The Role of the Informatics Nurse in Developing Highly Usable Bedside Systems

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Objectives

- Describe the phases of the software development process
- Describe how usability can be addressed in each phase of the software development process of bedside systems
- Describe the roles informatics nurses can play in phase
- Describe the nurse informatics skills and knowledge sets that are most beneficial for each of these roles and job positions

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What is Usability

The extent to which a product can be used by specific users to achieve specified goals with **effectiveness**, **efficiency** and satisfaction in a **specified context of use**

(ISO 9241)

Usability Misconceptions

- It is not just the software
  - System and its configuration
  - Hardware and its set up
  - Implementation and training
  - Environment and workflow
- It is not just look and feel
  - Includes features and functionality as well

Why Bedside Systems

- System used most by clinicians at the bedside
- Directly affects patients' quality of care and outcomes

Software Development in a Vendor Environment

- Products are provided in multiple releases over a long period of time
- Vendor employees are divided between the **Field** and the **Factory**
  - **Factory**: development and support
  - **Field**: sales, installations, support

Software Development Process

- To provide all deliverables at a high level of quality by release time
- Number of iterations depend on process, product, culture, etc.
- Cross-functional team
  - Marketing
  - System design
  - Software development (R&D)
  - Software quality
  - Learning products
  - Support
  - Program management

Deliverables
It is not just the clinical applications!

- Software:
  - Clinical applications
  - Configuration tools/designers
  - Support tools
  - Interoperability with systems and devices
  - Printed reports
  - Data Analysis tools
- Other
  - User documentation
  - Training materials
  - Sales demos

Phases of Development

Requirements

- At a high level, what features and services will the release provide
- Based upon
  - Road map (long term vision of the product)
  - Customers workflows, wants, and environment
  - Competition
  - Industry trends
  - Market analysis
- Can vary in the degree of detail by vendor and product
- Example: "System will automatically calculate the cardiac index based upon the manual entry of input parameters."

Specification

- Provides sufficient details so that
  - Software can be designed and developed
  - Training material can be designed
  - User documentation can be designed
  - Initial schedules can be generated
- Usually written, but may be automated
- Detail includes
  - User Interface
    - Screen designs
    - Behavior (including error conditions)
    - Look and feel
  - Report designs
  - Interoperability
  - Configuration tools
  - System installation and update process

Development

- Software is
  - Architectured
  - Designed
  - Written
  - Tested (unit, integration, verification, other)
- User documentation written
- Training programs developed

Clinical Trials

- Also called alpha or beta testing
- Purpose is to gain initial feedback and identify defects early for fixing prior to release
- Planning for trials starts early in the process
- One or more customer sites – based on criteria
- Involves the factory rather the field

Maintenance

- Provide ongoing support and assistance
- Support Levels
  - Hospital
  - Field
  - Factory support team (technical and clinical)
  - R&D engineers

What is User Centered Designed?

User-centered design is an approach to design that grounds the process in information about the people who will use the product. User centered design processes focus on users through the planning, design and development of a product

(Usability Professionals' Association)

User Centered Design is an approach to enhance system usability

Techniques in User Centered Design

All techniques involve variations of the following:
- Who represents the user (i.e. the domain expert)
  - Hospital clinicians
  - Consultants
  - Company employees (clinicians)
- Number of users involved
- Purpose is exploration or feedback
- Method is observation or Interviews

Common Approaches in User Centered Design

Approach	User	# of People	Purpose	Method
Field observations	Hospital	1 or more	Exploration Feedback	Observe
One on one interviews	All types	1	Exploration Feedback	Interview
Focus groups	Hospital Consultants	>1	Exploration Feedback	Interview
Formal usability testing	Hospital Consultants	1	Feedback	Observe
Try it	All types	1 or more	Feedback	Observe Interview

Techniques to Involve Users During Phases

Phase	Field Obs.	Interviews	Focus Groups	Usability Testing	Try it
Requirements	X	X	X		
Specifications	X	X	X		X
Development			X	X	X
Clinical Trials	X		X	X	X
Maintenance	X	X			

User Centered Design

The system will better meet the user needs more when user representatives
- Are close to developers
- Are the decision makers
- Are the system designers
- Participate actively in all phases of development

Informatics Nurses Involvement

- As an employee in the factory
- Helps make user centered design feasible
- Better systems because they can
  - Be close to developers
  - Take an active part in design and decisions
  - Take an active part in all phases
- Can help in other ways with users
  - Can identify where user input is needed
  - Can reach out to other users
- Can lead to faster development of better systems
  - Cost of defects found late in development
  - Faster definition of specifications and requirements

Roles versus Positions

- Position: a job
- Role
  - What a person in that job does
  - Can change from release to release
- Which position fills which role depends on
  - The size and type of organization
  - The product
  - The skill set of the person in the position

Roles

Phase	Roles
Requirements	Requirements investigator Requirements developer/author Requirements reviewer Domain expert
Specifications	Specifications investigator Specifications reviewer Specifications developer/author Domain expert
Development	Architect Software developer User documentation author Training material author Training program designer Tester Domain expert
Clinical Trials	Site educator Installation/support engineers Site coordinator Clinical trials organizer Domain expert
Maintenance	Technical support engineer Application support Domain expert

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What I Have Seen

Phase	Roles	
Requirements	Requirements investigator Requirements developer/author Requirements reviewer Domain expert	**Required to be a clinician**
Specifications	Specifications investigator Specifications reviewer Specifications developer/author Domain expert	**Also been filled by a clinician but not required**
Development	Architect Software developer User documentation author Training material author Training program designer Tester Domain expert	
Clinical Trials	Site educator Installation/support engineers Site coordinator Clinical trials organizer Domain expert	
Maintenance	Technical support engineer Application support Domain expert	

Likely Positions for Informatics Nurses

- Product Manager
- Analyst
- Software Quality Engineer/Tester
- Learning Products Developer
- Clinical Specialist

Product Manager

- Main roles
  - Requirements author and investigator
  - Designs the road map
  - Approver of specifications
- The product owner – the final decider
- Position in marketing department
- Skills
  - Investigation skills
  - Communication skills
  - Business skills such as market analysis, etc.
  - Education in business or equivalent experience

Analyst

- Main roles: specification investigator and author
- The main designer of the product
- May be a specific position or merged with others
- Position in R&D, in marketing, or in its own department
- Skills
  - Investigation skills
  - Communication skills
  - System analysis and design skills
  - Analyst or technical degree or equivalent in experience

Software Quality Engineer

- Main roles: test process and testing
- Usually in their own department or part of R&D
- Quality Engineers
  - Experts on testing methodologies
  - Focus on system wide testing and verification
- Skills
  - Technical degree or equivalent experience
  - Developing test scripts and processes
  - Testing methodologies and tools

Learning Products Developer

- Main roles:
  - **A**uthor for user documentation
  - **Designer of training and on site implementation**
- Skills
  - Writing skills
  - Education skills
  - Project management

Clinical Specialist

- Roles:
  - **Domain expert**
  - **Clinical trial site educator and coordinator**
  - **Application support**
- May be a position by itself or merged with other responsibilities
- May be in any department, but most are in learning products
- Skills
  - Communication skills
  - System implementation
  - Support issue investigation
  - Clinical background

Other Positions

- Chief Informatics Nurse Officer or Chief Nurse Officer: depends on the vendor
- Regulatory controller: FDA, etc.
- Software developer/architect
  - But requires a technical degree
- Program manager
  - Manages the release across the teams.
  - Project management skills
- Manager
  - In any department, but usually department with clinicians
- Support engineer
  - Designs support processes, technical education, and support
  - Requires a technical degree
  - Does not have much impact on application features

In Summary

- User centered design can provide more usability systems
- The informatics nurse involved in system development is one way, in combination with others, to do user centered design
- There are many positions and roles for the informatics nurse in system development

Thank you

Feel free to contact me with questions at Maria.hendrickson@verizon.net