

iStar 2.0: The i* Core Language and Experiences

iStar Workshop 2016

Co-located with RE'16, Beijing, China

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Outline

- iStar core Motivation
- Team
- Timeline
- Summary of Core Changes
- Core vs. Standard
- Highlight Issues
 - Softgoal vs. Quality
 - Means-ends
 - Actor Association Links
- Future Plans: Call for Action

iStar Core Motivation

- i* has been adopted for intentional modeling in RE and beyond, but...
- Many different versions, variations and extensions of i*
- Use and interpretation varies widely
- Flexibility is both a positive and negative quality
- Some concepts cause confusion in practice
- This makes it difficult to learn the language
- Difficult to **teach** the language
- Difficult to encourage **industrial adoption**, where to start?

Team

iStar Core Authors:

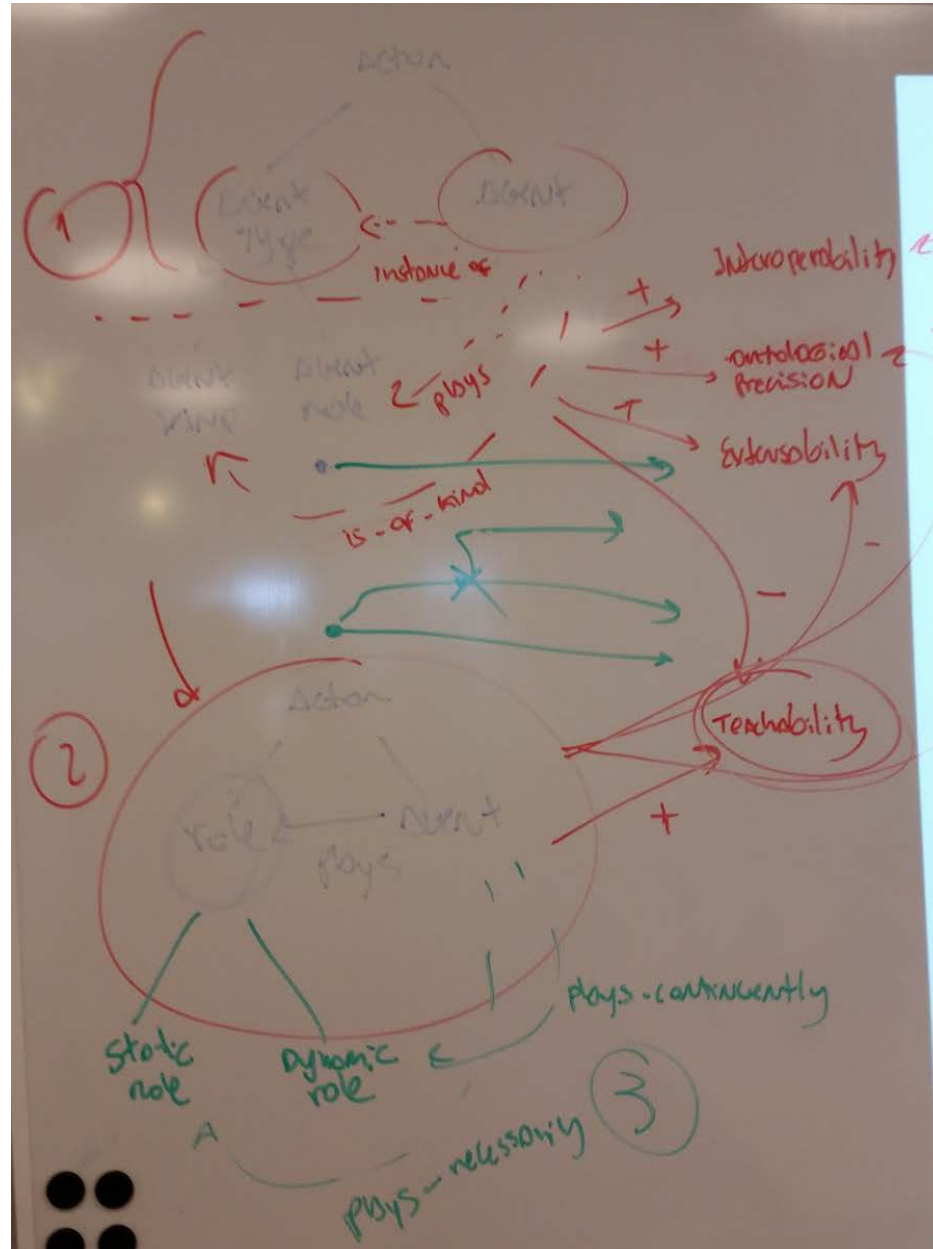
- Fabiano Dalpiaz, Utrecht University, The Netherlands
- Xavier Franch, Universitat Politecnica de Catalunya, Spain
- Jennifer Horkoff, City University London, United Kingdom

Endorsers/Participants:

- Okhaide Akhigbe, Fatma Basak Aydemir, Juan Pablo Carvallo, Jaelson Castro, Luiz Marcio Cysneiros, Sepideh Ghanavati, Alicia Grubb, Giancarlo Guizzardi, Renata Guizzardi, Matthias Jarke, Alexei Lapouchnian, Tong Li, Lin Liu, Lidia Lopez, Alejandro Mate, John Mylopoulos, Soroosh Nalchigar, Elda Paja, Angelo Susi, Juan Carlos Trujillo Mondejar, Eric Yu, Jelena Zdravkovic

Our Goals






From ER'15 Meeting (most Scribbles thanks to Giancarlo)



Our Goals

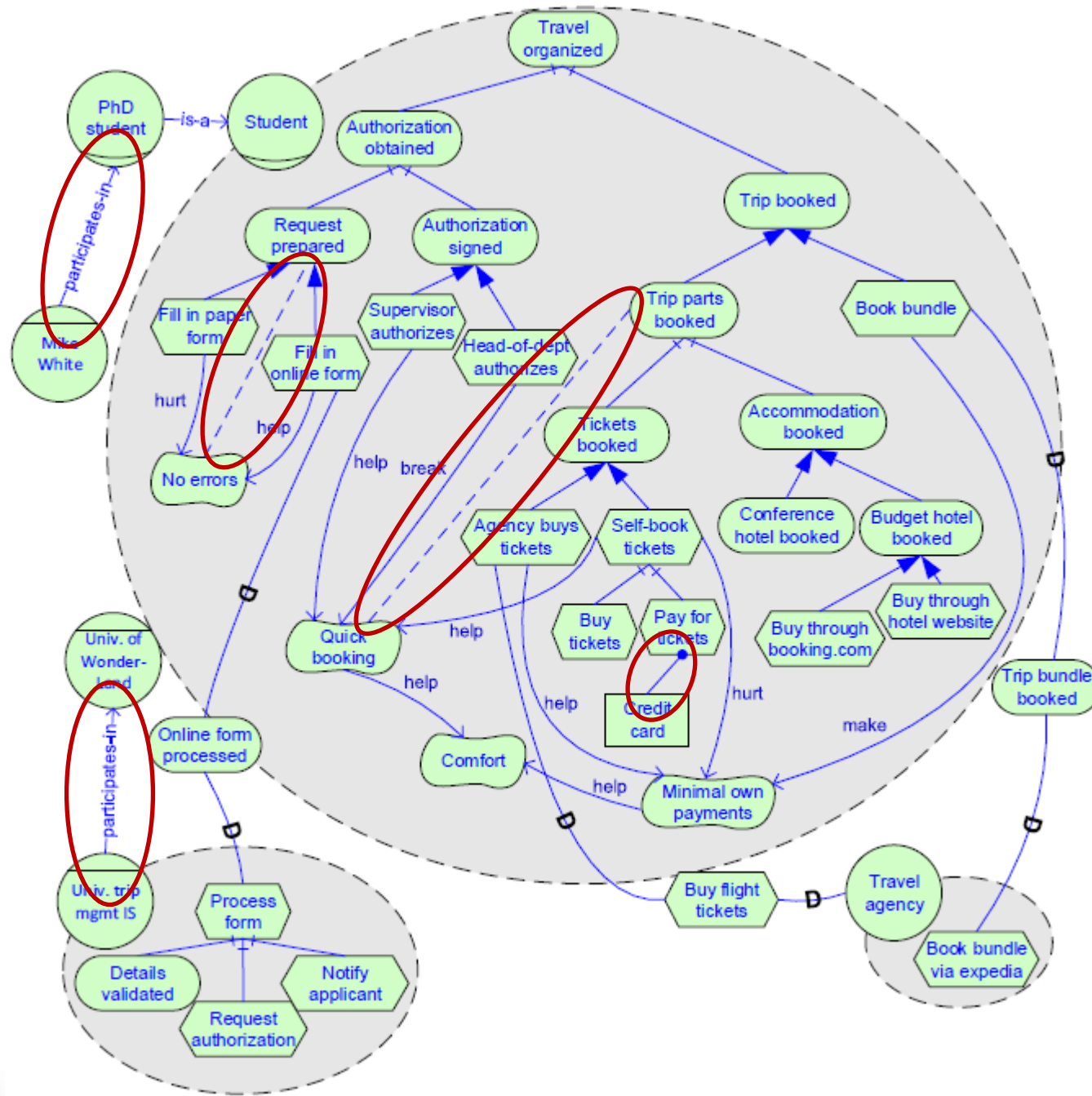
- Simplicity
 - Language Symmetry
- Usability
- Expressiveness
- Teachability
- Interoperability
- Extensibility
- Ontological precision
- ... (see Lidia's presentation for more)

Timeline

- One-day meeting the day before the ER'14 conference in Atlanta (October 2014)
-  • Draft of Discussions and open questions (January 2015)
- Community meeting at CAiSE'15 in Stockholm (at the iStar teaching workshop)
 - Decided that a smaller would guide the process
-  • Draft updated (v 0.1) August 2015
- Discussed at the iStar Workshop colocated with RE'15
- Discussed at another dedicated one-day meeting before ER'15 in Stockholm (October 2015)
- Distributed among the participating researchers (December 2015)
-  • Draft updated (v 0.2) January 2015
- More rounds of electronic feedback & meetings
 - 3 of us met at REFSQ'16 in Gothenburg
-  • iStar 2.0 Language Guide (March 2016)
- More iterations
-  • **iStar 2.0 Language Guide released May 2016**

Summary of Core Changes

| | i* 1.0 - wiki | iStar 2.0 | Comment |
|---------------------------|-------------------------------------|-------------------------|--|
| Actors | General actors | General actors | |
| | Roles, positions, agents | Roles, agents | |
| Actor links | is-a | is-a | |
| | is-part-of, plays, occupies, covers | participates-in | iStar 2.0 simplifies iStar 1.0 with a generic relationship that may be applied among two actors of any type |
| | INS | - | |
| Intentional elements | Goal, task, resource | Goal, task, resource | |
| | softgoal | quality | we move away from the hard/soft-goal dichotomy |
| Intentional element links | means-end, task decomposition | refinement | a single relationship for simplicity, different semantics depending on the connected elements and the logical connector AND/OR |
| | contribution | contribution | |
| | | qualification, neededBy | new relationships to link goals/tasks to qualities and resources, respectively |



Where is it?

- <https://sites.google.com/site/istarlanguage/>
- <https://arxiv.org/abs/1605.07767>
- Using the arxiv.org archive allows us to update the core whenever needed
- If you have feedback on the content of the standard itself, please:
 - Talk to us (myself, Fabiano, Xavier) offline (we are all at RE!)
 - Or use the form on the web site

Core vs. Standard

- Common RE/modeling standards such as OMG's UML or the ITU-T URN standard (should) contain (thanks to Daniel A.):
 - ✓ • An abstract syntax (e.g., a metamodels or some abstract grammar).
 - ✓ • Concrete syntax(es) (e.g., graphical and/or textual)
 - ✓ • A mapping from each concrete syntax to the abstract syntax
 - ✓ • Well-formedness constraints, often referred to as static semantics (e.g., OCL expressions on the abstract grammar)
 - ⚡ • Semantics (to support shared understanding and analysis)
 - ⚡ • Ideally semiotics (intuitive correspondence between the concrete symbols and their abstract meaning)
 - ✗ • An interchange format (for storage and tool interoperability)
 - ⚡ • A process for updates and improvements
- So we have an iStar "Core"

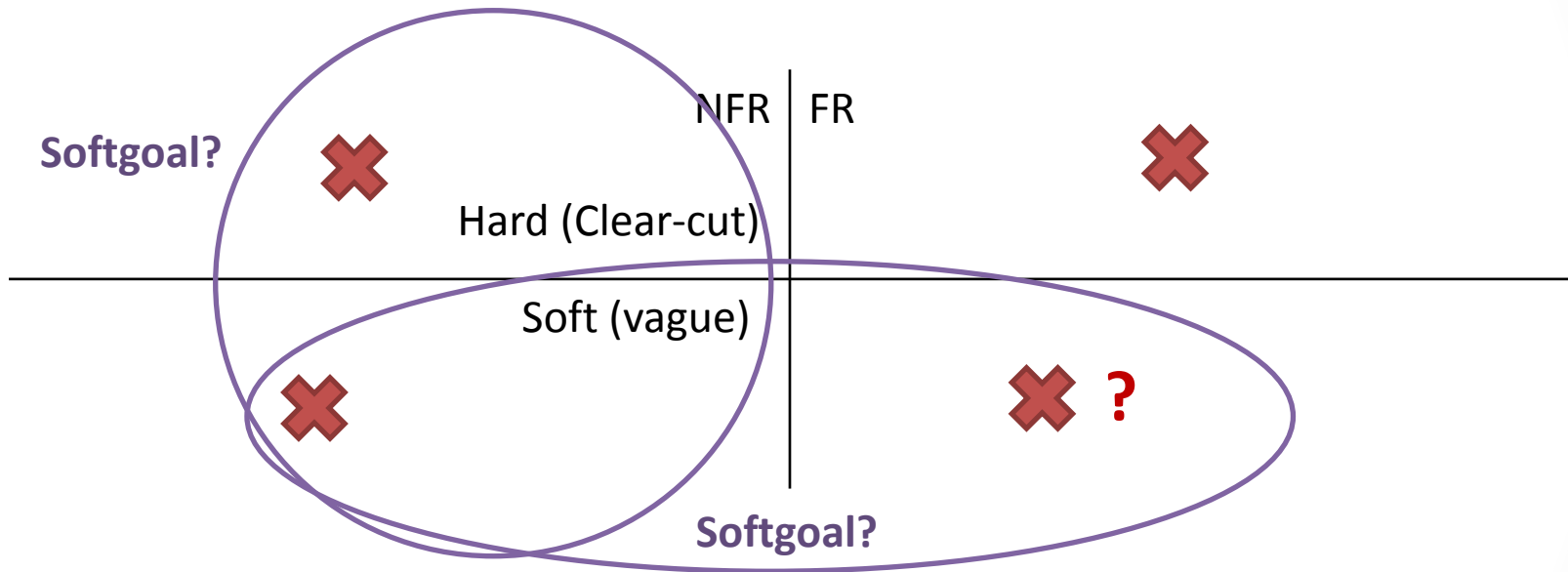
HIGHLIGHT ISSUES

Softgoal vs. Quality

- What is a softgoal?
- A goal without a clear-cut criteria for success?
 - Goals with clear-cut criteria are hard goals
- A goal representing an NFR?
 - Hard goals represent functional requirements
- But... what about?
 - 10% increase in usability
 - Clear-cut NFR
 - Increase Profit
 - In an RE context, this is a softgoal
 - In a business context this is a goal
 - NFR/FR distinction fails a bit in a business context, very RE-oriented

Softgoal vs. Quality

- The NFR/FR and Soft/Hard distinctions are orthogonal



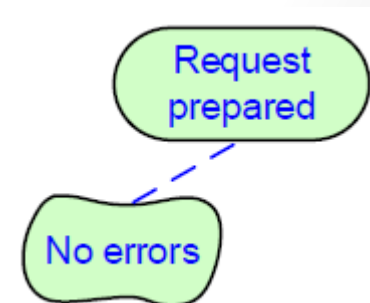
- Inspired by ontological frameworks (DOLCE, UFO), we turn instead to “qualities”

Softgoal vs. Quality

- Quality: an attribute for which an actor desires some level of achievement
- The level of achievement may be precise or vague
 - Qualities can be soft or hard
- Can guide the search for ways of achieving goals
- Can serve as criteria for evaluating alternative ways of achieving goals
- Aligns better with business terminology
- 10% increase in usability
 - Quality
- Increase Profit
 - Quality?
- Introduced *Qualification* Link....

Qualification Link

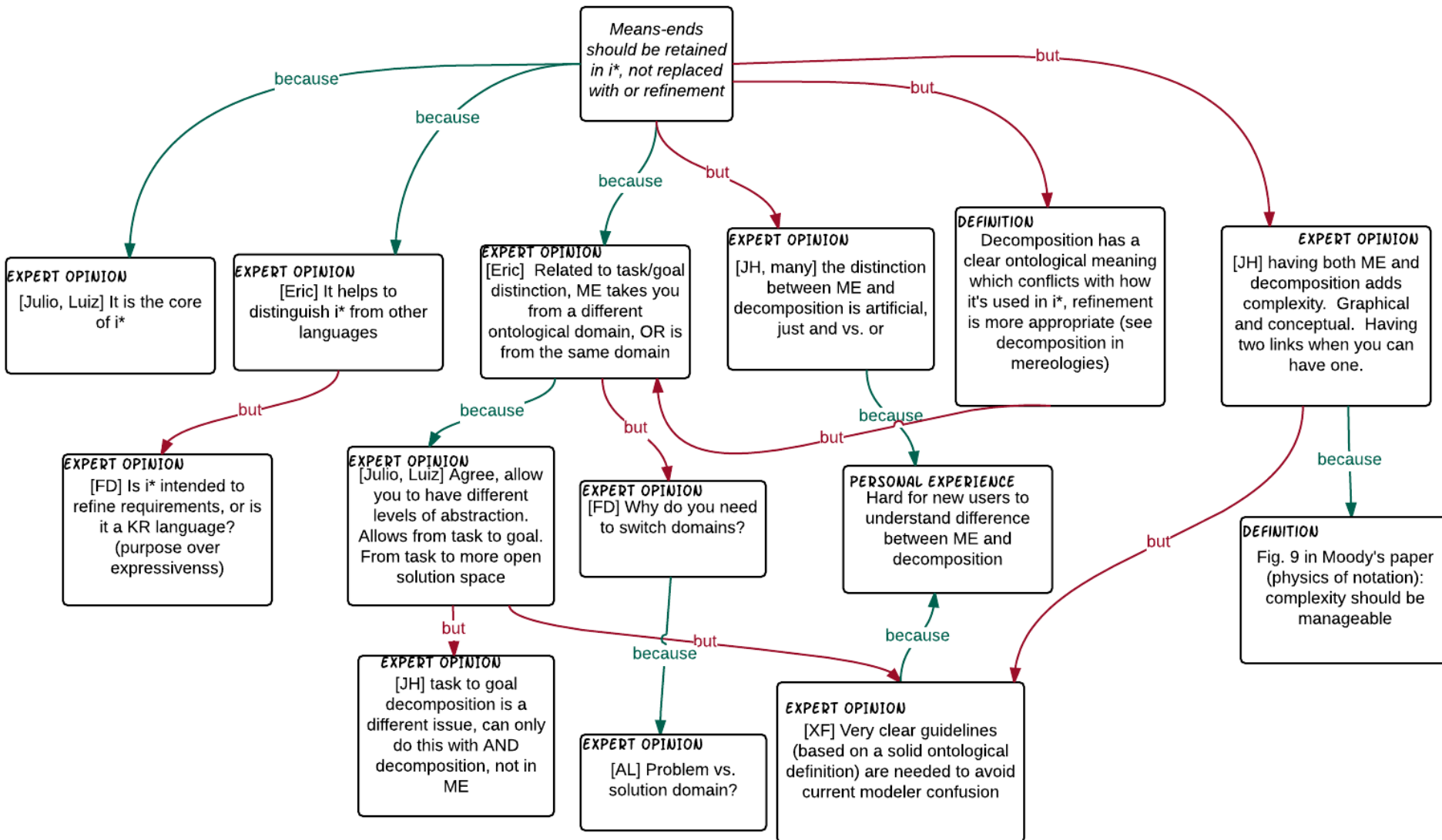
- Qualities qualify non-qualities (goals, tasks, resources)
- Relates a quality to its subject, quality of what?
- Why not refinement or contribution?
 - The quality is not strictly necessary in order to satisfy the subject (no refinement)
 - The quality does not contribute to the satisfaction of the subject (no contribution)
 - Separation between doing something/achieving something and how well it's done/achieved
 - But we want a way to associate qualities with the thing they qualify
 - Examples: send message, send message securely



Means-Ends

- Initially, for simplicity, means-ends (as well as decomposition) was replaced by refinement
 - We had AND/OR refinement
- This brought up a lot of discussion and issues
- “Tropos” view: goals AND/OR refined to tasks, tasks cannot be refined into goals.
 - In some views tasks cannot be refined at all
- “i*” view: tasks are means to the end of goals, tasks are decomposed into more tasks or goals, and so on

Means-Ends (Argument Map)



Means-Ends

- Somewhat of a compromise...
- Explicit means-ends is gone

| | | Arrowhead pointing to | | | |
|------------------|-----------------|-----------------------|----------------|---------------|-----------------|
| | | <i>Goal</i> | <i>Quality</i> | <i>Task</i> | <i>Resource</i> |
| Link starts from | <i>Goal</i> | Refinement | Contribution | Refinement | n/a |
| | <i>Quality</i> | Qualification | Contribution | Qualification | Qualification |
| | <i>Task</i> | Refinement | Contribution | Refinement | n/a |
| | <i>Resource</i> | n/a | Contribution | NeededBy | n/a |

- Note: right now the graphical syntax is the same as in i*, but this can be changed
- But...
- Tasks can be refined to goals
 - Can go back and forth between problems and solutions
- Restrictions on element type refinement type gone

Means-Ends

- A parent can only be AND-refined or OR-refined, not both simultaneously.
- If the parent is a goal :
 - In the case of AND, a child goal is a sub-state of affairs that is part of the parent goal, while a child task is a sub-task that must be fulfilled;
 - In the case of OR, a child task is a particular way (**a \means"**) for fulfilling the parent goal (**the \end"**), while a child goal is a sub-goal that can be achieved for fulfilling the parent goal;
- If the parent is a task :
 - In the case of AND, a child task is a sub-task that is identified as part of the parent task, while a child goal is a goal that is **uncovered by** analysing the parent task;
 - In the case of OR, a child goal is a goal whose existence that is uncovered by analysing the parent task which may substitute for the original task, while a child task is a way to execute the parent task.

Actor Association Links

- First, no positions (could be added back in later extensions)
- Before (something like):

| | Arrow Pointing to | | |
|-------|-------------------|---------------|--------------------|
| | Actor | Role | Agent |
| Actor | Part-of, ISA | | Part-of? |
| Role | | Part-of, ISA? | Part-of? |
| Agent | Ins? Part-of? | Plays | Part-of, Ins?, ISA |

- Do we really want to get into instance vs. class, i.e. runtime vs. design time? In the same model?
- ISA (inheritance) is complicated (please ask Lidia)
- Is part-of interpreted literally?

Actor Association Links

- is-a: represents the concept of generalization/specialization
 - Only roles can be specialized into roles, or general actors into general actors.
- Participates-in: represents any kind of association, other than generalization / specialization, between two actors.
 - When the source is an agent and the target is a role, this represents the plays relationship
 - When the source and the target are of the same type, this will often represent the part-of relationship

| | Arrow Pointing to | | |
|-------|-----------------------|----------------------------|------------------------------|
| | Actor | Role | Agent |
| Actor | Is-a, Participates-in | Participates-in | Participates-in |
| Role | Participates-in | Is-a, Participates-in | Participates-in |
| Agent | Participates-in | Participates-in (plays) | Participates-in (part-of) |

Future Plans: Call for Action

- Tutorial in ER'16
- Call for empirical evaluation (see Lidia et al. in next talk)
- Way to collect and process evaluation/feedback/examples?
 - Regular meetings? Committees?
- Process for updating standard
- Work on graphical syntax
- Work on formal semantics (maybe)
- Consistent tooling (see Tong et al. paper yesterday)
- Interchange language? iStar 2.0 ML?