Guidelines for Improving Usability: Proposed EHR Usability Evaluation Protocol

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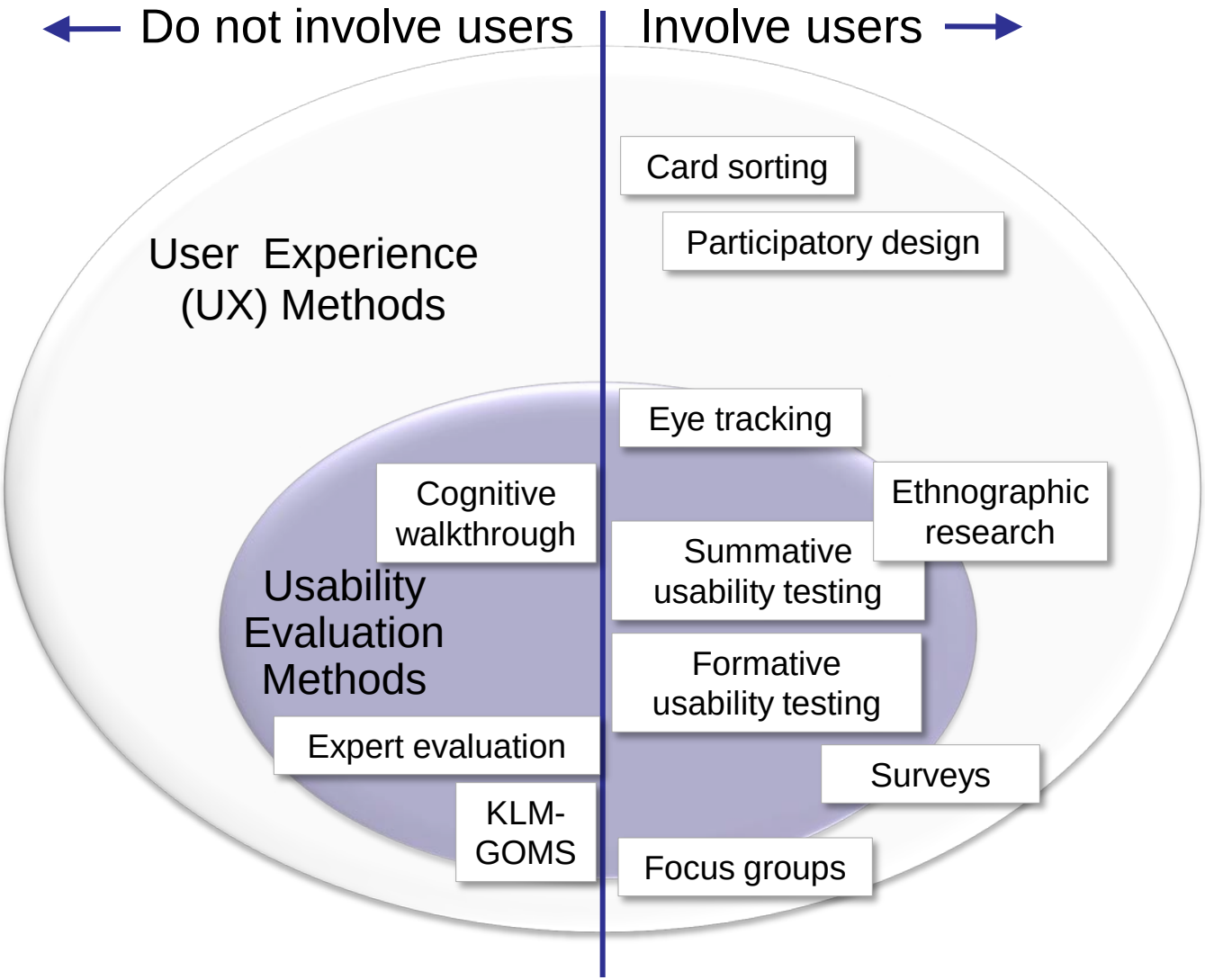
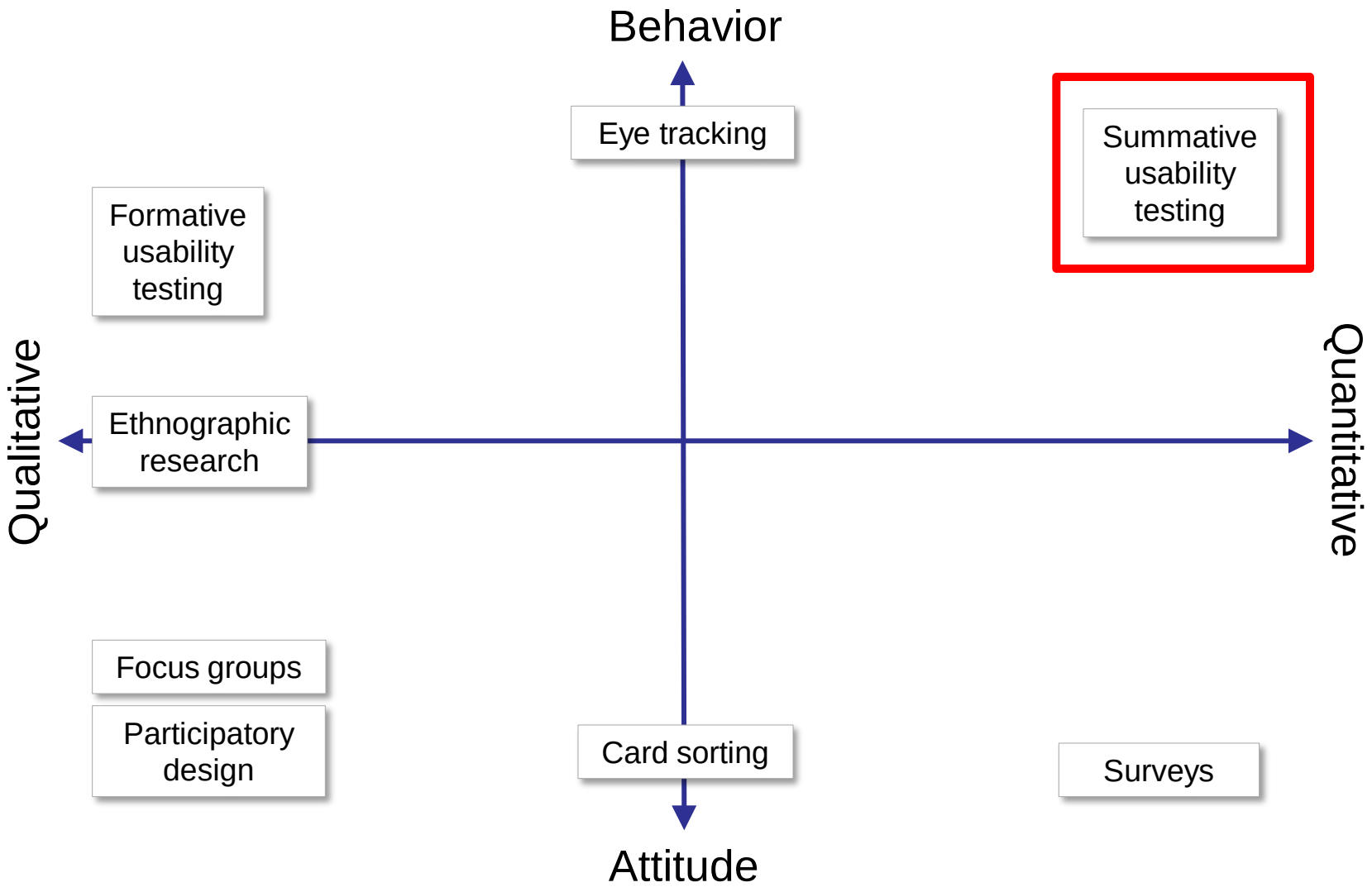
Usability Evaluation Methods in Context



UX Methods


Behavior
Eye tracking
Summative usability testing
Formative usability testing
Qualitative
Quantitative
Ethnographic research
Focus groups
Participatory design
Card sorting
Surveys
Attitude

Usability Testing Process

Summative Usability Test Plan

- **Objectives**
  - Assess human performance on key tasks in terms of
    - Effectiveness (for all tasks)
    - Efficiency (for frequently used tasks)
    - Critical errors that impact patient safety
    - Satisfaction (for all tasks)

- **Methodology**
  - Describe participants for recruitment
    - User groups performing core tasks (physicians, nurses, staff)
  - Describe the outcomes to be measured and how, e.g.
    - Errors and failures
    - Completion time
    - Efficiency

- **Materials**
  - Describe the key use cases to be tested
  - Describe the EHR, the test platform, and the test data that will be used.

- **Procedure**
  - Describe how test sessions will be conducted, e.g.,
    - User training procedures
    - Summarize the main activities during each session.

- **Lab set up and test moderators**
  - Describe the testing environment.
  - Describe how the session will be recorded.
  - Roles of all involved

Some Key Differences for EHR Summative Tests

- Participants
  (N=15-20 *per* user group)
  - Clinical users conforming to personas/profiles outlined by vendor
- Training
  - EHR is not walk up and use
- Tasks ← More
  - High importance; tied to key tasks surrounding MU
  - High frequency
  - High criticality
- Application
  - Version tested
- Moderators ← More
  - Must have expertise and experience in human factors and clinical domains
- Data collected
  - Focus on increased focus on use errors affecting patient safety
- Reporting format
  - CIF: Common Industry Format: NIST IR 7742; enables comparisons across variety of performance measures
  - Focus on reporting errors and changes to reduce errors

Tasks and Scenarios are under Development

- Many tasks will be tied to Meaningful Use (MU) criteria
  - Many of the MU criteria have a significant human factors or usability component.
- Tasks will be developed in cooperation with clinical users and vendors so that they can be evaluated on both a clinical and usability level.
- Evaluating participants' performances on tasks will form the basis of the usability evaluation of a given EHR.

- Examples
  - Order a blood test through a computerized interface
  - E-prescribe a medication
  - Record a patient's demographic characteristics
  - Review and update a problem list for a patient
  - Review and edit a medication list, removing one medication and replacing it with another.
  - Review and edit allergies list, add a newly discovered allergy. Discover that patient is allergic to an ingredient in one of the drugs in the list.
  - Record vital signs; look at a history of patient's morning heart rate.
  - Record smoking status

Evaluators: Experience & Expertise

- Education Each test administrator should have an advanced degree in a human factors discipline (i.e., social and behavioral sciences)
  - Computer science, graphic arts, medical informatics, ‘short-course’ certificants, etc. are typically not sufficiently skilled

- Experience Each moderator should have a minimum of three years experience with EHRs and/or other health information technologies

Observing and Recording Use Errors

- **Use error** is a user behavior has a different result than intended by the manufacturer or expected by the operator. Examples of use error categories include those identified in the Usability Safety Framework:
  - Patient identification error
  - Data accuracy error
  - Visibility error
  - Consistency error
  - Recall error
  - Feedback error
  - Data integrity error
  - Mode error

- Tasks will be constructed to specifically test for these error conditions

- Both the quantity and quality of errors will be recorded

- The report will require an analysis of the errors (e.g., severity, and impact) as well as discussion/ resolution on how the error will be mitigated

Protocol Development – Next Steps

- Finalize the adaptation of CIF processes to EHR testing
  - Test protocol examples (with tasks)
  - Data sheets
  - Etc.
- Development of the specific tasks
- Guidelines for engagement of clinical user groups
- Guidance for proper logistical test set up