

Piecing Together the Requirements Jigsaw-Puzzle

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REFSQ
Essen, July 2010



About Keynote Talks

- Novelty (*for Researchers*)
– impossible
- Specific Advice (*for Practitioners*)
– unwise
- Interest (*for Everyone*)
– required



Propositions

1. Requirements are **not put together well**.
2. Researchers, Authors, Trainers behave (and write) **as if all projects are alike**.
3. Projects are **NOT all alike**.
4. But certain **patterns constantly recur**.
5. **Quite enough solutions** have been suggested already.



pieces of
the puzzle

Questions

1. What are these **basic pieces**?
2. How do the pieces **fit together**, typically?
3. How can different projects **re-assemble** the pieces of their puzzles?



An Industry Observation

You mean there are **PIECES?!!**



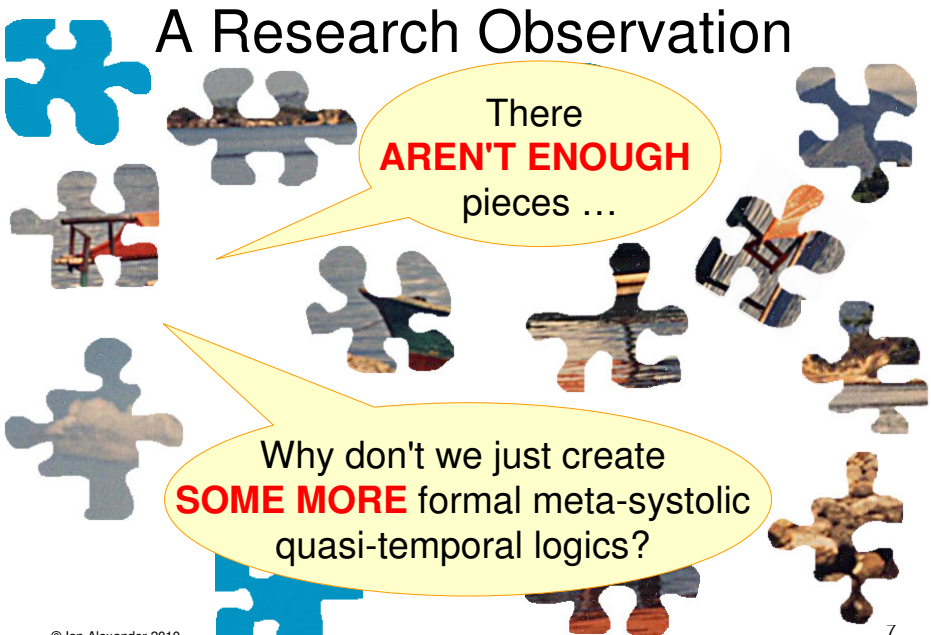
What would we **DO** with them all?



Let's just get on and write **REQUIREMENTS!**



A Research Observation



There **AREN'T ENOUGH** pieces ...


Why don't we just create **SOME MORE** formal meta-systolic quasi-temporal logics?

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A Fashion Observation

Requirements are so *passé* (...so 1990s)

Now we're all *agile*



New *Agile* Requirements

Old *Maladroit* Requirements

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Challenges

I've got to...

- model my Requirements *in UML*
- create **Use Cases**
- do **Agile instead of requirements**
- use my company's **Standard SRS* Template**
- upgrade a **highly-constrained existing system**
- research **aspect-oriented cultural hermeneutics** as **commonly used** in **practical industrial applications**



Brown-field
RE

Mhmm. Let's see if we can help a little.....

* Software Requirements Specification

The Requirements Jigsaw-Puzzle

1. **What are the basic pieces?**
2. How do the pieces fit together, typically?
3. How can different projects re-assemble the pieces of their puzzles?

We'll take a look at
the Challenges here

Pieces of the Puzzle

<i>Requirement Elements</i>		2. Stakeholders	3. Goals	4. Context	5. Scenarios	6. Qualities and Constraints	7. Rationale	8. Definitions	9. Measurements	10. Priorities
<i>Discovery Contexts</i>	1. Vision									
A. From Individuals										
B. From Groups										
C. From Things										
D. Trade-Offs										

Given (points to 1. Vision)

Elements to be Discovered (points to the blue grid area)

Not talking much about Discovery Contexts today (points to the bottom rows)

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1. Vision

Requirement Element	Stakeholders	Goals	Context	Scenarios	Qualities and Constraints	Rationale	Definitions	Measurements	Priorities
1. Vision									
A. From Individuals									
B. From Groups									
C. From Things									
D. Trade-Offs									

- *What is this project for?*

Business Vision

- “To become market leader in small-household burglar alarms”
- “To make steadily growing annual income from alarm sales, maintenance, and monitoring”

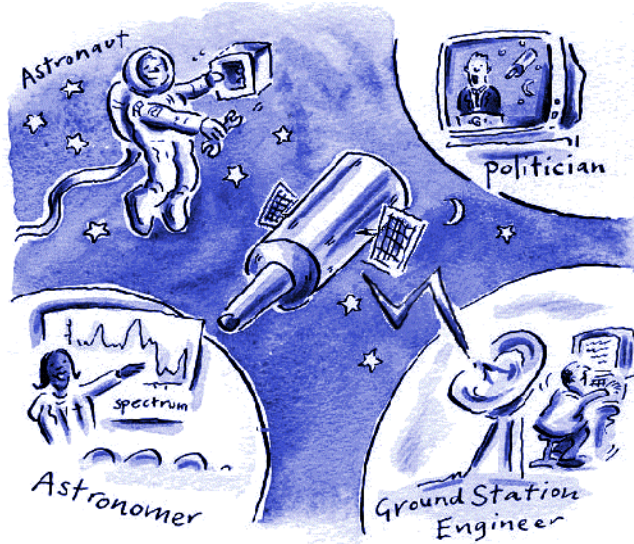
2. Stakeholders

Requirement Elements						
Requirement	Element	Value	Priority	Impact	Frequency	Time

- *Who has a valid interest in this product?*

Space Telescope Stakeholders

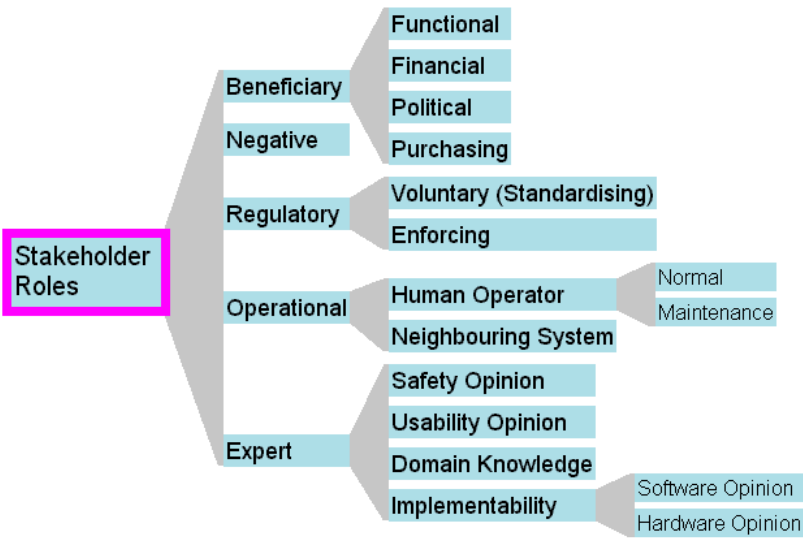
(From *Writing Better Requirements*, by Ian Alexander & Richard Stevens, Addison-Wesley 2002)



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Typical Stakeholder Roles



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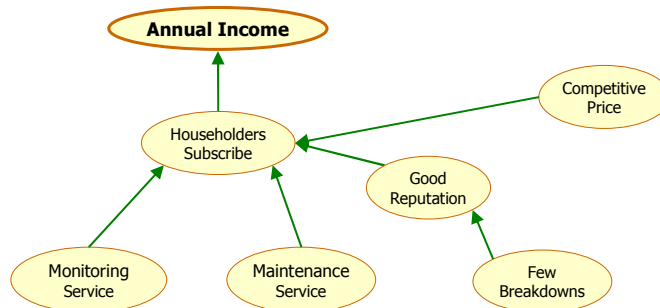
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3. Goals

Requirement Elements									
Requirement ID	Version	Priority	Category	Sub-category	Source	Target	Priority	Category	Sub-category

- *What do different stakeholders want?*
- *What conflicts exist?*

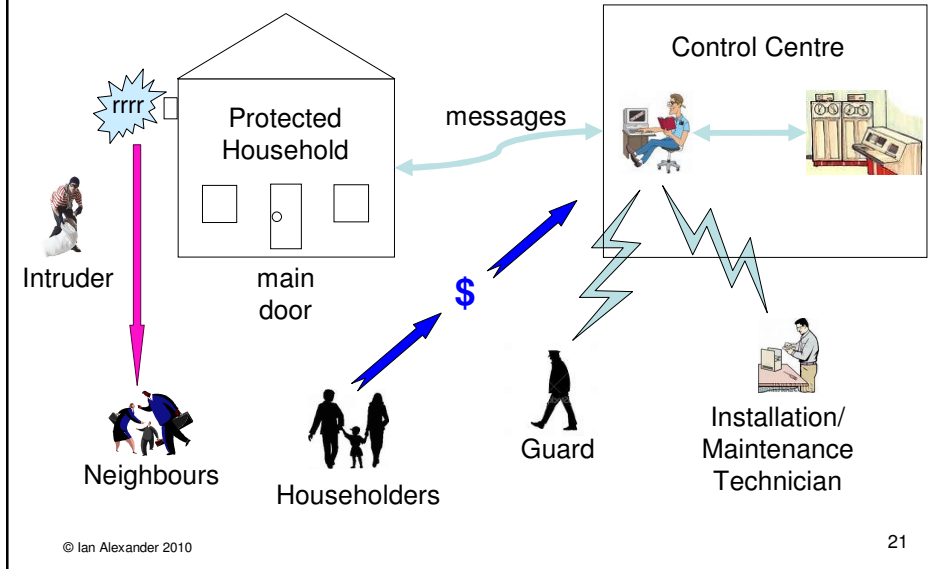
Goals



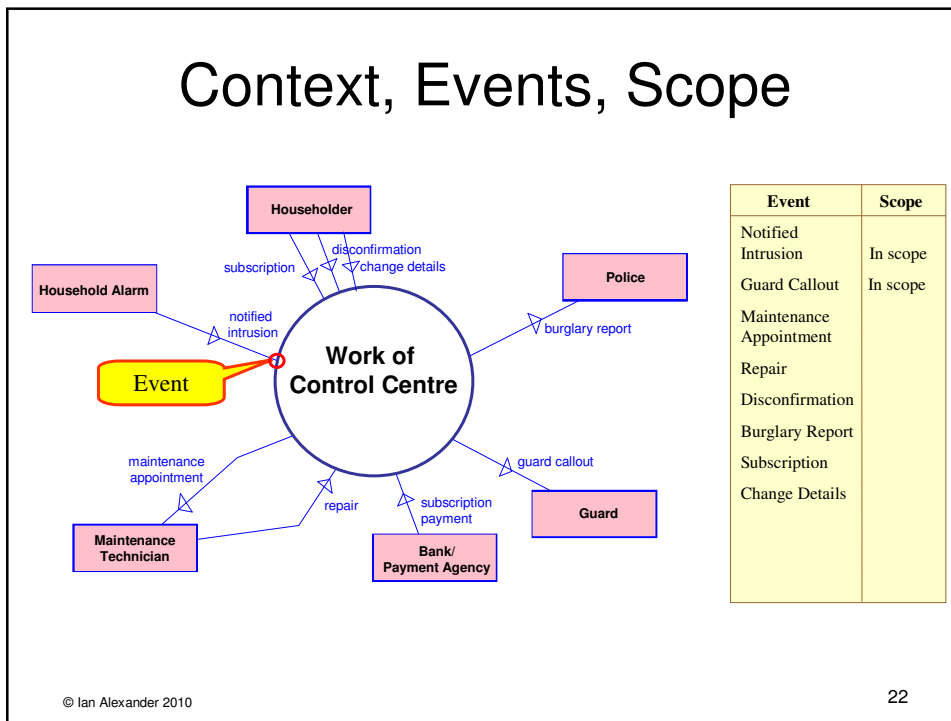
Key

Goal	Something a Stakeholder wants, even if not fully possible
→	supports

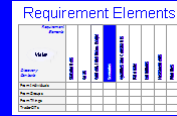
Rich Picture



Context, Events, Scope



5. Scenarios



A small table titled 'Requirement Elements' with columns for 'Requirement', 'Value', 'Priority', 'Status', 'Version', 'Created', 'Modified', and 'Deleted'. The 'Value' column contains a list of requirement types: 'User', 'System', 'Performance', 'Security', 'Usability', 'Reliability', 'Maintainability', 'Interoperability', 'Compliance', and 'Other'.

- *How will people use this product?*

Scenarios

<i>Role</i>	<i>Action</i>
<i>Householder</i>	<i>Arms the alarm</i>
<i>Alarm</i>	<i>Indicates 'arming' (e.g. buzzer, lamp), starts countdown timer for arming_period</i>
<i>Householder</i>	<i>Leaves house by main_door, closes main_door (and probably locks it)</i>
<i>Alarm</i>	<i>Stops countdown timer, stops indicating 'arming', begins watching</i>
<i>Burglar</i>	<i>Breaks into protected house</i>
<i>Alarm</i>	<i>...</i>

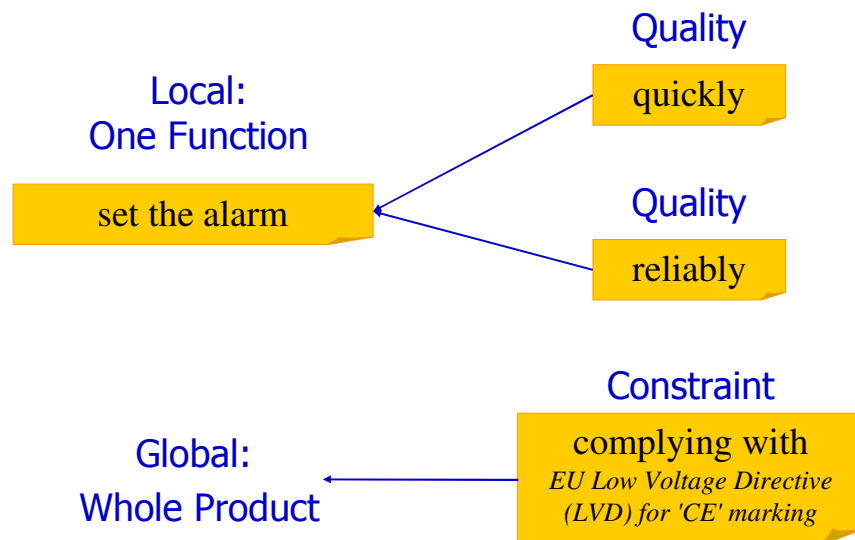
Notations include Role/Action, Swimlanes, Use Cases, Storyboards, ...

6. Qualities & Constraints

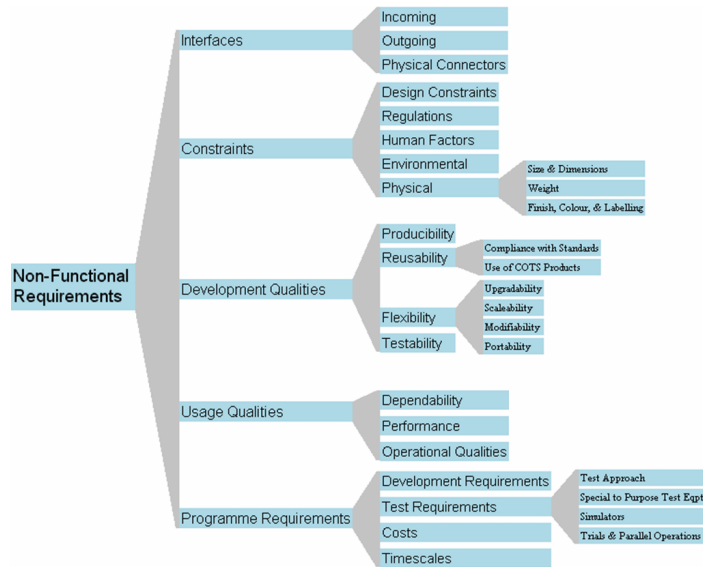
Requirement Elements						
Requirement	Priority	Source	Category	Version	Created	Updated
Use						
Created						
Updated						
Deleted						
Approved						
Rejected						
Cancelled						
Completed						

- *How do people want this product to be?*
- *What limits exist?*

Qualities and Constraints



Qualities and Constraints



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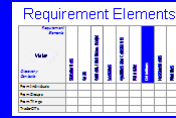
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7. Rationale

Requirement Elements									
Value	Priority	Source	Impact	Traceability	Testability	Verifiability	Consistency	Completeness	Clarity

- *Why is this requirement here?*

8. Definitions



A small table titled 'Requirement Elements' with columns for 'Requirement', 'User', 'System', 'Environment', 'Priority', 'Status', 'Version', and 'Date'. The 'Requirement' column contains several entries, some of which are highlighted in blue.

- *What does this term mean?*

Definitions

Term	Definition
Suspected Intrusion	Message from Household Alarm to Control Centre , indicating a possible Intrusion for Confirmation
...	...

9. Measurements

Requirement	Value	Unit	Min	Max	Step	Default	Min	Max	Step	Default
Value										
Unit										
Min										
Max										
Step										
Default										
Min										
Max										
Step										
Default										

- *How to know we have what we asked for?*

Measurements

- Goal: Alarm sounds locally (e.g. bell, siren)
 - Acceptance Criteria:
 - audible at **100** metres
 - stops after *alarm_sound_period* minutes

Approaches include:

- *Acceptance / Test / Fit Criteria*
- *Postconditions*
- *Success/Minimal Guarantees*
- *MoP*
- *MoE*
- *QoS ...*

... not to mention "traditional Shall-Statement requirements" ...

The Requirements Jigsaw-Puzzle

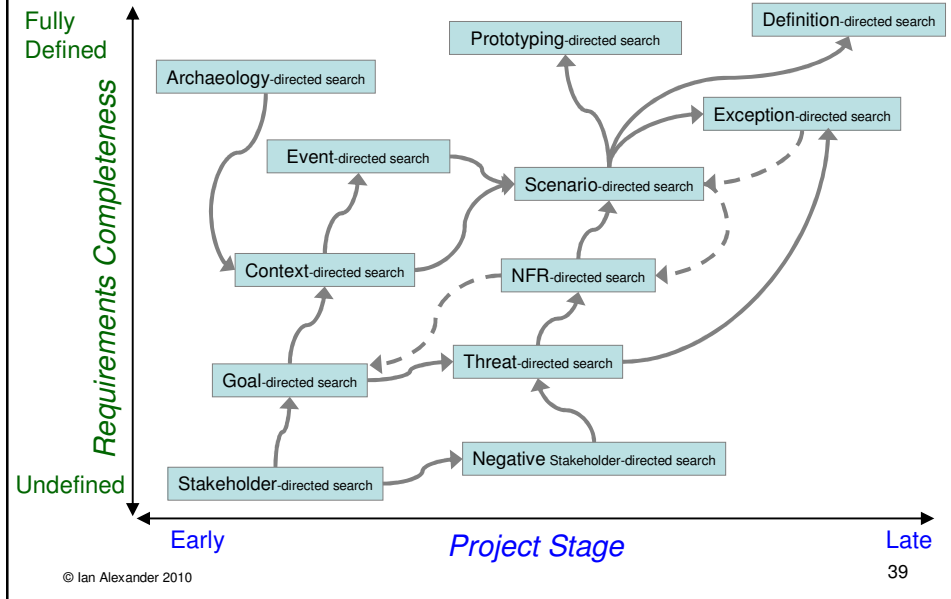
1. What are the basic pieces?
2. **How do the pieces fit together, typically?**
3. How can different projects re-assemble the pieces of their puzzles?

How do the pieces fit together?

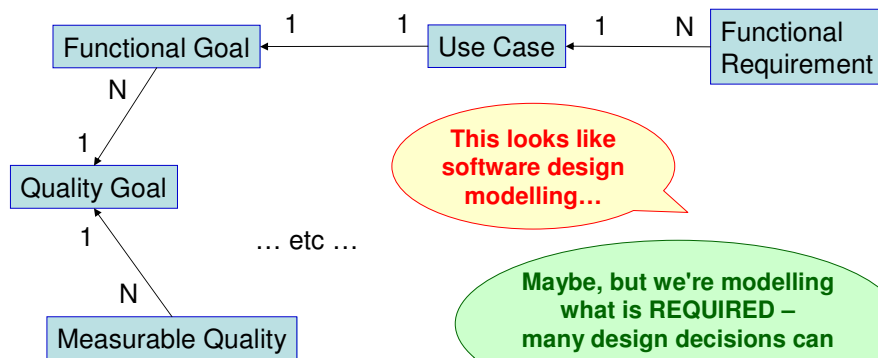
1. **Embryology**: as sequences in development life-cycle
2. **Traceability**: by a rich web of connections
3. **Validation**: making use of connections to cross-check
4. **Teamwork**: having all specialists pulling together
5. **Trade-offs**: choosing "least-worst" option(s)
6. **Dialogue**: translating back to stakeholder language

... no doubt you can think of more ...

1. Embryology

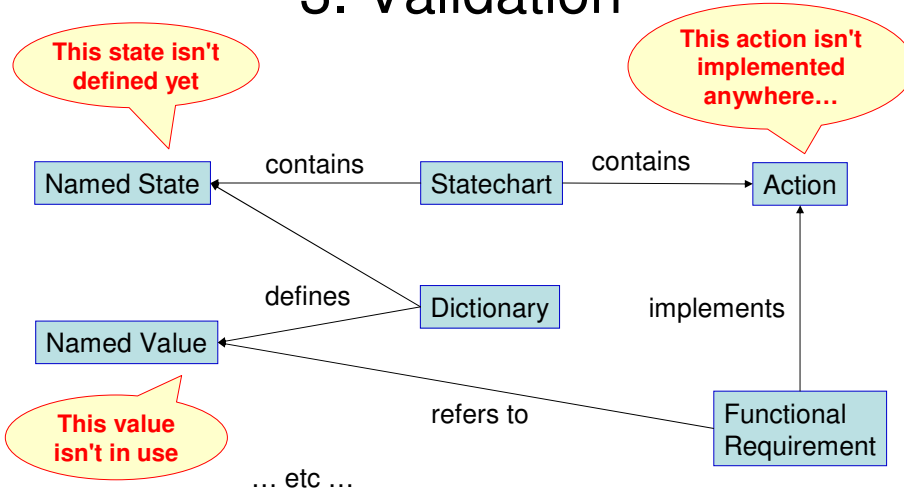


2. Traceability



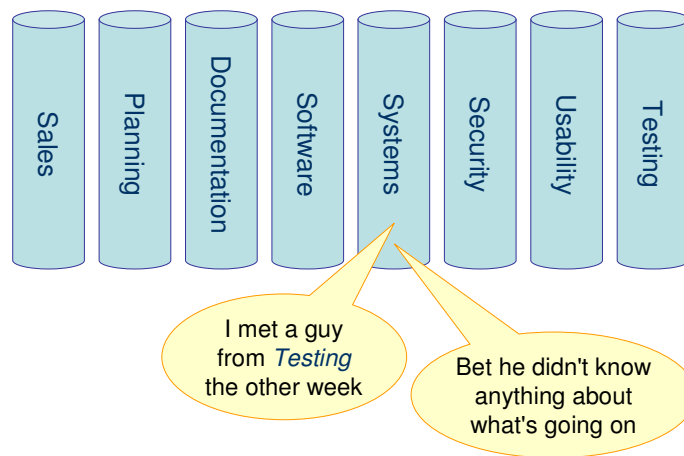
A rich web of interconnections everywhere

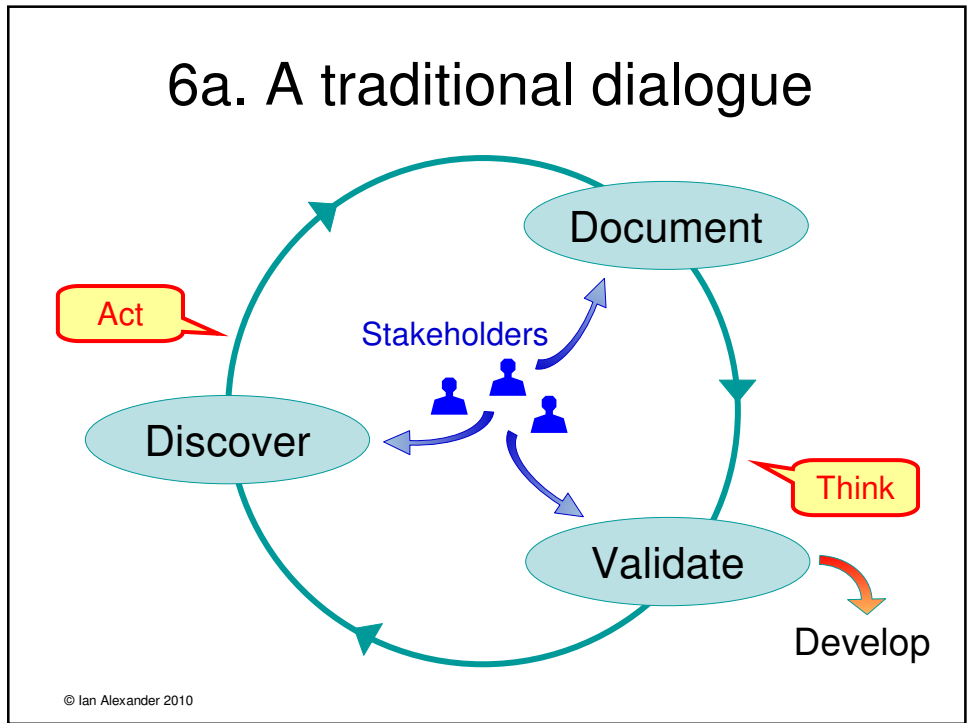
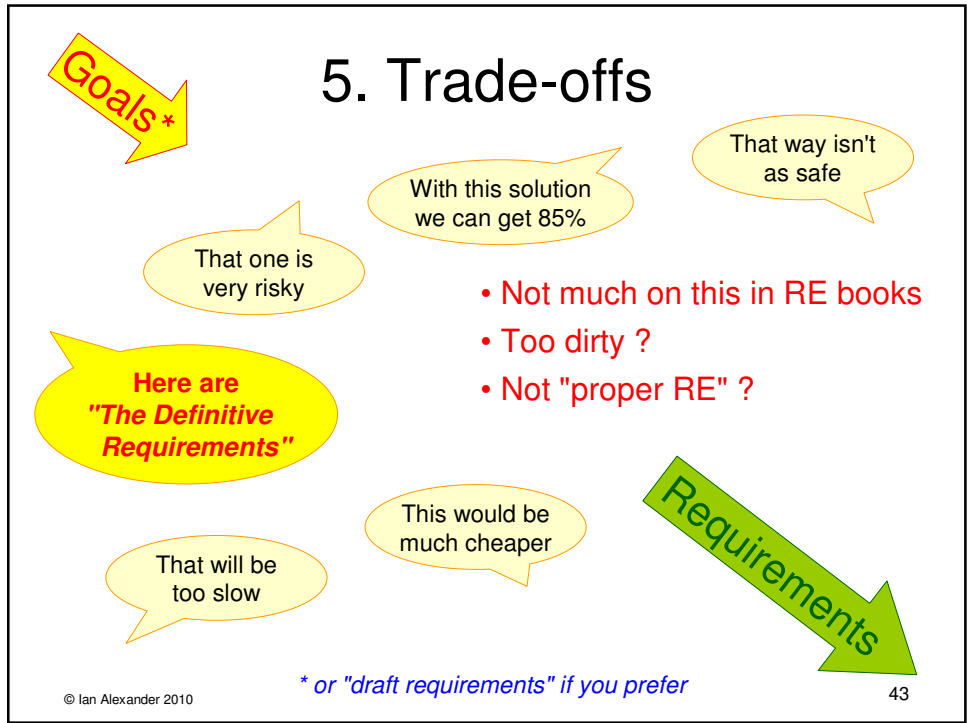
3. Validation



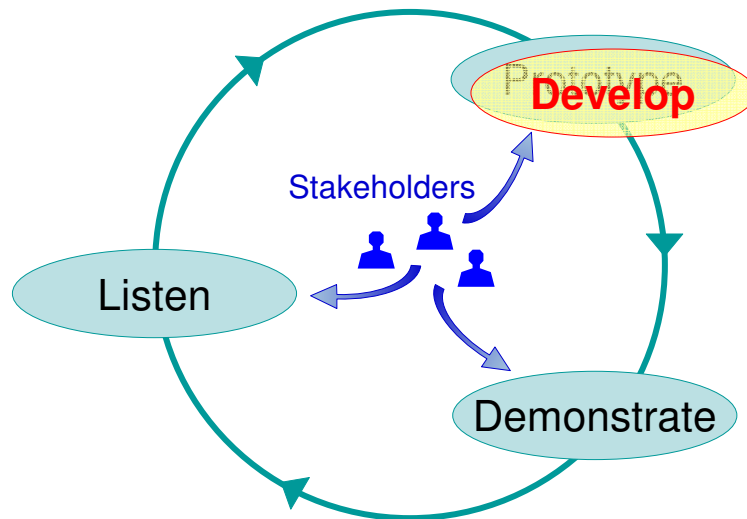
Makes use of rich web of interconnections

4. Teamwork





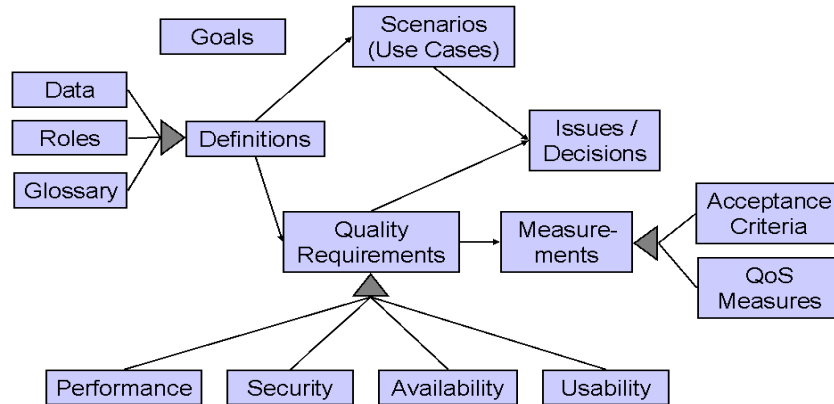
6b. A more 'agile' dialogue



The Requirements Jigsaw-Puzzle

1. What are the basic pieces?
2. How do the pieces fit together, typically?
3. **How can different projects re-assemble the pieces of their puzzles?**

Example: Meta-Model for a Retail Project



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Example: Matrix for a Retail Project

Requirement Elements									
	Stakeholders	Goals	Context, Interfaces, Scope	Scenarios	Qualities and Constraints	Rationale	Definitions	Measurements	Priorities
Discovery Contexts									
From Individuals									
From Groups									
From Things									
Trade-Offs									

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Example: Matrix for a Transport Planning Project

<i>Requirement Elements</i>									
<i>Discovery Contexts</i>	Stakeholders	Goals	Context, Interfaces, Scope	Scenarios	Qualities and Constraints	Rationale	Definitions	Measurements	Priorities
From Individuals	■	■	■						
From Groups		■	■						
From Things		■	■		■	■			
Trade-Offs		■	■		■	■		■	■

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Example Situations: "I've got to..."

- model my requirements in UML
- create Use Cases
- do Agile instead of requirements
- use my company's standard SRS template
- upgrade a highly-constrained existing system
- research ...

Projects work under many different constraints

Challenges, as promised at start of this talk

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I've got to **model my requirements in UML**

- **Goals:**
 - add informal diagrams
(abuse the Use Case notation...)
 - or just make a list
- **Rationale:**
 - annotate with notes for assumptions, etc
 - add informal diagrams

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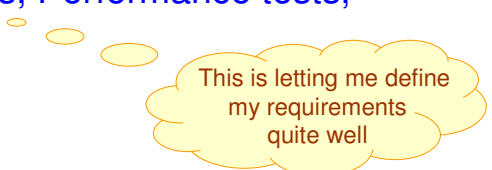
I've got to **create Use Cases**

- **Annotate your Use Cases**
 - add subsections for
 - Stakeholders
 - Rationale
 - Qualities & Constraints
 - Priority
- **Add Misuse Cases**
 - to identify & justify
 - Safety, Security, Reliability Requirements
 - Trade-offs

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I've got to **do Agile** *instead of Requirements*

- make use of **User Stories** to define both Functions (scenarios) and product Qualities
- write **Usability tests, Performance tests, Security tests**
- list **Issues, Risks**
- **when all else fails**, draw an **Architecture**



This is letting me define my requirements quite well

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I've got to **use my company's** **standard SRS template**

- well, fill it in then!
 - as briefly as possible
- then add sections for "Goals", "Scenarios", "Qualities" *, ...
 - until you can say what you need to, clearly

* why not borrow the NFR template from www.scenarioplus.org.uk ?

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I've got to upgrade a highly-constrained existing system

0. Throw away your "green-field" requirements textbooks
1. Model your **goals** for the upgrade
2. Define **context** of existing and new systems
3. Identify interfaces that **cannot be changed**
4. Explore **options** where scope can be changed
5. Identify **stakeholders**, esp. where scope has changed
6. Discover stakeholder **goals, conflicts, input priorities**
7. **Trade-off** alternative solutions against goals
8. Set project's **output priorities**

Brown-field
isn't like classical RE

Who here is working on
Brown-field RE?

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I've got to research ...

- remember only **specialty tame** industrialists are allowed into research conferences
- go and visit an industrial project
 - **see** what they are doing
 - **find out** what they need
 - **prototype a simple front end** that everyone can use



Whatever you do, please keep it simple

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Challenges for the Future



Thank you for Listening

