem: certain colors have deep-rooted cultural significance. For instance, in Western cultures, red is an attention-grabbing color that signifies danger and urgency (think stop signs). However in some Eastern cultures, like China and India, red represents luck and happiness.

Black: modern, classic and sober, black is the color of luxury, ideal for high-end products.



Blanc: purity, peace, clarity, cleanliness. It is used in medicine, news, industry, science. It is associated with black, gray, silver, gold. It is a color that can be used on all types of websites.

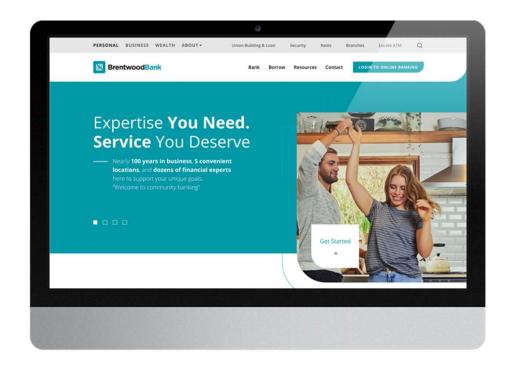


Green: When we see green, we think of two things: nature and money. Green also has a calming effect, so if that's important to your brand, it'll be a good choice for your website.



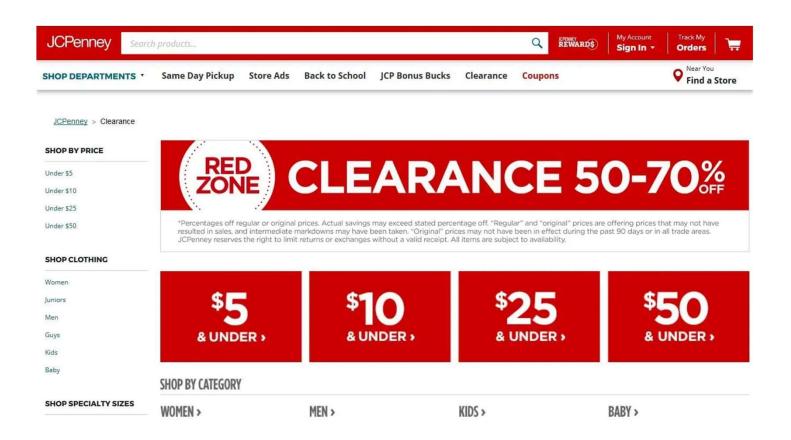


Blue: the most versatile and beloved color. Since blue inspires confidence, it's no wonder it's the most popular color for brands. Moreover, it can be noted that blue appears in more than half of the logos.





Red: energy, excitement, passion and danger. Using red on your website is a great way to push your visitors to action.



Yellow: since it is the color of the sun, yellow is generally associated with: happiness, optimism, creativity, friendliness





Pink: It is often used to target a female audience, it expresses sweetness and sincerity



Color scheme

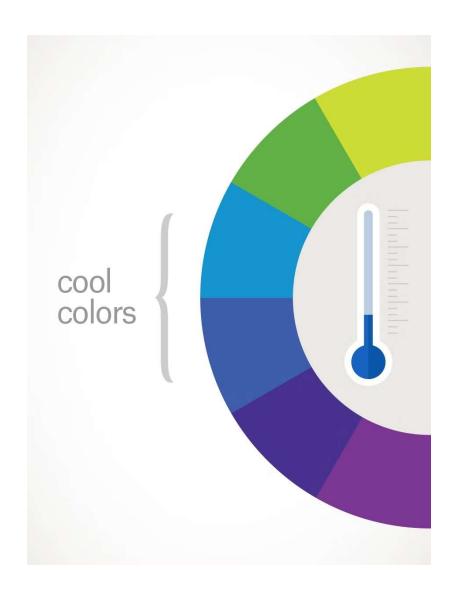
It is important to understand how the color wheel and colors work (which ones go well or not and what they evoke) to communicate effectively with visitors to your website.

The color wheel is made up of three **primary colors** (red, yellow, and blue), three **secondary colors** (obtained by mixing the primary colors: green, orange, and purple), and six **tertiary colors** (which obtained by mixing the primary and complementary colors: blue green, red purple, etc.)



Draw a line in the center of the circle to separate warm colors (red, orange, yellow) from cool colors (blue, green, purple).

Warm colors are associated with energy, brightness and action, while cool colors are often associated with calm, peace and serenity. Understanding that colors have "temperatures" will help you understand how much they can influence your message.





- There are certain groups of colors that work together very well...they might be referred to as Color Schemes.
- There are some basic color schemes that have worked well for many years...
- It's not just a matter of aesthetics. It's not just a matter
 of favorite color. Choosing the best website color
 scheme is also a matter of SEO, the psychology of a
 website's color palette, and marketing.

Monochromatic

A color scheme using one color, and tints, tones and shades of that color.

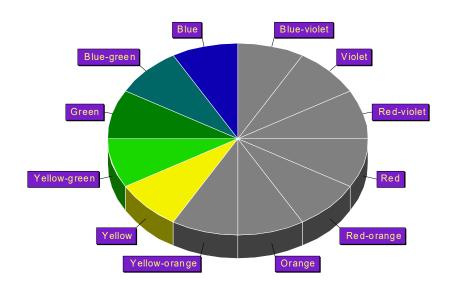






Analogous

A color scheme using colors next to each other on the color wheel.



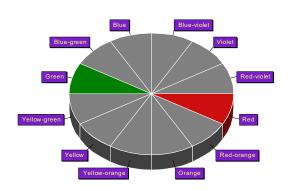
Note that even though these are very bright hues of 5 colors next to each other on the color wheel, that they are analogous, even though they are bright.





Complementary

A color scheme using colors opposite each other on the color wheel





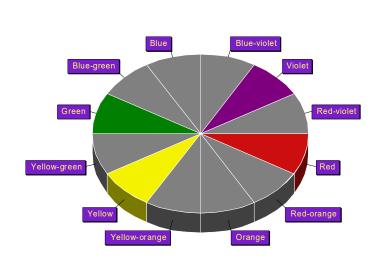


Note again that even though the colors are dulled red and green, they are still complementary.



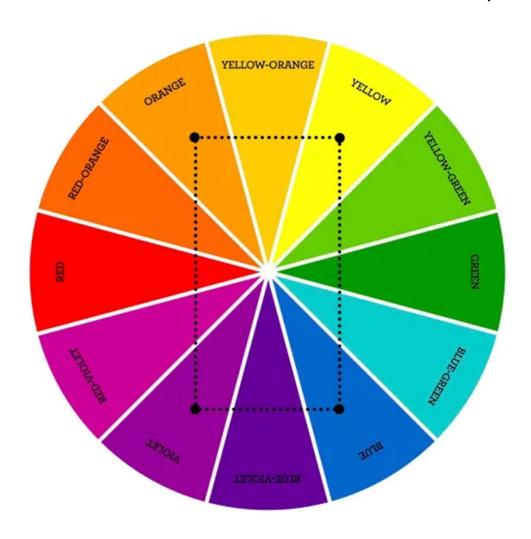
Double Complementary

A Color scheme using two sets of complementary colors.





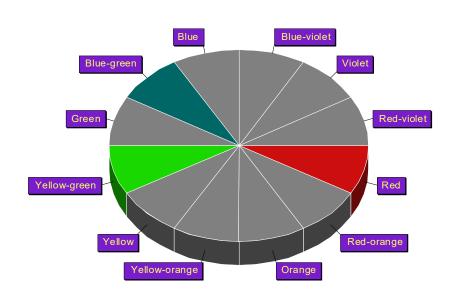
To make it even easier, this kind of color combination is also known as *rectangular colors* because when the four colors are connected on the color wheel they form a rectangle.





Split Complementary

A color scheme using one color, and the colors on either side of its complement.

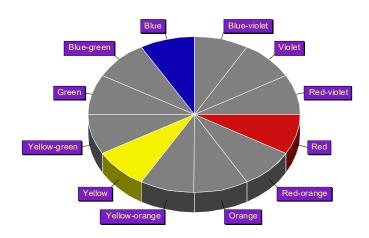






Triad

A color scheme using three colors equal distance from each other on the color wheel.







text ergonomics

Reading on websites means reading from the screen and this is very tiring compared to reading from paper. In order to do so, we must respect some rules for displaying texts on websites to comfort the browser visually and psychologically.

To facilitate the reading of a web page, here are some useful typographical rules and recommendations.

1. Choose a suitable web typography

The main objective of a site is to convey information, to be read and to make Internet users want to come back. Choosing a typography capable of conveying the message is not so easy.

Main text: The 10 point rule.

There is no hard and fast rule for font size, but make sure the main text is at least 10 points or larger. It is accepted that for the general public, teenagers and adults, the font size can vary from 10 to 12 points. For seniors and young children, using a font size between 12 and 14 points is preferable.

Choice of fonts.

- Choose a font from the most used fonts that come with basic operating systems Times, Helvetica, Arial, Verdana, Georgia, etc.
- Opting for a standard font means controlling the display of text on the screen and offering better readability to users.
- Ensure that the chosen fonts are available on the user's computer.

The same font size can make text appear larger or smaller depending on the font used.

Astuce web:

Une même taille de police peut faire paraître plus grand ou plus petit le texte selon la police utilisée.

Arial 12 points

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Verdana 12 points

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Consistent typefaces.

Use consistent typographic rules throughout the site.

Examples:

For page titles:

- level 1 page titles will be written in: "font n, body n,...".
- Level 2 page titles will be written in: "font n, body n,...".
- Level 3 page titles will be written in: "font n, body n,...".

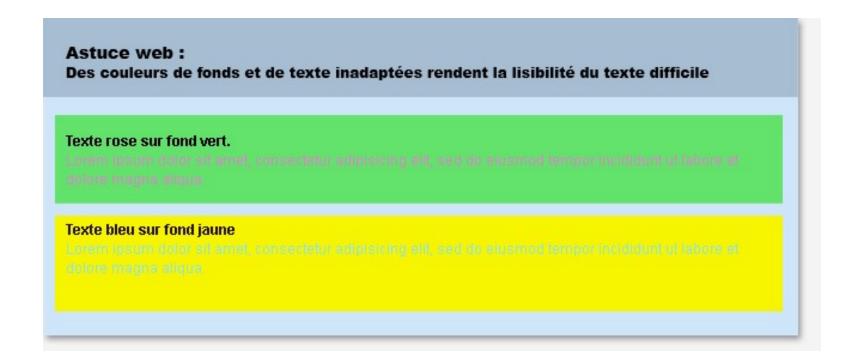
The navigation texts will be written in: "font n, body n,...". The other texts will be written in: "font n, body n,...".

For each title, the size of the characters will be proportional to its level (example: a level 3 title should not be written larger than a level 1 title).

Avoid using more than three different fonts on the same page. Too many fonts affect the readability of a text and therefore the understanding of the page.

2. Create strong contrast between text and web background.

To improve visual comfort, particular attention must be paid to the contrast of the color of the text and that of the background (background) of a website.



3. Manage letter, word and line spacing.

Spacing between characters, words, lines affects readability

Astuce web:

Des espacements inadaptés entre les caractères rendent la lecture difficile

Caractères trop rapprochés

Des caractères trop près les uns des autres sont difficiles à différencier etrendent la lecture moins bonne. Des caractères trop près les uns des autres sont difficiles à différencier et rendent la lecture moins bonne. Des caractères trop près les uns des autres sont difficiles à différencier et rendent la lecture moins bonne. Des caractères trop près les uns des autres sont difficiles à différencier et rendent la lecture moins bonne.

Caractères trop espacés

Des caractères trop espacés empêchent le regroupement des lettres pour former les mots. La lecture est ralentie. Des caractères trop espacés empêchent le regroupement des lettres pour former les mots. La lecture est ralentie. Des caractères trop espacés empêchent le regroupement des lettres pour former les mots.

Astuce web:

Des espacements inadaptés entre les mots rendent la lecture difficile

Mots trop rapprochés

Si les mots sont trop près les uns des autres, ils se distinguent mal et la ligne de texte est difficile à parcourir pour l'oeil. Si les mots sont trop près les uns des autres, ils se distinguent mal et la ligne de texte est difficile à parcourir pour l'oeil. Si les mots sont trop près les uns des autres, ils se distinguent mal et la ligne de texte est difficile à parcourir pour l'oeil. Si les mots sont trop près les uns des autres, ils se distinguent mal et la ligne de texte est difficile à parcourir pour l'oeil.

Mots trop éloignés

sont trop espacés, le lien entre les mots pour former Lorsque les mots la phrase s'avère difficile à faire. Lorsque les mots sont trop espacés . le lien entre les à mots former la phrase s'avère difficile faire pour

Astuce web:

Des espacements inadaptés entre les mots rendent la lecture difficile

Aller à la ligne pour continuer la phrase ou la suite du texte devient difficile.

Lignes trop rapprochée
Si l'espacement des lignes n'est pas suffisant, il devient alors difficile de passer d'une ligne à l'autre.
L'effet de chevauchement rend difficile la poursuite de la lecture. Si l'espacement des lignes n'est pas suffisant, il devient alors difficile de passer d'une ligne à l'autre. L'effet de chevauchement rend difficile la poursuite de la lecture. Si l'espacement des lignes n'est pas suffisant, il devient alors difficile de passer d'une ligne à l'autre. L'effet de chevauchement rend difficile la poursuite de la lecture.

Lignes trop éloignées

Si l'espacement des lignes est trop important, il y a rupture dans le processus de la lecture. Aller à la ligne pour continuer la phrase ou la suite du texte devient difficile. Si l'espacement des lignes est trop important, il y a rupture dans le processus de la lecture. Aller à la ligne pour continuer la phrase ou la suite du texte devient difficile. Si l'espacement des lignes est trop important, il y a rupture dans le processus de la lecture.

4. Lower case rather than upper case.

- The use of capitals to write a text is to be avoided.
- Character and word shape recognition is made more difficult because the letters are all the same height. Reading is slowed down.
- When the text consists of several words, only capitalize the first letter of the group of words, even if it is a section title or a page title.

Astuce web : Un texte en capital est lu plus difficilement

L'utilisation des capitales pour écrire un texte est à proscrire. La reconnaissance des caractères et de la forme des mots est rendue plus difficile car les lettres ont toute la même hauteur. La lecture s'en trouve ralentie. L'utilisation des capitales pour écrire un texte est à proscrire. La reconnaissance des caractères et de la forme des mots est rendue plus difficile car les lettres ont toute la même hauteur. La lecture s'en trouve

L'UTILISATION DES CAPITALES POUR ÉCRIRE UN TEXTE EST À PROSCRIRE. LA RECONNAISSANCE DES CARACTÈRES ET DE LA FORME DES MOTS EST RENDUE PLUS DIFFICILE CAR LES LETTRES ONT TOUTE LA MÊME HAUTEUR. LA LECTURE S'ENTROUVE RALENTIE. L'UTILISATION DES CAPITALES POUR ÉCRIRE UN TEXTE EST À PROSCRIRE. LA RECONNAISSANCE DES CARACTÈRES ET DE LA FORME DES MOTS EST RENDUE PLUS DIFFICILE CAR LES LETTRES ONT TOUTE LA MÊME HAUTEUR. LA LECTURE S'EN TROUVE RALENTIE.

5. Highlight elements of the text.

Avoid writing in italics.

This style is difficult to read, even unreadable on the screen; however, it can sometimes be used only for short texts.

To catch the eye, several means are at our disposal. Two techniques are particularly effective provided you use them well: using bulleted lists and bolding characters.

The bulleted list.

- The bulleted list helps to structure the text well. Information is better organized, better organized and easier to memorize.
- Bulleted lists speed up reading, with bullets acting as visual markers guiding the eye through the page.

Astuce web:

Une liste à puce permet de structurer les informations et de mieux les retenir

Avec liste à puces

L'utilisation des listes à puces permet de :

- · structurer l'information
- · mieux hiérarchiser les informations
- rendre le texte plus facile à comprendre
- rendre plus facile la mémorisation des informations

Sans liste à puces

L'utilisation des listes à puces permet de : structurer l'information, mieux hiérarchiser les informations, rendre le texte plus facile à comprendre, rendre plus facile la mémorisation des informations

Bold characters.

Bolding is used to highlight and make certain important words more visible. It should not be abused because this enhancement technique would lose all its effectiveness. It is therefore advisable not to bold more than two or three words in a paragraph. These words thus form a set read at the same time. On the contrary, too many words put in bold complicate the reading and slow it down.

Do not underline words or text.

Underlining is only reserved for hypertext links. Using it other than for links is confusing for the user: he no longer knows what is clickable and what is not. If text other than links needs to be highlighted, use bold

Rules for images

Why are your site images so important?

Make a good first impression

Visuals are the first elements that people arriving on your site will notice.

They are therefore decisive regarding the behavior of a first-time visitor, and will undoubtedly make the difference when they make the decision to stay on the site or leave immediately.

Embellish boring texts

Also remember that web pages containing a lot of writing (or long texts) can be a little indigestible to read, and bore your visitors, who risk leaving before having read everything.

Nice images, on the contrary, distract the eye, and can brighten up a text, making it much more pleasant to read.

Simply convince

Finally, the images of a commercial site help to highlight your products and services, and to convince your prospects of the quality of your brand.

How to choose images for your website?

A suitable format

Remember to adapt your photo format to the location provided on your site. For example, a photo for the banner will not have the same template as a photo illustrating an article, or a background image.

Most of the time, the horizontal format (landscape) is recommended for the web.

High-quality resolution - but without weighing down your site

Above all, keep in mind that the **quality** account.

On a website, grainy or poorly reproduced photos can cause visitors to immediately leave.

Select only images**HD**, while ensuring that the files remain small. Do not try to enlarge a low resolution image, to avoid distortion.

Before finalizing your website, view it on a large screen to make sure images don't appear pixelated or blurry.

• **Compress**all images as much as possible, without altering visibility. For this you can, for example, use tools such as Short Pixel.

Check licenses

Be careful when collecting your photos on the internet. Not all of them are free of rights, and it is **illegal** to use photos protected by Copyright, especially for commercial purposes.

Choosing the Right File Type

In terms of file format, you can choose:

- THE<u>PNG format</u>for the visuals**graphics**(such as logos, designs or infographics) in particular those which use large or uniform color areas, or for textual visuals, but also for transparent backgrounds.
- If you can, save your PNG in "24-bit" format for better quality and richer display of colors.
- The JPEG format forphotos, because it can efficiently handle colors in a small file size, which will reduce the image loading time.
- NewformatWebP(which Google is starting to favor).
- On the other hand, avoidBitmap format(.bmp), generally heavier to load.

Respect your graphic charter

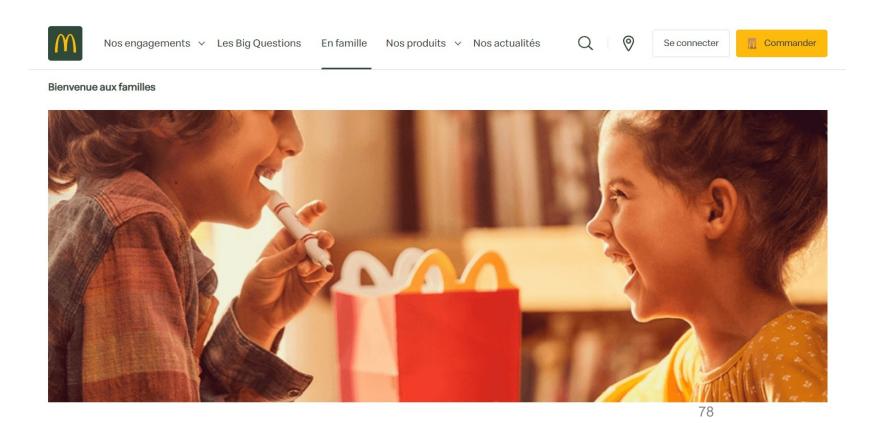
Your images must matchthe general appearance of your site, and more generally, stay inconsistency with your brand image.

Elicit an emotional response

The emotionoften plays a role in the purchasing process.

A well-chosen image can push the visitor to action.

For example, just think of a photo of a person who seems obviously happy to use a product or service. This reinforces the potential customer's desire to identify and plan for the purchase.



Principle of 2 seconds

Principle: the system response must not take more than 2 seconds to arrive

Risks:

- The user can relaunch the action
- Bugs or messages error

Solutions: quick actions: action performed indicator

Principle of 3 clicks

Principle: the desired information must be accessible in 3 clicks (web) quickly

Risks:user can abandon the task/application

Solutions: make important actions accessible directly or at least quickly adapt to the situation

Baby bird (or rearview mirror) syndrome

Principle:users tend to reject items or approx. unfamiliar"it was better Before»

Risks:

- rejection of new applications/versions
- Strategies of bypass
- problem for innovations, software evolution

Solutions:

- Evolution in the consistency
- To accompany the change



Criteria of Bastien and Scapin

- Guidance
- Workload
- Explicit user control
- Flexibility
- Error handling
- Homogeneity (consistency)
- Meaning of Codes and Denominations
- Compatibility (familiarity)