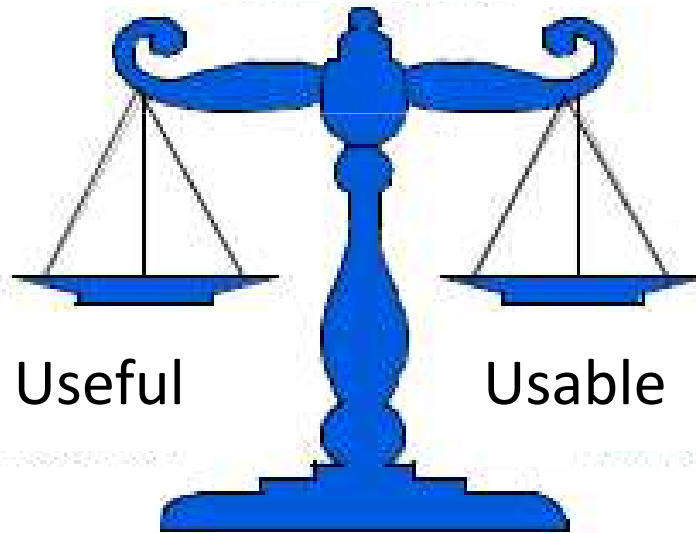


Chapter III

Ergonomics Recommendations

Interface



Outline

- I. Introduction
- II. Utility & uability
 - 1. Definitions
 - 2. Economic issues
- III. Ergonomics
- IV. Aspects of ergonomics
 - 1. Physical ergonomics
 - 2. Organizational ergonomics
 - 3. Cognitive ergonomics
- V. Recommendations of ergonomics
- VI. User Rights Charter
- VII. Conclusion

- ✓ Have you ever experienced **frustration** or **panic** when **mistakes** destroy your work?



- ✓ Have you ever experienced the **gradually increasing stress** when the software **response time is too long** ?

- ✓ Have you ever **abandoned** a website without finding what you were **looking for** ?

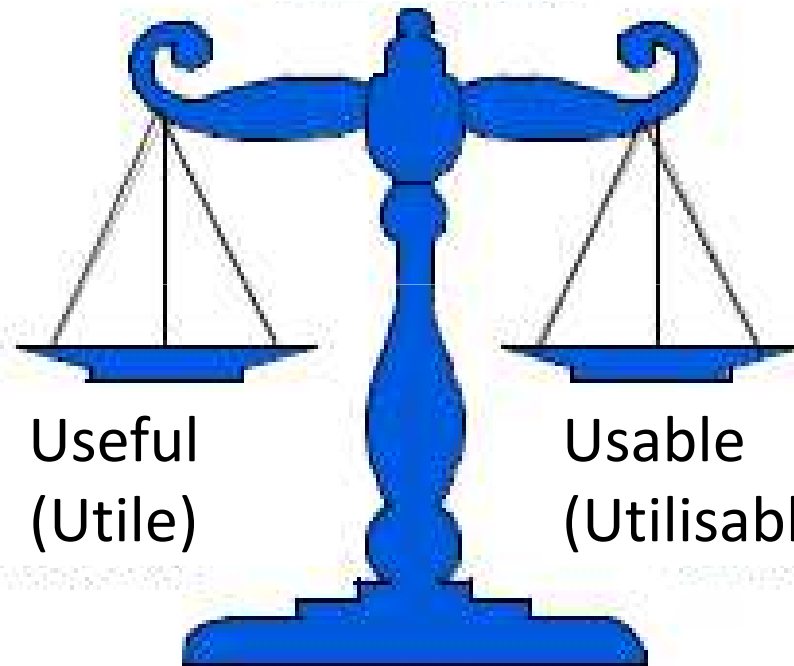


I. Introduction

- The objective of this course is to familiarize you with the various criteria for **designing** and **evaluating** a **useful** and **usable** human computer interface.
- It also aims to show you that the **skills** of an **ergonomist** and a **computer scientist** are not in competition but rather **complementary**.

II. Utility and Usability (Utilité et Utilisabilité)

Interface



Useful
(Utile)

Usable
(Utilisable)

Utility

An interface is said to be **useful** if it provides the **necessary functions** for the user to accomplish the tasks assigned to him.

Utility = Does the interface do what users need ?

Example : To send an email, **Yahoo is useful** but Excel is not.

Usability

An interface is said to be **usable** if the means it provides to accomplish the task are **compatible** with the **user's cognitive profile** and do not involve actions foreign to the nature of the task.

Usability is a **quality attribute** that assesses how **easy** user interfaces are to use.

Usability is defined by **some quality components like:**

1. **Performance** of accomplishing task :
 - ex. how **quickly** can the users perform tasks ?
2. **Satisfaction**; how pleasant is it to use the interface ?
3. **Ease**; how easy is it for users to accomplish basic tasks the first time they encounter the design?

Economic issues of Utility and Usability

1. **Allows** people of all skill levels to use interfaces **effectively** in their field (e.g. children, disabled people, managers, doctors, etc.),
2. **Increase the productivity** of experts users,
3. **Commercial success**; often this criterion is more important than technicality, or aesthetics,
4. **Loyalty**: the user buys with his eyes closed when he is sure that he can use the software easily.

III. Definition of Ergonomics

The term *ergonomics* (from the Greek; **ergon**, meaning "work", and **nomos**, meaning "law").

➤ **Ergonomics**, is the application of **psychological** and **physiological** principles to the engineering and design of products, processes, and systems.

- Primary **goals** (objectives) are to
- ✓ reduce human error,
 - ✓ increase productivity,
 - ✓ and enhance safety, health, comfort and performance.

with a specific focus on the **interaction** between the **human and equipment**.

Example

Text magnification software for people with visual impairments.



Ergonomics = adaptation of an object / device to its user.

Aspects of ergonomics

There are **three** types of ergonomics:

1. physical ergonomics: focus on the **body's physical** interaction with the environment,
2. organizational ergonomics: focus on the **structure** of **work** itself,
3. cognitive ergonomics: focus on the **mental processes** involved in work.

1. Physical ergonomics

- focuses on injury prevention through design and evaluation of workplaces, including **postures**, **manual tasks**, and **repetitive movements**,
- also focuses on how to **increase** productivity and **reduce** quality issues and error.
- It examines the ways in which **people's bodies** interact with the tools they use on a daily basis.

An adjustable-height desk that allows a user to sit or stand throughout the day.



Examples

1. A computer mouse designed to maintain a neutral wrist posture.
2. A car's dashboard layout with controls placed in easy-to-reach locations to minimize driver distraction.
3. Software with an interface designed for quick access to information to reduce prolonged screen time.

2. Organizational Ergonomics

Focuses on the structure and policies of the workplace, including teamwork, communication, scheduling, and job design.

Examples

- Creating clear team structures and communication protocols to **improve collaboration**.
- Allowing employees to take **regular breaks** to prevent both physical and mental fatigue.
- Ensuring employees have some **control over their schedules** to reduce stress.

Example: Office layout



Interruptions, irrelevant conversations and noise can be distracting and impact performance.

3. Cognitive Ergonomics

- Focuses on brain functions, human-machine interaction, mental workload, decision making, usability and design, and training.
- It examines the mind's ability to process information and interact with data:
 - ✓ perception,
 - ✓ reasoning,
 - ✓ memory,
 - ✓ stimuli, and psycho-motor responses, etc.

Why cognitive ergonomics ?

- Reduce errors,
- Reduce learning times,
- Make the software as easy as possible to use.

Examples

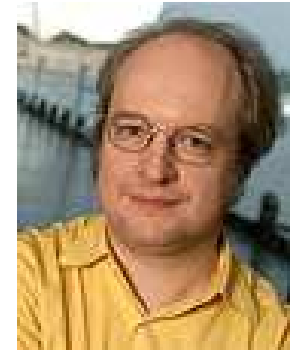
1. Designing a user interface with clear, simple instructions to **reduce** mental workload (charge de travail) and **prevent** errors.
2. Using **video instructions** instead of written ones, which can be easier to follow and less demanding on memory.
3. **Arranging a control panel** so that a pilot or driver can easily monitor multiple screens and make necessary decisions without being overwhelmed.

IV. Ergonomic Criteria

- They are principles and rules (heuristics) derived from research carried out in different fields (psychology, cognitive sciences, neurosciences, behavioral studies, etc.)
- Constitute a **classification** of the properties of a human-machine interface which condition its **usability**.

Nielsen's 10 heuristics (1993)

They are called "heuristics" because they are broad rules of thumb and not specific usability guidelines.



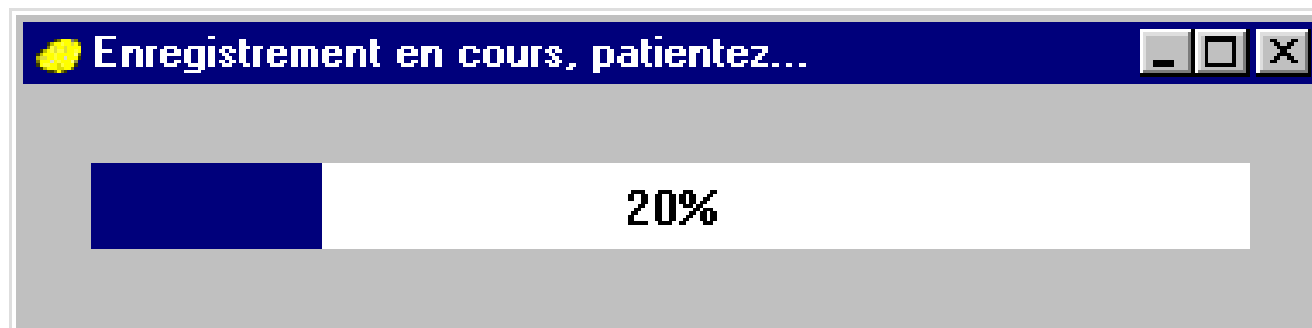
1. Visibility of System Status
2. Match Between the System and the Real World
3. User Control and Freedom
4. Consistency and Standards
5. Aesthetic and Minimalist Design
6. Recognition Rather than Recall
7. Flexibility and Efficiency of Use
8. Help Users Recognize, Diagnose, and Recover from Errors
9. Error Prevention
10. Help and Documentation

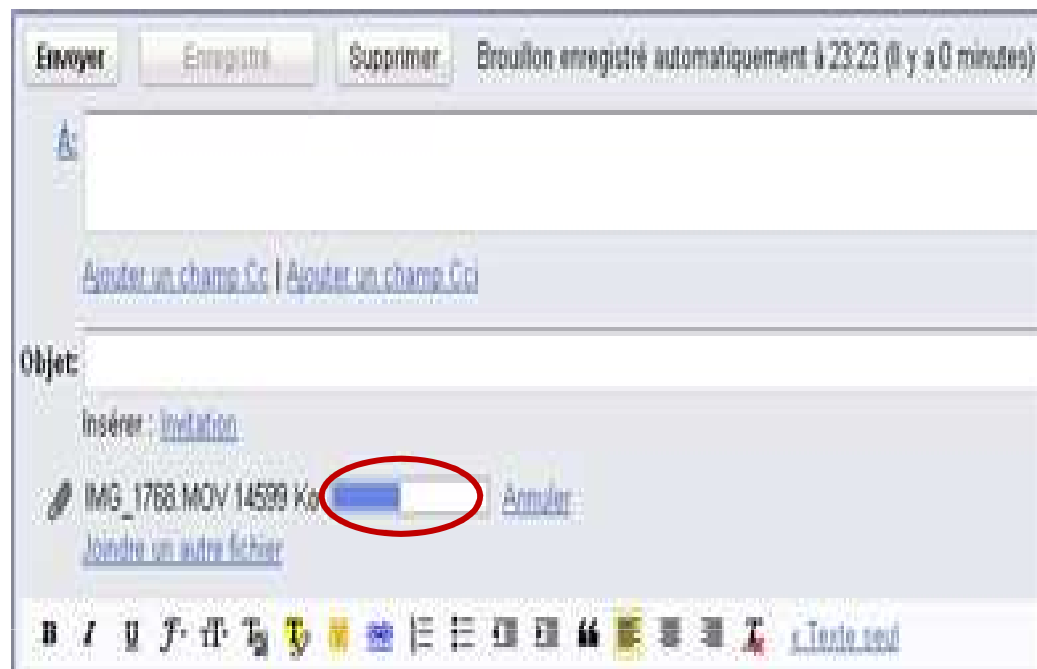
1. Visibility of System Status (Feedback)

Visibilité de l'état du système

- The system should always keep users **informed** about what is going on, through appropriate feedback within a **reasonable amount of time**.
- The **clarity** and **timeliness** of system feedback directly influence a user's ability to complete a task correctly.

Example: Progress bar for long tasks (>5s).





Attaching a file to an email

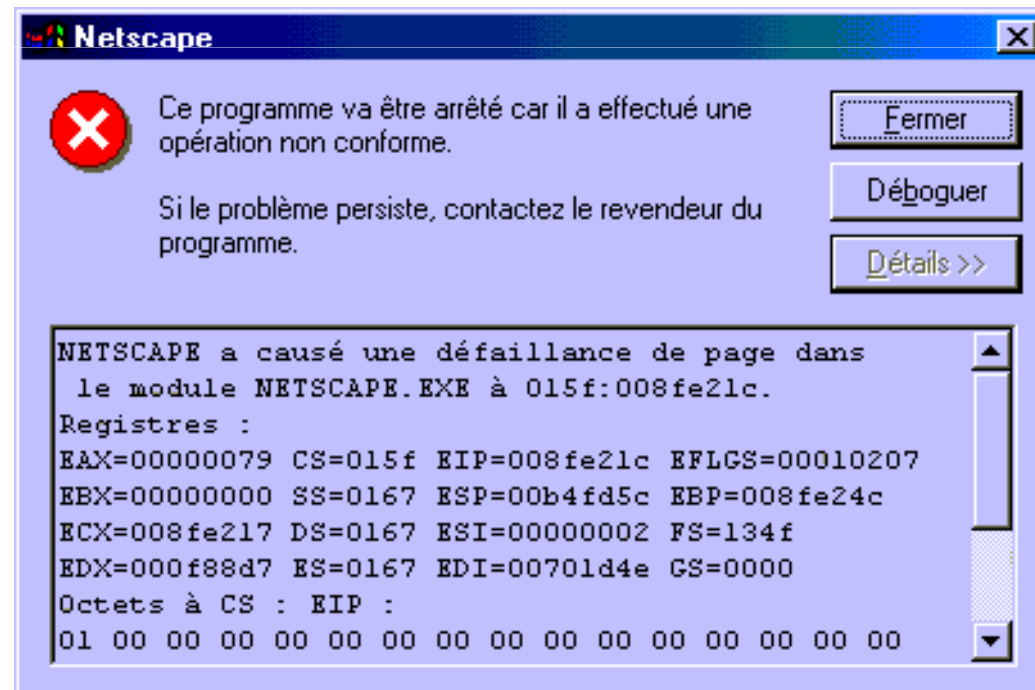
```
J:\>copy j:\cgr\Chap3\adaptabilite.html c:\
      1 file(s) copied.

J:\>
```

The copy command under MsDOS

2. Match Between System and the Real World (Adéquation du système au monde réel)

- The system should **communicate** with users using **familiar** words, phrases, and concepts, rather than system-oriented terms.
- Information should appear in a **natural and logical order**.



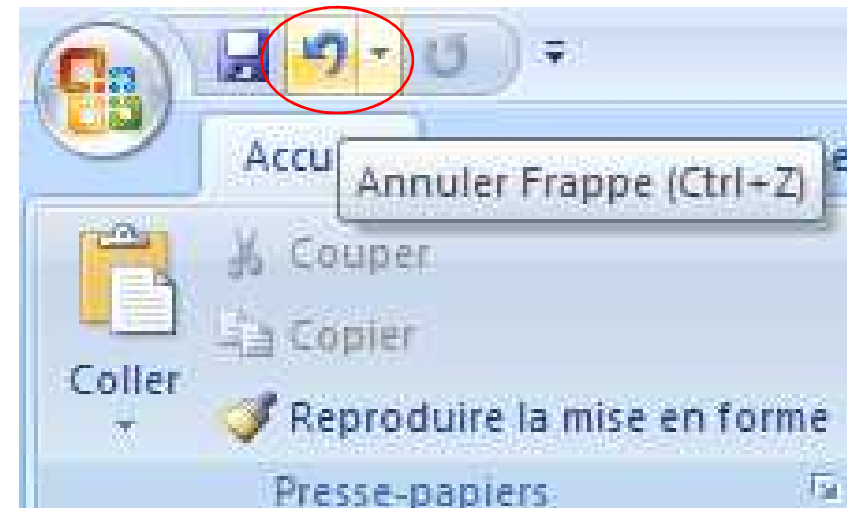
3. User Control and Freedom (Contrôle et liberté de l'utilisateur)

Users often perform actions by mistake. They need a clearly marked "**emergency exit**" to leave the unwanted action without having to go through an **extended process**.

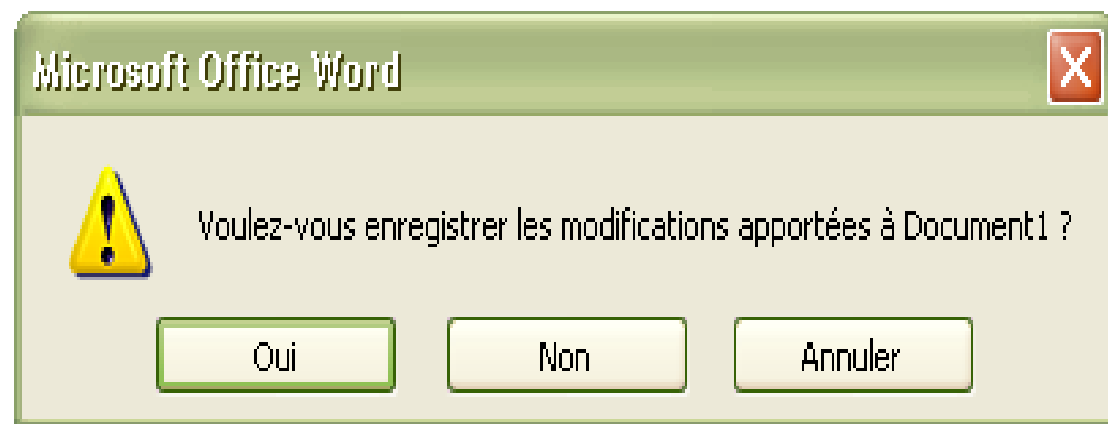
- When it's easy for people to back out of a process or **undo an action**, it fosters a **sense of freedom and confidence**.
- **Exits allow** users to remain in control of the system and avoid getting stuck and **feeling frustrated**.



Switch from one task to another



"Undo" and "Redo" actions



Bouton "Annuler" sur les boîtes de dialogue

4. Consistency and Standards

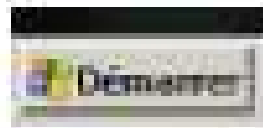
Cohérence et Respect de Standards

- Users should not have to **wonder** whether different words, situations, or actions mean the **same thing**.
- **Follow** platform and industry conventions.
- **Failing to maintain consistency** may increase the users' cognitive load by forcing them to learn **something new**.

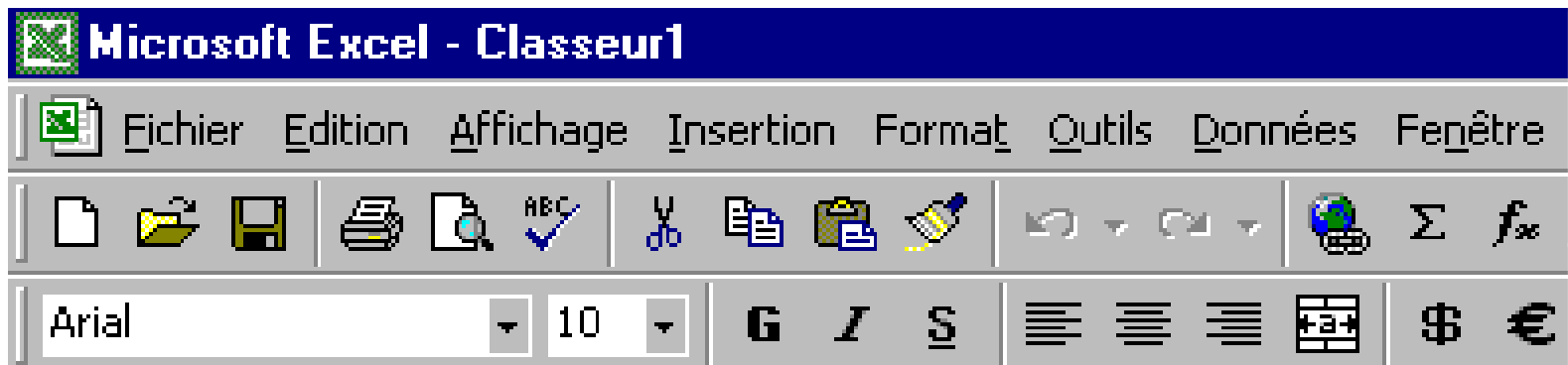
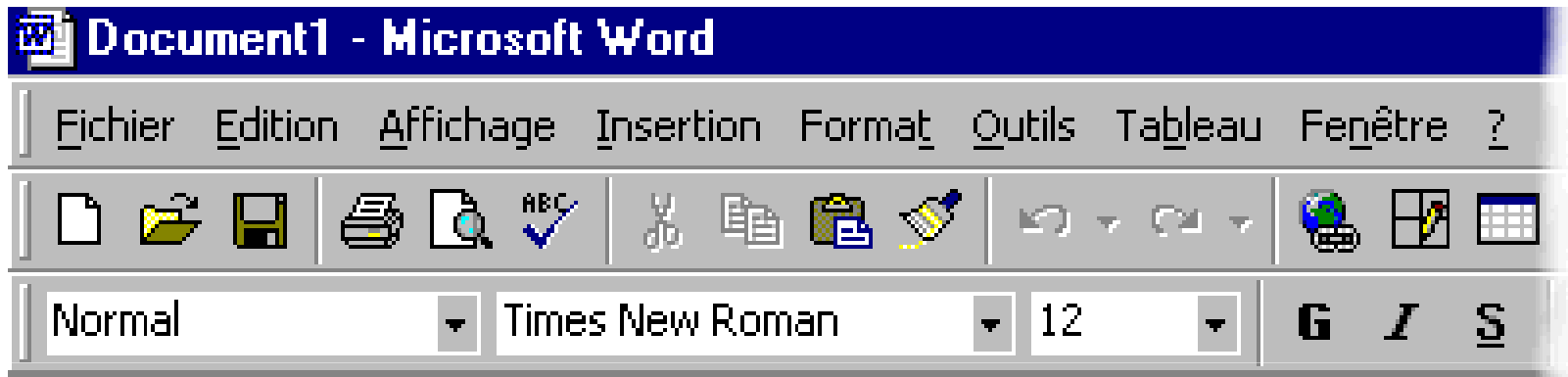
Examples

1. The generic "Copy/Paste" commands are the same in almost every application on the Microsoft Windows system.

2. Start menu of Windows



- ❑ Consistency also refers to the consistency of an application with other applications or itself.



Cohérence entre Microsoft Word 2003 et Microsoft Excel 2003

5. Aesthetic and Minimalist Design

Design minimaliste et esthétique

- Interfaces **should not contain** information that is irrelevant or rarely needed.
- Every extra unit of information in an interface competes with the relevant units of information and **diminishes** their relative **visibility**.
- **Less important information** (logo, software version, etc.) may be accessible but, for example, on other screens, or may not be presented at all.



Recherche Google

J'ai de la chance

JavaScript



Thank you for your interest in browsing our catalog! It's Easy and it's Efficient! Adobe Acrobat Reader 4.0 uses a 'Pointing Finger' with a 'W' for a mouse pointer whenever you encounter an area where a 'Selection' can be made. When the catalog index page appears, you will notice that the 'Pointing Finger' will appear when you pass over an index item (Product Type) that is selectable. If you click on an item, the pages related to that product will be downloaded to you. Each page has been modularized so that typical download times with a V 90 modem will not exceed 60 seconds with the average download time less than 20 seconds. Depending on your Browser, you may not see a line line, just be patient and the pages will appear. In some cases another index page will appear requiring further selection. The same process should be followed. Using the pages in Acrobat Reader is easy and efficient and in a short time you will be an expert at it. To return to the previous index, simply click your Browser 'Back' button. Two other configurations of mouse pointers are also used by Acrobat Reader. An 'Open Hand' for moving the page around and a 'Magnifier' for zooming in and out while viewing the page. You may select either one from the tool bar at the upper part of the screen. Please carefully jot down the Model Numbers of interest so that they can be entered accurately in the on-line ordering system.

OK

6. Recognition Rather than Recall (Reconnaissance plutôt que rappel)

- Minimize the user's memory load by making elements, actions, and options visible.
- The user should not have to remember information from one part of the interface to another.
- Information required (e.g. field labels or menu items) should be visible or easily retrievable when needed.

Sexe

☒ Masculin ☐ Féminin

Date d'anniversaire

Jour ▼ Mois ▼ (ex : 1978)

Profession

[Sélectionnez une réponse] ▼

Formulaire Web demandant la date de naissance



DATE DE NAISSANCE

JJ MM AAAA

7. Flexibility and Efficiency of Use

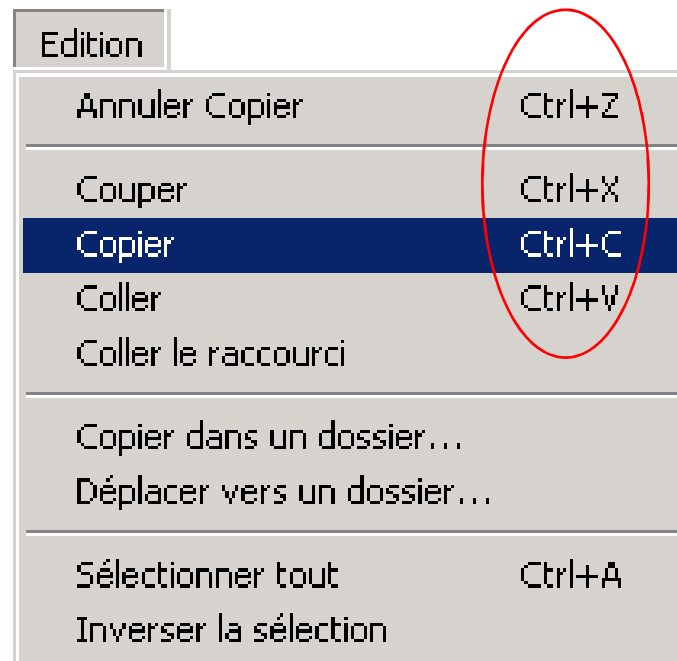
Flexibilité d'utilisation

- Shortcuts — hidden from novice users — may speed up the interaction for the expert user so that the design can cater to **both inexperienced and experienced users**.
- Allow users to tailor (personnaliser) frequent actions.
- Flexible processes can be carried out in **different ways**, so that people can pick whichever method works for them.

Exemples

1. Tous les navigateurs Web actuels incluent la **fonction de complétion** automatique lorsque l'utilisateur insère un début d'URL déjà visitée.
2. **L'historique** des adresses des sites dernièrement visités permet aussi de retrouver rapidement un site.
3. L'utilisateur a la possibilité de modeler sa page selon ses préférences, et de contrôler (ajouter, retirer, modifier) certains éléments: favoris, raccourcis, thèmes, couleurs, titres et libellés, etc.

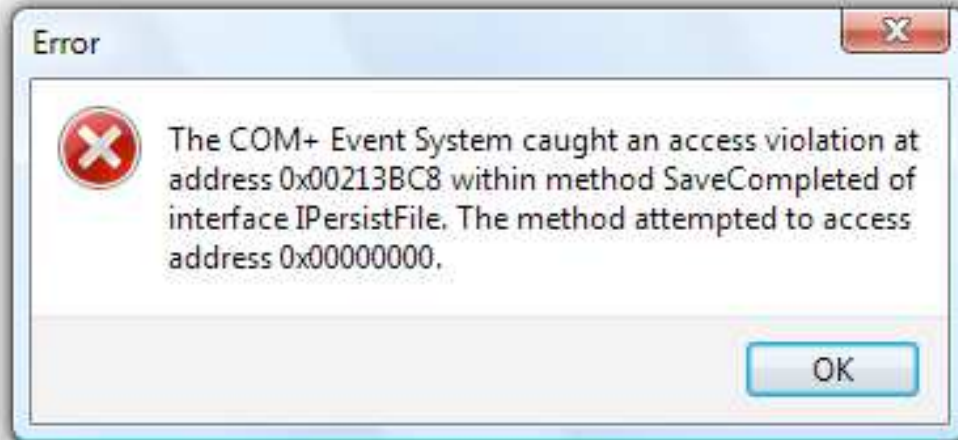
4.



8. Help Users Recognize, Diagnose, and Recover from Errors

(Aide à la gestion des erreurs)

- Error messages should be **expressed** in plain language (no error codes), precisely indicate the problem, and constructively suggest a solution.
- Error messages should also be **presented** with visual treatments that will help users notice and recognize them.



Aucun accès à Internet

Voici quelques conseils :

- Vérifiez les câbles réseau, le modem et le routeur.
- Reconnectez-vous au réseau Wi-Fi
- [Exécutez les diagnostics réseau de Windows](#)

ERR_INTERNET_DISCONNECTED

Hum, nous ne parvenons pas à trouver ce site.

Impossible de se connecter au serveur à l'adresse perso.liris.cnrs.fr.

Si l'adresse est correcte, voici trois autres choses que vous pouvez essayer de faire :

- Réessayer ultérieurement.
- Vérifier votre connexion au réseau.
- Si vous êtes connecté au travers d'un pare-feu, vérifier que Firefox a la permission d'accéder au Web.

Réessayer



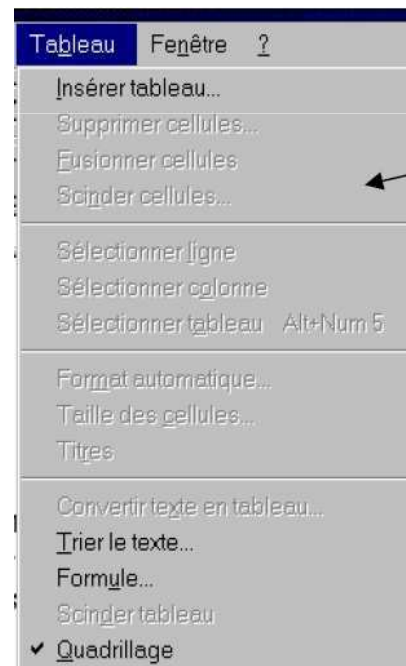
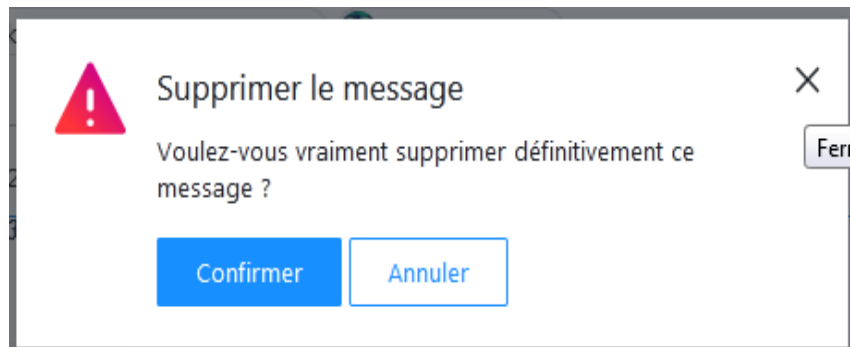
9. Error Prevention (Prévention des erreurs)

Good error messages are important, but the best designs carefully prevent problems 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.

There are two types of errors:

- **Slips** are unconscious errors caused by inattention.
- **Mistakes** are conscious errors based on a mismatch between the user's mental model and the design.



Griser les fonctions
non disponibles

10. Help and Documentation

(Aide et documentation)

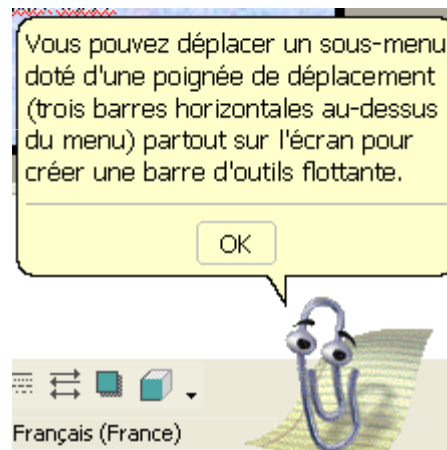
It's best if the system doesn't need any additional explanation. However, it may be necessary to provide documentation to **help users understand** how to complete their tasks.

Help and documentation content should be :

- ✓ easy to search,
- ✓ focused on the user's task,
- ✓ concise,
- ✓ list concrete steps that need to be carried out.

Help can take different forms:

- Tutorials, demonstrations
- Contextual help
- Tooltip
- Assistants, ...



Ergonomic Criteria of Bastien & Scapin

(French researchers at INRIA)
(1993)



Dominique
Scapin

1. Guidance (Guidage)
2. Workload (Charge de travail)
3. Explicit Control (Contrôle utilisateur explicite)
4. Adaptability (adaptabilité)
5. Error Management (Gestion des erreurs)
6. Consistency (Cohérence)
7. Significance of Codes (Signification des codes et dénominations)
8. Compatibility (Compatibilité)

1. Guidance

IT refers to the means available to advise, orient, inform, instruct, and guide the users throughout their interactions with a computer (messages, alarms, labels, etc.), including from a lexical point of view.

The criterion Guidance is subdivided into **four** criteria:

1. Prompting (**Incitation**),
2. Grouping/Distinction of Items (**Groupement**),
3. Immediate Feedback, and
4. Legibility

1. Guidance:

1.1. Prompting (Incitation)

- It refers to the means available in order to **lead** the users to making specific actions whether it be data entry or other tasks.
- It also refers to all the means that help users to **know the alternatives** when several actions are possible depending on the contexts.

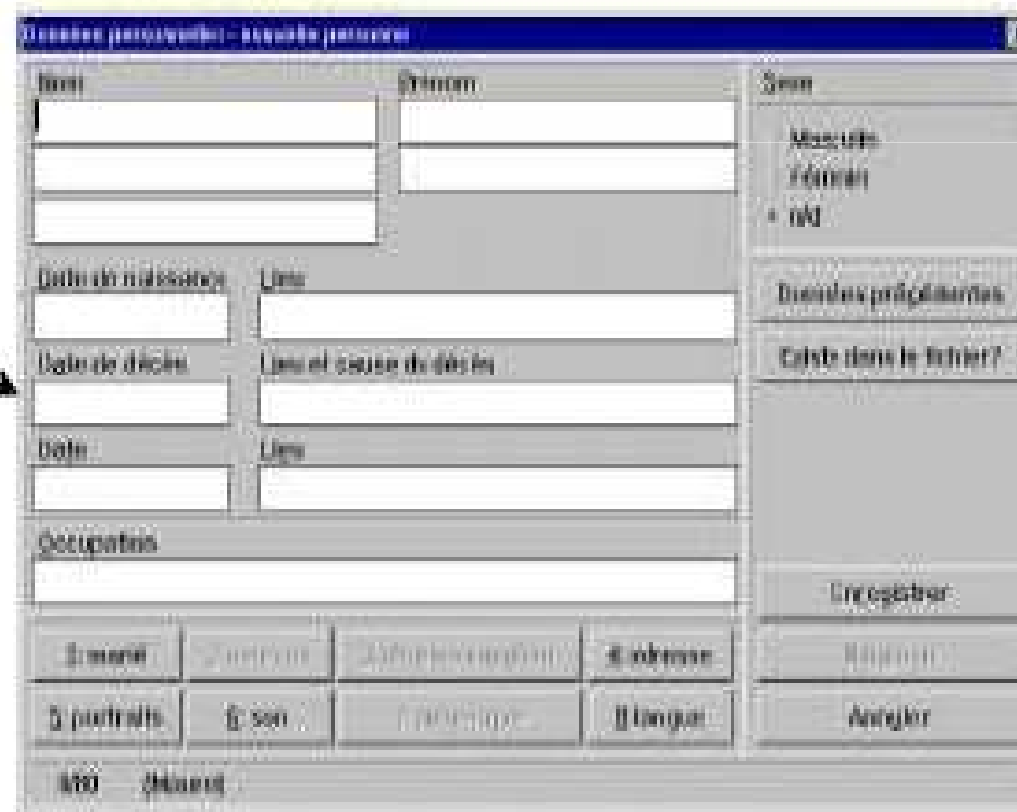
Goals:

- ☐ guides the users and saves them, for instance, from learning a series of commands.
- ☐ allows users to know exactly the current mode, where they are in the dialogue
- ☐ helps users to navigate in the application or the system and helps to reduce errors.

Examples

1. Display measurement units for data entry.
2. for each data field, display an associated label.
3. Provide cues on the acceptable length of entries.
4. Provide a title for each window.
5. Break an input field into several pieces.

Non, pas de
format
de saisie

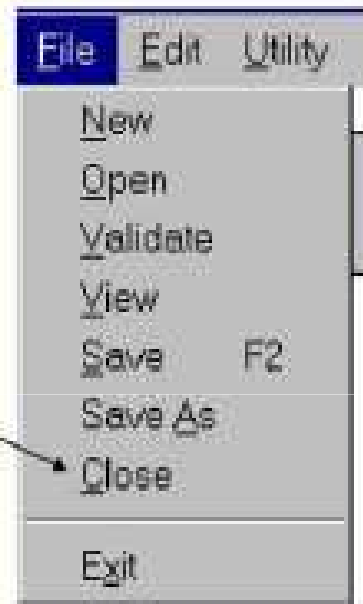


1. Guidance:

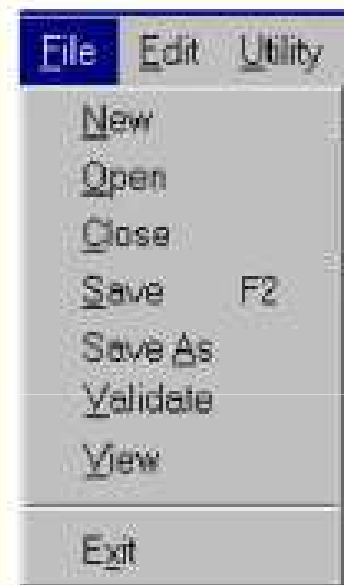
1.2. Grouping/Distinction of Items (Groupement)

- It concerns the visual organisation of information items in relation to one another.
- It takes into account the topology (location) and some graphical characteristics (format) in order to indicate the relationships between the various items displayed, to indicate whether or not they belong to a given class, or else to indicate differences between classes.
- This criterion also concerns the organisation of items within a class.

Option mal
positionnée



Non



Fichier

Contenu

Application

Oui

1.Guidance:

1.3. Feedback

Visibility of System Status

(see Nielsen's heuristics)

1.Guidance:

1.4. Legibility

It concerns the lexical characteristics of the information presented on the screen that may hamper or facilitate the reading of this information (character brightness, contrast between the letter and the background, font size, interword spacing, line spacing, paragraphs spacing, line length, etc.).

Ex.

- ✓ Dark letters on a light background are easier to read than the other way around;
- ✓ Text presented with mixed upper/lower case is read faster than a text presented with only upper-case letters

Charles Prince of Wales

Person Edit Define Options Report Help

ID: Tree Comments

Surname: Sex:

Names: Age:

Birthdate:

Deathdate:

Father:

Mother:

Spouse:

Children:

SAVE CLOSE

Non

Écriture en majuscules
 Espacements limités
 Fin de ligne cachées

Police

Police, style et attributs Espacement Agrégation

Échelle:

Espacement: Dg:

Position sur la ligne: De:

☐ Grillage: points et plus

Aperçu:

Police TrueType, Metropolis 3 l'écrit et l'impression

Par défaut... OK Annuler

Oui

Espacement
 Contraste

2. Workload

It concerns all interface elements that play a role in the reduction of the users' perceptual or **cognitive load**, and in the increase of the **dialogue efficiency**.

The criterion Workload is subdivided into **two** criteria:

1. **Brevity** (Brièveté)

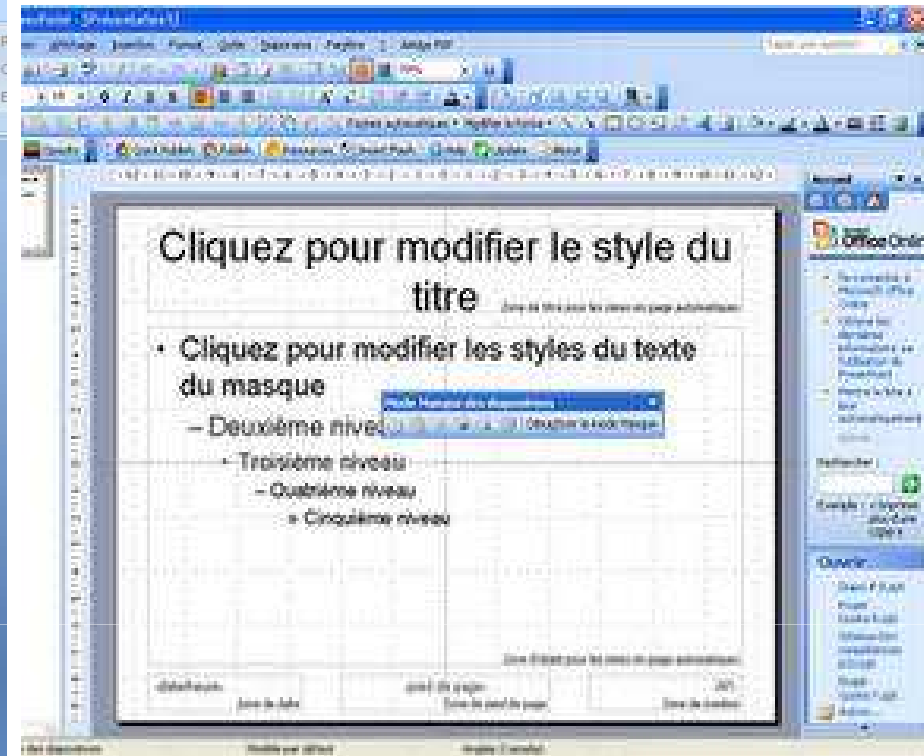
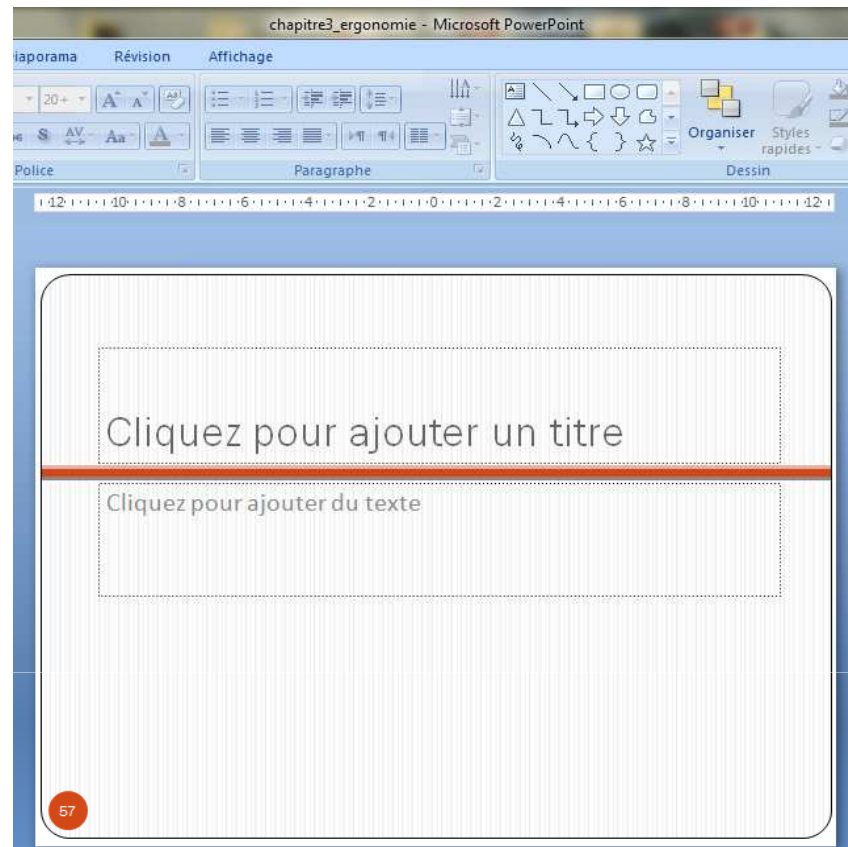
✓ **Concision**

ex. When a measurement unit is associated with a particular data field, include that unit as part of the field label rather than requiring a user to enter it.

✓ **Minimal Actions**

ex. Minimise the number of steps required to make a selection in a menu.

2. **Information Density** (Densité Informationnelle)



Lancer

oui

Lancement de l'application de gestion des notes

Non

Form1

Date:

Month Day Year

May 22 1997

Month Day Year

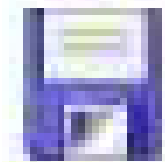
May ▼ 22 ▼ 1997 ▼

The image displays a window titled 'Form1' with four different date input controls. A red arrow points to a single text box labeled 'Date:'. A blue arrow points to three separate text boxes labeled 'Month', 'Day', and 'Year'. A light green arrow points to three text boxes containing 'May', '22', and '1997', also labeled 'Month', 'Day', and 'Year'. A green arrow points to three dropdown menus containing 'May', '22', and '1997', also labeled 'Month', 'Day', and 'Year'.

Significance of Codes

It qualifies the relationship between a term and/or a sign and its reference.

Codes and names are significant to the users when there is a strong semantic relationship between such codes and the items or actions they refer to.



Save



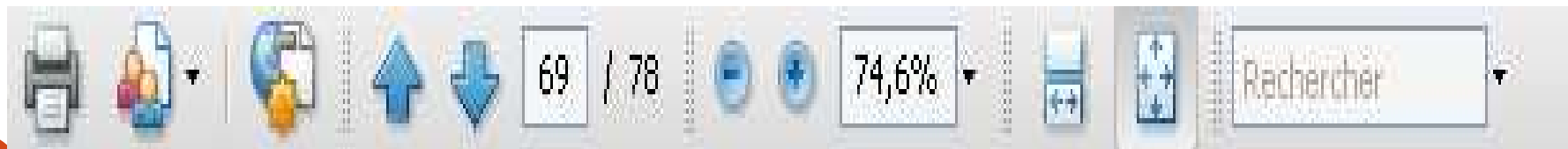
Search



Print



Cut





Oui



Non
Signification des
icônes ?

Liste d'enseignants

Types d'enseignant

Disponibilités des
enseignants

Liste de salles

Types de salles

Disponibilités
des salles

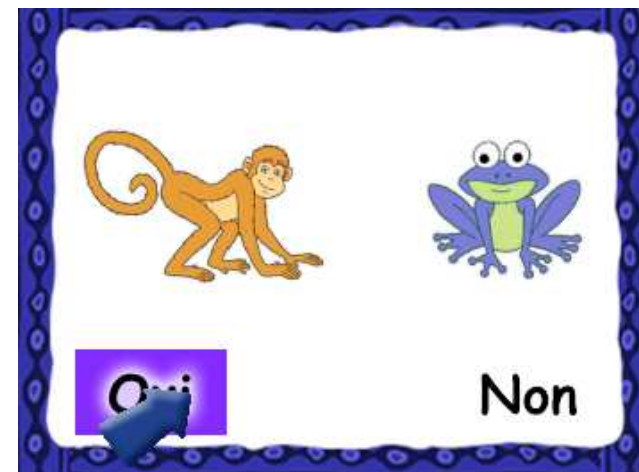
Session

Durée

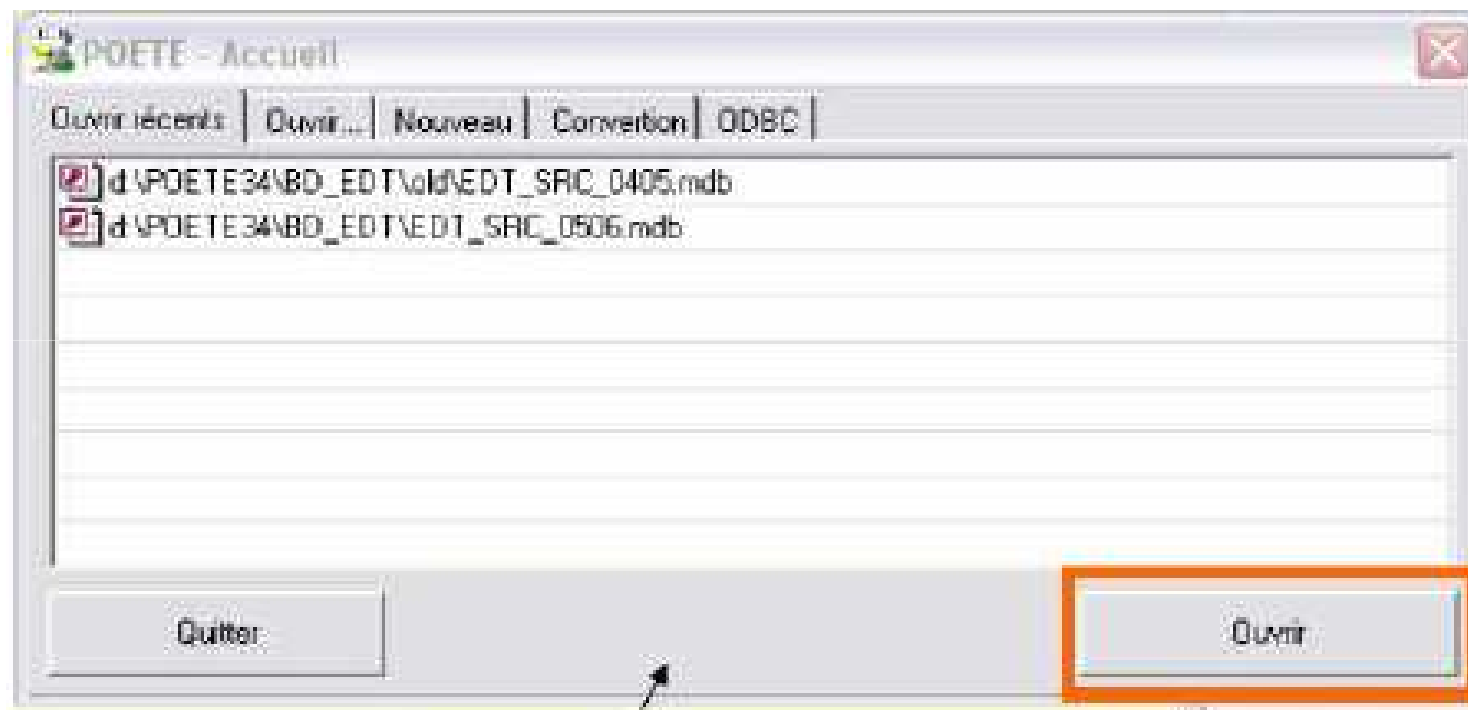
Types de cours

Compatibility

- It refers to the **match** between **users' characteristics** (memory, perceptions, skills, age, expectations, etc.) and **task characteristics** on the one hand, and the organisation of the output, input, and dialogue for a given application, on the other hand.
- also concerns the coherence between environments and between applications.



- ❑ La compatibilité concerne aussi la capacité de l'application à s'inscrire dans des standards établis pour des contextes similaires.



Non

L'ordre des boutons de l'application POETE n'est pas conforme à l'ordre adopté dans les applications largement déployées

VI. User Rights Charter

1. The user **is always right**; if there is a problem in using the system, the system is the problem, not the user.
2. The user has the right to **install** and **uninstall** software without any negative consequences.
3. The user has the right to a system that **meets his needs**.
4. The user has the right to use **easy instructions** to accomplish their tasks.

5. The user has the right to a system that provides clear, understandable and precise information regarding the task he is performing.
7. The user has the right to be clearly informed of all the system's requirements for successful use.
8. The user has the right to know the limits of the system.

VII. Conclusion

- Ergonomic recommendations are numerous, partially redundant and often conditional.
- The interpretation of ergonomic recommendations requires taking into account the particular context in which they will be applied (type and diversity of users, general context, work environment, potential risks, etc.)
- Ergonomic recommendations can serve as a guide to design HCI.
- Ergonomic recommendations allow for a simple and rapid evaluation of an existing system.
- Ergonomic recommendations are easy to remember and simple to apply.

Questions ...