Design Principles: Principles of Interaction Design, Comprehensibility, Learnability, Effectiveness/Usefulness, Efficiency/Usability, Grouping, Stimulus Intensity, Proportion, Screen Complexity, Resolution/Closure, Usability Goals

Interaction Design Models: Model Human Processor, Keyboard Level Model, GOMS, Modelling Structure, Modelling Dynamics, Physical Models

Usability Testing: Usability, Usability Test, Design the Test, prepare for the Test, Perform the Test, Process the Data.
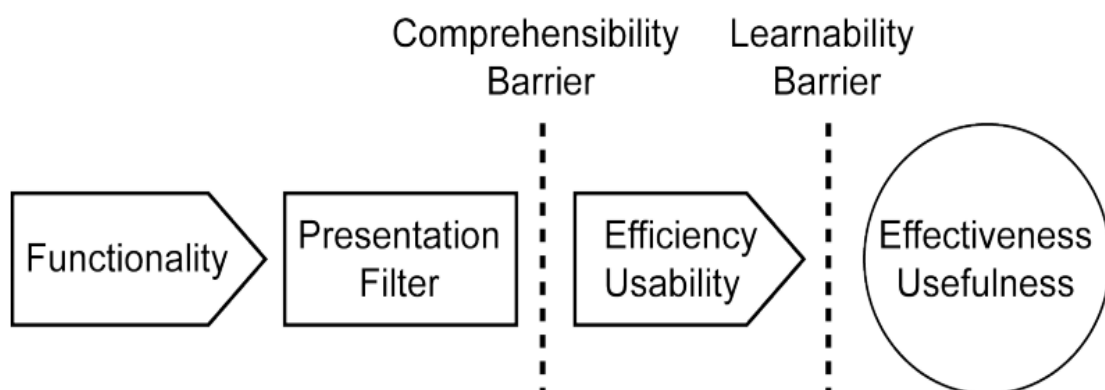
Design Principles

Principles of Interactive Design:

Design principles can be used to guide design decisions

•Design principles do not prescribe specific outcomes; they function within the context of a particular design project.

•Design principles guide interaction designers and help them make decisions that are based on established criteria.

• Design principle can be used to determine if there are gulfs of execution or evaluation

• Gulfs of execution relate to the effectiveness principles

• Gulfs of evaluation relate to the efficiency principles.

Framework For Design Principles:

The framework has the following components:

• Usability Goals – There are two main usability goals in the framework; comprehensibility and learnability.

• Design Principle Categories – The framework also divides the design principles into two main groups; efficiency principles and effectiveness principles.

• Format to Describe Design Principles – The framework uses the format "serves the principle of … which promotes …" to describe the different principles. – Familiarity serves the principle of memorability, which promotes usability.

Functionality - The system must have adequate functionality for a particular task.

Presentation Filter - The functionality must be made accessible through the presentation filter (interface).

Comprehensibility Barrier - If the presentation is comprehensible, the comprehensibility barrier will be superseded. This depends on the degree of efficiency/usability in the interface design.

Learnability Barrier – If the interface is comprehensible it will be learnable, there is a direct relationship.

Effectiveness/Usefulness - If the user can learn the interface he can take advantage of the functionality and the interface will, therefore, be useful.

Design Principle Categories:

Effectiveness/Usefulness:

Effectiveness describes the usefulness of a design

• The effectiveness goal stipulates that a design must fulfill the user's needs by affording the required functionality.

• Utility - The principle of utility relates to what the user can do with the system.

• Safety - If a design has a high degree of safety, it will prove more useful than a design that involves a high degree of risk. – Recovery - can be implemented in interaction designs by incorporating appropriate undo functionality and robust error recovery routines.

• Flexibility - A tool that is flexible can be used in multiple environments and may address diverse needs – Customization - A tool would have greater flexibility if people were able to customize the interface according to their personal preferences

• Stability - A stable system is a robust system. – A system that functions consistently well will be more useful than a system that crashes frequently.

Efficiency/Usability:

Efficiency describes the usability of a design

• The efficiency goal stipulates that a design should enable a user to accomplish tasks in the easiest and quickest way possible without having to do overly complex or extraneous procedures.

• Simplicity - If things are simple they will be easy to understand and, therefore, easy to learn and remember. – Ockham's Razor - Pluralitas non est ponenda sine necessitate - pluralities should not be posited without necessity – 80/20 Rule - The 80/20 rule implies that 80% of an application's usage involves 20% of its functionality – Satisficing - Combines the conflicting needs of finding the optimal solution that satisfies all the requirements and the need to settle on a solution that will be sufficient to proceed with the design.

– Constraints

• Psychological – Conventions - exploit learned behaviour to influence a user's actions – Mapping - can influence the way in which people perceive relationships between controls and effects – Symbols - can influence the way in which we interact with an interface by defining meaning and constraining our possible interpretations of interface elements

• Memorability - Interfaces that have high memorability will be easier to learn and use – Many different parameters affect memorability: • Location • Logical Grouping • Conventions • Redundancy

• Predictability - Predictability involves a person's expectations and his ability to determine the results of his actions ahead of time. – Consistency-Correctness

• Consistency reinforces our associations and, therefore, increases our ability to remember and predict outcomes and processes.

• Before we strive to be consistent, we must make sure we are correct.

• Predictability – Generalizabilty: can help us use the knowledge we gathered from previous experience and apply it to similar situations – Conventions: allow us to use our intuitions – Familiarity: familiar menu names and options help users locate objects and functions more easily – Location, Location, Location: Not all areas on the screen are created equal.

Grouping:

Low-level principles - used to make decisions about specific screen controls, menus and layouts.

• Gestalt Principles of Perception – Gestalt psychology strives to explain the factors involved in the way we group things – At the heart of Gestalt psychology is the idea that we strive to find the simplest solutions to incomplete visual information

• The Gestalt Principles of Perception: – Proximity – Similarity – Common Fate – Closure – Good Continuity – Area – Symmetry – Surroundedness.

Other Principles of Perception - Stimulus Intensity

 • We respond first to the intensity of a stimulus and only then do we begin to process its meaning.

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1    3    9    7
4    8    6    2
5    7    1    3
2    4    8    6
7    9    3    1
6    2    8    4
7    1    3    9
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Other Principles of Perception – Proportion

• Proportion can be used to represent logical hierarchies.

• Golden Ratio - The golden ratio expresses the relationship between two aspects of a form such as height to width and must equal 0.618.

• Fibonacci - A sequence of numbers in which each number is the sum of the two preceding numbers. – The relationship between the numbers in the Fibonacci series is similar to the golden ratio.

Other Principles of Perception - Screen Complexity

• The measure of complexity developed by Tullis (1984) can be used to calculate the relative complexity, and therefore the difficulty, of a design. – This measure of complexity uses information theory.

• Formula for calculating the measure of complexity

$$C = -N \sum_{n=1}^{m} p_n \log_2 p_n$$

C, complexity of the system in bits

N, total number of events (widths or heights)

m, number of event classes (number of unique widths or heights)

pn, probability of occurrence of the nth event class
   (based on the frequency of events within that class)

• To calculate the measure of complexity for a particular screen, do the following: 1. Place a rectangle around every screen element 2. Count the number of elements and the number of columns (vertical alignment points) 3. Count the number of elements and the number of rows (horizontal alignment points).

• Comber and Maltby found tradeoffs between usability and complexity: – As complexity decreased, predictability increased. – As complexity decreased, it became harder to differentiate among screen objects; the screen became artificially regular. – Decreased complexity meant that there were fewer ways to group objects. – Excessive complexity made screens look artificially irregular. – Increased complexity could occur from increased utility.

Other Principles of Perception - Resolution/Closure • Resolution/Closure - Relates to the perceived completion of a user's tasks. – When the user's objective is satisfied, he or she will consider the task complete and move on to the next goal.

Usability Goals – Principles –

 Guidelines

• Usability Goal—Easy to use – Most people are interested in completing their tasks and do not enjoy struggling with the tools they need to use. One of the most important goals of user-centered design is to make things easy to use.

 • Design Principle—Simplicity – Simple things require little effort and can often be accomplished without much thought. If interaction designs are guided by the principle of simplicity, they will be easier to use.

• Project Guideline—All dialogue boxes should present only the basic functions that are most often used and that other, less used functions can be accessed using an expandable dialogue with a link for "More Options."