

Evaluation of Products for Usability in Dynamic, Critical Mobile Health Care Environments

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Objectives

- Identify basic approaches to user research
- Describe challenges presented by mobile user experience
- Technique and practices for usability testing of mobile applications
 - Basic usability testing
 - Mobile usability testing
 - Mobile healthcare usability testing

Basics of User Research

- User Research
 - Defines user characteristics and tasks
 - Who, What, When, How
 - Informs design decisions
 - Explores context

Usability

- Testing
 - Summative
 - Concrete
 - Formative
 - Abstract
- Research
 - Ethnography
 - Studies

Rationale for Testing

- Beyond Opinion Wars
 - Everyone has one
 - Subject Matter Experts
- Gather Data
 - Innovation
- Define basic questions
 - Example
What screen size is better for mobile users in healthcare?

Usability: Human Centered Design

- Use guiding questions to frame, but not limit, the research (don't put blinders on)
- Select data-gathering strategies
- Suspend judgment
- Capture data
- Learn, don't teach
- Analyze

Observational Research

- Self-reporting of behavior is often inaccurate
 - User's don't analyze their own behavior
 - Users internalize many steps of their work
 - Users are trained to use their system as it is
 - They do not in envision how it could be
 - Design is extension to a product
 - Innovation is novel: iPhone
- Qualitative research is useful
 - Patterns of behavior can emerge with few informants.

Observational Research

- **A**ctivities Users' goals
 - **E**nvironments Context
 - **I**nteractions Social context, equipment, interrelationships
 - **O**bjects List in each space
 - **U**sers Stakeholders attributes
-
- Cues that trigger behavior
 - Signals that show status
 - Messages that explicitly form communications between people
 - Obstacles that cause temporary behavior changes
 - Barriers which are more permanent obstacles
 - Workarounds which people develop to get around system limitations
 - Repurposed Objects which are used in ways designers didn't intend
 - Wear Patterns which physically show how objects are used most often

Mobility Research

- Traditional usability research
 - Usability labs
 - Controlled environment
- Mobility Research
 - Difficulties
 - Application of tradition

Mobility Defined

- Mobile devices
 - Literature code word
 - Cell phone
 - Blackberry
 - iPhone
- Mobile users
 - Literature code word
 - Business oriented
 - Younger population

Research on Mobility

- Defining Mobility
- Study to observe cell phone users
- ACM articles from 2005
- Research in ACM, IEEE, CIN

Mobile Device Options

- Hand-held computer or PDA
 - Compact, easy to carry
 - Limited data entry
- Smartphone
 - Mobile phone networks
 - Security
- Tablet computer
 - Better data entry
 - Heavy
- Mobile carts
 - Full functionality
 - Cumbersome

Mobility – State of the art

Business



Healthcare



Healthcare Applications

- C5 / WOW
 - Full screen, traditional apps ported to these devices
- iPhone
 - WebMD Mobile
 - iTriage
 - Glucose Buddy – Diabetes 2.0
 - OsiriX – Display & Analysis of medical images – works with MAC desktop version
 - Rounding
- PDA
 - Reference information
 - Medication administration

Our Research Study Goals

- Hardware:
 - Screen size – 4.5" (Sony Vaio) vs. 7" (Samsung Q1)
 - Hardware keyboard required or not (Sony Vaio has keyboard; Samsung Q1 does not)
 - Acceptability of mobile device by target users
- Additional
 - Tradeoff information about the two devices – weight vs. size, etc.
 - Observation of physical handling of different mobile devices in hospital-like setting
- Software:
 - Touch screen navigation
 - Organization of data

Our Exploration Of Mobility

- Research Questions
 - Explore the acceptability of mobile devices within a nursing healthcare setting
 - Attributes of this mobile population
 - Limit to nursing
 - Mobility:
 - Business the office moves to a hotel, airport, car
 - Healthcare – there is no office; mostly shared devices
 - » Users tend to bond with WOW
 - Explore data entry on mobile devices
 - Acceptability of entering text, numeric data
 - Handwriting recognition
 - Text-ing model

Research Method

- Adoption of traditional usability methods
 - Basics still apply
- Adaptation of Contextual Inquiry
 - Create a typical environment
 - Manipulate environment
- Selection of research subjects
 - Criteria selection
 - Real end users
 - No internal stakeholders or SMEs

Innovation

Development of mobile research methodology

- Create an environment
- Manipulate the environment
- Develop higher fidelity prototypes
 - Purposed to explore design questions
 - Re-structure typical tasks
 - Innovative interface designed for devices
- Select commercially available devices
 - Settled on UMPCs: two different types:
 - Sony Vaio UMPC – high resolution screen with keyboard
 - Asus – larger screen, no keyboard

Create Environment

- Can't test in a real hospital with real patients
- Nursing Simulation Lab
 - Support of nursing practice
 - Access to educators
 - Adoption of student simulation scenarios
 - Educators operated/became patients
 - Access to equipment
 - Human Simulators
 - Cameras / recorders
- Construct a simulated environment
 - 3 patients, supply room, med room
 - Lab simulates hospital rooms

Create an Environment

- Nursing Tasks
 - Take notes during clinical report
 - Review patient data
 - Decide tasks to perform
 - Administer meds
 - Change dressing
 - “Be interrupted”

Manipulate Environment

- Unobtrusive camera
 - Assembled environment to angles needed
- Messy rooms
 - Disallow easy place for setting device down
- Create interruptions
 - Patient scenarios

Develop Prototype

- Developed by User Interface Designers
 - SMEs useful
- Touch based
 - All Thumbs
- Organization of knowledge
 - Task based
 - Task Selection
 - Report – data entry
 - Environment interaction: Administration of meds

Research Study Design

- Within Subjects Design
 - Participants use both devices for nursing tasks
 - Randomize which one used first
 - 20 participants for 2.5 hrs/participant
- Basic Structure
 - Pre: orientation to device, lab, testing procedure
 - Testing: device handling and HF observation
 - Post: structured feedback, workload assessment, unstructured feedback

Select Devices

- Focused on UMPCs
 - Ultra Mobile Personal Computers
 - Quickly changing market

Images



Staff

- Observers
 - Clinical Facilitator: *orientation, report, simulation, clinical questions*
 - Device Observer: *focus on device handling (how device is carried, placed, used)*
 - HF Observer: *focus on traditional elements (affect, comments, tasks attempted, timing)*
- Faculty
 - Dealing with Sim-Man equipment
- Ancillary
 - Videographer
 - Procurement of lunch & chocolate

Participants

- Requirements
 - RNs - bedside care who administer meds
 - Adult care only
 - 3+ years experience only
 - Some computer experience
 - Demographic goals skewed given known age, gender distribution of RN population
 - Recruited by agency

Video Clips

- Introduction to Sim-Man lab for participants
- Lab setup for testing.

Analysis



- One week
- 15 Participants
 - Practicing ICU nurses
- Analysis done daily
 - Group exchange
 - Individual

Results

- *Observations* point to *Insights*
 - System design
 - People who use it
 - Flow of information within it
- *Insights* point to *Design Criteria*
 - Design Criteria are unrestrictive statements that will guide the selection of Design Requirements
- *Design Criteria* guide *Design Requirements*

Requirements are traceable to observations

Expertise

- Knowledge of usability research theory
- Experience with usability research and testing
- Experience with observation
- Knowledge of targeted users' environment
- RNs to interact with targeted users

Expertise

- Coordination of McKesson's resources
 - Nursing leadership
 - Product management
 - User Interface Designers
 - Clinical analysts
 - Development engineers
 - Legal counsels
 - Budget resources

Summary

Thank You!

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