System acceptability

Social acceptability

Usefulness

Utility

Easy to learn
Efficient to use
Easy to remember
Few errors
Subjectively pleasing

System acceptability

Practical acceptability

Cost
Compatibility
Reliability
...

From Jakob Nielsen, Usability Engineering, 1993
Usability Attributes

- Learnability
  - easy with which new users can begin effective interaction and achieve maximal performance.

- Efficiency:
  - once the user has learned to use the system, a high level of productivity should be possible.

- Memorability
  - should be easy to remember.

- Errors
  - should have a low error rate.

- Satisfaction
  - should be pleasant to use
Usability measurements

- Test users (selected to be as representative as possible of the intended users) use the system to perform a prespecified set of tasks.
- Usability is measured relative to certain users and certain tasks.
- Determine the system’s overall usability on the basis of a set of usability measures by taking the mean value of each of the attributes that have been measured and checking whether these means are better than some previously specified minimum. Ex: criterion for subjective satisfaction: mean value should be at least 4 on a 1-5 scale and no more than 5% of the users gave 1.
Usability - Learnability

- ease of learning - refers to the novice user's experience on the initial part of the learning curve.
- highly learnable systems allow users to reach a reasonable level of usage proficiency within a short time.
- pick some users who have not used the system before and measures the time it takes them to reach a specified level of proficiency in using it.
- express the specified level of proficiency:
  - state that the users have to be able to complete a certain task successfully.
  - specify that users need to be able to complete a set of tasks in a certain minimum time before one will consider them as having "learned" the system.
Usability – Efficiency of Use

- Efficiency refers to the expert user’s steady state level of performance at the time when the learning curve flattens out.
- Users are considered experienced either if they say so themselves or if they have been users for more than a certain amount of time.
- Experience can also be defined by the number of hours spent using the system.
  - Test users are asked to use the system for a certain number of hours, after which their efficiency is measured.
- Continuously measure user’s performance (ex: in terms of number of seconds to do a specific task) until it stops to increase, when the user is considered to reach the steady-state level of performance.
Usability – Memorability

- Casual users are people who are using the system intermittently (expert users use the system frequently).
- In contrast to novice users, casual users have used the system before and do not need to learn it all from scratch.
- Casual users only need to remember how to use the system based on their previous learning.
- measuring process:
  ➡ standard user test with casual users that have been away from the system for a certain time.
  ➡ memory test: after they finish a test session and ask them to explain the effect of various commands or the name of a command that done a certain thing (assess the number of correct answers).
Usability – Errors

- users should make as few errors as possible when using a computer system.
- error: action that does not accomplish the desired goal.
- system error rate is measured by counting the number of such actions made by the user while performing a certain task.
- Some errors are corrected immediately by the user and have no other effect than to slowdown the user’s transaction rate. Need not to be counted separately, as their effect is included in the efficiency of use.
- catastrophic errors should be counted separately from minor errors and special effort should be made to minimize their frequency.
Usability – satisfaction

- how pleasant it is to use the system.
- psychophysiological measures (pupil dilatation, blood pressure, heart rate)
- simply ask the users for their subjective opinion (average of multiple answers).
- the most difficult episode a user experience is the most memorable one (no extreme peak in difficulty).
- questionnaires:
  ➡ users are asked to rate the system on 1-5 or 1-7 rating scales that are normally either
    - Likert scales
    - or semantic differential scales.
Usability – satisfaction

• questionnaires:

⇒ Likert scale – users indicate their level of agreement on a 1-5 scale for each statement.

Please indicate the degree to which you agree or disagree with the following statements about the system:

• “It was very easy to learn how to use the system.”
• “Using this system was a very frustrating experience”
• “I feel that this system allows me to achieve very high productivity”
• “I worry that many of the things I did with the system may have been wrong”
• “This system can do all the things I think I would need”
• “This system is very pleasant to work with”

From Jakob Nielsen, Usability Engineering, 1993
Usability – satisfaction

- questionnaires:
  ➡ A semantic differential scale lists two opposite terms along some dimension and asks the user to place the system on the most appropriate rating along the dimension.

Please mark the positions that best reflect your impressions of the system:

Agradável  _ _ _ X _  Irritante
Completo    _ _ X _ _  Incompleto
Cooperativo X _ _ _ _  Não cooperativo
Simples     _ X _ _ _  Complicado
Rápido      X _ _ _ _  Lento
Seguro      _ _ _ _ X  Perigoso

From Jakob Nielsen, Usability Engineering, 1993
Usability – satisfaction

- Final rating for subjective satisfaction is often calculated as a mean of the ratings for the individual answers (after compensating for any use of reverse polarity).

- No matter what rating scales are used, they should be subjected to pilot testing to make sure that the questions are interpreted properly by the users.

- Users tend to be positive, unless they have had a really unpleasant experience. This phenomenon can be partly counteracted by using reverse polarity on some questions.

- If multiple systems are tested, subjective satisfaction can be measured by asking users which system they prefer and how strongly they prefer various systems over the others.
Usability – trade-offs

- Not all usability aspects can be given equal weight in a given design project.

- It is not always possible to achieve optimal scores for all usability attributes simultaneously.
  
  - avoiding catastrophic errors may lead to a user interface that is less efficient to use.

- When usability trade-offs seem necessary, try to find a win-win solution that can satisfy all requirements.

- If that is not possible, define which usability attributes are the most important given the specific circumstances of the project.
Usability – trade-offs

- Considerations other than usability may lead to designs violating some usability principle.
  
ex: security considerations often require access controls that are non-user friendly – error message in login.

- make priorities clear on the basis of users and task analysis
  
ex:
  - learnability – when new employees are constantly being brought in on a temporary base
  - memorability – when application is used periodically, once every 3 months.
Usability – trade-offs

- “best of both worlds”

  ➞ accelerators – user interface elements that allow the user to perform frequent tasks quickly, even though the same task can also be performed in a more general, and possibly slower way. Ex: function keys, command name abbreviations,
Usability – goal setting

For each usability attribute of interest, several different levels of performance can be specified as part of the goal-setting process.

usability goal line

unacceptable Minimum Target Exceeds

5 4,5 3 2 1 0

Current value Planned value Optimal value

From Jakob Nielsen, Usability Engineering, 1993
Usability – goal setting

• usability goals are reasonable easy to set for new versions of existing systems or for systems that have a clearly defined competitor on the market.

  ➡ minimal acceptable usability would be equal to the current usability level and the target usability could be derived as an improvement that was sufficiently large to induce users to change system.

• For complete new systems without any competition, usability goals are much harder to set.

  ➡ define a set of sample tasks and ask several usability specialists how long it takes users to perform them.

  ➡ get an idea of the minimum acceptable level by asking users, but this is dangerous.
Usability Principles

• Learnability
  ➡ easy with which new users can begin effective interaction and achieve maximal performance.

• Flexibility
  ➡ multiplicity of ways the user and the system exchange information.

• Robustness
  ➡ level of support provided to the users in understanding and achieving their goals.
Usability Principles: Learnability

- **Predictibilidade**
  - Utilizador determina efeito duma acção futura com base na interacção passada

- **Sintetizabilidade**
  - Utilizador avalia efeito de acções passadas no estado actual

- **Familiaridade**
  - Aplicabilidade do conhecimento “do mundo” ao sistema

- **Generalizabilidade**
  - Capacidade do utilizador aplicar conhecimento duma interacção específica a outras semelhantes

- **Consistência**
  - Regularidade comportamental decorrendo de situações ou tarefas semelhantes
Usability Principles: Flexibility

- **Iniciativa de diálogo**
  - Evitar restrições artificiais no diálogo

- **Multi-tarefa**
  - Lidar com mais de uma tarefa simultaneamente

- **Migração de tarefas**
  - Transferir a gestão duma tarefa entre o utilizador e o sistema

- **Substitutividade**
  - Permitir que representações diferentes do mesmo valor possam ser usadas sem mais consequências

- **“Customizabilidade”**
  - Utilizador modifica a interface segundo preferências
Usability Principles: Robustness

• Observabilidade
  ➡ Capacidade de avaliar o estado interno com base na representação externa

• Recuperação de erros
  ➡ Possibilidade de tomar medidas correctivas quando um erro foi detectado

• Reactividade
  ➡ Percepção da intensidade de comunicação com o sistema

• Completude de tarefas
  ➡ Em que medida é que o sistema faz tudo o que o utilizador espera que ele faça
Usability Principles

“Every designer wants to build a high-quality interactive system that is admired by colleagues, celebrated by users, circulated widely, and imitated frequently.”

(Shneiderman, 1992)