Designing with Priorities and Thresholds for Health Care Heterogeneity

The Approach of Constructing Parametric Ontology

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Heterogeneous Sets of Requirements

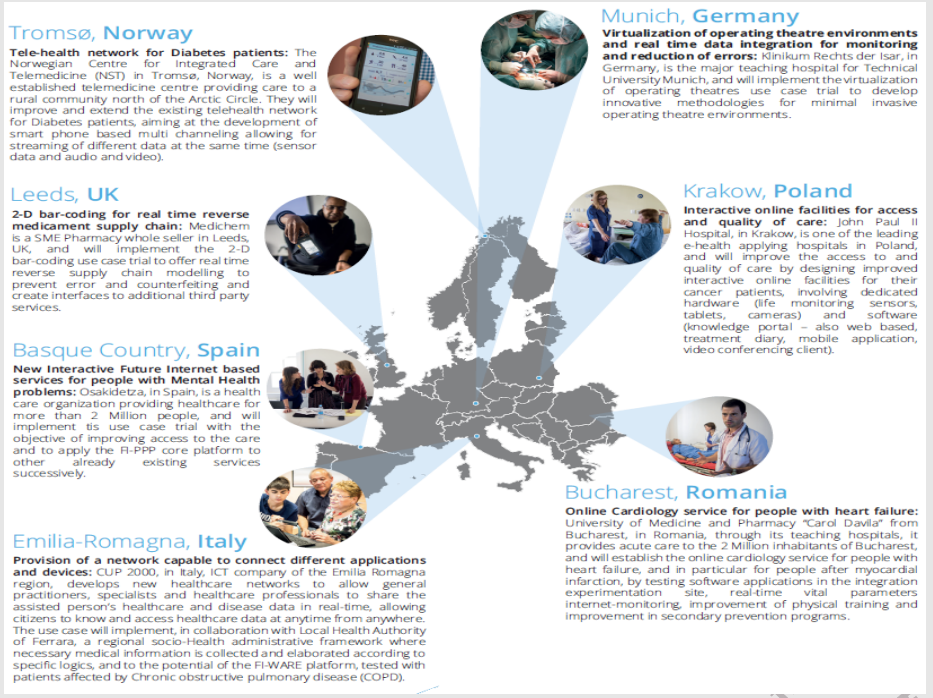
The requirement document for each case reflects a different set of features and quality attributes comparing to others.

Need to evaluate multiple designs (and final products), compare them and aggregate them to a total.

A common platform is designed/being designed for all those products and future products in the ecosystem. The platform might take responsibility of providing some of the common features or facilitate some common quality attributes.

Q: What are the most common and highly demanded quality attributes or features for all products (they would become evaluation aspects for the designs and implementations)?

FI-STAR Project and its 7 Use-Cases



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Solution: Ontology Construction Out of the Quality Attributes

Explicitly specified qualities/entities in a domain/case can be communicated through an ontology.

Explicitly specified relations between qualities/entities can be captured in an ontology in a network model.

If we limit:

- the ontology form (e.g *rooted acyclic graph*): we can apply some specific traversing, construction, or aggregating algorithms over the ontology
- the relations to specific class (e.g. *subclass-superclass with weights*) we can gain some structural benefits (such as unification)
- the relations to specific quantitative and/or qualitative class (e.g. *subclass-superclass with weights*) deduce/infer some knowledge out of the network

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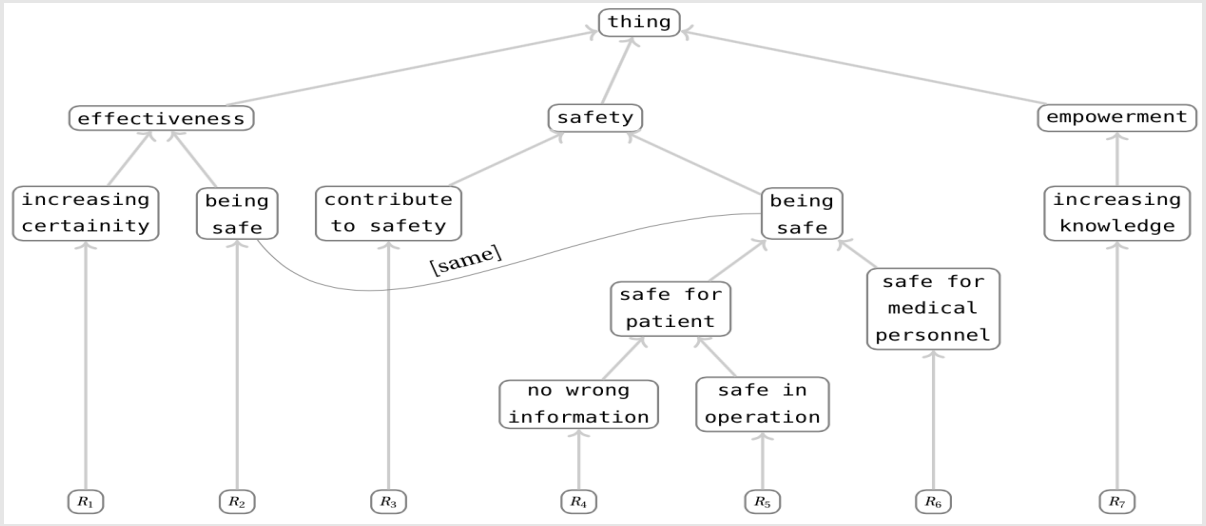
Ontology Construction: How it Can Look
(before assigning weights and fixing the wordings)

- Gather all quality attributes move them from top (*thing* node) to their right position or expand the ontology
- In our case (FI-STAR) we reached around ~400 nodes, gathered from 7 cases
- We had some minor complains from cases about attributes less relevant
- Changed wordings to better reflect subclass and superclass relations (e.g. safe to safety)



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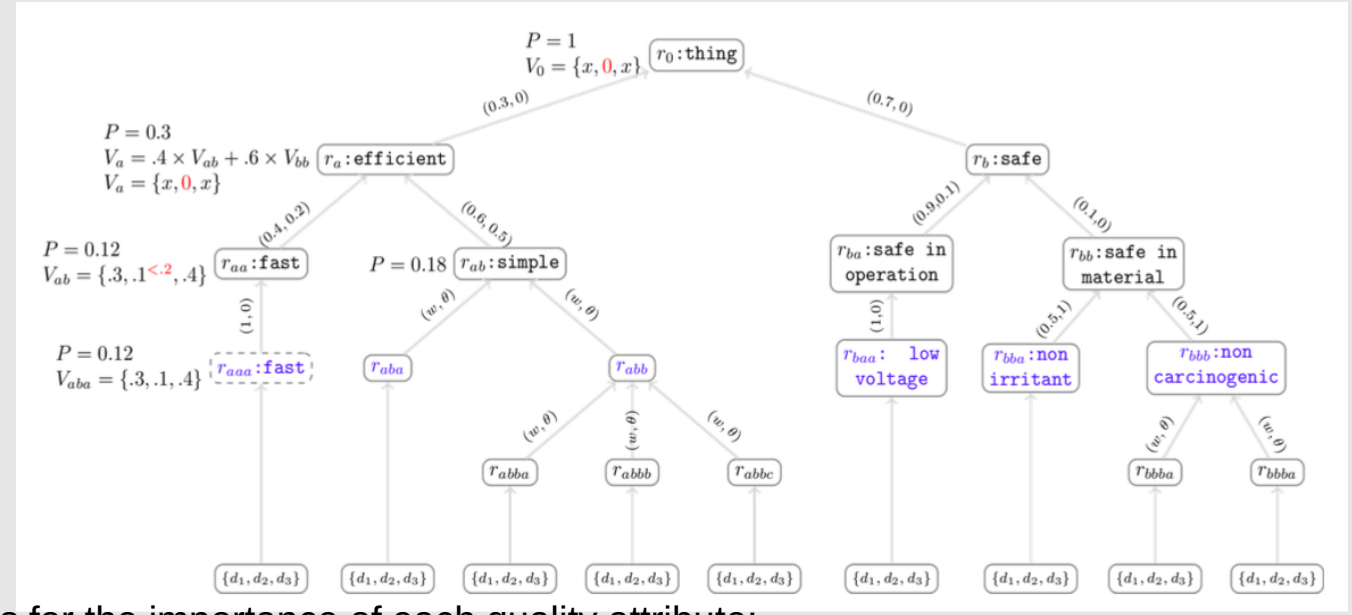
Double Weighting of Relations



Two dimensions for the importance of each quality attribute:

- *Affirmative Contribution (X,...):* how much does it **contribute** to the parent quality attribute? It also determines **P** value (value contribution) of each node.
- *Negative Threshold (…,Y):* below what threshold does it **defuse** the parent quality?
- Designs or implementations {d1, d2, d3} go up ontology to gain credits or being rejected (**V**)
- There can be a summarizing level (in blue)

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Features and Limits

F: While originally a user based approach it can be extended by merging an ontology from a quality attributes specified in a model (we used the MAST model)

L: What if all the quality attributes end up as the first level nodes (low unification)?

L: What if it ends up in unbalanced levels in the tree (too generic ones same level as too specific ones), we injected some nodes between some parents/childs

L/F: Subjectivity in each subclass/superclass decision. The inevitable minimum?

F: Communication of regulations? Possibility of using upper ontologies? Possibility to rely on well developed biomedical ontologies?

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Thanks!

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