

Requirements Engineering as Science in the Small

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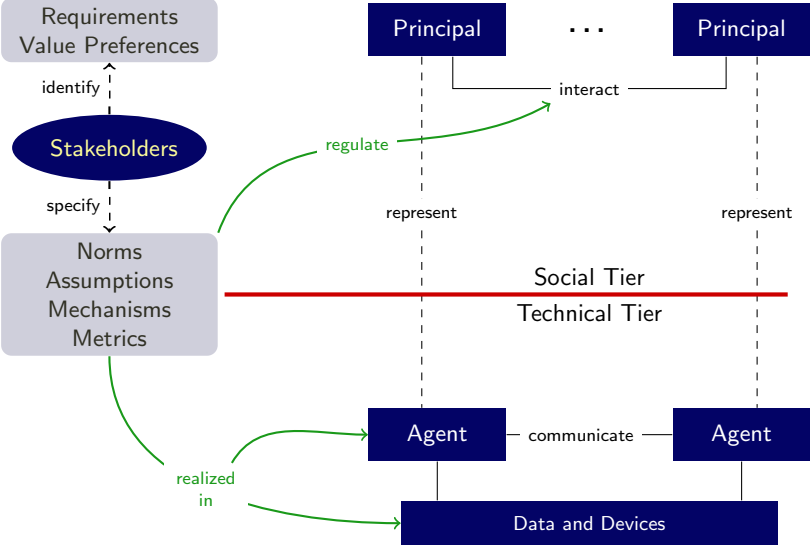
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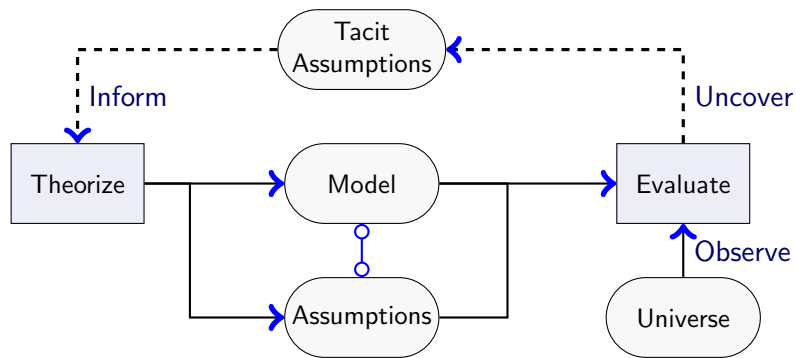
RE from a Sociotechnical Systems Perspective



Natural Science

The scientist controls the model but the universe, as instrumented and observed, is fixed

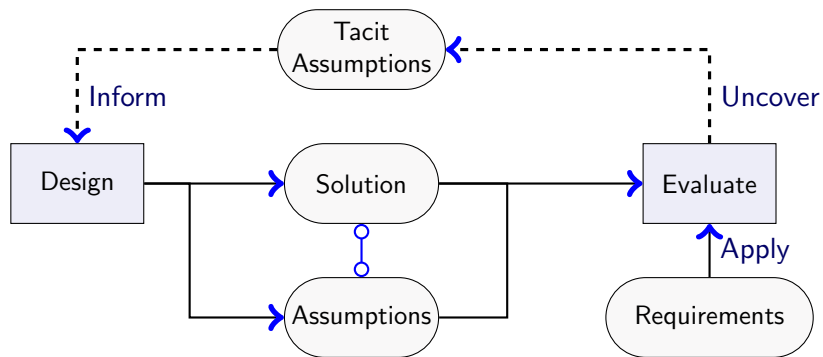
The assumptions scope out the observations and the model



Software Development

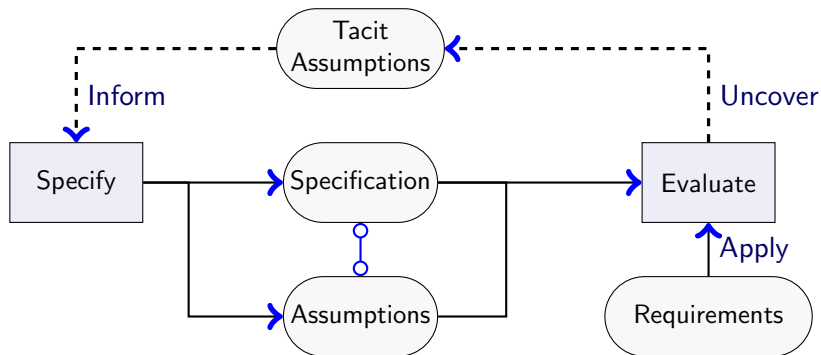
The developer controls the solution artifact but not the requirements

The assumptions carry contractual force between developers and stakeholders



Refine Requirements into Specifications and Assumptions

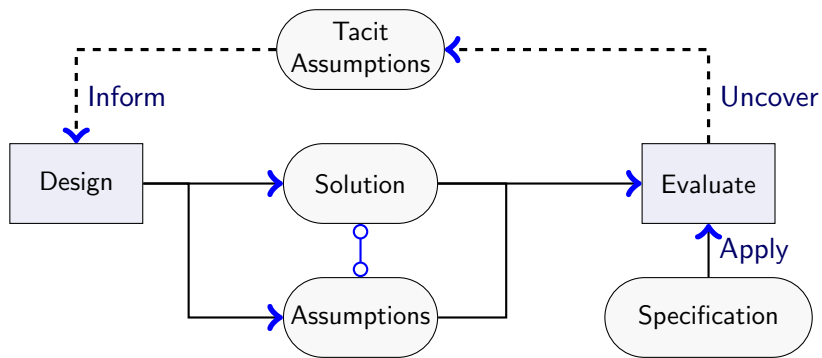
Requirements can be informal and lack clear criteria for evaluating specifications



Solutions Implement Specifications

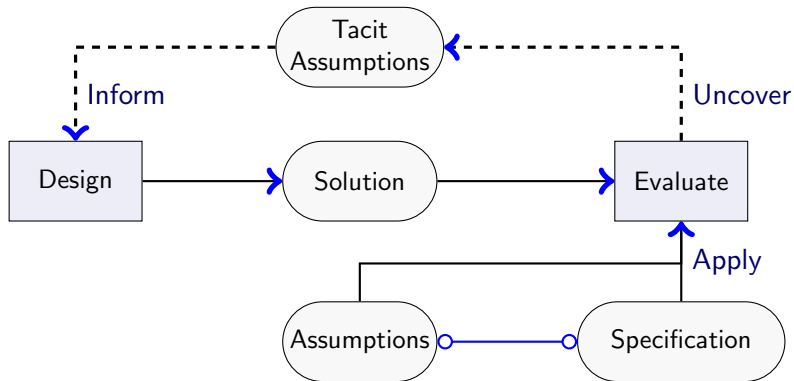
The assumptions delineate the limitations of the solution artifact

The assumptions should be more general for a solution than for the specification

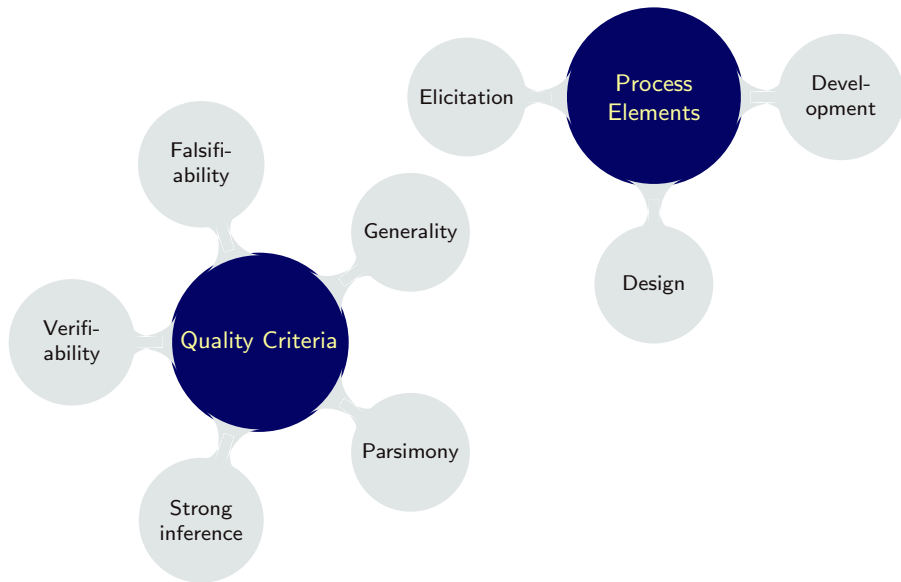


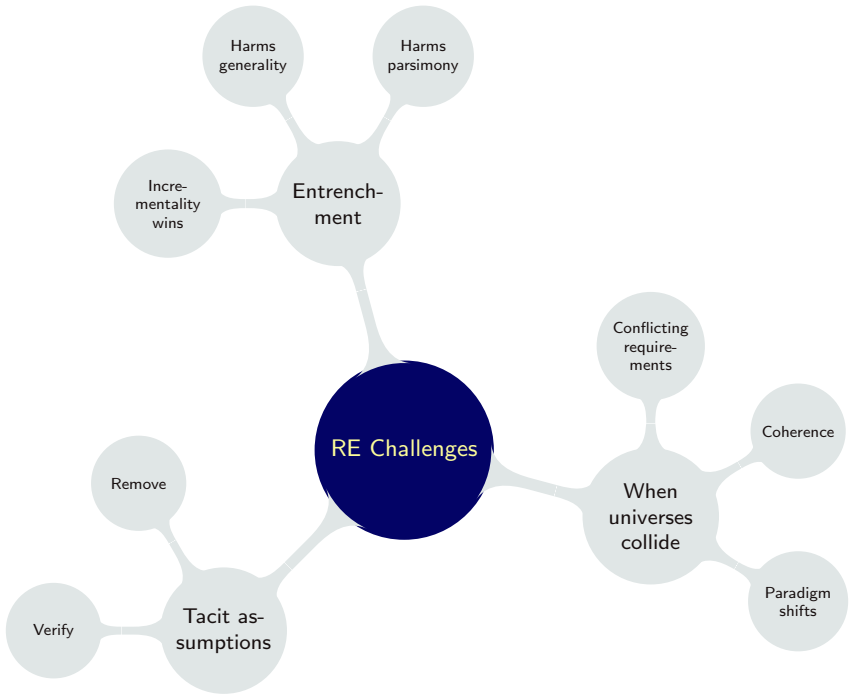
Pairing Assumptions and Specifications

Shifting the assumptions to the specification is crucial, else the contract with the stakeholders is meaningless because different solutions are incomparable



Adopting Ideas from the Philosophy of Science





RE Challenges

Entrenchment

Harms generality

Harms parsimony

Incrementality wins

Conflicting requirements

Coherence

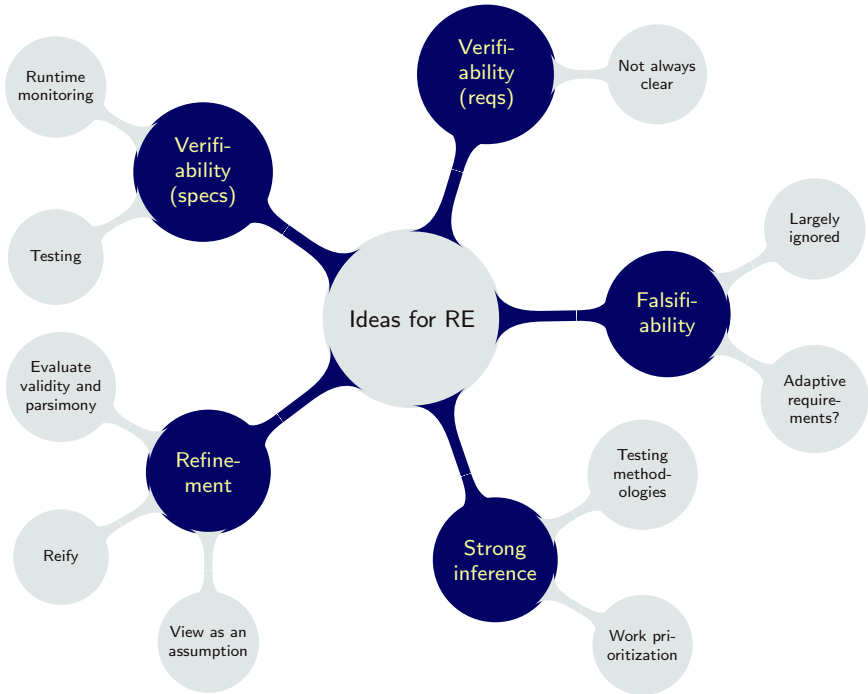
When universes collide

Paradigm shifts

Tacit assumptions

Remove

Verify



Ideas for RE

Verifiability (specs)

Runtime monitoring

Testing

Verifiability (reqs)

Not always clear

Falsifiability

Largely ignored

Adaptive requirements?

Strong inference

Testing methodologies

Work prioritization

Refinement

Evaluate validity and parsimony

Reify

View as an assumption

RE as Science in the Small

	Natural Science	RE
Focus	Existing universe	Artificial universe, to be realized
Representation	Theories about observations	Specifications as bases for contracts
Correctness	Descriptive Seeks objectivity	Prescriptive Negotiated
Human acceptance	Not essential	Essential
Entrenchment	Theories build on prior theories	Requirements based on current practice
Social	Global community	Problem-specific community

Thanks!

- ▶ Singh: Science of Security Lablet
- ▶ Chopra: EPSRC grant EP/N027965/1 (Turtles)

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