Verification & Validation an inconvenient truth

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Topics

1. Subjective V&V; a blessing in disguise?

2. V&V incentives; a core problem in (infrastructural) projects

3. Poor system Integrity & Coherence; a recipe for disaster

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Accepted level of transparency

ambition	++++	++	+
mobility	++++	++++	++
costs	0,2 bio €	1,5 bio €	3,1 bio €
Cost/benefits	++	+	-
environment	+/-	+/-	-
risks	◆◆	◆◆◆	◆◆◆◆

Subjective V&V

PLAN STADSSPOOR

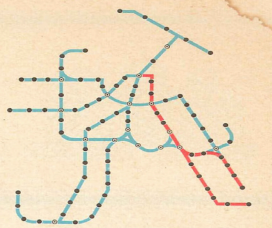
Fietsen, auto's, trams en bussen lopen vast in spitsdrukte

VERKEER TUSSEN HUIS EN WERK EIST NIEUWE VORM VAN VERVOER

Het 'waarom' van de metro

Het is nog niet zo lang geleden dat de Amsterdammer op betrekkelijk korte afstand van zijn werk kon wonen. De lasser van de NDSM zocht een woning in Tuindorp-Oostzaan, de bankwerker van Werkspoor ging wonen op de Eilanden en duizenden die hun werkterrein in de binnenstad hadden, vestigden zich in de 19de-eeuwse wijken rond die binnenstad, die ook nu nog het dichtstbevolkte stadsgebied van Europa vormen. Het woon-werk-verkeer (het verkeer van huis naar werk en terug) bestond voor velen uit een wandeling, voor vele anderen uit een kwartiertje fietsen en de rest maakte gebruik van tram en bus en behoefde niet langer dan een half uurtje te reizen.

Het Amsterdam van 1968 is in oppervlakte verdubbeld vergeleken bij het Amsterdam van 1939. De werker van de binnenstad kan geen woning meer vinden in de naaste omgeving, maar woont wellicht in Nieuwendam-Noord of Osdorp en menige winkelier, die vroeger achter of boven zijn winkel woonde, heeft nu een flatje in de verre buitenwijken. Er zijn tuinsteden verrezen en er zijn buiten de binnenstad nieuwe werkcentra ontstaan. De afstanden, die de Amsterdammer moet afleggen, zijn belangrijk vergroot, zelfs in eigen wijk.



Schema Stadsspoor

Metrotunnel graaft zichzelf onder IJ door

Het ontwerp van de noord-zuidlijn van de stadsspoorweg voorziet in een tunnel onder het IJ en onder het Centraal Station. De uitvoering van dit project zal geschieden volgens de z.g. schildmethode. Hierbij graaft de tunnel zich als het ware diep onder de grond door. De tunnels zullen bestaan uit ronde buizen, die vlak achter de ontgravingsapparatuur uit segmenten worden opgebouwd.
Voor de aanleg van deze metro-tunnel is een studie verricht in samenwerking met een in deze werkwijze ervaren buitenlands ingenieursbureau.
De schildmethode is vrij kostbaar, doch bij de bouw van tunnels op grote diepte toch goedkoper dan andere bouwwijzen. Zij kan alleen worden toegepast wanneer de samenstelling van de bodemlaag ervoor geschikt is.

Zó raakt onze binnenstad verstopt. Hier móet een oplossing komen!

Accepted level of transparency

	1968		
ambition	++++		
mobility	++++		
costs	0,2 bio		
Cost/benefits	++		
environment	+/-		
risks	◆◆		

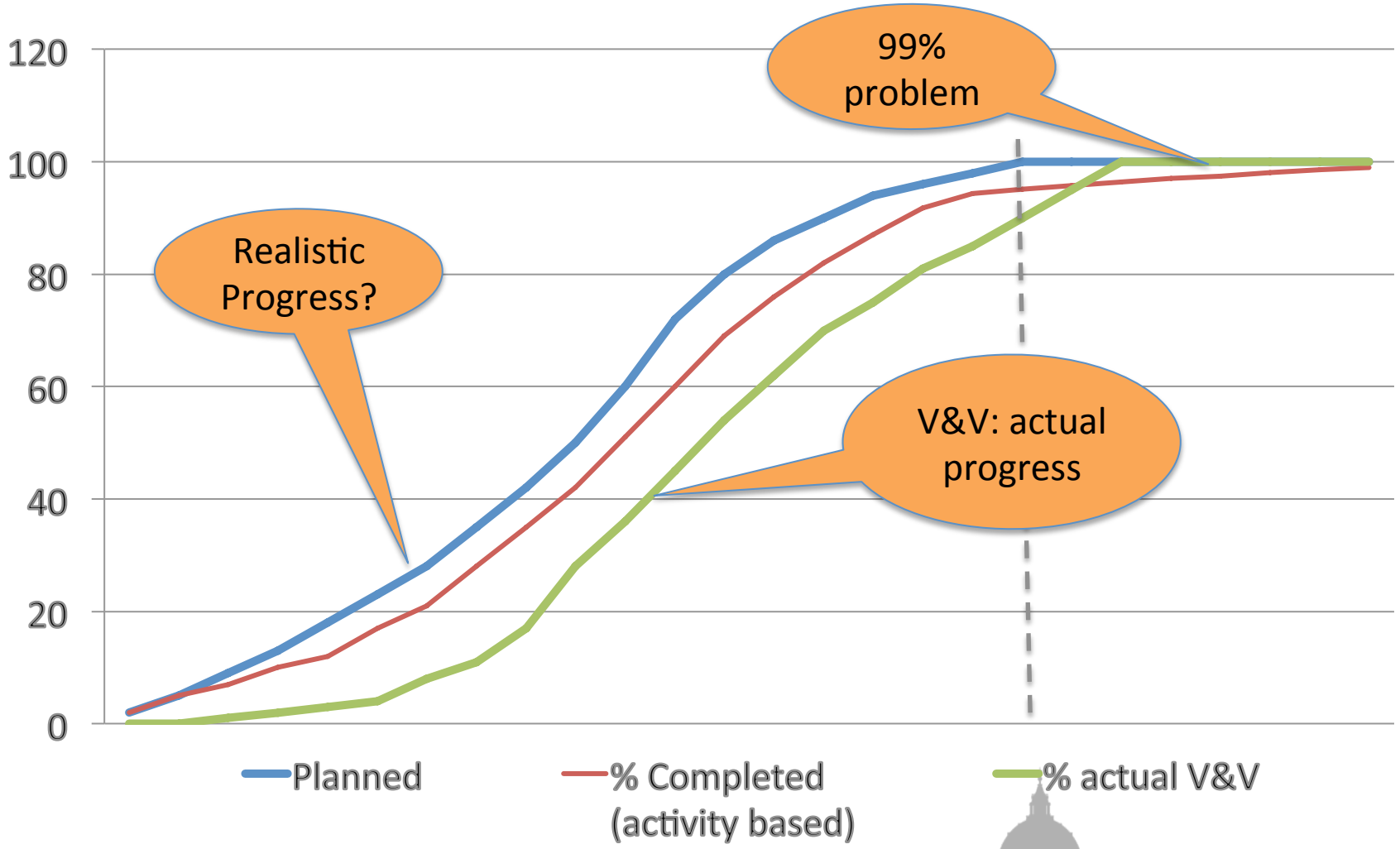
Accepted level of transparency

	1968	2002	
ambition	++++	+++	
mobility	++++	++++	
Costs	0,2 bio €	1,5 bio €	
Cost/benefits	++	+	
environment	+/-	+/-	
risks	◆◆	◆◆◆	

Accepted level of transparency

	1968	2002	2017
ambition	++++	++	+
mobility	++++	++++	++
costs	0,2 bio €	1,5 bio €	3,1 bio €
Cost/benefits	++	+	-
environment	+/-	+/-	-
risks	◆◆	◆◆◆	◆◆◆◆

Transparent progress



Transparency

Reveals inconvenience:

- Hidden interests
- Early failures
- Lack of progress
- Value trade-offs
- Risk profiles
- Feasibility
- Subjectivity

Subjective V&V recommendations

- Real independent V&V (a.o. business case)
- Explicit sign-off/denial all stakeholders
- Dedicated V&V capacity in all phases
- Certified & acknowlegded craftsmanship
- Reveal non-accepted level of transparency, by means of risks

T R U S T

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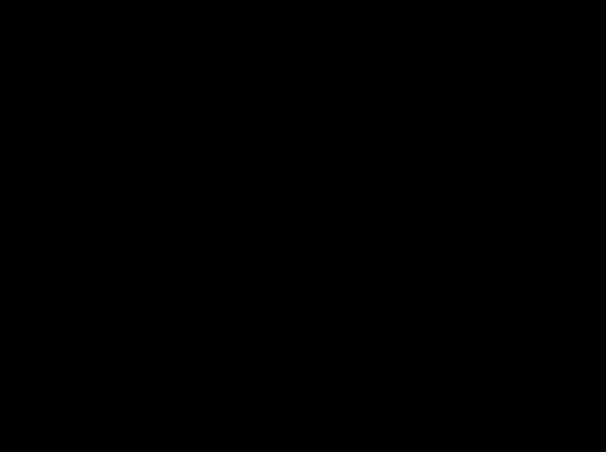
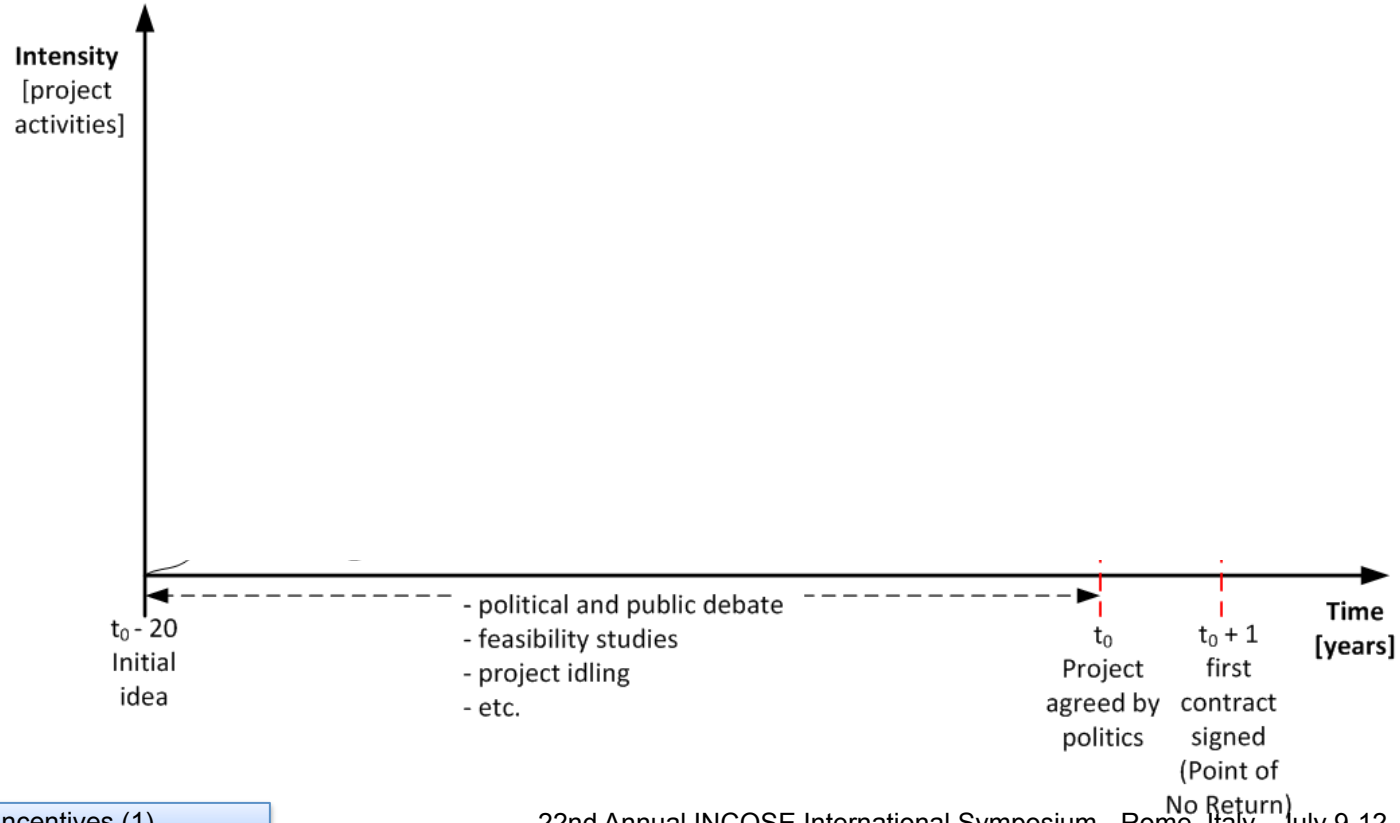
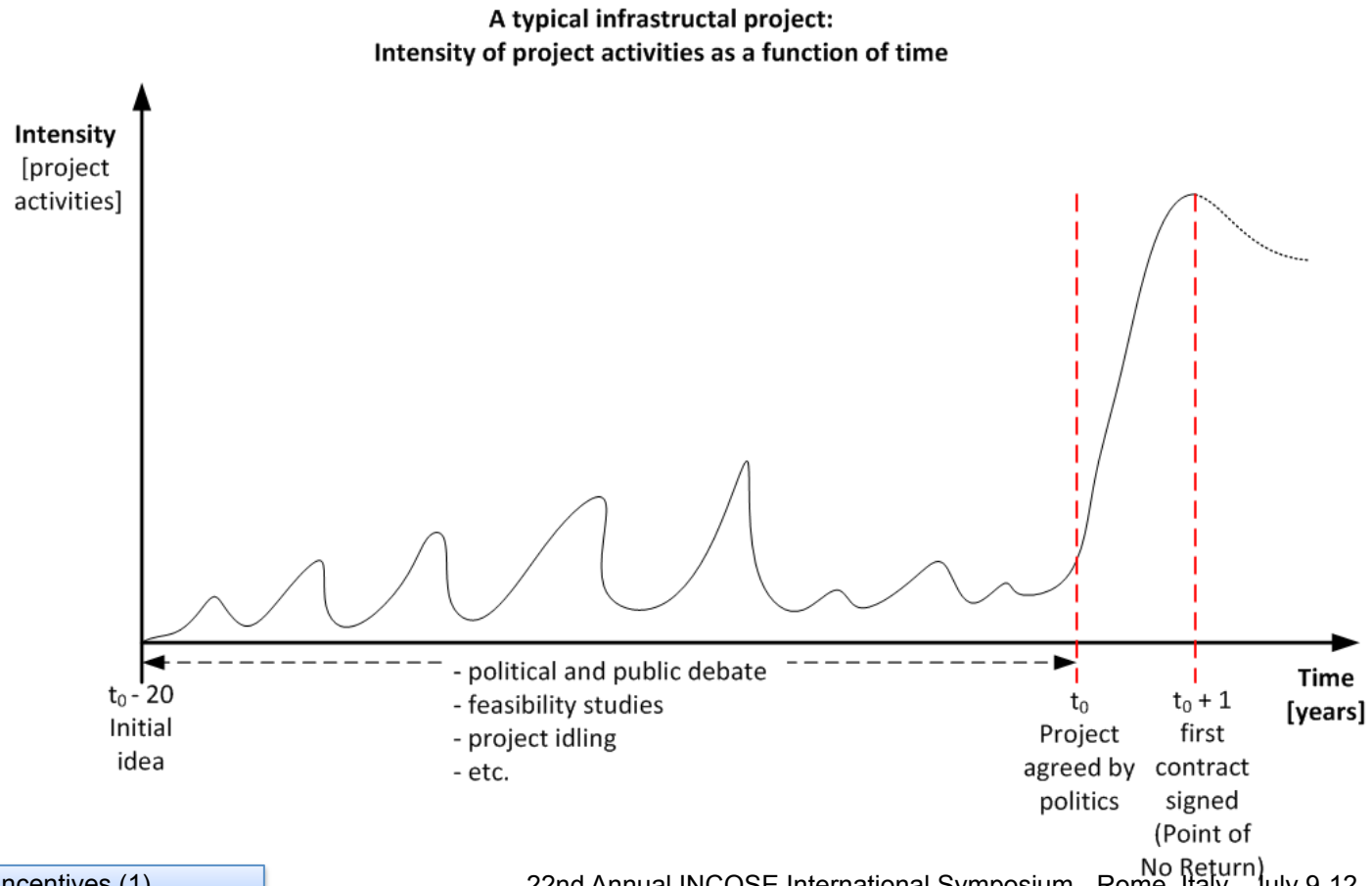


A typical infrastructal project:
Intensity of project activities as a function of time



The Next Phase Problem



Penny wise, pound foolish

- No overall incentive to deliver a complete and operating system; e.g.:
  - Verification is for the (sub)contractor
  - Validation is for the principal only

- Granting a contract is often purely based on the lowest price against fixed requirements
  - Hidden risks and mixed interpretations
  - Biased incentives to deal with uncertainties in a dynamic environment

V&V incentives recommendations

- Good V&V starts with elicitation of requirements and clear stakeholders / users expectations at the beginning of each phase
- V&V shall have a central role to manage project delivery and planning
- Ensure consistent and balanced incentives between parties to deal with uncertainties in a dynamic environment (e.g. mutual risk budgets)

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System integrity and V&V

- Limited (or scattered) knowledge of the integral system
- Lack of management and responsibility w.r.t. system architecture
- Scope of V&V often doesn't include N^{-1}
  - N^{-1} is often associated with the user's needs (that's not the contract)
  - Validation of the "contractual system" in the N^{-1} context implies a risk resulting in a (non)acceptance

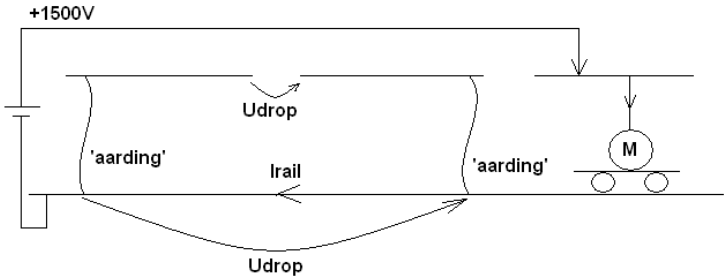
Results in:

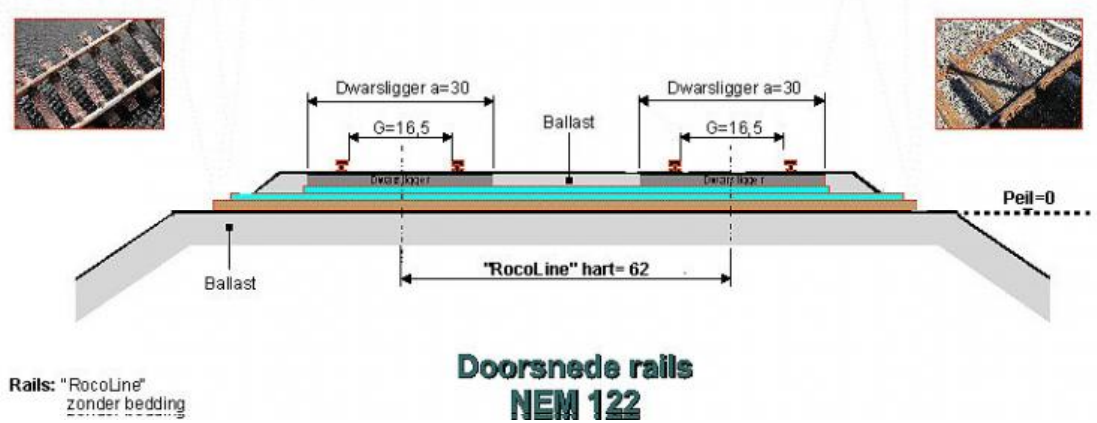
- Multiple separate plans and reports (bureaucracy)
- Scattered V&V approach with lack of coherence

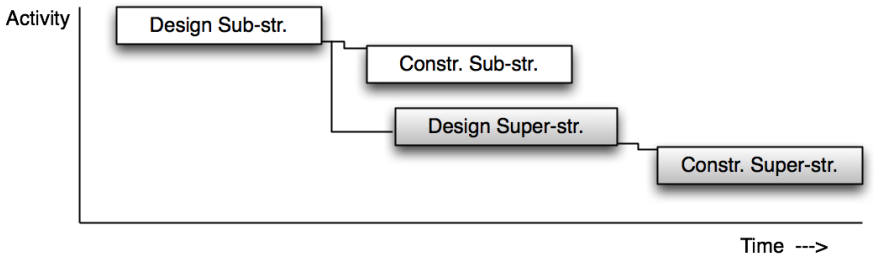
Railway example: sub-structure vs super-structure

Contractual division of a system is often used as system architecture during development

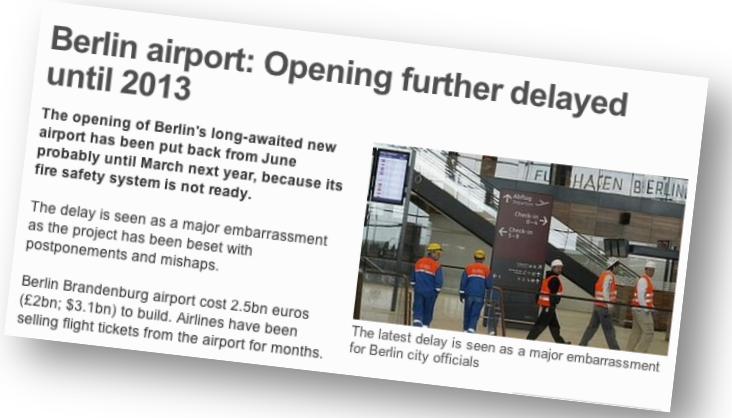
→ Effect of the grounding concept on Sub-structure?







Built acc. to requirements?!



Berlin airport: Opening further delayed until 2013

The opening of Berlin's long-awaited new airport has been put back from June probably until March next year, because its fire safety system is not ready.

The delay is seen as a major embarrassment as the project has been beset with postponements and mishaps.

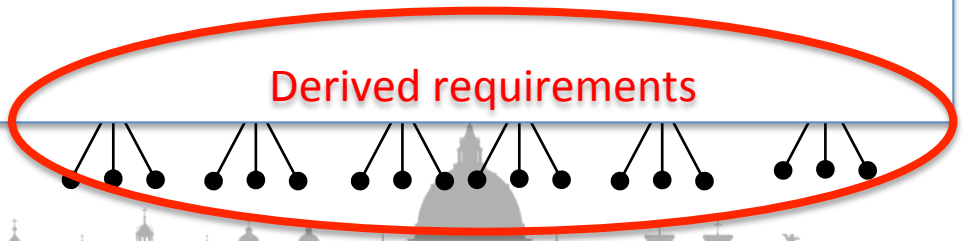
Berlin Brandenburg airport cost 2.5bn euros (£2bn; $3.1bn) to build. Airlines have been selling flight tickets from the airport for months.

The latest delay is seen as a major embarrassment for Berlin city officials

Do we like trees!!!???

Yes, but ……

1. Trees are often too simple to reflect reality
2. V&V by contractors tend to limit to the bottom-line, which does not ensure an integrated operating system according to the specific required needs



Integrity & Coherence recommendations

- Principal needs to assure that all required V&V activities are covered by all parties involved
- During all phases; consider 'your' V&V activities wrt 'your' SoI and its context (N^{-1})
- Validation needs to be done under responsibility of the party that makes the design choices (incl. the contractor)

Inconvenient questions?