ProRail

Welcome

Tailoring the Systems Engineering Process

Goal Oriented Engineering Phasing

Richard Bosch, Paul Brouwer

INCOSE International Symposium

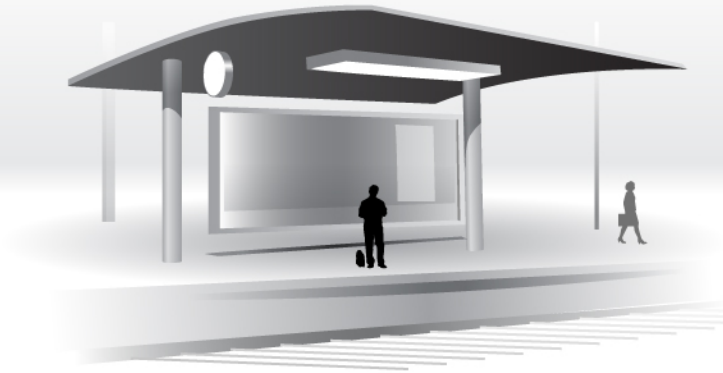
Contents

What will we tell you?

- Something about ProRail – *by Paul*
- Overview of the concept – *by Richard*
- More about the concept – *by Paul*
- Something about the concept in practice – *by Paul*

ProRail

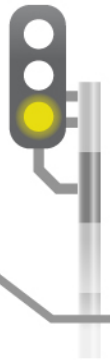
What does ProRail do?



Maintaining
existing rail network

Managing stations

Building
new railway,
maintenance and
updating stations



Informing
operators and travellers

Controlling
all train traffic

Distributing
the slots on
the railway

ProRail

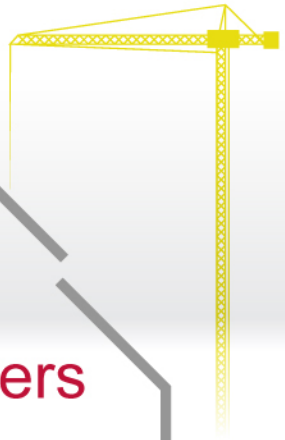
Interests

Operators

Reliability

Safety

Capacity



Partners

Continuity

Reliability

Environment

Minimum disruption

Travellers

Safety

Reliability

Travel information

Government

Sustainable mobility

Spatial Integration

The concept

What's triggered us?

- lack of overview on the multitude of processes involved, each with its own cycles and stages
  - project management
  - engineering
  - contract management
  - external decision making process for public permits, land acquisition,
  - procedures for allowing the use of systems in the railway infrastructure
  - etcetera…

Each additional process coming with additional input and output relations.

The concept

What's triggered us?

- lack of overview on the multitude of processes involved, each with its own cycles and stages
- effective use of public means
  - less rework
  - support of innovation by contractors
  - increased predictability of outcome
  - accountability

The concept

What's triggered us?

- lack of overview on the multitude of processes involved, each with its own cycles and stages
- effective use of public means
- changing perspective
  - more attention to the customers point of view
  - adaptability
  - versatility

The concept

What's triggered us?

- lack of overview on the multitude of processes involved, each with its own cycles and stages
- effective use of public means
- changing perspective

In short: increasing our efficiency and effectiveness

Regular practice seems to be less effective!

The concept

What's the regular practice?

- Use of standard cycle's for all projects, e.g. Cenelec EN 50126 or DoD
- Each cycle comes with a detailed list of product associated with the stage

- Consequences
  - Too many or too few engineering products required at the end of a stage
  - Less efficiency and effectiveness

The concept

What approach is needed?

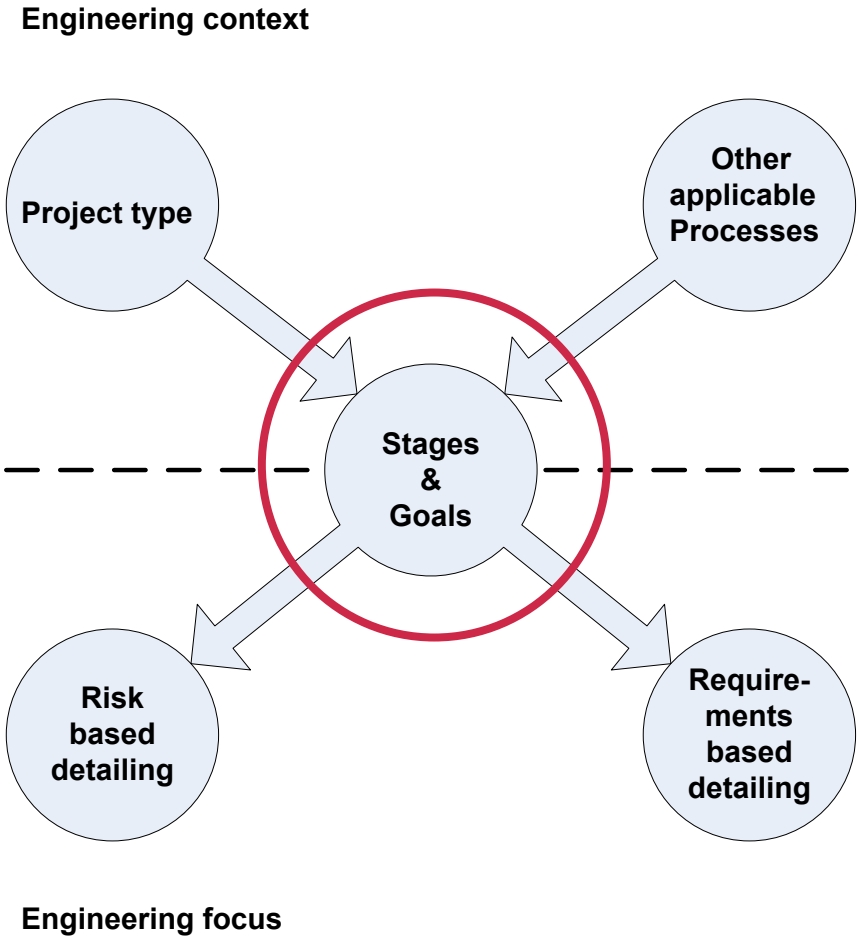
- The different engineering approaches are like buying a suit:

one-size-fits-all

off the rack

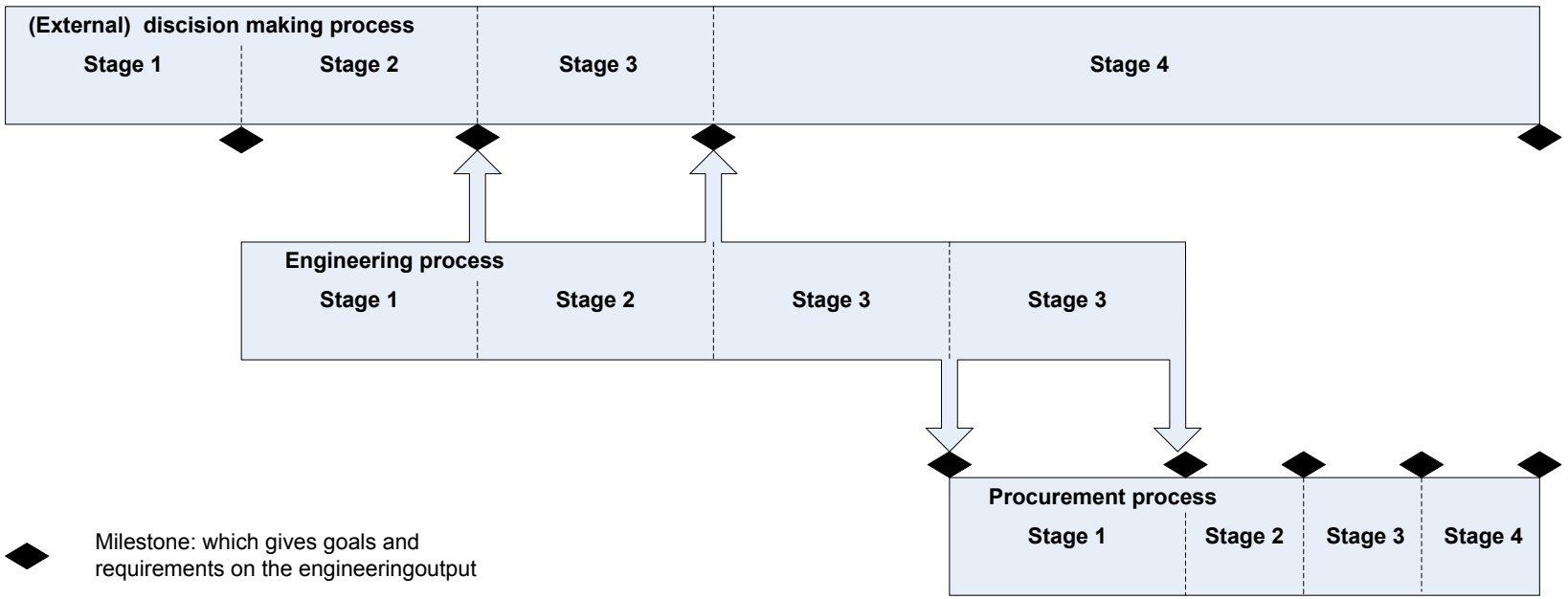
tailor made

Our concept


Engineering context
Project type
Other applicable Processes
Stages & Goals
Risk based detailing
Require-ments based detailing
Engineering focus

Our concept

Goal Oriented Staging



Our concept

Different level of detail needed

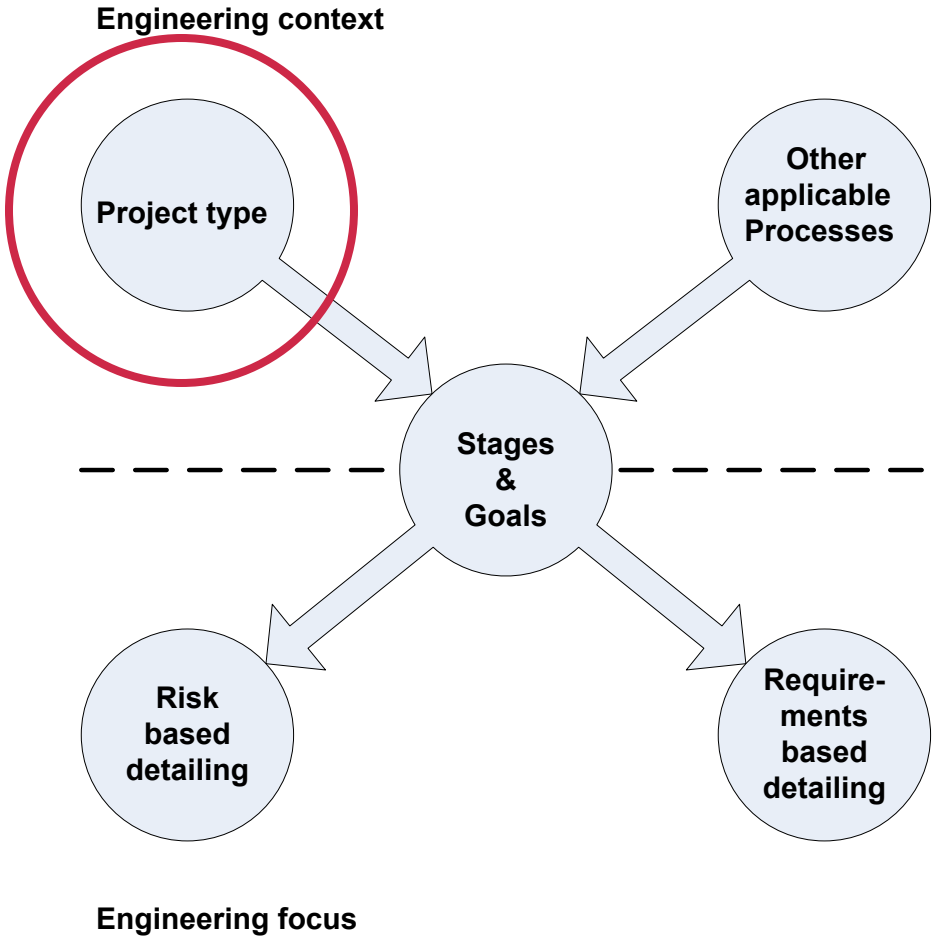
System/ system element	Energie supply system			Support system			Crossing system			Track system		
Detail related to acquired land	**Overhead lines**	**Electrical substation**	**Control system**	**Ground work**	**Water system**	**Demacation**	**Overpass**	**Tunnel**	**Fly over**	**Rail track**	**Sleepers**	**Ballast**
Key Requirements		x		x	x	x	x	x	x	x	x	x
Conceptual Design		x		x	x	x	x	x	x	x		
Detailed design		x		x		x				x		

Our concept

Different level of detail needed

System/ system element	Energy supply system			Support system			Crossing system			Guiding system		
Detail related to needed cost accuracy of 30%	**Overhead lines**	**Electrical substation**	**Control system**	**Ground work**	**Water system**	**Demacation**	**Overpass**	**Tunnel**	**Fly over**	**Rail track**	**Sleepers**	**Ballast**
Key Requirements	x	x	x	x	x	x	x	x	x	x	x	x
Conceptual Design		x		x	x		x	x	x	x		
Detailed design							x	x	x			

Our concept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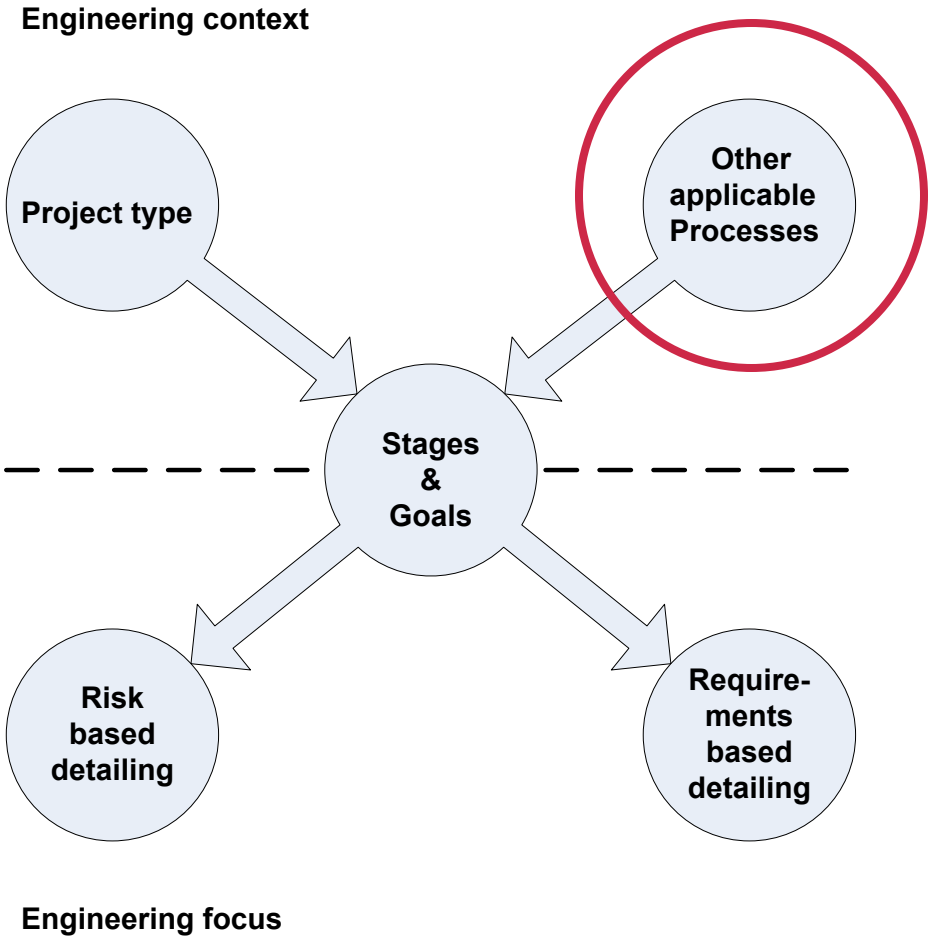
Engineering focus

Our concept

Project types

Type	Complexity	Disciplines involved	Time to completion
New tracks	Large	Many	> 5 years
Changes	Medium	Many	2-5 years
Renewal, replacement	Small	Few	1-2 years
Overpass, underpass	Small	Few	2-5 years
Stations and transfer	Large	Many	2-5 years
Product development	Middle	Few	1-2 years

Our concept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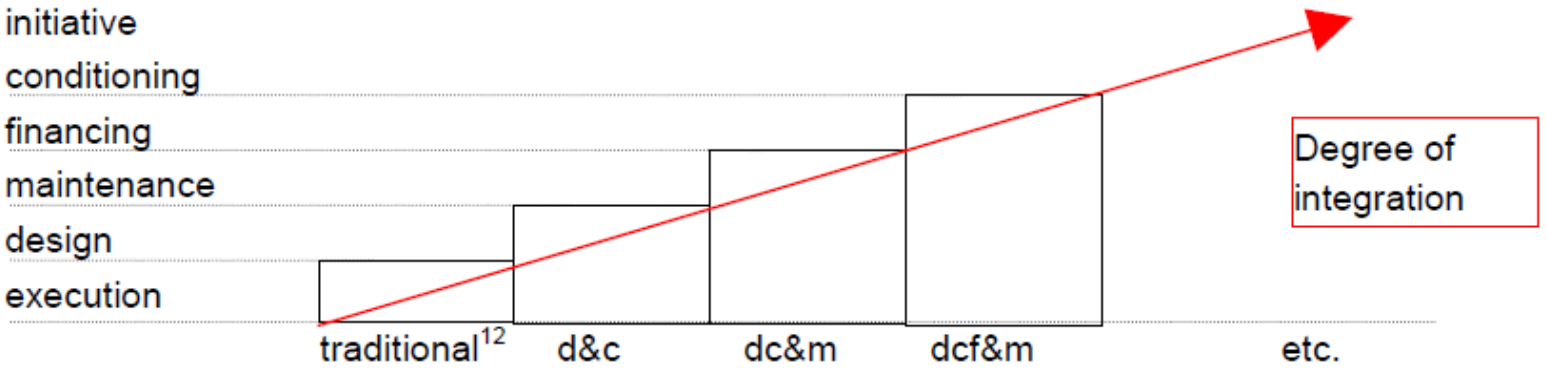
Our concept

Other applicable processes: procurement

- organisational form



Our concept

Other applicable processes: procurement

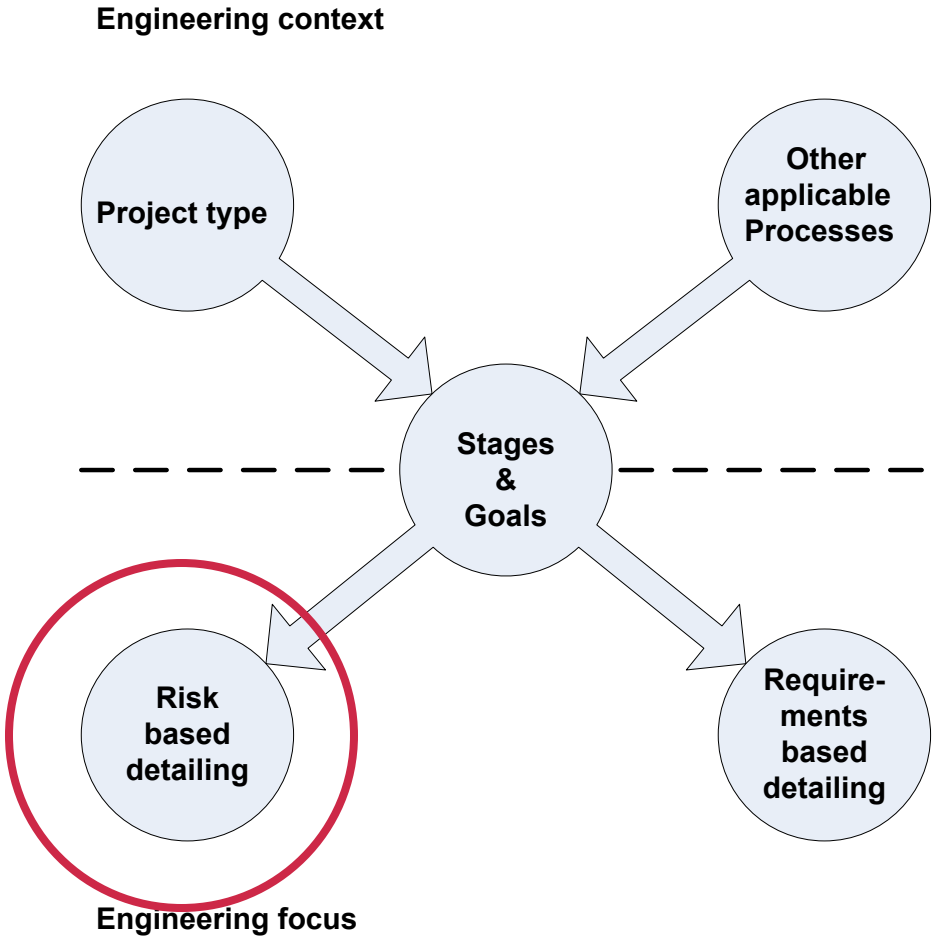
- organisational form
- legal procedure
- negotiation strategy / tender procedure

Our concept

Other applicable processes

- procurement
- generic project process
- decision making process
- engineering process

Our concept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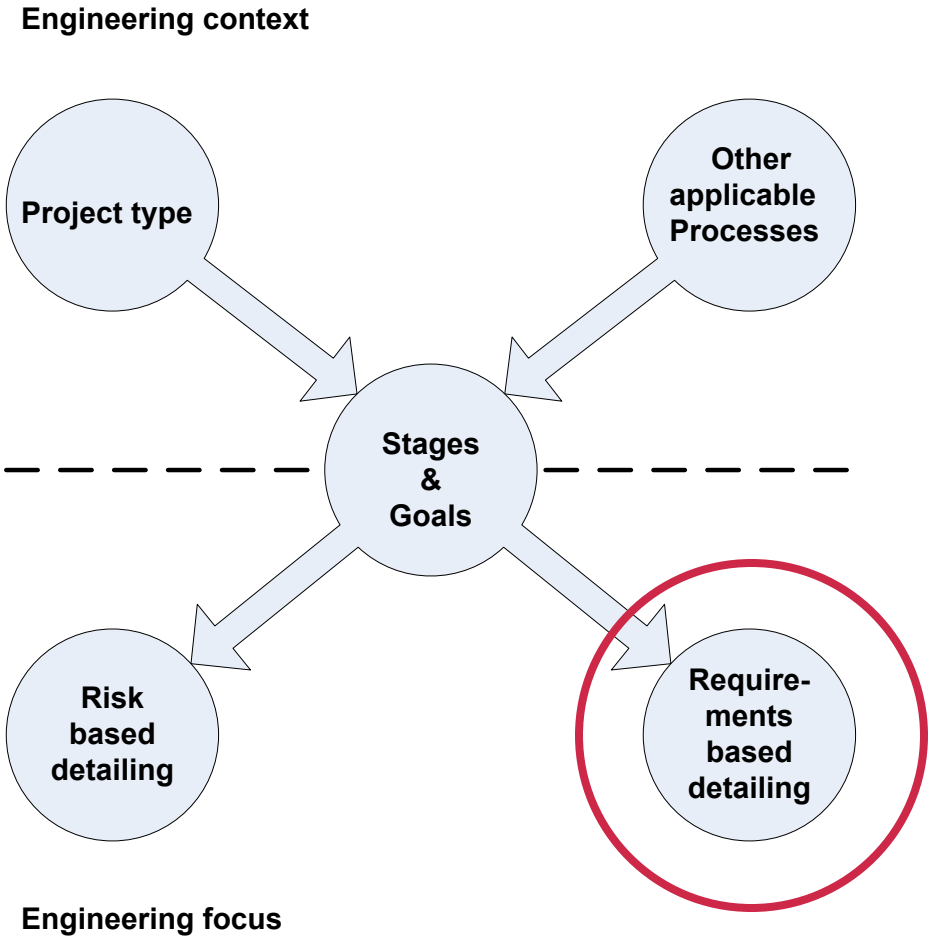
Risk based detailing

Risk based detailing

ProRail

Our model



ProRail's Core Process

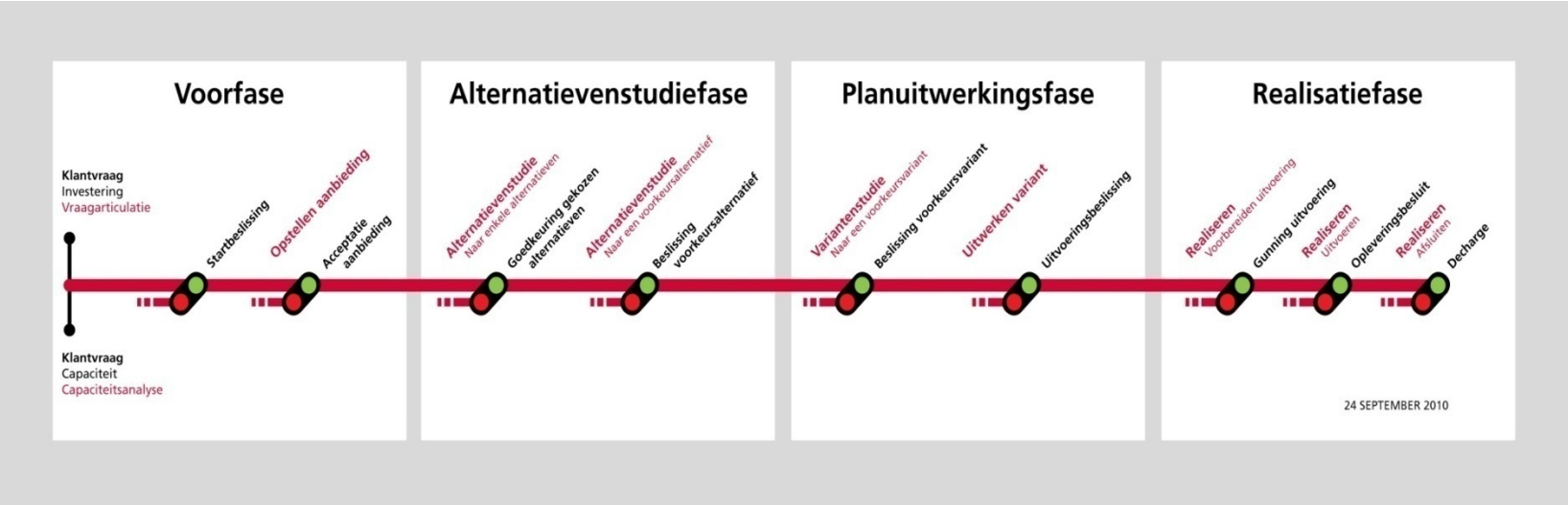
What good use is there for our idea?

- 90 defined processes
- implementation programme since 2007
- Per process: ranging from 1 to 50 steps
- Spaghetti!

- So… how will we integrate all these things-we-need-to-do?

ProRail's Core Process

What good use is there for our idea?

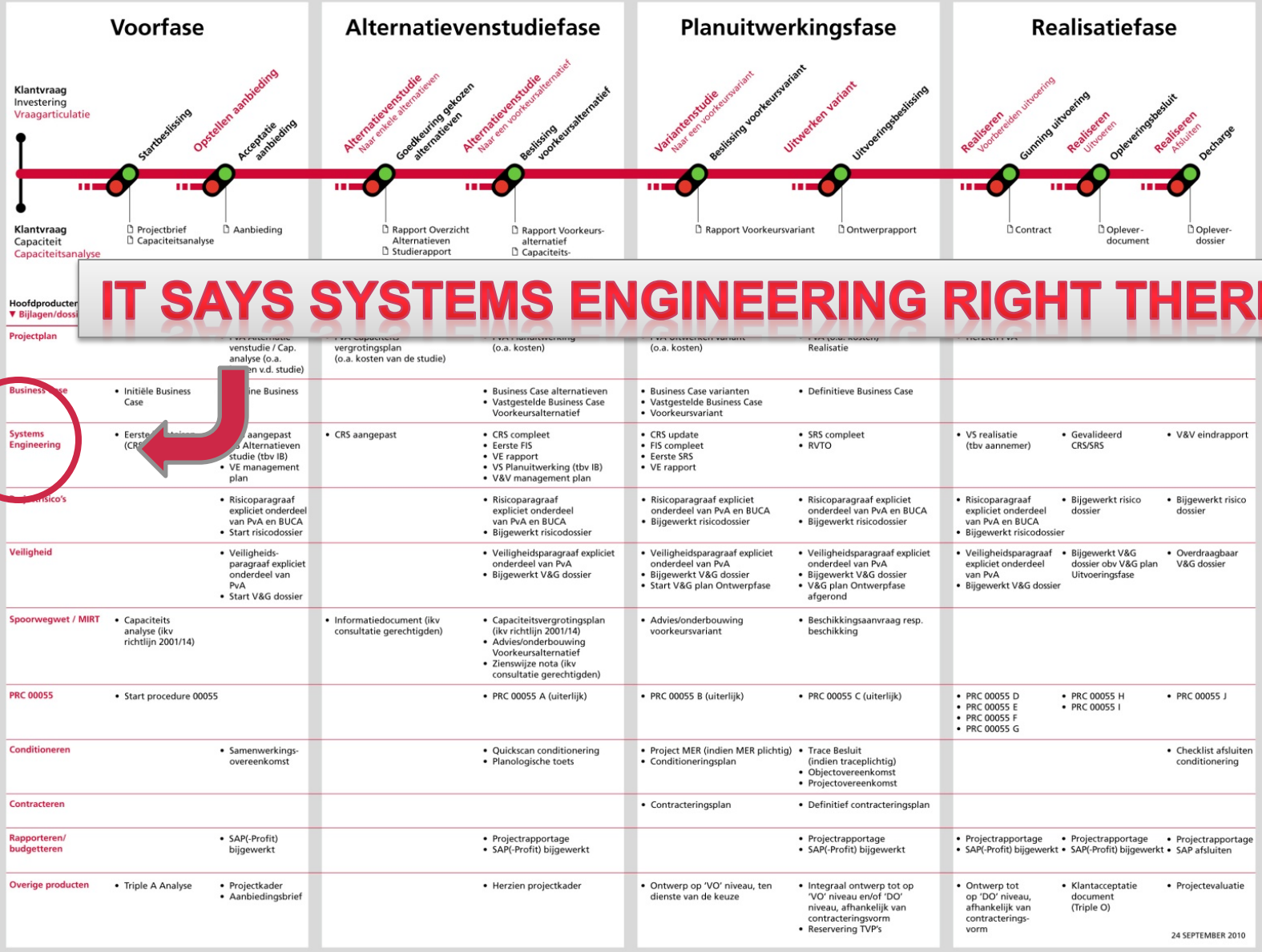


ProRail's Core Process

What good use is there for our idea?

- The idea behind the Core Process:
  - define decision gates
  - define what products you want finished
  - don't continue before all defined products have passed QC

Kernproces productenoverzicht



IT SAYS SYSTEMS ENGINEERING RIGHT THERE!

Hoofdproducten ▼ Bijlagen/dossiers	Voorfase		Alternatievenstudiefase		Planuitwerkingsfase		Realisatiefase		
Projectplan		venstudie / Cap. analyse (o.a. …en v.d. studie)	vergrotingsplan (o.a. kosten van de studie)	(o.a. kosten)	(o.a. kosten)	Realisatie			
Business …	• Initiële Business Case	• …ine Business		• Business Case alternatieven • Vastgestelde Business Case Voorkeursalternatief	• Business Case varianten • Vastgestelde Business Case • Voorkeursvariant	• Definitieve Business Case			
Systems Engineering	• Eerste … (CRS)	• … aangepast … Alternatieven studie (tbv IB) • VE management plan	• CRS aangepast	• CRS compleet • Eerste FIS • VE rapport • VS Planuitwerking (tbv IB) • V&V management plan	• CRS update • FIS compleet • Eerste SRS • VE rapport	• SRS compleet • RVTO	• VS realisatie (tbv aannemer)	• Gevalideerd CRS/SRS	• V&V eindrapport
…risico's		• Risicoparagraaf expliciet onderdeel van PvA en BUCA • Start risicodossier		• Risicoparagraaf expliciet onderdeel van PvA en BUCA • Bijgewerkt risicodossier	• Risicoparagraaf expliciet onderdeel van PvA en BUCA • Bijgewerkt risicodossier	• Risicoparagraaf expliciet onderdeel van PvA en BUCA • Bijgewerkt risicodossier	• Risicoparagraaf expliciet onderdeel van PvA en BUCA • Bijgewerkt risicodossier	• Bijgewerkt risico dossier	• Bijgewerkt risico dossier
Veiligheid		• Veiligheids-paragraaf expliciet onderdeel van PvA • Start V&G dossier		• Veiligheidsparagraaf expliciet onderdeel van PvA • Bijgewerkt V&G dossier	• Veiligheidsparagraaf expliciet onderdeel van PvA • Bijgewerkt V&G dossier • Start V&G plan Ontwerpfase	• Veiligheidsparagraaf expliciet onderdeel van PvA • Bijgewerkt V&G dossier • V&G plan Ontwerpfase afgerond	• Veiligheidsparagraaf expliciet onderdeel van PvA • Bijgewerkt V&G dossier	• Bijgewerkt V&G dossier obv V&G plan Uitvoeringsfase	• Overdraagbaar V&G dossier
Spoorwegwet / MIRT	• Capaciteits analyse (ikv richtlijn 2001/14)		• Informatiedocument (ikv consultatie gerechtigden)	• Capaciteitsvergrotingsplan (ikv richtlijn 2001/14) • Advies/onderbouwing Voorkeursalternatief • Zienswijze nota (ikv consultatie gerechtigden)	• Advies/onderbouwing voorkeursvariant	• Beschikkingsaanvraag resp. beschikking			
PRC 00055	• Start procedure 00055			• PRC 00055 A (uiterlijk)	• PRC 00055 B (uiterlijk)	• PRC 00055 C (uiterlijk)	• PRC 00055 D • PRC 00055 E • PRC 00055 F • PRC 00055 G	• PRC 00055 H • PRC 00055 I	• PRC 00055 J
Conditioneren		• Samenwerkings-overeenkomst		• Quickscan conditionering • Planologische toets	• Project MER (indien MER plichtig) • Conditioneringsplan	• Trace Besluit (indien traceplichtig) • Objectovereenkomst • Projectovereenkomst			• Checklist afsluiten conditionering
Contracteren					• Contracteringsplan	• Definitief contracteringsplan			
Rapporteren/ budgetteren		• SAP(-Profit) bijgewerkt		• Projectrapportage • SAP(-Profit) bijgewerkt		• Projectrapportage • SAP(-Profit) bijgewerkt	• Projectrapportage • SAP(-Profit) bijgewerkt	• Projectrapportage • SAP(-Profit) bijgewerkt	• Projectrapportage • SAP afsluiten
Overige producten	• Triple A Analyse	• Projectkader • Aanbiedingsbrief		• Herzien projectkader	• Ontwerp op 'VO' niveau, ten dienste van de keuze	• Integraal ontwerp tot op 'VO' niveau en/of 'DO' niveau, afhankelijk van contracteringsvorm • Reservering TVP's	• Ontwerp tot op 'DO' niveau, afhankelijk van contracterings-vorm	• Klantacceptatie document (Triple O)	• Projectevaluatie

24 SEPTEMBER 2010

ProRail's Core Process

What good use is there for our idea?

- The idea behind the Core Process:
  - define decision gates
  - define what products you want finished
  - don't continue before all defined products have passed QC

- This would do, if…
  - … we knew what products are needed,
  - … we knew what makes a product 'good enough'.

ProRail's Core Process

What good use is there for our idea?

So…

- consider the next goal you want to achieve in the decision making process
- check the relationships with the other applicable processes
  → standards for different project types
- define the next engineering stage
- decide whether additional engineering is needed either to reduce project risk,
- … or to make sure requirements are met.

For us: from products to goals.

Thank you kindly for your attention!