

Lecture Notes:

Improving Documentation by Improving the Product: Human Factors in UI Design

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What is a User Interface?

An interface is the place where independent systems meet and act on, or communicate with, each other.

A software product's user interface is comprised of...

- the hardware that makes up the system
- the software that comprises what the user sees, hears, or touches onscreen
- the hardcopy or embedded user assistance that comes with that hardware and software
- the assumptions of the product design team

The Product Manager's Model

- Reflected in the product's marketing requirements document, audience analysis
- Focus of interest: the features that comprise the product (not necessarily the way the user will interact with the product)
- Emphasis: balance between user needs, development resources, schedule; business decisions
- Achilles Heels:
 - Time to market
 - Profit

The Programmer's Model

- Reflected in the product's functional specifications
- Focus of interest: the objects and data that comprise the product (not necessarily the way the user will interact with the product)
- Emphasis: platform, operating system, shell, development tools, guidelines
- Achilles Heels:
 - Scope of functionality
 - Schedule
 - "Doc it"

The UI Designer's Model

- Reflected in the product's physical layout, look and feel
- Focus of interest: consolidating presentation, interaction, and object relationships
- Emphasis: user's conceptual model (real-world experiences -- tasks, processes, tools, results), programmer's model, user interface design principles and guidelines
- Achilles Heels: everyone else's, plus the actual usability of the finished product -- which takes time to determine

To Sum Up..

A well-designed user interface is not the same as a graphical "front end."

If you want create a product or web site that people will use, you have to understand the metaphors and models that drive user interactions with your medium (the computer).

This understanding forms the basis for user interface principles and guidelines.

“Anne!”

Anne was seated on the springboard; she turned her head. Jubal called out, “That new house on the far hilltop -- can you see what color they’ve painted it?”

Anne looked in the direction in which Jubal was pointing and answered, “It’s white on this side.”

Jubal went on in normal tones, “You see? ... it [wouldn’t] even occur to her to infer that the other side is probably white, too, unless she herself went around to the other side and looked. And even then she wouldn’t assume that it stayed whatever color it might be after she left ... “

Robert Heinlein, Stranger In A Strange Land

How People Learn About Their World

All learning is the product of experience.

When objects behave the same way from interaction to interaction, people come to expect that behavior from them all the time -- and generalize those expectations to other objects like them.

When object behavior conforms to expectations, the user can draw on their past experience and use the object successfully.

Thus they learn how to use the object.

Learning and Exploration

- **Children** -- who still have years of knowledge acquisition ahead of them -- are motivated by the need to explore their world in great detail.
- **Teens** are more interested in learning about the world by exploring their peers, and learning appropriate behavior.
- **Adults** -- who are already grappling with more information than they know what to do with -- want to continue to succeed by leveraging that which they already know.

What Happens When The Model Breaks?

When an object behaves differently than expected (same cues, different functionality), users are not immediately discouraged.

If the variation in behavior still falls within the parameters of what has historically been “normal” for that object, they’ll try alternate solutions -- until they lose patience.

When the model breaks:

- First we blame ourselves
- THEN we blame the object

Before conducting product usability tests, human factors and usability testing professionals always instruct people that the product is being tested, not the user, and that there is nothing they can do that can harm the computer. And, no matter how many times you tell them you are not testing them, it rarely works. They still blame themselves!

Theo Mandel, The Elements of User Interface Design

Side Trip: Breaking the Model on Purpose

Interface cues should give users an idea of the object’s form and function, and should allow them to determine their appropriate behavior.

Objects that provide deliberate misdirection (two sets of conflicting cues) cause users to hesitate before proceeding.

A “comedy of errors” amuses the spectator -- rarely the participant!

Mental Models and the Acquisition of Knowledge

Your mental model is an internal representation of how you understand and interact with a system. It includes all connections you make -- intellectually, emotionally, and socially -- between your actions and your results.

Your model is based on your experiences, and your assumptions.

It is your attempt to simplify your world.

Users employ models...

- To predict future events (or infer invisible events)
- To determine causes for observed events
- To determine appropriate actions to cause desired changes
- To serve as mnemonic devices for remembering relations and events
- As a means of understanding a similar device or event
- To overcome information processing limitations

Limitations of Human Cognition

(from Deborah Mayhew)

Human Strengths:	Human Weaknesses:
Pattern recognition	Low-capacity STM
Selective attention	Fast-decaying STM
Capacity learn	Slow processing
Infinite-capacity LTM	Error-prone
Rich, multikeyed LTM	Unreliable access to LTM

Computer Strengths:	Computer Weaknesses:
High-capacity memory	Simple template matching
Permanent memory	Limited learning capacity
Fast processing	Limited capacity LTM
Reliable memory access	Limited data integration

Hansen's 1979

"User Engineering Principles for Interactive Systems"

- Know the user
- Minimize memorization
- Optimize operations
- Engineer for errors

Theo Mandel's 1998

"Golden Rules of UI Design"

- Place users in control
- Reduce users' memory load
- Make the interface consistent

Place users in control

- Use modes judiciously
- Allow users to use either keyboard or mouse (flexible)
- Allow users to change focus
- Provide immediate and reversible actions, and feedback
- Provide meaningful paths and exits
- Accommodate users with different skill levels
- Allow users to manipulate interface objects directly

Reduce users' memory load

- Relieve short-term memory
- Rely on recognition, not recall
- Provide visual cues

- Provide defaults, undo, and redo
- Provide interface shortcuts
- Promote an object-action syntax
- Use real-world metaphors
- Use progressive disclosure
- Promote visual clarity

Make the interface consistent

- Sustain the context of users' tasks
- Maintain consistency within and across products
- Keep interaction results the same
- Provide aesthetic appeal and integrity
- Encourage exploration

We are surrounded by large numbers of manufactured items, most intended to make our lives easier and more pleasant. ... All these wonderful devices are supposed to help us save time and produce faster, superior results.

But ... if these new devices are so wonderful, why do we need special dedicated staff members ("power users" or "key operators") to make them work? Why do we need manuals or special instructions to use the typical business telephone? Why do so many features go unused?

And why do these devices add to the stresses of life rather than reduce them?

Donald Norman, The Psychology Of Everyday Things