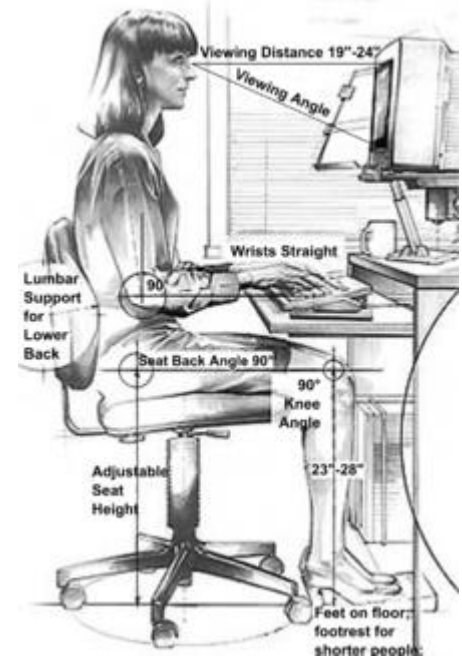


Module IHM

4



IHM



Principles of Software Ergonomics, ergonomic quality criteria

PART

1

Ergonomics

Definition

ergonomics

It is the Science of work and human activities. It aims to understand human/system interactions and concerns the optimization of the well-being of people and the overall performance of systems.

in ancient Greek

ἔργον

Ergon

work

νόμος

nomos

natural law

The term ergonomics (from the Greek ἔργον, meaning "work", and νόμος, meaning "natural law")

Definition

ergonomics

Ergonomics 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 to optimize human well-being and overall system performance.

Ergonomics draws on many disciplines in its study of humans and their environments, including :

- القياسات البشرية,
- الميكانيكا الحيوية,
- الهندسة الميكانيكية،
- هندسة صناعية،
- التصميم الصناعي، تصميم المعلومات،
- علم الحركة،
- علم وظائف الأعضاء،
- علم النفس المعرفي،
- علم النفس الصناعي والتنظيمي،
- وعلم نفس الفضاء.
- anthropometry,
- biomechanics,
- mechanical engineering,
- industrial engineering,
- industrial design, information design,
- kinesiology,
- physiology,
- cognitive psychology,
- industrial and organizational psychology,
- and space psychology.

Ergonomics applications

Ergonomics can be applied to a wide range of settings, including the **workplace**, the **home**, and the **public environment**.

- **In the workplace**, ergonomics can help to reduce the risk of work-related injuries and illnesses, ergonomics can also help to improve productivity and comfort, and to create a more positive work environment.
- **In the home**, ergonomics can help to prevent injuries and illnesses associated with everyday activities, such as cooking, cleaning, and gardening. Ergonomics can also help to make the home more accessible and comfortable for people with disabilities.
- **In the public environment**, ergonomics can help to design products and services that are easy to use and accessible to everyone. For example, ergonomic principles can be applied to the design of public transportation systems, playgrounds, and office buildings.

Ergonomics applications - examples

Here are some examples of how ergonomics can be applied in different settings:

In Workplace

- Adjusting the height of a chair and desk to ensure that the user's elbows are at a 90-degree angle and their feet are flat on the floor.
- Using a keyboard and mouse tray to keep the wrists in a neutral position.
- Taking breaks throughout the day to move around and stretch.
- Using ergonomic tools and equipment, such as a standing desk or a headset.



Ergonomics applications - examples

Here are some examples of how ergonomics can be applied in different settings:

In the Home

- Using a comfortable chair with good lumbar support.
- Keeping the kitchen counter and sink at a height that is comfortable for the user.
- Using a long-handled broom and dustpan to avoid bending over.
- Using a lightweight vacuum cleaner with a long cord.
- Adjusting the height of the showerhead to avoid reaching up or bending down.



Ergonomics applications - examples

Here are some examples of how ergonomics can be applied in different settings:

In Public Environment

- Designing public transportation seats with adequate legroom and back support.
- Designing playgrounds with equipment that is appropriate for the age and abilities of the users.
- Designing office buildings with ramps and elevators for accessibility.
- Designing public restrooms with fixtures that are at a height that is comfortable for everyone.



Importance of ergonomics

- ❖ **The ergonomics of a system** influences the productivity of users, this economic aspect is an important criterion for the choice of software used for professional purposes.
- ❖ **Ergonomic software** will allow the planned task to be carried out quickly, without loss of time and with less stress, which contributes to maintaining a pleasant working climate.
- ❖ **Ergonomics** very often conditions the commercial success of a product (often a more important criterion than technique or cost).
- ❖ **It is also a loyalty factor:** the user buys blindly when he is sure he can easily use the software.
- ❖ **The ergonomics of the user interface** is very often a determining factor in the success of an IT project and its acceptance by users.

Areas of ergonomics

Ergonomics can be divided into three main areas:

1. Physical ergonomics:

This area focuses on the **physical aspects** of the **work environment** and how they can be adapted to the user to reduce the risk of injury and discomfort. This includes things like workstation design, tool design, and posture.

Exemples

- Adjusting the height of a chair and desk to ensure that the user's elbows are at a 90-degree angle and their feet are flat on the floor.
- Using a keyboard and mouse tray to keep the wrists in a neutral position.
- Taking breaks throughout the day to move around and stretch.
- Using ergonomic tools and equipment, such as a standing desk or a headset.



Areas of ergonomics

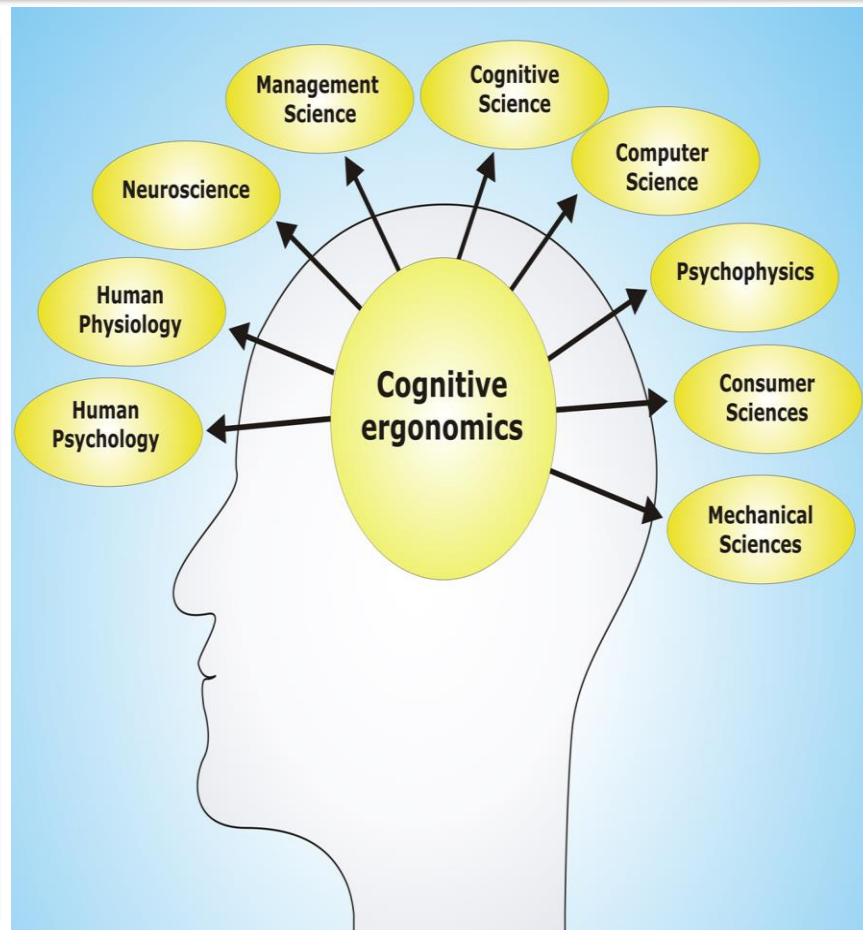
Ergonomics can be divided into three main areas:

2. Cognitive ergonomics:

This area focuses on the **mental aspects** of work and how they can be designed to reduce **fatigue** and **errors**. This includes things like task design, information display, and workload management.

Examples

- Designing tasks to be broken down into smaller, more manageable steps.
- Providing clear and concise instructions.
- Using visual cues and feedback to help users avoid errors.
- Providing opportunities for users to rest and recharge.



Areas of ergonomics

Ergonomics can be divided into three main areas:

3. Organizational ergonomics:

This area focuses on **the social and organizational aspects** of work and how they can be designed to improve efficiency and well-being. This includes things like work schedules, teamwork, and communication.

Examples

- Designing work schedules to avoid excessive overtime and fatigue.
- Encouraging teamwork and collaboration.
- Providing opportunities for employees to participate in decision-making.
- Creating a positive and supportive work environment.



Areas of ergonomics

Ergonomics can be divided into three main areas:

1. **Physical ergonomics:**
2. **Cognitive ergonomics:**
3. **Organizational ergonomics:**

- These three areas are interrelated, and the best ergonomic solutions often involve considering all three. For example, a workstation that is physically comfortable may not be efficient if it is not designed to support the user's cognitive tasks.
- By applying ergonomic principles in all three areas, employers can create workplaces that are safe, healthy, and productive for everyone.

PART

2

Computer Ergonomics & Ergonomic criteria

Computer Ergonomics

Computer Ergonomics also known as IT ergonomics or workstation ergonomics, focuses on optimizing the design and arrangement of computer workstations and equipment to promote the health, comfort, and productivity of computer users. It involves considering the physical, cognitive, and environmental factors that can impact the well-being and performance of individuals working with computers.



Computer Ergonomics

Computer Ergonomics.

- ❖ Aims to **improve HCI**, ease of use, and learning of interactive systems.
- ❖ This practice seeks to design or modify interactions and interfaces so that they are in line with the **physiological, perceptual** and **cognitive** characteristics of their potential users.
- ❖ Design **efficient, accessible**, and **intuitive** HMIs.
- ❖ It is based on different design and evaluation methods to obtain the HMI best suited to the targeted users.



Ergonomic criteria

Ergonomic criteria refer to a set of principles or guidelines that are used to evaluate the ergonomic qualities of a product, system, or environment.

These criteria help assess how well the design meets the needs and capabilities of the users and how it supports their **comfort, safety, and efficiency**.

| Main Criteria | Sub-criteria |
|--------------------------|---|
| 1. Guidance | 1.1 Prompting 1.2 Grouping/Distinction by location 1.3 Immediate feedback 1.4 Legibility |
| 2. Workload | 2.1 Brevity 2.2 Information density |
| 3. Explicit control | 3.1 Explicit user action 3.2 User control |
| 4. Adaptability | 4.1 Flexibility 4.2 User experience |
| 5. Error Management | 5.1 Error protection 5.2 Quality of error messages 5.3 Error correction |
| 6. Consistency | |
| 7. Significance of codes | |
| 8. Compatibility | |

Ergonomic criteria constitute a classification (typology) of the basic rules which condition the usability of an interface.

Ergonomic criteria

The establishment of ergonomic criteria mainly aims at two complementary objectives:

- ❖ They make it possible **to evaluate** the **usability** of software (ergonomic audit) by serving as a basis for establishing **evaluation grids** (checklist).
- ❖ On the other hand, and this is even more important, they serve as a **guide** when designing a user interface by helping designers to take into account - from the initial development phase - the ergonomic aspects of the software.



Answer the questions below by putting an X in the corresponding column

| N° | Questions | Always | Often | Sometimes | Never | Don't know |
|--|---|----------------|-------|-----------|-------|------------|
| In terms of consistency | | | | | | |
| 1 | Are the colors used consistently? | X | | | | |
| 2 | Are the abbreviations, codes, and other information used consistently? | | X | | | |
| 3 | Are the graphic representations, symbols, icons, and other pictorial information used consistently? | X | | | | |
| 4 | Does the cursor appear in the same initial position for similar displays? | | | | | X |
| .. | ... | | | | | |
| In terms of clarity and cleanliness | | | | | | |
| 12 | Are the stages that the interface may go through during the execution of a task easy to understand? | X | | | | |
| 13 | Does the user always know where he is? | | X | | | |
| 14 | Are the operations in each part of the interface easy to understand? | | | X | | |
| .. | ... | | | | | |
| | Do you wish to add any further comments? | Bla bla bla... | | | | |

Ergonomic criteria

Despite some differences in terminology, level of detail and nuances of classification, researchers in the field (C. Bastien, D. Scapin, J-F. Nogier, H.X. Lin, etc.) agree on the list and classification of these basic ergonomic criteria which are also at the origin of certain standards in the field.

At the origin of this notion of ergonomic criteria, ergonomists **Christian Bastien** and **Dominique Scapin** synthesized around **900 recommendations** gathered in the field of computer ergonomics.

They sought to classify these recommendations and came up with a list of around twenty elementary criteria (**basic criteria**) distributed across **8 dimensions** (**main families**).

Bastien & Scapin Ergonomic criteria

The Bastien and Scapin criteria were published in **May 1993** in the form of an INRIA research report.

- ❖ These ergonomic criteria therefore come from a study carried out by Dominique Scapina assisted by Christian Bastien who both gave their names to these famous “criteria” to identify this tool which has become a reference in HMI ergonomics.
- ❖ **In 1997**, they produced a synthesis of around **900** recommendations in the field of ergonomics.
- ❖ This colossal work made it possible to produce **18** criteria divided into **8** dimensions.

Bastien & Scapin Ergonomic criteria

- These 8 dimensions are not completely orthogonal and there remain **some dependencies** between certain families. However, this classification makes it possible to approach the notion of ergonomics and the numerous associated recommendations in a much more rational manner.
- These criteria also provide a **common framework** and **vocabulary**.
- They have been the subject of experimental evaluations which have demonstrated that they offer measurable advantages compared to the use of other references,

Bastien & Scapin Ergonomic criteria

The Bastien & Scapin ergonomic criteria are a specific set of criteria developed by Jean-Claude Bastien and Dominique Scapin for evaluating the usability and ergonomics of interactive systems. These criteria are widely used in the field of **HCI** and interface design. The Bastien & Scapin criteria consist of eight key dimensions or aspects of usability:

1. Guidance

2. Workload

3. Explicit control

4. Adaptability

5. Error management

6. Consistency

7. Significance of codes

8. Compatibility

Bastien & Scapin Ergonomic criteria

The Bastien & Scapin ergonomic criteria

- can be used **to evaluate** user interfaces at any stage of the design process, from early prototypes to finished products.
- They can also be used **to compare** different user interfaces or to identify areas for improvement in an existing interface.

1. Guidance

2. Workload

3. Explicit control

4. Adaptability

5. Error
management

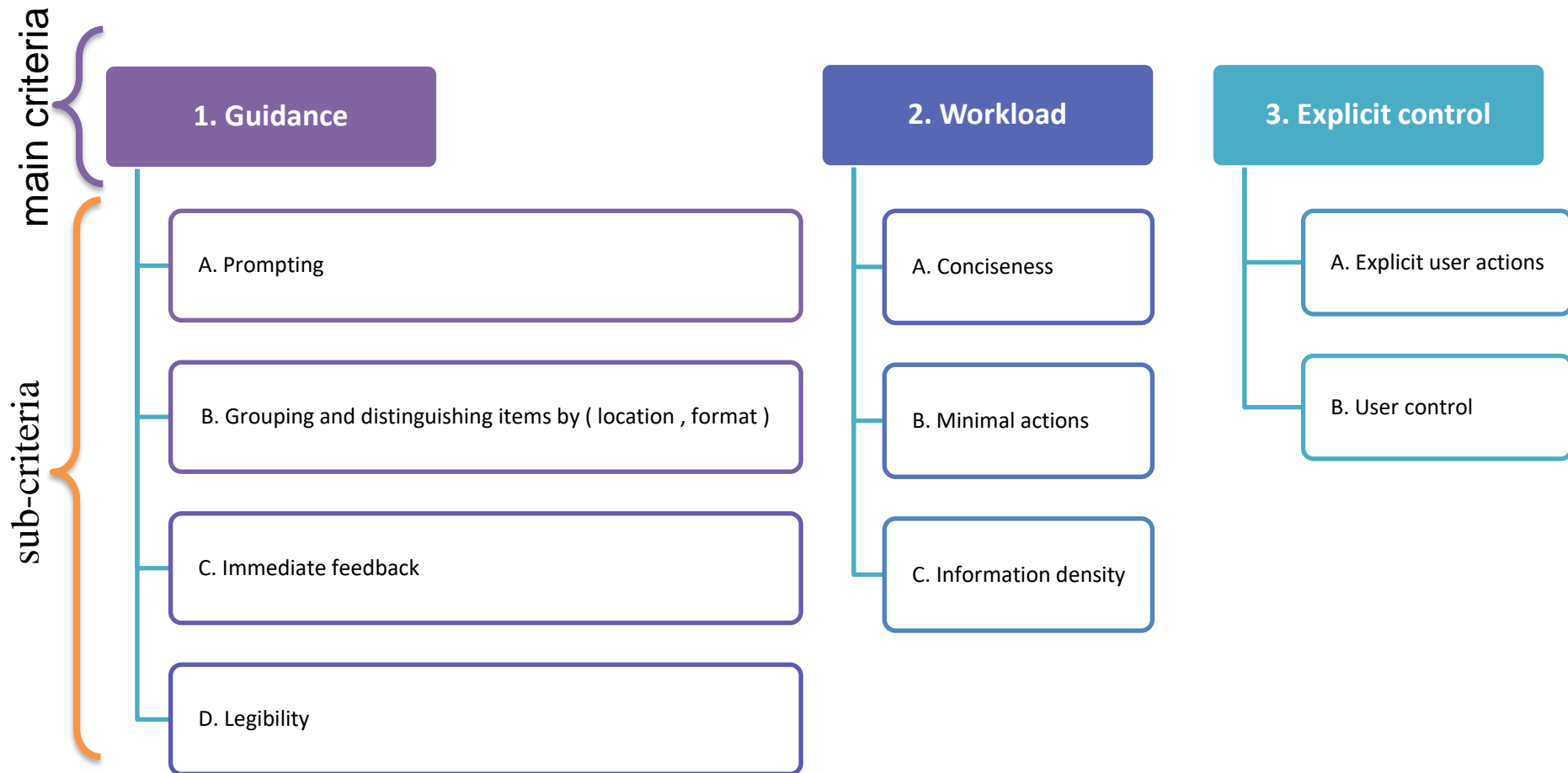
6. Consistency

7. Significance of
codes

8. Compatibility

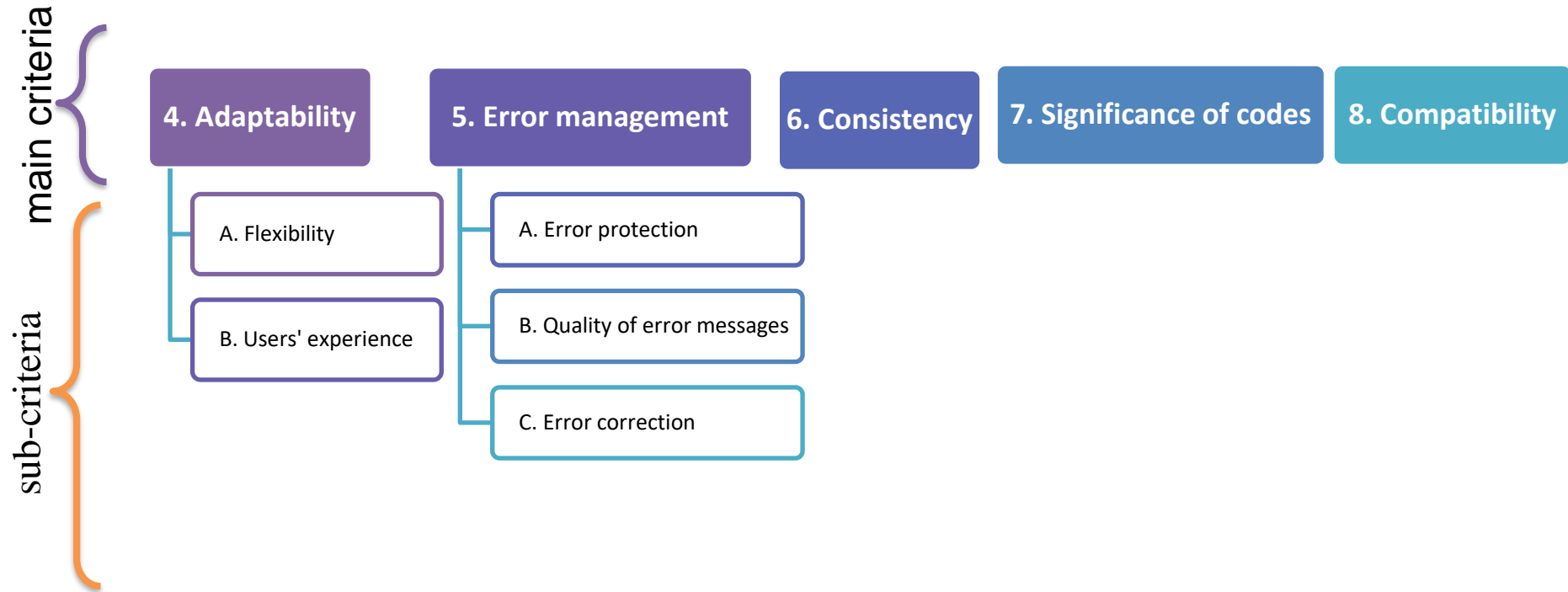
Bastien & Scapin Ergonomic criteria

The **Bastien & Scapin ergonomic criteria** are divided into main criteria and sub-criteria



Bastien & Scapin Ergonomic criteria

The Bastien & Scapin ergonomic criteria are divided into main criteria and sub-criteria



Bastien & Scapin Ergonomic criteria

En

1. Guidance

2. Workload

3. Explicit control

4. Adaptability

5. Error management

6. Consistency

7. Significance of codes

8. Compatibility

Fr

1. Guidage

2. Charge de travail

3. Contrôle explicite

4. Adaptabilité

5. Gestion des erreurs

6. Cohérence

7. Signifiante des codes

8. Compatibilité

Ar

5. إدارة الأخطاء

4. قابلية التكيف

3. السيطرة الصريحة

2. عبء العمل

1. التوجيه

8. التوافق

7. دلالة الرموز

6. التناغم (الاتساق)