

# A Review on Usability Features for Designing Electronic Health Records

Luis Bernardo Villa  
Ivan Cabezas



The 1<sup>st</sup> International Workshop on  
**R**eliability of **eH**ealth **I**nformation **S**ystems

In conjunction with  
16th International Conference on E-health Networking,  
Application & Services (HealthCom 2014)  
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# Introduction

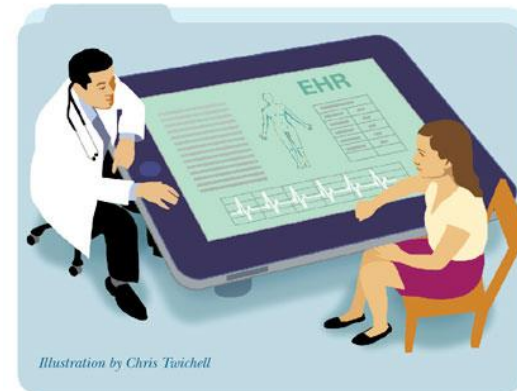
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# Electronic Health Record

- ❑ Electronic Health Record – EHR
- ❑ EHR: Health information of a person, which is created, gathered, managed, and consulted by authorized health care clinicians and staff



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(HIPAA, 2014)

(Massachusetts Medical Society, 2014)



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# EHR Requirements

□ An EHR should :

- Be available
- Gather complete and reliable data
- Allow a timely access
- Bring support to clinicians staff on decision making



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(Goldberg et al., 2011)

(Thizy, 2013)



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# Problem Statement

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# Problem Statement

□ The considered problem is two fold:

- Users are ignored during the EHR design process, leading to a low usability EHR
- There is a lack of clarity regarding how to incorporate users' requirements in EHR design





# Research Questions

- ❑ The addressed problem raises the following research questions:
  - ¿How to achieve a usable EHR?
  - ¿How to incorporate users' requirements within EHR design?



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# Usability Standards

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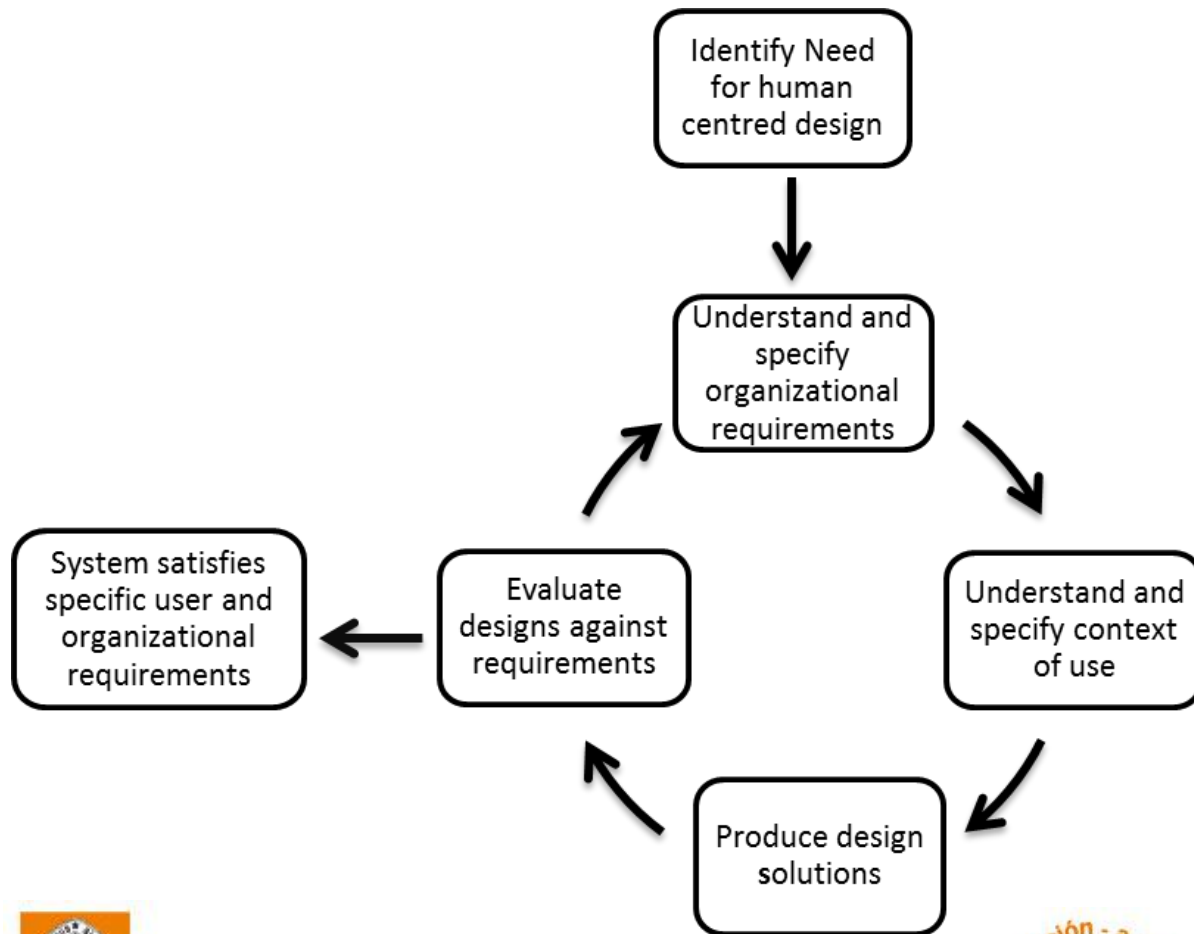


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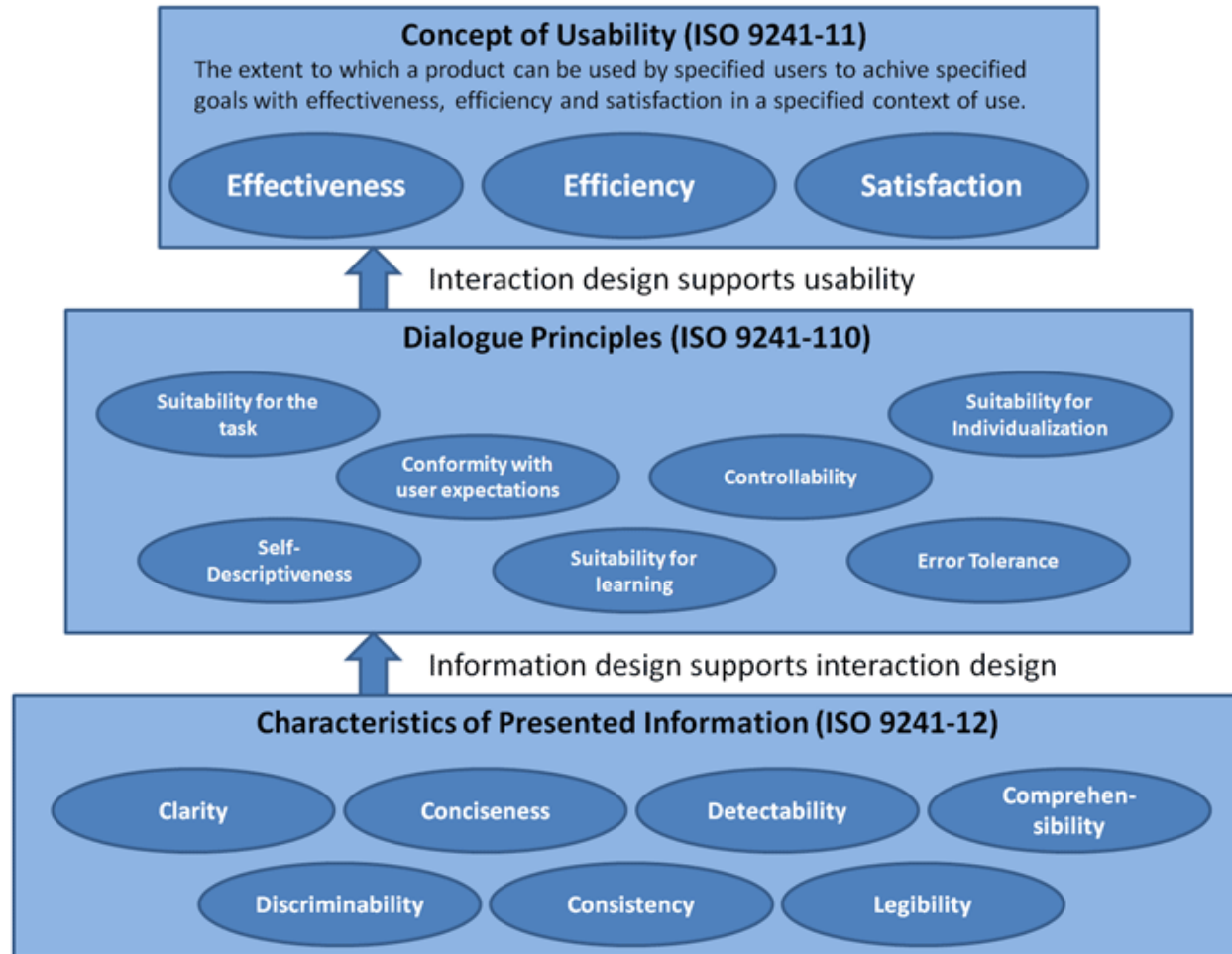


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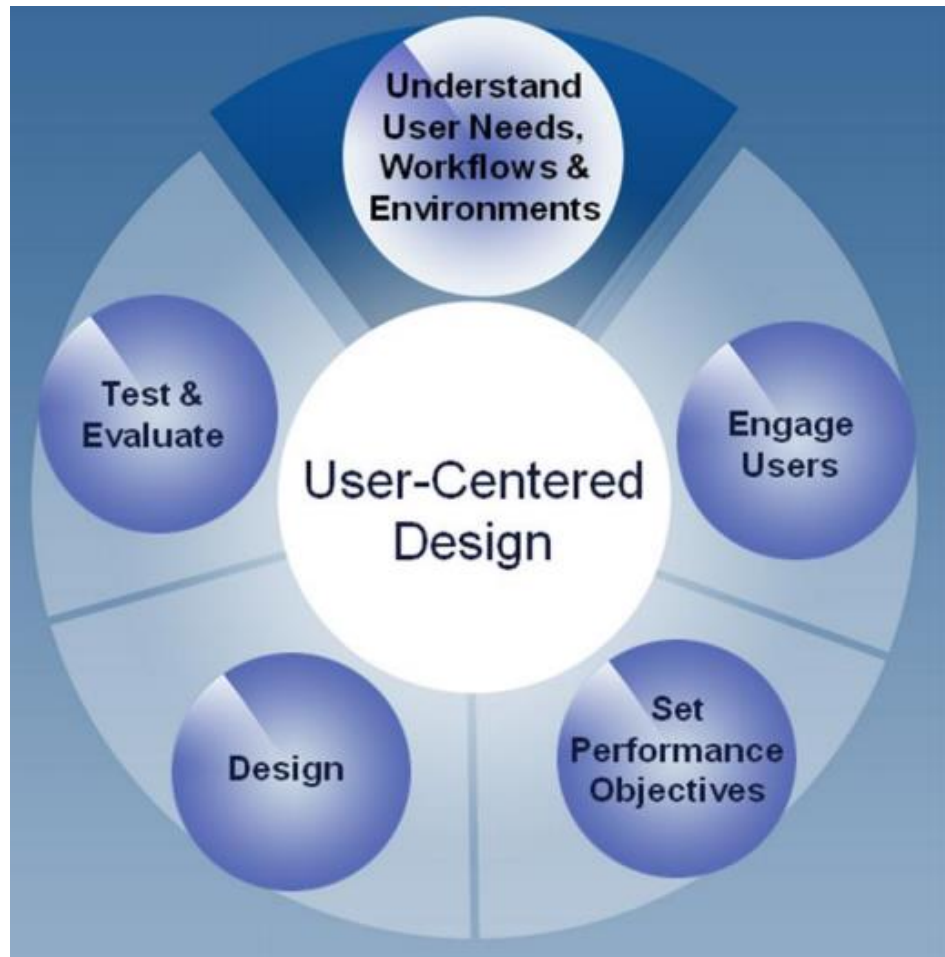
# ISO 9241-210 Standard



# ISO 9241-11



# NISTIR 7741



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(National Institute of Standards and Technology NIST, Schumacher, & Lowry, 2010)



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# ISO/TR 16982

## Direct involvement of Users

Observation of Users

Performance-Related Measurements

Critical Incidents Analysis

Questionnaires

Interviews

Thinking Aloud

Collaborative Design and Evaluation

Creativity Methods

## Indirect Involvement of Users

Document-Based Methods

Model-Based Methods

Expert Evaluation

Automated Evaluation

## Additional Methods and Techniques

Log Files

Video Capture

Scan Converter

Electronic Surveys

Parallel Design

Focus Group

Brainstorming



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(ISO, 2002)



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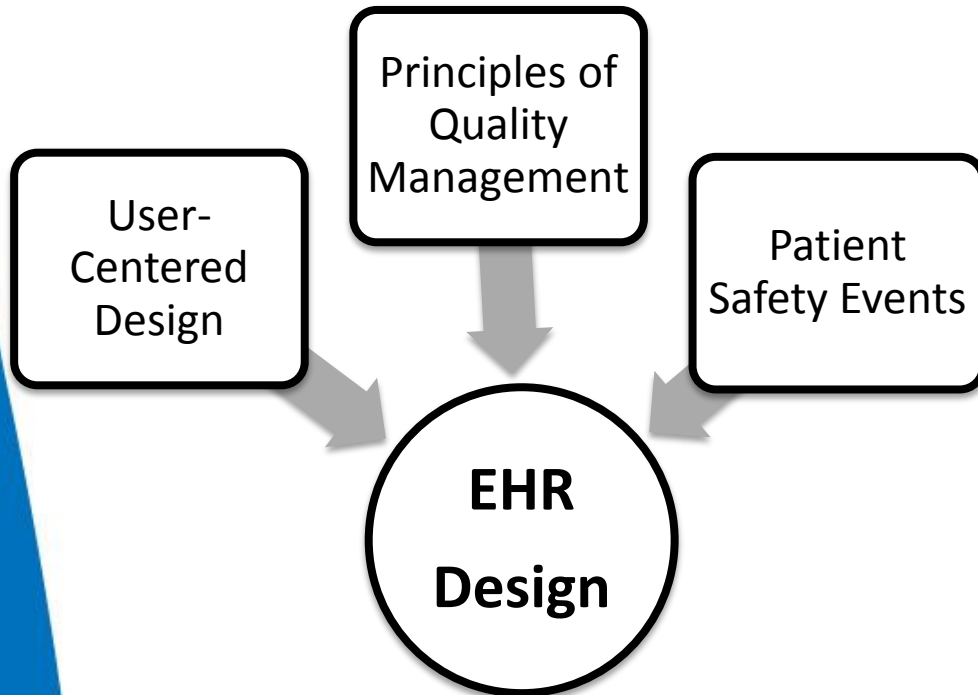
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# Usability of Electronic Health Records

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# EHR Design



CRITERIA	CONSIDERATIONS
<b>Strategy</b>	Associated to a development stage when the evaluation is performed.
<b>Location</b>	Related to where the evaluation is performed.
<b>Prejudice</b>	Subjectivity or objectivity Inherent to a method which will affect the outcome.
<b>Measure of Usability</b>	Type of measurement provided by a method (i.e. quantitative or qualitative).
<b>Information</b>	Granularity of the response provided by a method.
<b>Immediateness of Response</b>	Speed with which a method generates a response.
<b>Intromission</b>	Changes in user behavior due to an evaluation scenario.
<b>Cost</b>	Required resources to perform an analysis and an evaluation.

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# EHR Usability Evaluation

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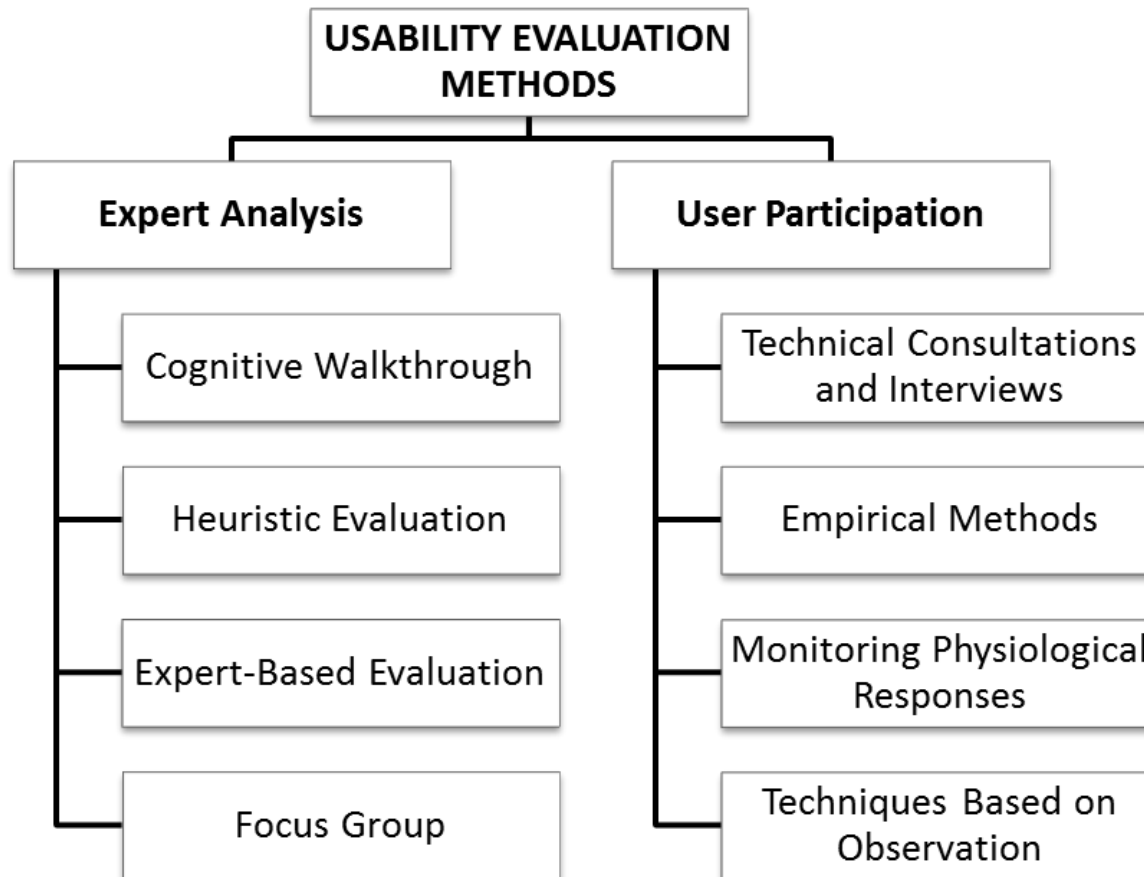


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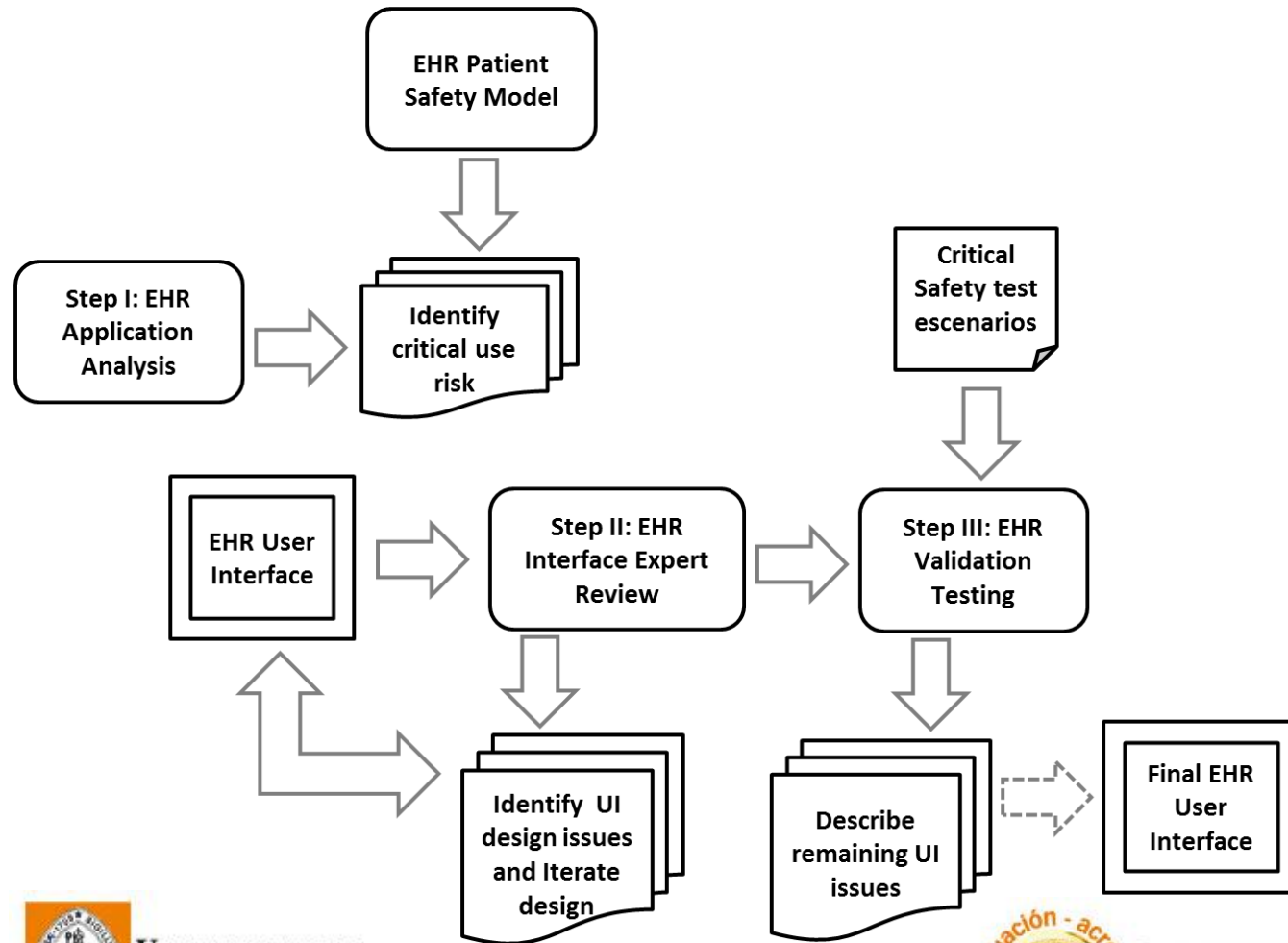


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# Usability Evaluation Methods



# EHR Evaluation Usability Protocol



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# Contribution

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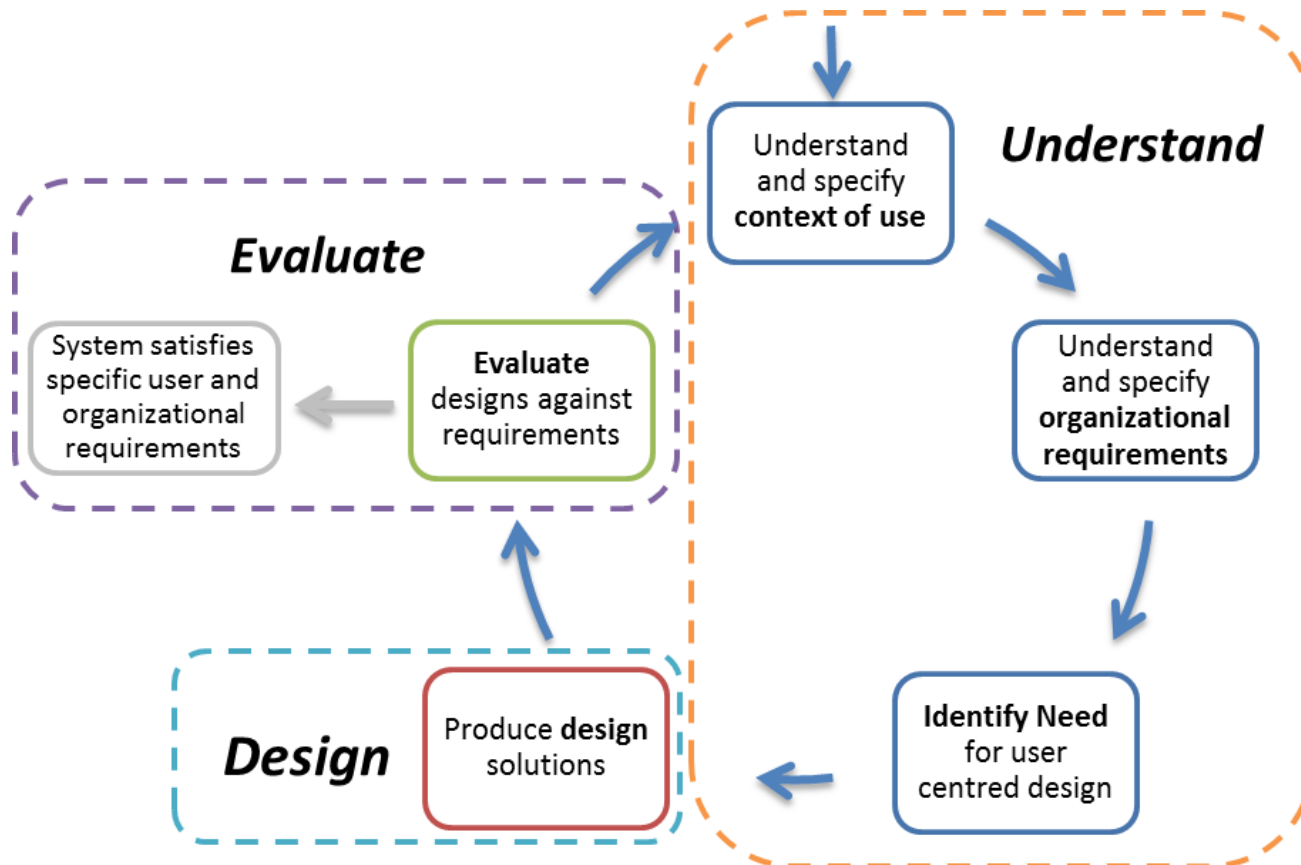
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# Proposed Interpretation of the ISO 9241-210 Standard



# Prioritization of Usability Characteristics

- ❑ Case of study: EHR focused on patients on an emergency situation

<b>Characteristic / Design Component</b>	<b>User Centered Design</b>	<b>Principles of Quality Management</b>	<b>Patients Safety Events</b>
<b>Learnability</b>	LOW	NONE	LOW
<b>Operability</b>	HIGH	MEDIUM	MEDIUM
<b>Protection against user errors</b>	HIGH	HIGH	HIGH
<b>Aesthetics of the user interface</b>	MEDIUM	NONE	NONE
<b>Intelligibility</b>	LOW	HIGH	HIGH
<b>Accessibility</b>	MEDIUM	NONE	LOW

# Prioritization according to UCD



User-  
Centered  
Design

## ❑ HIGH

- Operability
- Protection against user errors

## ❑ MEDIUM

- Accessibility
- Aesthetics of the user interface

## ❑ LOW

- Intelligibility
- Learnability



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# Prioritization according to Principles of Quality Management

Principles of  
Quality  
Management

## ❑ HIGH

- Intelligibility
- Protection against user errors

## ❑ MEDIUM

- Operability



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# Prioritization according to Patient Safety Events

Patient  
Safety Events

## ❑ HIGH

- Intelligibility
- Protection against user errors

## ❑ MEDIUM

- Operability

## ❑ LOW

- Accessibility
- Learnability



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# Final Remarks

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# Final Remarks

- ☐ The proposed interpretation of the ISO 9241-210 UCD was conceived in the context of patients in an emergency situation
- ☐ Protection against user errors, intelligibility and operability are among the main characteristics that a usable EHR should fulfill
- ☐ Proposed interpretation of the standard may be used beyond an EHR design process



# Final Remarks (ii)



- ❑ EHR usability is a key factor within an e-Health system
- ❑ The goals of the proposal and the presented characteristics prioritization, as well, are:
  - Guide developers to achieve and improve an EHR usable design
  - Consider principles of quality management and patient safety events
  - Improve acceptance rates of e-Health systems by physicians
  - Reduce adverse events caused by human error due to lack of information about patients



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# Thanks    Obrigado    Gracias

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# Support Slides

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# Usability

- ❑ "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use."
- ❑ The effectiveness, efficiency and satisfaction with which specified users achieve specified goals in particular environments.
  - Effectiveness: the accuracy and completeness with which specified users can achieve specified goals in particular environments
  - Efficiency: the resources expended in relation to the accuracy and completeness of goals achieved
  - Satisfaction: the comfort and acceptability of the work system to its users and other people affected by its use





# Usability Characteristics

## Learnability

- Degree to which the software product allows users to learn its application

## Operability

- Degree to which users find the product easy to use and control

## Protection against user errors

- Degree to which the system protects users from making mistakes

## Aesthetics of the user interface

- Extent to which the interface allows an enjoyable and satisfying user interaction

## Intelligibility

- Extent to which the software product allows users to recognize whether the software is suitable for your needs

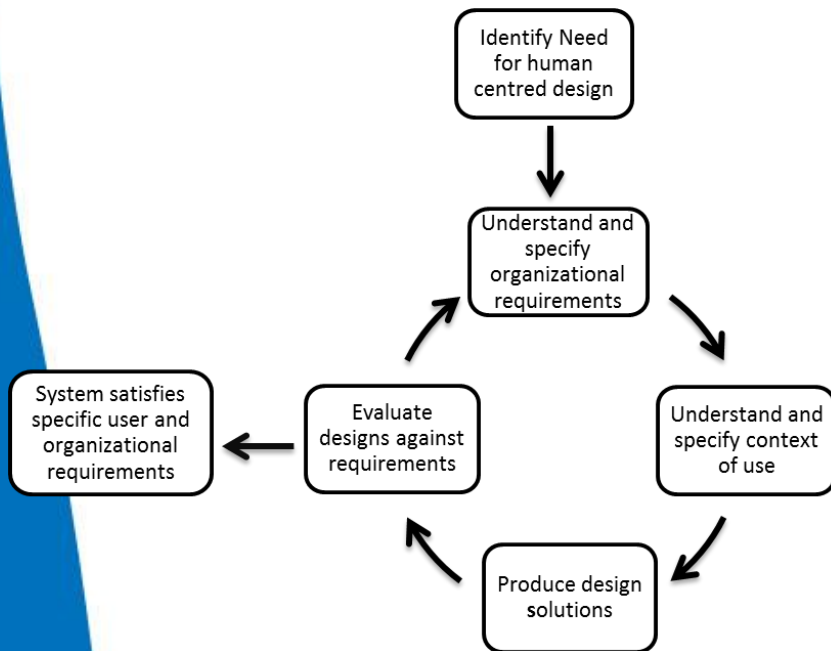
## Accessibility

- Ease of use and safety for users with specific disabilities



# ISO 9241-210

## Current Approach



## Proposed Interpretation

