

Principles & Benefits of User Centered User Interface Design

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Common Misconceptions

- TM Users don't know what they want
- TM We don't have the time to consult our users
- TM We have too many users, can't talk to them all
- TM We know what our users want
- TM We will design it right the first time
- TM don't accept that design is iterative
- TM must include time to test & debug UI
- TM No problem, the users will be trained!



Common Design Problems

- TM Communications gap between users and developers
- TM No methodology for UI design
- TM Developers lack GUI design experience
- TM No usability objectives or target measures
- TM No time for iterative design and usability testing
- TM Real users are not available for usability testing
- TM Usability testing is performed too late...
 - TM only time for minor improvements
 - TM no time to fix conceptual design problems.



Common Usability Problems

- ™ Difficult to use (terminology, unclear navigation, lack of consistency, poor feedback, intolerant to error)
- ™ Conceptual design problems
- ™ Doesn't meet user needs (poor task analysis)
- ™ Doesn't provide the needed information
- ™ Requires the user to remember too much information (codes, terminology)
- ™ Doesn't display information in a useful or natural format (outside user's knowledge and task domain)
- ™ Product lacks visual appeal (“out of the box experience”)



Interesting Statistics - Sales/Marketing

- TM 40% of buyers look at alternative products because the installed system does not meet their needs. 52% of respondents cited performance and ease-of-use as the major factor influencing a purchase (Data Decisions Applications Software Survey, 1985)
- TM Marketing - focus on usability & customer satisfaction
 - TM Average of 11.2 usability related comments found per magazine review article (Anderson, 1990)
 - TM InfoWorld assigns 18-30% of software review articles to 1) Ease of Learning; 2) Ease of Use; 3) Quality of documentation.



Interesting Statistics - Development

- TM UI = 47-60% of application code (MacIntyre, Estep, Sieburth 1990)
- TM UI = 29% of development budget (Rosenberg, 1989)
- TM Cost of change (Pressman, 1992)
 - TM during project definition - 1 unit
 - TM during development - 1.5-6 units
 - TM during maintenance - 60-100 units
- TM American Airlines found that identifying and fixing usability problems during design saved 60-90%. (LaPlante, 1992)



Interesting Statistics - Development

TM 63% of software projects exceed estimates (Lederer and Prasad, 1992)

TM 1) user change requests; 2) overlooked tasks; 3) users don't understand their own requirements; 4) poor communication between user/analyst

TM European Community (EC) standards directive require:

TM “software must be easy to use”

TM “software must be suitable for the task”

TM “principles of software ergonomics must be applied”

TM Companies lose 33% of after-tax profit when they ship 6 months late vs. 3.5% when they exceed development budgets by 50%.



Interesting Statistics - Ongoing Maintenance

- TM 80% of lifecycle costs occur in maintenance (Pressman, 1992)
- TM 80% of maintenance is caused by unmet or unforeseen user requirements, 20% is caused by bugs or reliability problems (Martin, McClure, 1983)
- TM Help desk support calls cost between \$12 and \$250/call.



How a User Group Benefits from Usability Engineering

- ™ Increased productivity (helps stabilize or lower staff cost)
- ™ Product better meets user goals, tasks, and objectives
- ™ Better product usability
- ™ Decreased user errors
- ™ Decreased training costs
- ™ Decreased user support (help desk, buddy, supervisor, documentation)
- ™ Shorter intervals (lead time) for new functionality
- ™ Better user satisfaction - Possible reduction in employee turnover



How a Vendor Benefits from Usability Engineering

- TM Increased sales (satisfaction, market appeal, usability as a feature) - Required if competitor's focus is usability!
- TM users decide if a product is usable in less than 1 hour
- TM users rated ease-of-use second at 6.8 out of 10 and ease-of-learning fourth at 6.4.
- TM Reduced cost to identify and prioritize requirements
- TM Reduced cost of development - make changes early
- TM Minimize last minute changes to publications and training
- TM Decreased customer support (hot-line call volume)



How can Usability Engineering Help during the Planning Phase?

- TM Identify User Profile - customer site visits, interviews, user surveys, focus groups
- TM Perform Competitive Analysis - evaluate usability of competing products (what works? what doesn't? what needs improving? How do users use your competitor's product?). Results can be input into usability objective measures.
- TM Perform Needs Assessment - What are customer needs? Are customer needs currently being met.



How can Usability Engineering Help during the Planning Phase?

- TM Critical Incident Analysis - identify usability problems that generate calls to the support line and/or lead to misuse or overuse. Goal is to stop first call, and thus possible repeat callers. Use service and maintenance records and customer complaints.
- TM Set usability objectives and measures (need basis and comparative data from similar products)



Usability Engineering - Planning Phase

Build a User (Group) Profile

- TM Know thy User! - No substitute for the real user.
- TM Gather background information about your users.
 - TM Psychological: attitude, motivation
 - TM Experience and future use (novice, advanced)
 - TM Job task, education (domain knowledge)
 - TM Physical aspects of user, of workplace
- TM Assess how user background impacts user performance, objectives, task execution, interpretation.
- TM Identify Primary and Secondary user groups
 - TM Expert mode and short-cuts, separate interfaces for the same task
 - TM Should training target ease of learning or ease of use?
 - TM Help should target user profiles (task and operational help)



Usability Engineering - Planning Phase

Set Usability Goals

- TM Define and quantify objectives for usability, acceptability, performance, and functionality.
- TM Every product must have Usability Goals - define early
- TM Should support Product Goals
- TM Goals can be “high level” initially, but become more detailed as your product matures.



How can Usability Engineering Help in the Analysis Phase?

- TM Early and continual focus on users & tasks - Participatory, interactive team design
- TM Evaluate Usability early and often - do it when it's cheap. Average usability test identifies 70-100 design issues (Jeff Schueler, 1992)
- TM Iterative design, test for usability, and redesign
- TM Ensure a User driven vs. Process, Data, or Technology driven design
- TM Standards for GUI design (Industry & company)



Typical UI Design Methodology

- TM Assemble design team with critical skills
- TM Define “high level task flow”
- TM Select UI platform, GUI development tools
- TM Define “detailed task flow”
- TM Develop low fidelity window prototypes
- TM Develop Application UI Handbook
- TM Perform Informal usability testing

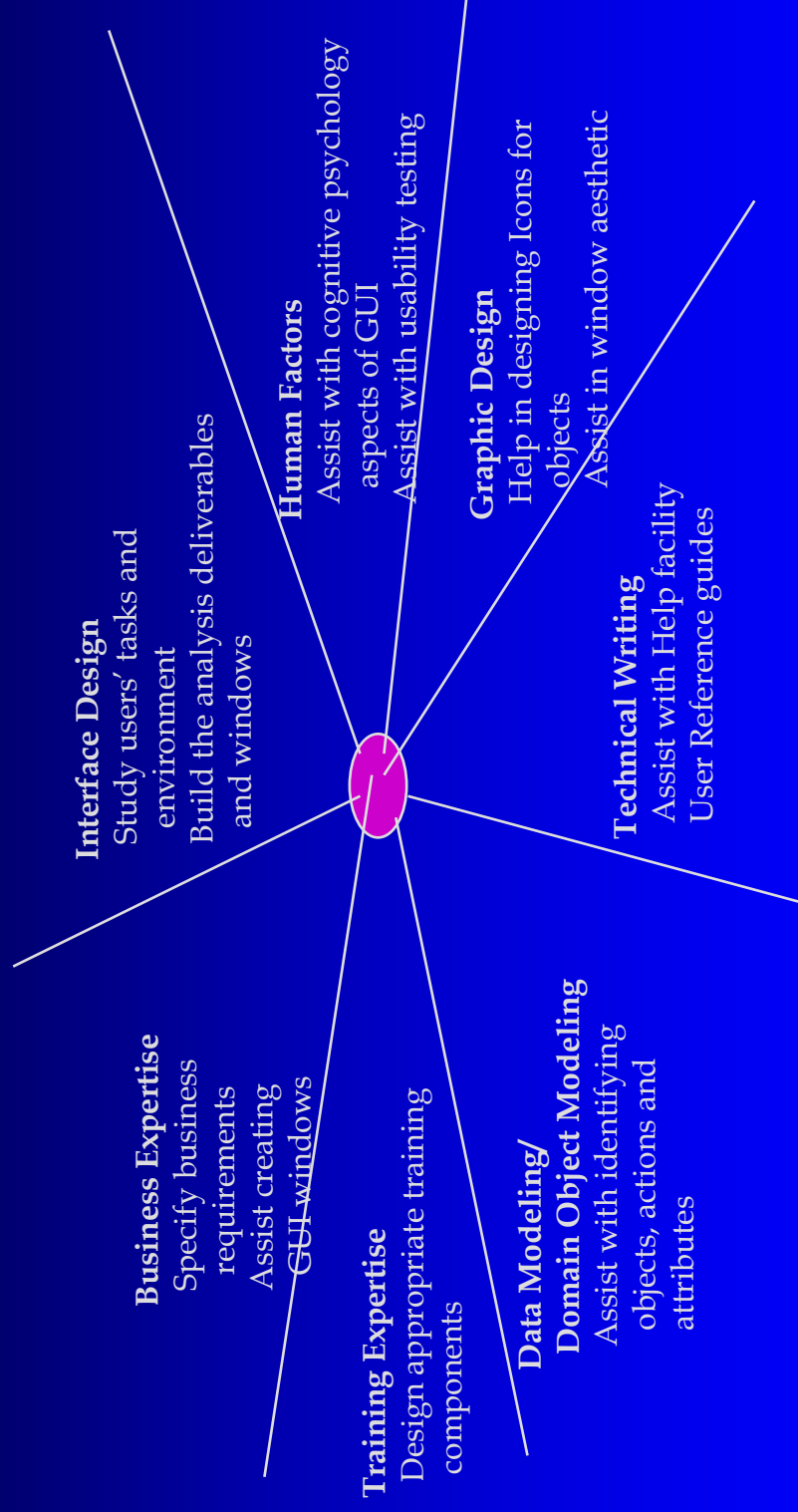


Typical UI Design Methodology

- TM Document UI requirements
- TM Develop Usability Test Scenarios
- TM Develop Usability Test Plan & Schedule
- TM Develop a Navigational prototype
- TM Perform Formal Usability Testing
- TM Develop Final Prototype - refine requirements
- TM Build



Skills Required on the UI Design Team





10 Components of a Usable Design

- TM Task Design that supports the user
- TM Design that supports development of the user's Mental Model
- TM Build a Metaphor to enhance learning
- TM Consistency
- TM Availability

- TM Feedback
- TM Error Handling
- TM Put the user in Control
- TM Design for human limitations and performance
- TM Provide effective graphics and art.



Effective Task Design

TM Task design must match:

TM actual use and job requirements

TM user's mental model

TM user's objectives

TM Task design must be flexible:

TM extend functionality and usage scenarios

TM add new capability



Building the User's Mental Model

TM User's knowledge of how a system works (e.g., inputs / outputs, invisible as well as visible processes, how and why it works, navigation, and structure)

TM Mental Models often are:

- TM Incomplete, inconsistent, imprecisely defined
- TM Confused with similar systems

TM Why bother with mental models?

- TM Allows the designer to learn business requirements; initial step in performing task analysis
- TM Capitalize on what the user already knows



Using a Metaphor in Your Design

- TM Simplifies complex tasks
- TM Takes advantage of existing user knowledge
- TM Don't force a metaphor - not a requirement
- TM Task objects and hierarchy may be ample metaphor
- TM Don't let the metaphor obstruct with user bandwidth (ability to complete the task).



UI Consistency

- TM Internal (controls, layout, terminology, drag and drop, object selection, object manipulation)
- TM External (style guides, other industry applications)
- TM Navigation (menu design, movement between windows, movement between fields)
- TM Task design
- TM Required for incremental learning
- TM Apple Style Guide strategy in 1985



Availability

- TM Access to task (unnatural task sequence, hidden controls)
- TM Access to information - misplaced in wrong task window
- TM Hidden controls
- TM Improper grouping of menu items and data



Feedback

- TM** Every user action must invoke a response
- TM** Indicates everything is OK, input accepted
- TM** Critical tasks require different feedback
- TM** Provide clear information, warning, and error messages
- TM** Don't let feedback get in the way
- TM** Use Redundant feedback



Error Handling

- TM Design for forgiveness - accommodate user exploration and mistakes
- TM Design to avoid errors (edits, UI controls)
- TM Effectively communicate and explain errors
- TM Guide the user
- TM Allow the user to recover
- TM Allow the user to stay in control



Other Characteristics of a Usable GUI

TM Put user in control

TM UI is “transparent” to the user

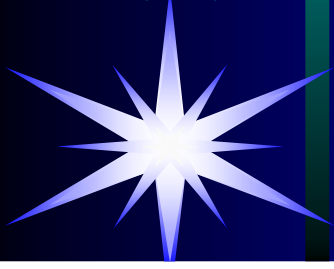
TM User can customize UI

TM UI is responsive

TM Design to accommodate Human Strengths
and Limitations

TM Maximize Human Performance

TM Use effective graphic design and artwork.



Industry Style Guides

TM OSF Motif Style Guide V1.2 - Prentice Hall
(ISBN-0-13-643123-2)

TM Windows Interface - An Application Design
Guide (ISBN-1-55615-384-8)

TM Psychology of Everyday Things - Dr. Don
A. Norman



Summary

- TM Define objectives for Usability
- TM Know Thy User!
- TM Involve users to do *Iterative* User Centered Design.....
- TM Analysis
- TM Design
- TM Usability Testing
- TM Follow GUI Style Guide conventions