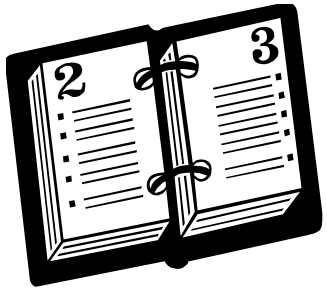
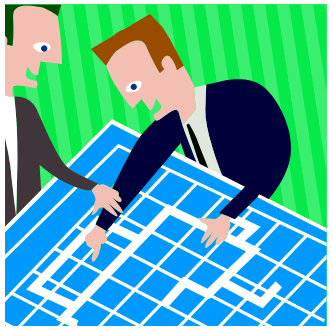
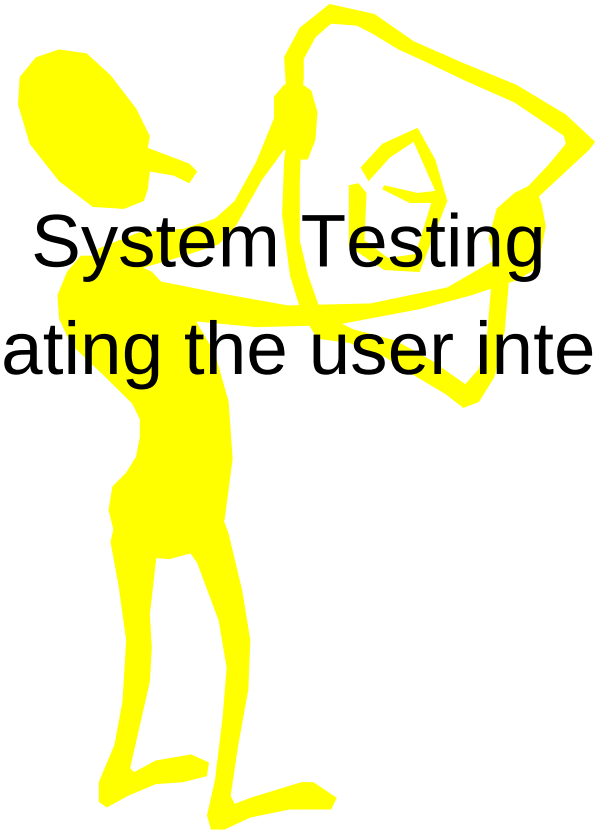
THE UNIVERSITY OF SYDNEY

INFO5990 Professional Practice in IT

Lecture 08B







System Testing

Evaluating the user interface

Guest Lecture's

- Week 10 – **Leon Fry-Kontaxis**
- **Professional Development Coordinator**
- Week 11 – **Ananda Rao – Founder Infosys (Aus), JustDial (India) serial entrepreneur - To be confirmed**
- Week 12/13 : **Roberto Donat – Executive Manager Westpac Portfolio**

By the end of this lecture you will be able to:

- Understand what is involved in system testing
- Appreciate the value of continuous testing and the significance of the V-Model
- Appreciate the importance of the user interface
- Distinguish usability and ease of use
- Explain how ‘user satisfaction’ is assessed
- Make wise software choices

User interface specialists are paid Between $700-$1000 per day

Reducing cost
Avoiding chaos!

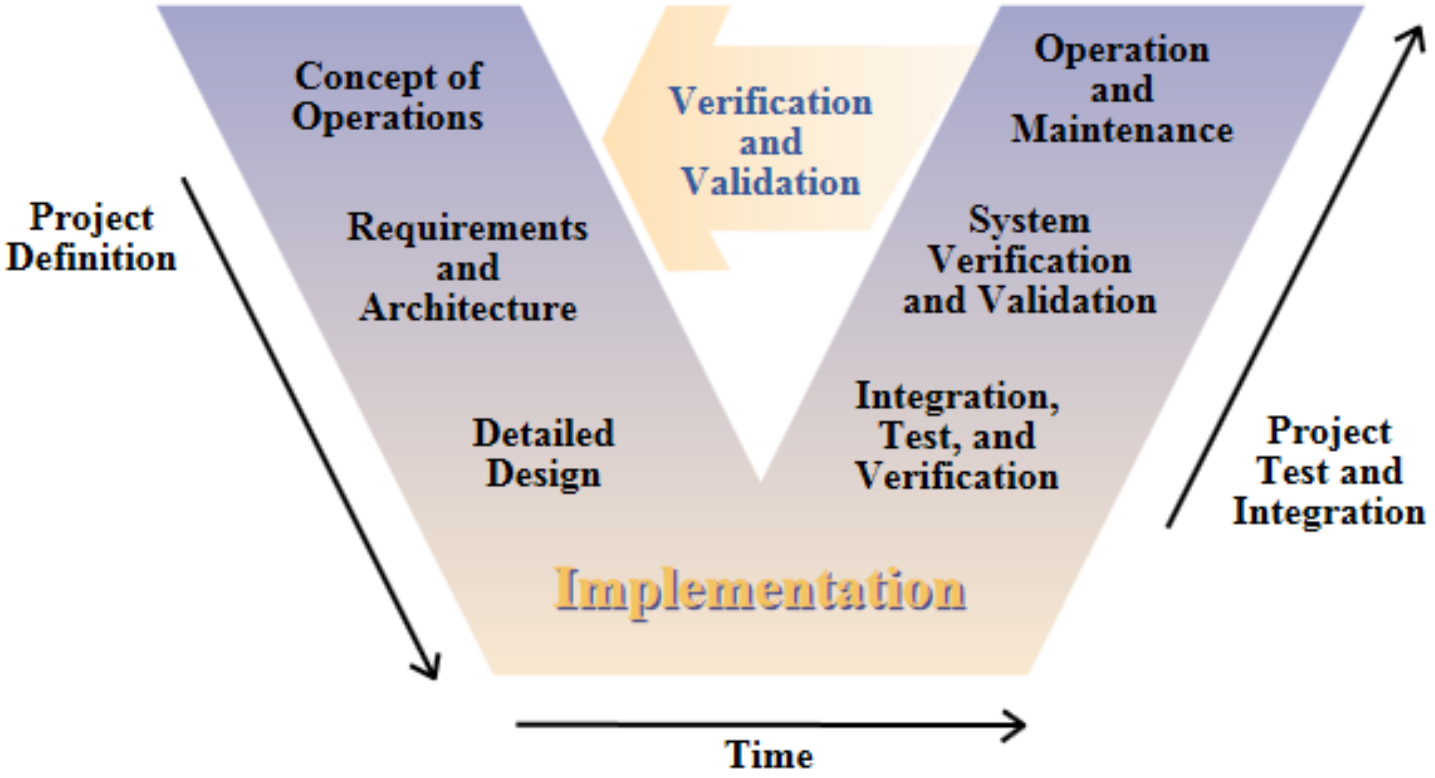
Continuous testing policy during system development

The cost of rectifying software defects

Stage at which Defect is Detected	**Typical Cost of Correction**
User Requirements	$100-$1,000
Coding/Unit Testing	$1,000 or more
System Testing	$7,000 - $8,000
Acceptance Testing	$1,000 - $100,000
After Implementation	Up to millions of dollars

The sooner a defect is discovered the cheaper and simpler it is to rectify.

The V-Model for software development



Verification & Validation

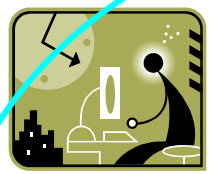
- Verification: *Are we doing the job right?*
  - Checking for conformance and consistency with the specification
  - Process oriented
  - Static testing, using reviews, inspections, walk-through carried out by programming team
- Validation: *Are we doing the right job?*
  - Checking that the specification is what the user actually wanted
  - Product oriented
  - Dynamic testing using test scripts, scenarios
  - Sponsor and end users involved in testing

System verification cycle

Examine program specification

Decide on test cases

Work out expected outcomes



Several iterations

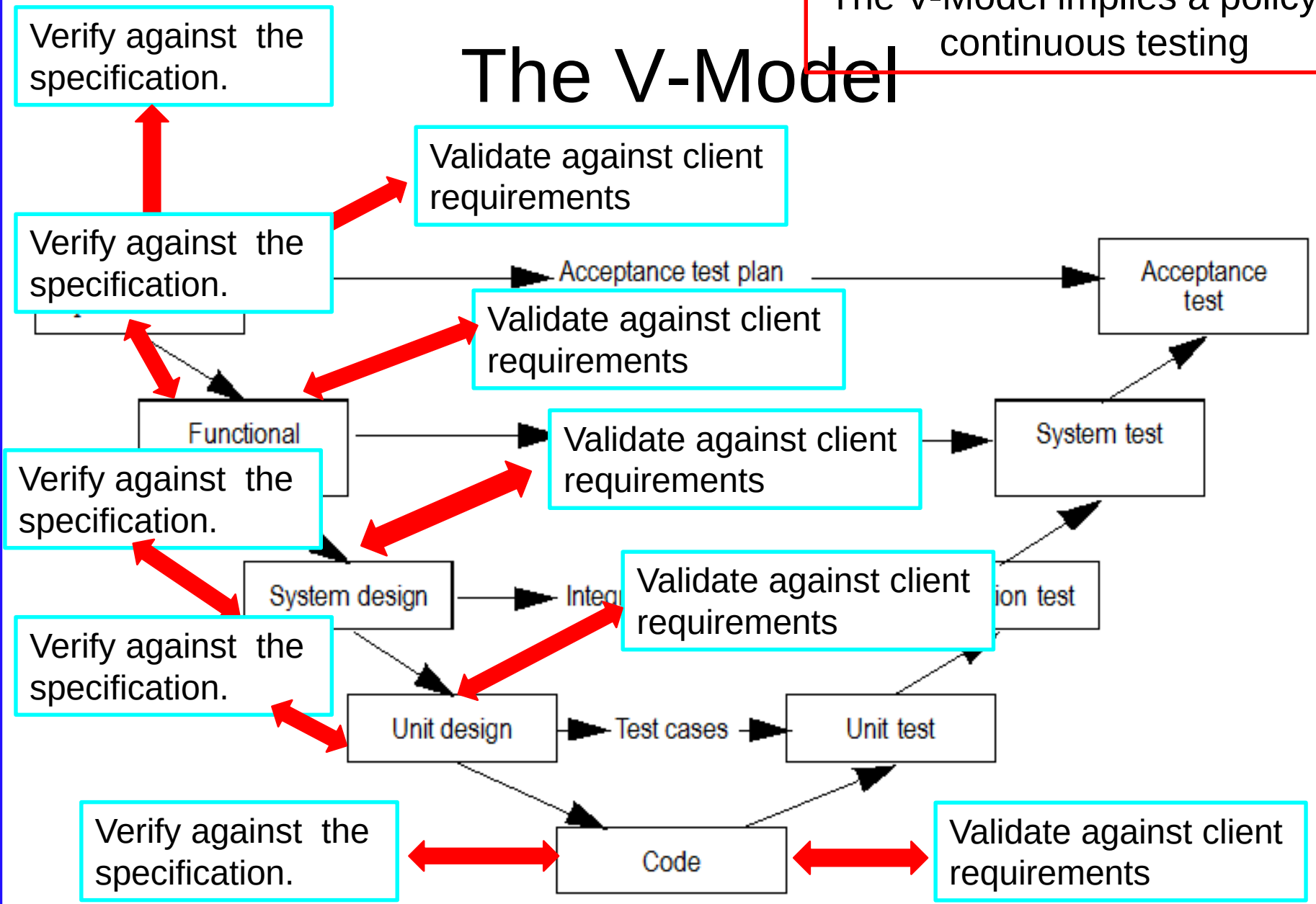
Code the program

Run tests

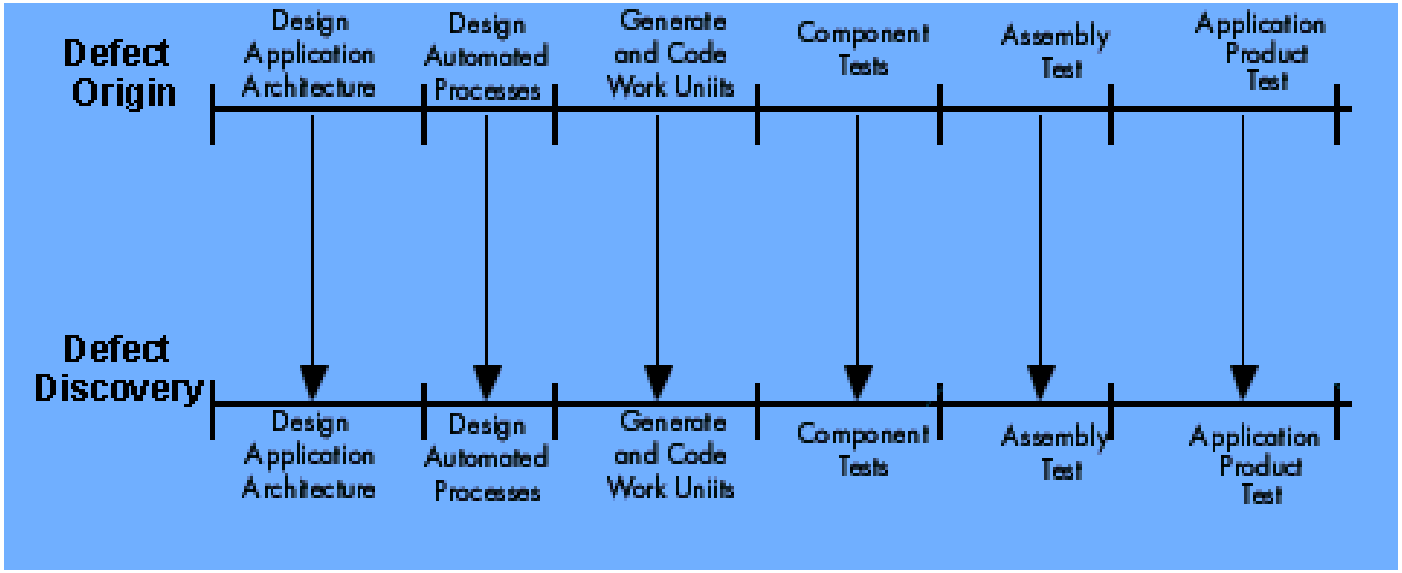
Check outcomes

The V-Model implies a policy of continuous testing

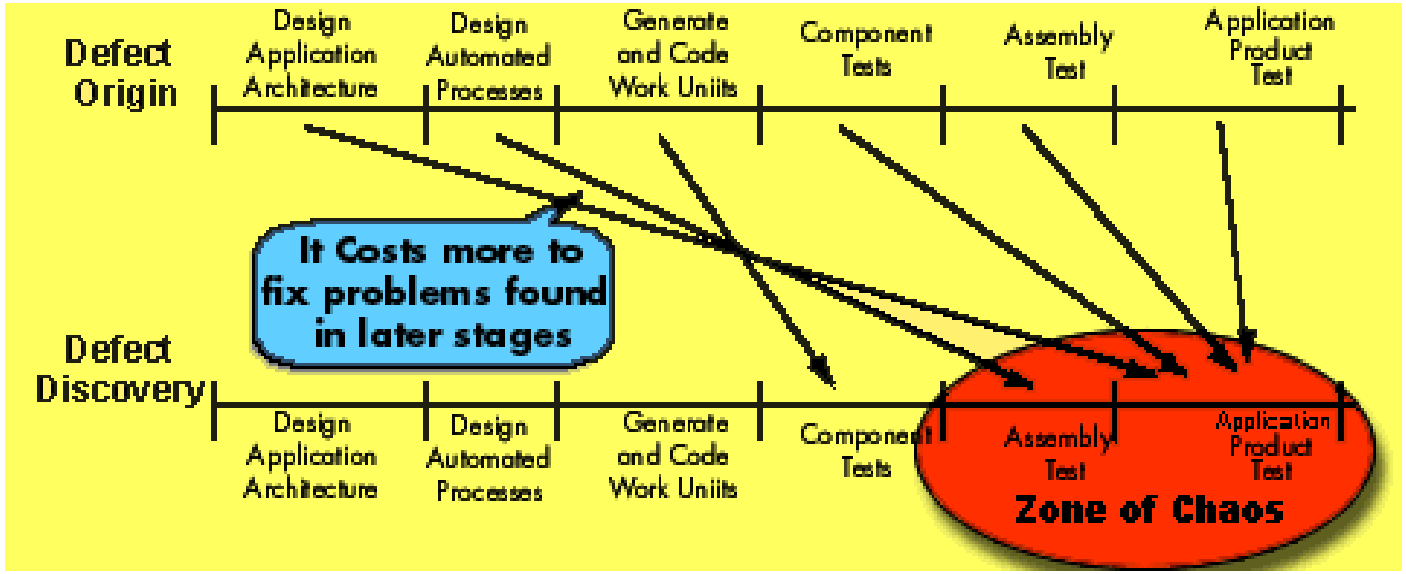
The V-Model



The benefit of continuous testing



"Continuous testing"



The alternative: "Put it off until later" policy

Implications of the V-model

- Means that testing is considered early in the development life cycle, well before coding
- Avoids chaos towards the end of the project
- System design is continuously checked
  - against specifications (verification) and
  - against user requirements (validation)
- Means that the probability that the final product will satisfy the user's needs is much improved

Case Study
Using the V-MODEL

What would you do to ensure the V-model method was being used ?

Q1. Which of the following properly illustrates ‘verification’?

A. Asking the client to comment on some system function

B. Creating a suite of test cases for testing

C. Creating a complete story relating to the way users will employ the component

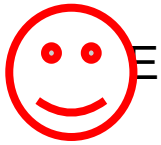
D. Reading the system requirements spec. and comparing with the component functionality

E. Devising a test environment resembling the actual user environment as close as possible

Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Score / 6
A B C D E	A B C D E	A B C D E	A B C D E	A B C D E	A B C D E	

Q2. A claimed benefit of a ‘continuous testing regimen’ is that

A. Discrepancies and omissions are identified earlier
B. The chances of users being satisfied are improved
C. The amount of chaos at the end of a project is reduced
D. Testing is incorporated into the development process at an early stage
E. ALL of the above

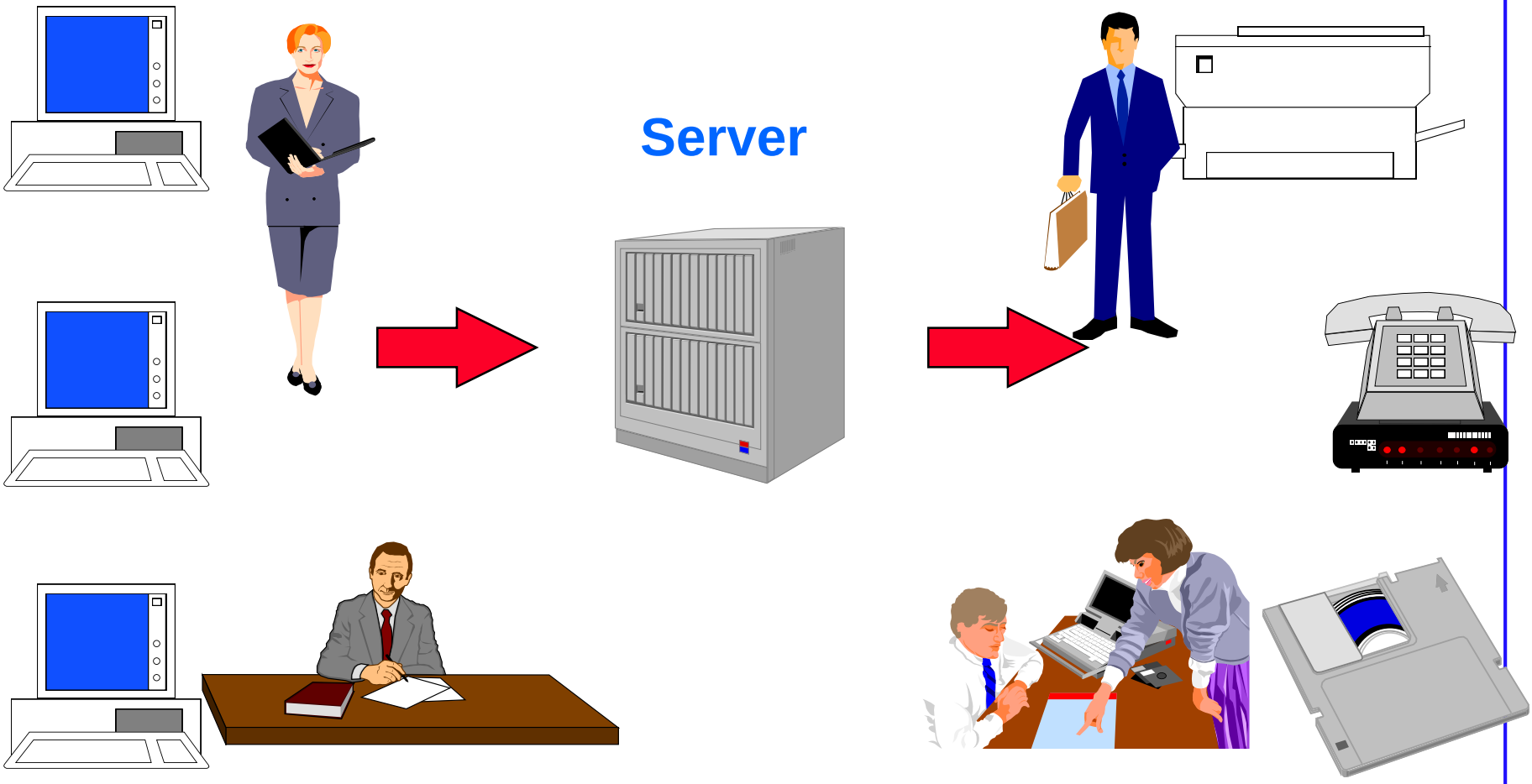


Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Score / 6
A B C D E	A B C D E	A B C D E	A B C D E	A B C D E	A B C D E	

The user interface

A user interface involves

PEOPLE



Two distinct categories of software

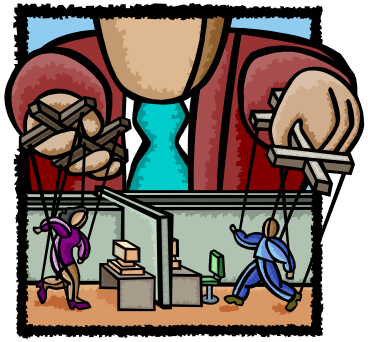
- Generic tools
  - e.g. Word, Excel, Project, Google, etc.
  - There is no specific ‘user’?
  - So, who defines the ‘user requirements’?
- Custom-built, or customised systems
  - Accounting, personnel, retail, inventory
  - Either custom built, or customisable (e.g. ERP)
  - Specific users exist and user needs are known
  - So, user requirements can be clearly defined

What is the role of the user?

- Owner of the system
- Payer of bills

- Supplier of data
- Consumer of information

- Controller of processing



Functions of the human-computer interface

- **From point of view of the Human:**
  - initiate programs
  - input data (facts about the real world)
  - set parameters for processing
- **From point of view of the Computer:**
  - request input (prompt the human)
  - present output requested by the human
  - report status or errors encountered in processing

How do users see software

- Usefulness
  - does the job
  - makes them more efficient
  - gives them additional power; they can do more
- Usability
  - ease of use
  - easy to learn
  - ‘user friendly’
- Subjective appeal
  - aesthetic appeal
  - similarity to other products used
  - good experiences

Usability studies

Evaluating ‘usability’

* *Ben Shneiderman, “Designing the User Interface”*, Addison-Wesley 1987

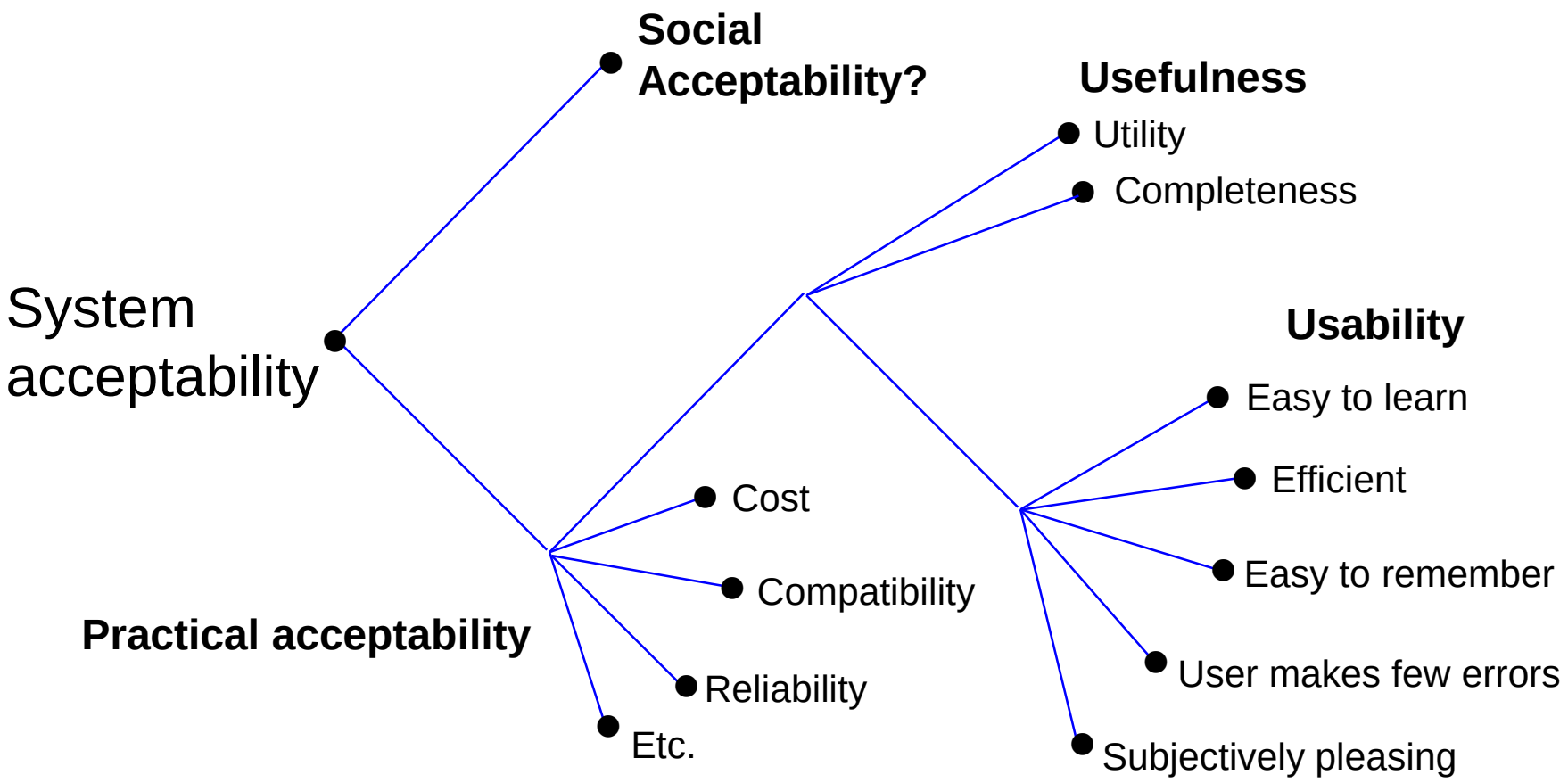
- Need to know about the user and the task
- Need to go deeper than a checklist of subjective guidelines
- Need to develop criteria that can be evaluated
- User friendliness “*is a meaningless concept*”*

Shneiderman's usability criteria*

1. Time taken to learn basic/advanced skills
2. Speed of performance of *skilled* users
3. Retention of syntactic knowledge over time
4. Error rates and ease of correction
5. Subjective satisfaction

* *Ben Shneiderman, "Designing the User Interface"*, Addison-Wesley 1987

Nielsen Usability Measures



Jakob Nielsen, *Usability Engineering*, 1994

Larry Constantine on ‘usability’

- The Great Law of Usability
  - “A system should be usable - without assistance or instruction - by someone inexperienced with the system but knowledgeable and experienced in the domain of the application”
- The Lesser Law of Usability
  - “A system should not substantially impede or interfere with efficient and sophisticated use by highly experienced users”

Larry Constantine, *Persistent Usability, OzCHI Proceedings, 1994*

Difficulty of testing usability

- To test the usability of new products must have skilled, highly-experienced users

  So, have to train subjects to high levels of skill before can even begin the experiment…

- "Intuitive" and "easy to learn" may not be synonymous when evaluating software, but often they are taken to be equivalent.

Larry Constantine, "*Persistent Usability", 1994, OzCHI Proceedings, Australian Centre for Human-Computer Interaction*

Q3. A major problem with assessing 'usability' is that

A. It is a meaningless construct
B. Users do not generally know what they want
C. It is impossible to distinguish usability from ease of use
D. Users need to be expert before they can be used for usability assessment
E. Intuitive and easy to learn are indistinguishable

Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Score / 6
A B C D E	A B C D E	A B C D E	A B C D E	A B C D E	A B C D E	

Web site usability: what is measured?

Web site usability research, Lonergan Research Pty Ltd, 2009

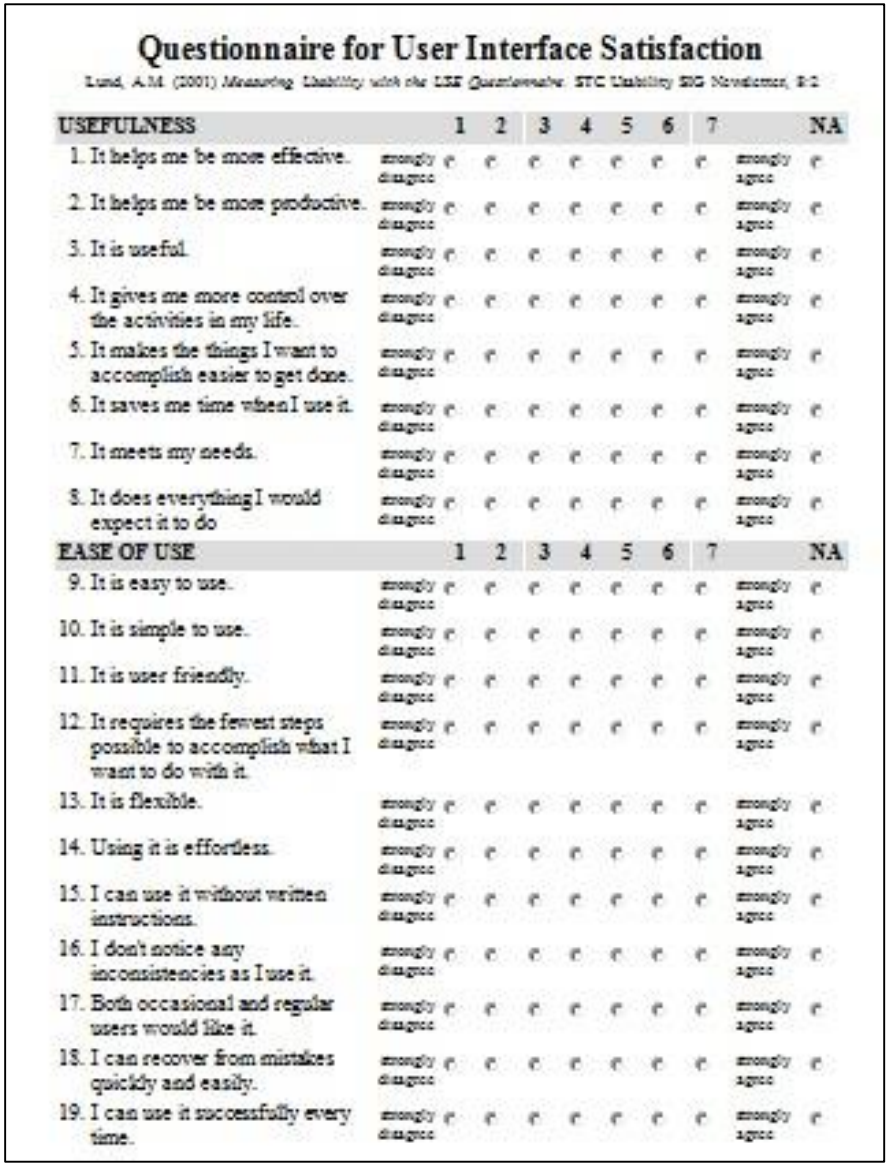
- Learnability
  - How easy it is for users to achieve tasks when visiting your web site for the first time
- Efficiency
  - How quickly tasks can be achieved once a user is familiar with your site
- Memorability
  - How quickly proficiency can be re-established when users have not visited your web site for some time
- Errors & Problem Resolution
  - How often errors are made,
  - How serious these errors are, and
  - How easy it is for users to recover from these errors

Lund's USE questionnaire

Lund, A.M. (2001)
Measuring Usability with the USE Questionnaire

Four areas of evaluation

1. **USEFULNESS**
2. **EASE OF USE**
3. **EASE OF LEARNING**
4. **USER SATISFACTION**



Questionnaire for User Interface Satisfaction

Lund, A.M. (2001) *Measuring Usability with the USE Questionnaire.* STC Usability SIG Newsletter, 8:2

USEFULNESS	1	2	3	4	5	6	7		NA
1. It helps me be more effective.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
2. It helps me be more productive.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
3. It is useful.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
4. It gives me more control over the activities in my life.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
5. It makes the things I want to accomplish easier to get done.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
6. It saves me time when I use it.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
7. It meets my needs.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
8. It does everything I would expect it to do	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
EASE OF USE	**1**	**2**	**3**	**4**	**5**	**6**	**7**		**NA**
9. It is easy to use.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
10. It is simple to use.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
11. It is user friendly.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
12. It requires the fewest steps possible to accomplish what I want to do with it.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
13. It is flexible.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
14. Using it is effortless.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
15. I can use it without written instructions.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
16. I don't notice any inconsistencies as I use it.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
17. Both occasional and regular users would like it.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
18. I can recover from mistakes quickly and easily.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○
19. I can use it successfully every time.	strongly disagree	○	○	○	○	○	○	○	strongly agree	○

Lund's USE Questionnaire (2001)

	1. USEFULNESS
1	It helps me be more effective*.
2	It helps me be more productive.
3	It is useful.
4	It gives me more control over the activities in my life.
5	It makes the things I want to accomplish easier to get done.
6	It saves me time when I use it.
7	It meets my needs.
8	It does everything I would expect it to do.

* The user scores each item on a scale from 1 (strongly disagree) to 7 (strongly agree)
Called a Likert† Scale.
† Named after Rensis Likert (1903-1981): American organizational psychologist

Lund's USE Questionnaire (2001)

	2. EASE OF USE
9	It is easy to use.
10	It is simple to use.
11	It is user friendly.
12	It requires the fewest steps possible to accomplish what I want to do with it.
13	It is flexible.
14	Using it is effortless.
15	I can use it without written instructions.
16	I don't notice any inconsistencies as I use it.
17	Both occasional and regular users would like it.
18	I can recover from mistakes quickly and easily.
19	I can use it successfully every time.

Lund's USE Questionnaire (2001)

	3. EASE OF LEARNING
20	I learned to use it quickly.
21	I easily remember how to use it.
22	It is easy to learn to use it.
23	I quickly became skilful with it.

Lund's USE Questionnaire (2001)

	4. SATISFACTION
24	I am satisfied with it.
25	I would recommend it to a friend.
26	It is fun to use.
27	It works the way I want it to work.
28	It is wonderful.
29	I feel I need to have it.
30	It is pleasant to use.

Measuring user satisfaction

C1. Does the system provide the precise information you need?
C2. Does the information content meet your needs?
C3. Does the system provide reports that seem to be exactly what you need?
C4. Does the system provide sufficient information?

A1. Is the system accurate?
A2. Are you satisfied with the accuracy of the system?

F1. Do you think the output is presented in a useful format?
F2. Is the information clear?

E1. Is the system user friendly?
E2. Is the system easy to use?

T1. Do you get the information you need in time?
T2. Does the system provide up-to-date information?

Measured on Five point Likert-type scale: 1 = almost never; 2 = some of the time; 3 = about half of the time; 4 = most of the time; and 5 = almost always.

William J. Doll and Gholamreza Torkzadeh, "*The Measurement of End-User Computing Satisfaction*", MIS Quarterly Vol. 12, No. 2 (Jun., 1988), pp. 259-274

Q4. Which of the following is NOT a useful item in a questionnaire to determine user satisfaction?

A. Would you recommend it to a friend?

B. Is it fun to use?

C. Does it work the way you want it to work?

D. Do you feel empowered by it?

E. Is it user friendly?

Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Score / 6
A B C D E	A B C D E	A B C D E	A B C D E	A B C D E	A B C D E	

User interface design guidelines

Factors influencing design of the interface:
1.Operational considerations

- Productivity demands, e.g. data through put
- Specific task demands, e.g. environment
- Special data quality requirements
- Security requirements
- Consistency with other software in use
- Need to comply with an existing standard
  e.g. *Windows, Mac*
- Need to satisfy market demands
- Ability to port to other platforms

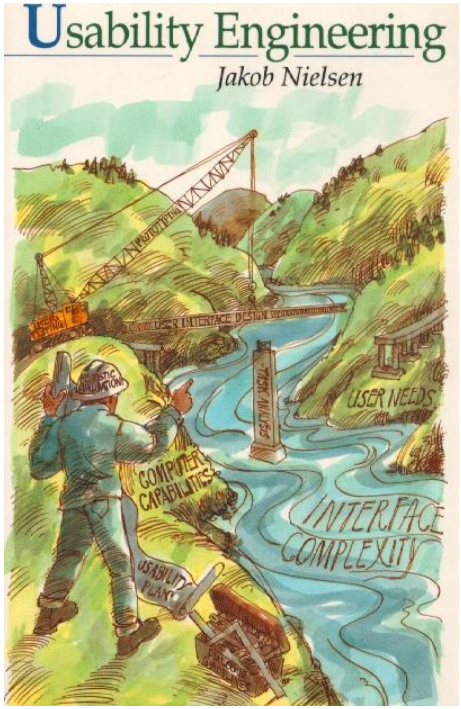
Factors influencing design of the interface:

2. User related considerations

- Expertise of the users
  - Suitability for novice/expert users
  - Relevant phase of software acquisition, e.g. initial acquisition, transition, production
  - Effectiveness in facilitating staff turnover
- Satisfying subjective preferences
- Availability of technical support
- Availability of suitable training

Jakob Nielsen (1993)
Nine Heuristics for interface design

1. Simple and natural dialogue
2. Speak the user's language
3. Minimize the user's memory load
4. Be consistent
5. Provide feedback
6. Provide clearly marked exits
7. Provide shortcuts
8. Provide good error messages
9. Prevent errors



Jakob Nielsen, *Usability Engineering*, 1993, Morgan Kaufmann, San Francisco

Larry Constantine (1994)
Eight Golden Rules for interface design

1. Strive for consistency
2. Enable ‘power’ users to take shortcuts
3. Offer informative feedback
4. Design dialogues to yield *closure*
5. Offer simple error handling
6. Permit easy reversal of actions
7. Support ‘internal locus’ of control
8. Reduce short-term memory load

Larry Constantine, *Persistent Usability, OzCHI Proceedings, 1994*

Comparison

Constantine

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2. Enable ‘power’ users to take shortcuts
3. Offer informative feedback
4. Design dialogues to yield *closure*
5. Offer simple error handling
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Nielsen

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4. Be consistent
5. Provide feedback
6. Provide clearly marked exits
7. Provide shortcuts
8. Provide good error messages
9. Prevent errors

Bruce Tognazzini (2003)
16 Principles for user-interface design

1. Anticipation
2. Autonomy
3. Colour blindness
4. Consistency
5. Defaults
6. Efficiency of the user
7. Explorable interface
8. Fitts' Law*
9. Human-interface objects
10. Latency reduction
11. Learnability
12. Metaphor use
13. Protect user's work
14. Readability
15. Track state
16. Visible Navigation

* Paul Fitts (1954) "The time required to rapidly move to a target area is a function of the distance to the target and the size of the target".

Benefits from improved usability

- Jakob Nielsen, 2003
  http://www.useit.com/alertbox/roi-first-study.html
- Data from 863 design projects
- Estimated productivity gains from redesigning an intranet interface to improve usability
  - for a company with 1,000 employees
    8 times bigger than the costs
  - for a company with 10,000 employees
    20 times bigger than the costs
  - for a company with 100,000 employees
    50 times bigger than the costs

Remember Readings

Next week is final chance to present