Conception de Systèmes Interactifs

Design Rationale

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References

- Carroll, J. M., & Rosson, M. B. (2003) Design Rationale as Theory. Ch. 15 in J.M. Carroll (Ed.), HCI Models, Theories, and Frameworks. San Francisco: Morgan Kaufmann
- MacLean, Allan; Young, Richard M.; Bellotti, Victoria M. E., and Moran, Thomas P. Questions, Options, and Criteria: Elements of Design Space Analysis. Lawrence Erlbaum Associates; 1991; 6, pp. 201-250.
- Célia Martinie, Philippe A. Palanque, Marco Winckler, Stéphane Conversy: DREAMER: a design rationale environment for argumentation, modeling and engineering requirements. SIGDOC 2010: 73-80

Structure of the lecture

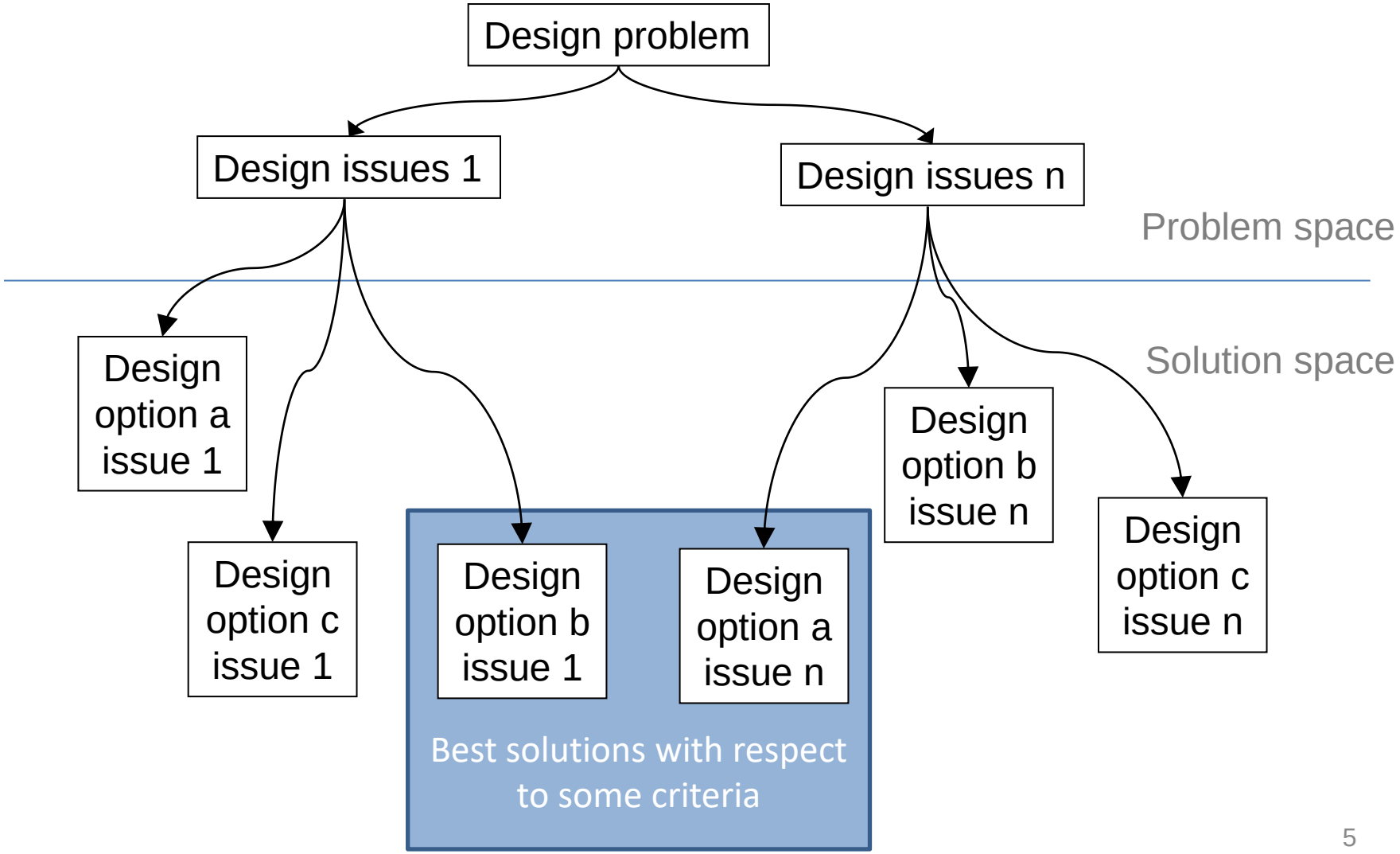
- About design process
- What is Design Rationale?
- What is the purpose?
- How is it conducted?
- Contributions to HCI
- Notations

First, about design

- **Design** is a problem-solving process whose objective is describe and find a way to… **implement requirements**, **respecting constraints**, and **ensure good quality**

- The result of the process includes:
  - **Specification** of the product to be implemented
  - A set of design **decisions**

Taking decisions



The design process

- A designer has to face with several issues
  - Each issue part of the overall problem
  - Each issue might be solved by more than one design option
  - The designer makes a decision to resolve every issue
- This process implies to chose the best option among the alternatives

What is Design rationale?

- Rationale has to do with logical explanations and reasoning
- Discussions, debates, negotiations
- Reasons for features
- Reasons against features
- Weighing of tradeoffs

Why to use Design Rationale?

- Increase understanding interaction situations by:
  - Documentation
  - Analysis
  - Descriptions
  - Causes and consequences
- Showing important aspects about:
  - Context
  - Applicability
  - Scope

Steps in Design Rationale

- Scenarios
- Narratives
- Generating claims
- Claims analysis

Scenarios

- Describe user interaction
- Created or observed situations
- Documented as narratives
- Several scenarios are recommended

- Typical scenarios comes from theory, observation, field studies, personal experiences, documented experiences
- We look for situations where contradictions are obvious

Types of scenarios

- Goals: what can I do?
  - What - other than sending e-mails - does this system support?
- Opportunism: what does this do?
  - What does the “Rules” preference support?
- How-To: carrying out procedures.
  - How do you add mailboxes and hierarchies of mailboxes?
- Sense-Making: what happened?
  - Why is there suddenly a mailbox for drafts?

Claim analysis

- Claims are statements
  - interpreted as design suggestions
  - are carefully examined
- Every claim is associated with benefits and drawbacks, systematically documented
- Decisions are supported by theories relevant for the current situation

Supporting theories

- Psychological theories (see second class…)
  - Memory
  - Gestalt laws
  - etc.
- Sociological theories
- Ergonomics
- Different point of views according to users
- …

Tradeoff analysis

Goals	Medical researchers	Health analysts	Non-functional requirements		
			Accuracy	Security	Usability
Plot data on maps	✓	✓✓			++
Show hotspots on maps	-	✓✓✓			++
Provide simple statistics	✓	✓✓			+
Annotate maps	-	✓✓✓			+
Check data errors	✓✓	✓	++	+	
Provide advanced statistics	✓✓✓	-	++		

Example

- Have a shared calendar at work:
  + saves time when meetings are scheduled.
  + easy to know when people are available.
  - but people have to remember to make a note of everything they do.
  - but people might not feel comfortable that everyone knows where they are and what they do.

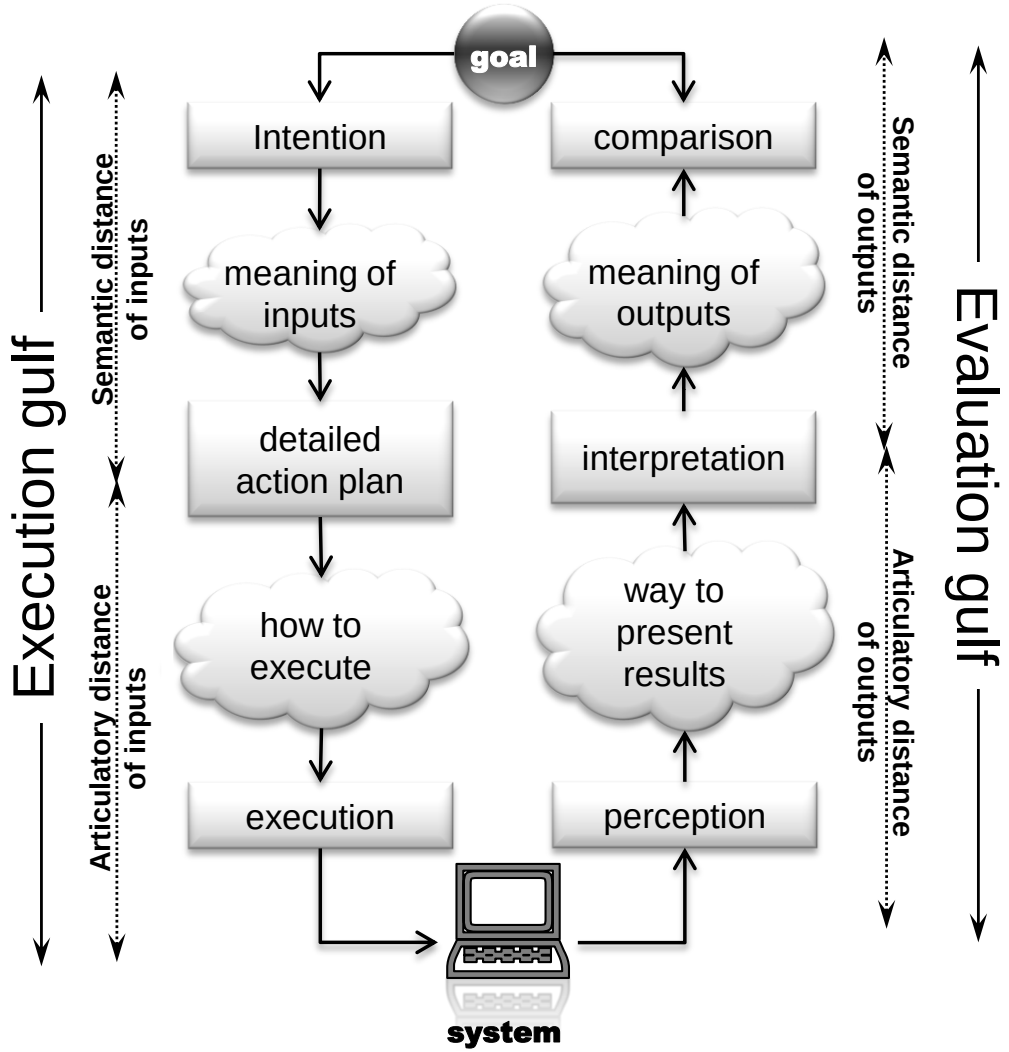
How to find claims

- Text analysis
  - Scanning for causes & effects
- Pose questions related to situations/ actions/goals
  - what made her click there?
- **Analyze scenarios with users**
- Reuse of prior analyses
- **Use Norman's stages of action**

Norman's stages of action

- Forming the goal
- Forming the intention
- Specifying an action
- Executing the action
- Perceiving the state of the world
- Interpreting the state of the world
- Evaluating the outcome

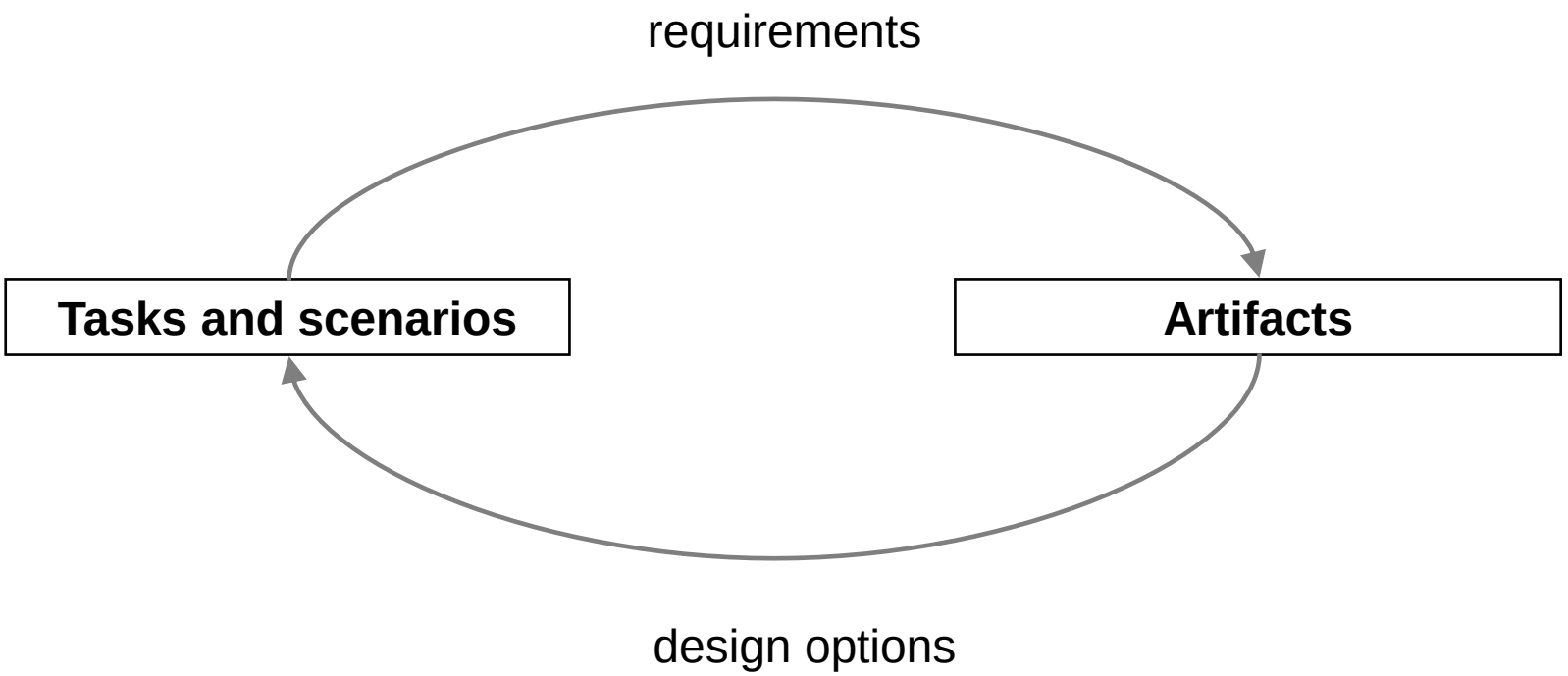
Interaction gulfs *(according to D. Norman, 1986)*



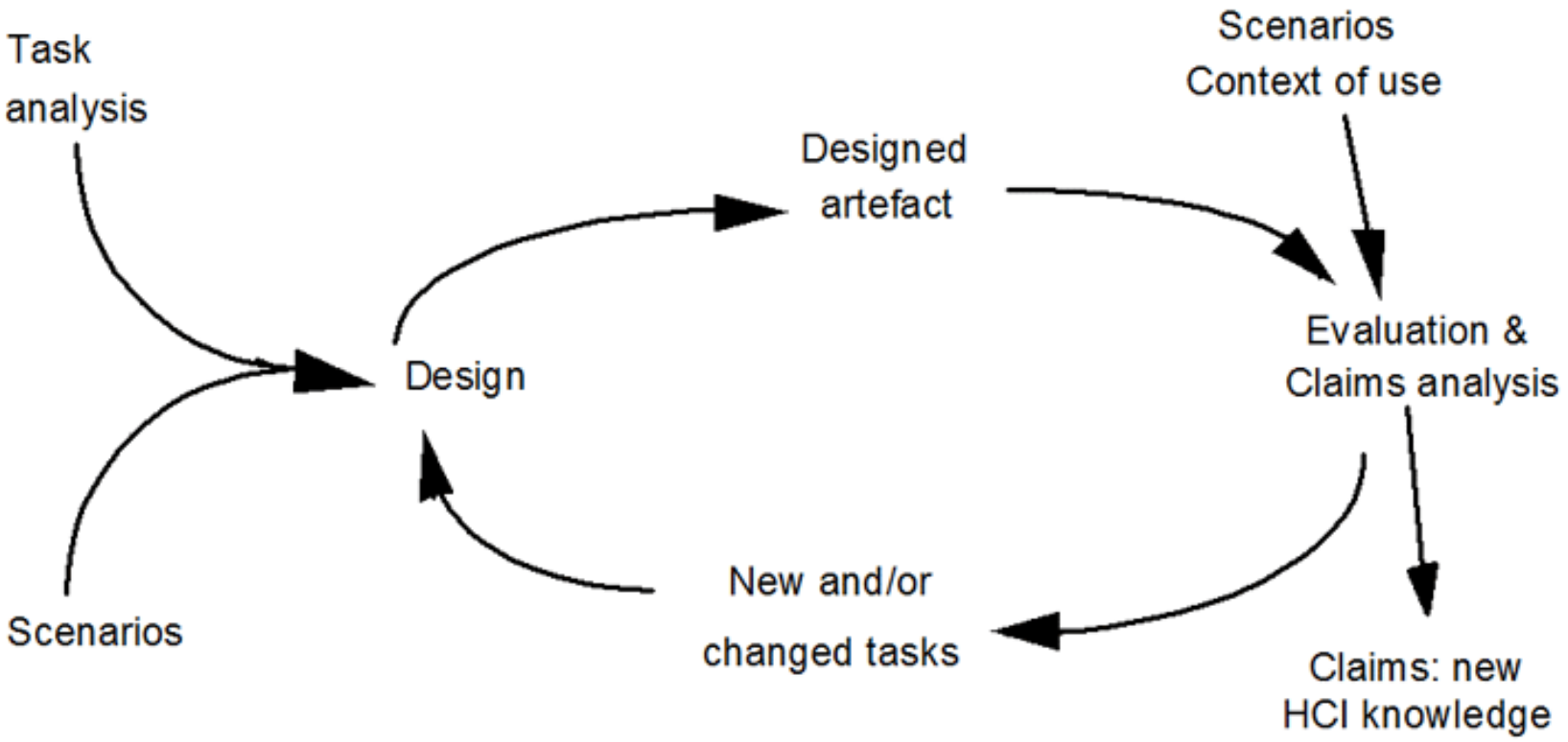
Execution gulf is the effort required for a user to express an intention in terms of commands or instructions

Evaluation gulf refers to the way the results provided by the system are meaningful or understandable by the users, and in accordance with their goals

Task-artifact cycle



Design artefact and knowledge reuse



Summary

- Design rationale at several levels:
  - A tool for communicating design alternatives/decisions to users or clients
  - Contributes to general design knowledge
  - Supports research approaches contributing to HCI theory

Exercise for the TD

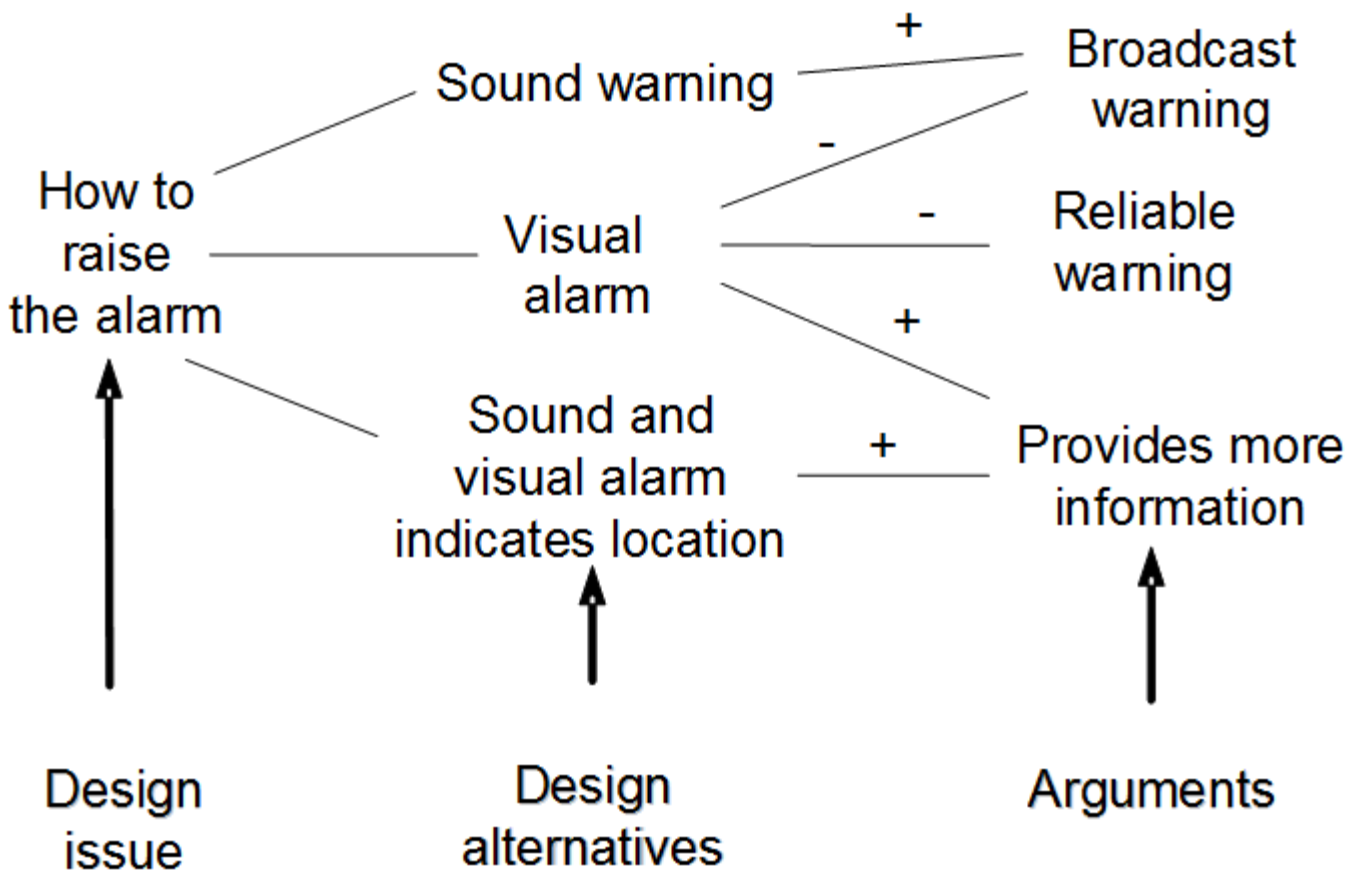
- Examine and discuss scenarios and claims for the design options described with your prototypes
  - Are the scenarios plausible?
  - Is it clear how the claims are identified?
  - What HCI knowledge grounds the claims analysis?
  - Can other claims be identified?

- See slide 15 for an example

Design Rationale Notations

- gIBIS (Conklin & Begeman, 1988)
- QOC (MacLean & McKerlie, 1995)
- DREAM TEAM (Lacaze, Palanque, Barboni & David Navarre, 2005)
  - Based on QOC

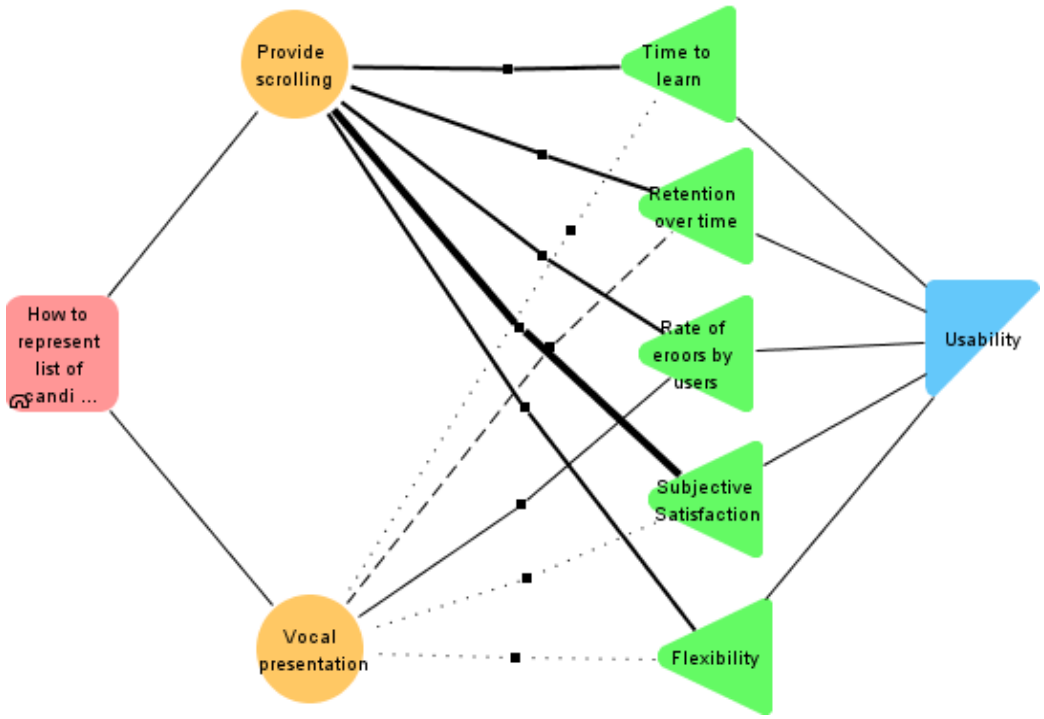
QOC (Question, Options, Criteria)



The TEAM Notation

Questions, Option, Criteria:

+ factors associated to criteria
+ assessment of options
+ traceability of options selected
+ view of participants
+ task models associated to options
+ executable scenarios for an options



Extensions on the TEAM Notation

***R**equirements*

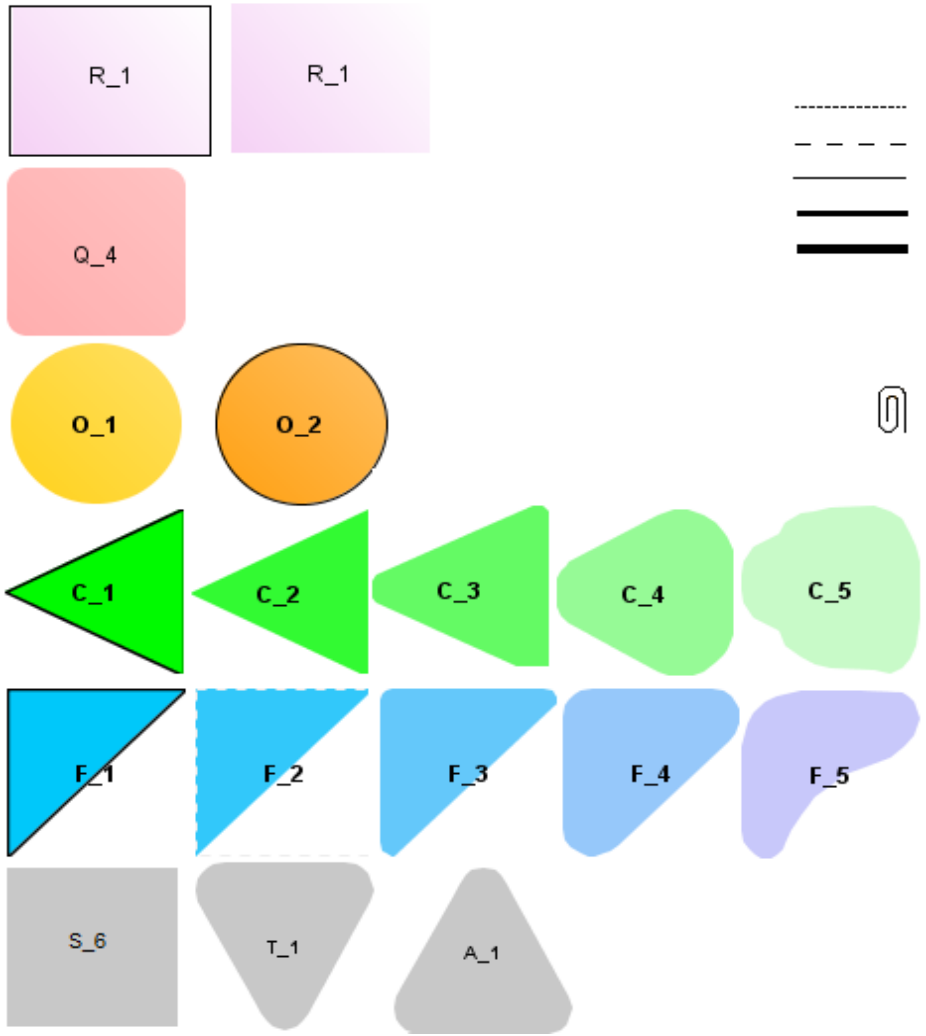
***Q**uestions*

***O**ptions*

***C**riteria*

***F**actors*

***S**cenarios*, ***T**asks*, ***A**rguments*



Case Study

- Source: DGAC (French Civil Aviation Authority)
- Goals on this project:
  a) To develop a formal description technique for describing widgets in user applications for cockpit display system; This issue has been addressed by extending the ICO notation;
  b) To specify user applications compliant with ARINC 661 standard, which is an aeronautical international standard.

The standard ARINC 661

RadioBox2 alternatives for "look and feel"

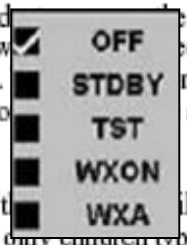
3.0 WIDGET LIBRARY

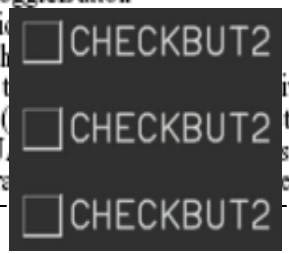
3.3.34 RadioBox

Categories:
Container

Description:
A RadioBox wid visibility and the interactivity of a grou
It enables a crew ct one Button out of "n" exclusive ones
be SELECTED. ntained in the RadioBox should be indi
widget. RadioBo any graphical representation.

Restriction:
The children of t ll be positioned relative to the parent of
A radioBox has only children types:
ToggleButton
Pi
Ch
Only one t iven RadioBox at a time. The CD
consistent (ted) at all times, including when the
prevents U selected child of a RadioBox (this
state genera eselect and one for select.





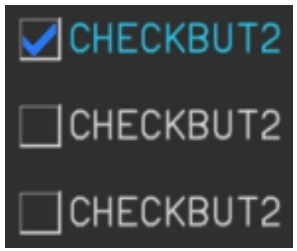


Table 3.3.34-1 RadioBox Parameters Table

Parameters	Change	Description
Commonly used parameters		
WidgetType	D	A661_RADIO_BOX
WidgetIdent	D	Unique identifier of the widget.
ParentIdent	D	Identifier of the immediate container of the widget.
Visible	DR	Visibility of the widget
Enable	DR	Ability of the widget to be activated

Table 3.3.34-2 RadioBox Creation Structure Table

CreateParameterBuffer	Type	Size (bits)	Value/Range When Necessary
WidgetType	ushort	16	A661_RADIO_BOX
WidgetIdent	ushort	16	
ParentIdent	ushort	16	
Enable	uchar	8	A661_FALSE A661_TRUE
Visible	uchar	8	A661_FALSE A661_TRUE

The RadioBox widget does not send any event.

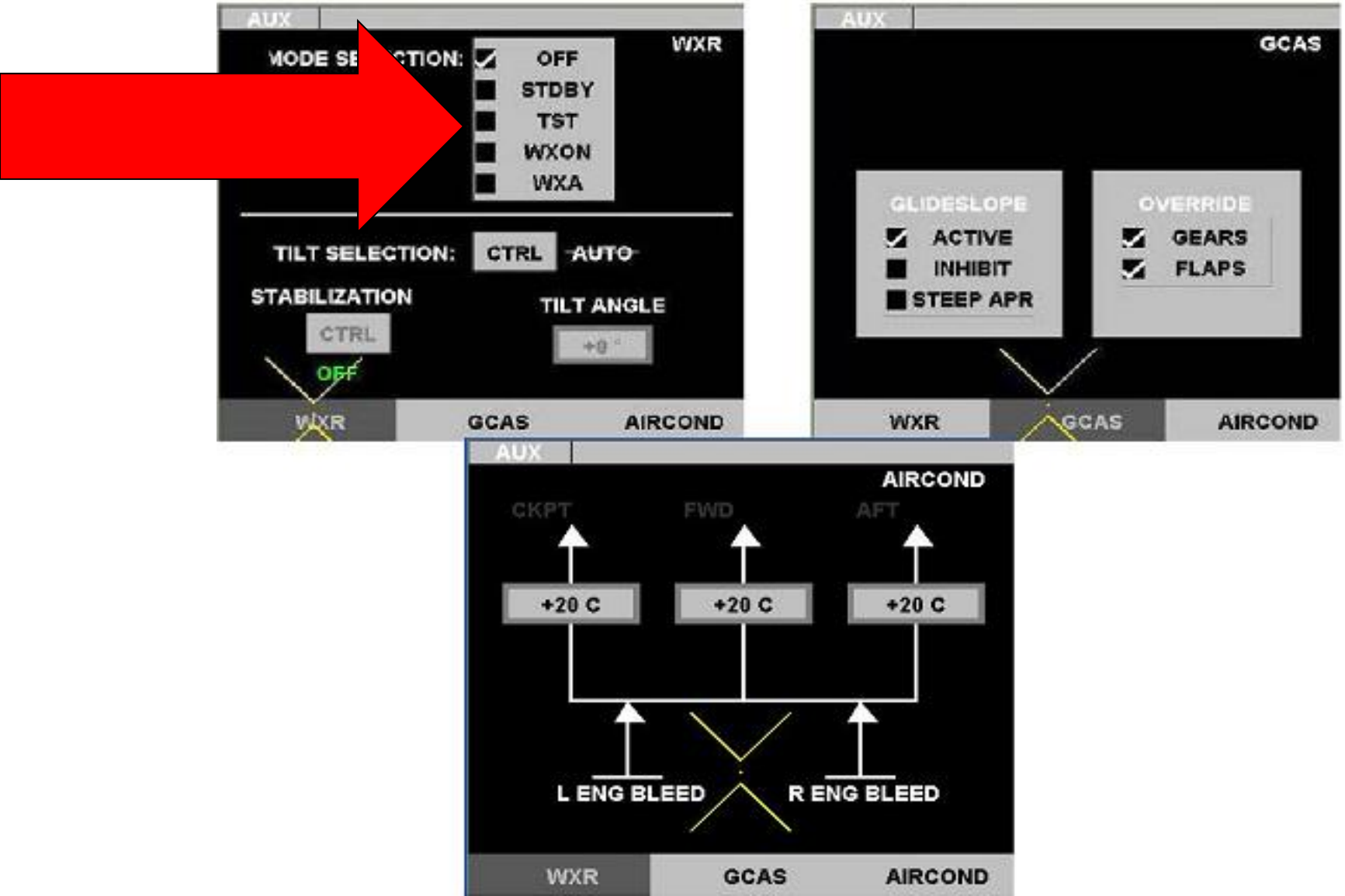
Available SetParameter identifiers and associated data structure are defined in Table 3.3.34-3.

Table 3.3.34.3 RadioBox Runtime Modifiable Parameters Table

Name of the Parameter to Set	Type	Size (bits)	ParameterIdent Used in the ParameterStructure	Type of Structure Used (Refer to Section 4.5.4.5)
Enable	uchar	8	A661_ENABLE	A661_ParameterStructure_1Byte
Visible	uchar	8	A661_VISIBLE	A661_ParameterStructure_1Byte

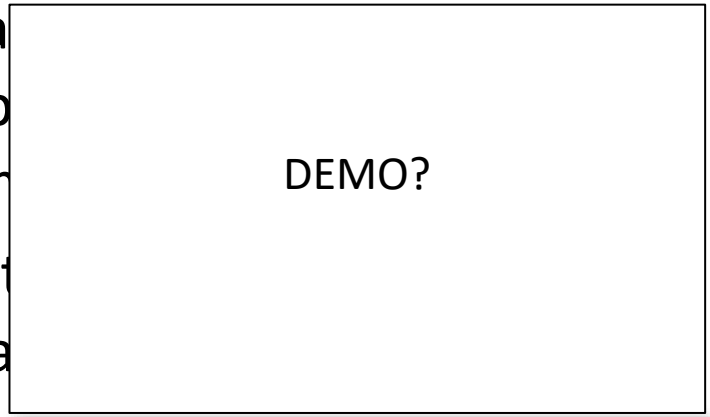
ARINC 661 RadioBox 2 in context:

Multi Purpose Interactive Application (MPIA)

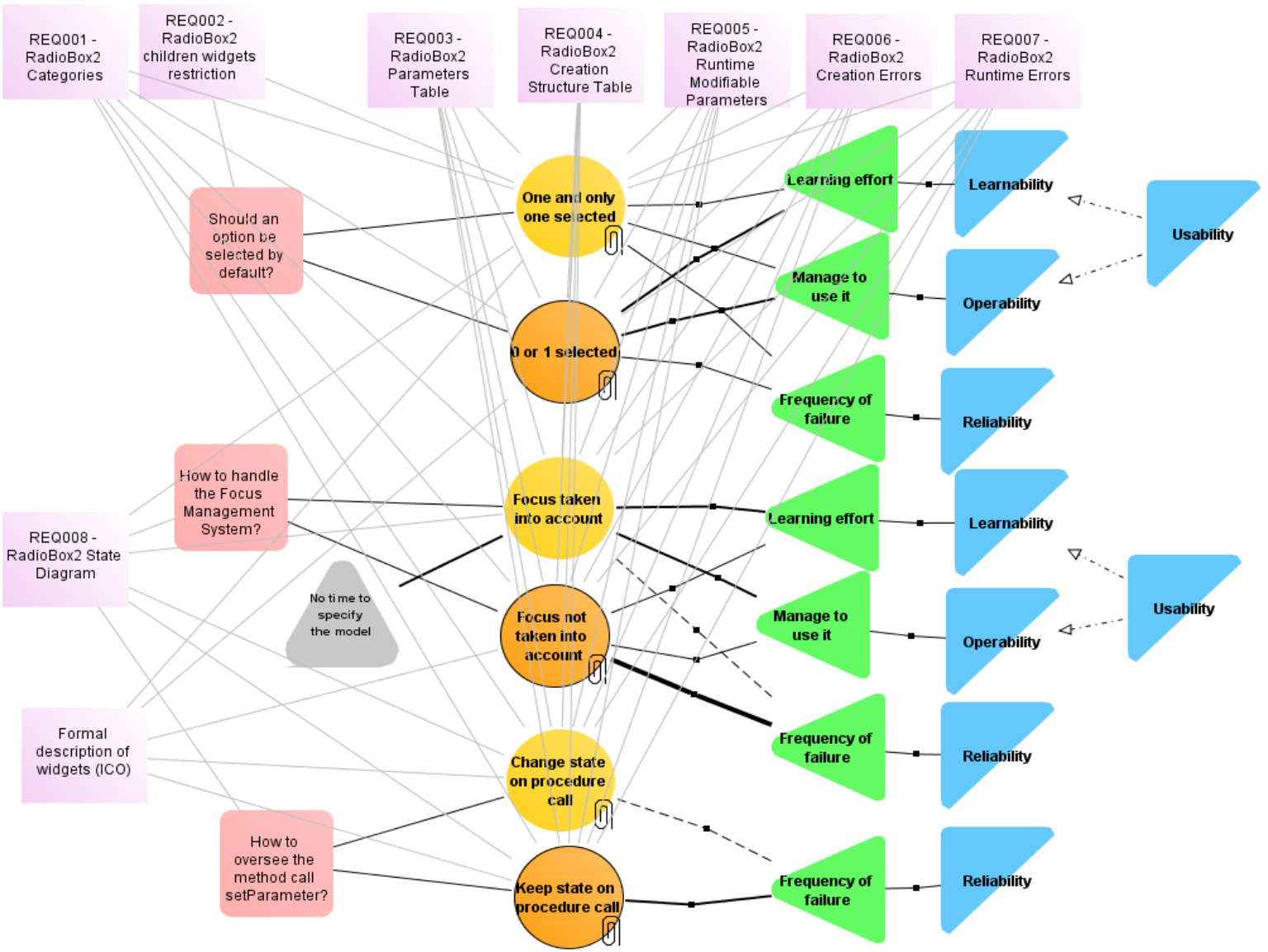


Rationalizing the Design of the ARINC RadioBox2

- Known requirements are added to the diagram;
- Questions raised by designers during brainstorming meetings are included in the diagram;
- For each question raised, severa
  explored and the relationships b
  depicted by edges in the diagrar
- Any artifacts (i.e. ICO models in t
  related to a particular element a
  corresponding design option;
- Criteria and factors influencing the choice are added to the diagram (e.g. ISO 9126 standard on Software Quality);
- Edges are added for connecting options and criteria;



DREAM diagram for the design of the behavior of the ARINC 661 RadioBox2 widget



Tool Support: DREAMER