Modular Maintenance

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Why do we perform maintenance?

Cost

- Production loss
- Cost-effective activities
- Resources and materials

Safety

- Hazardous work
- Failures and accidents

Environment

- Emissions/discharge due to shutdowns
- Transport of personnel and materials
- Failures and accidents

Why maintain? Why is it important?

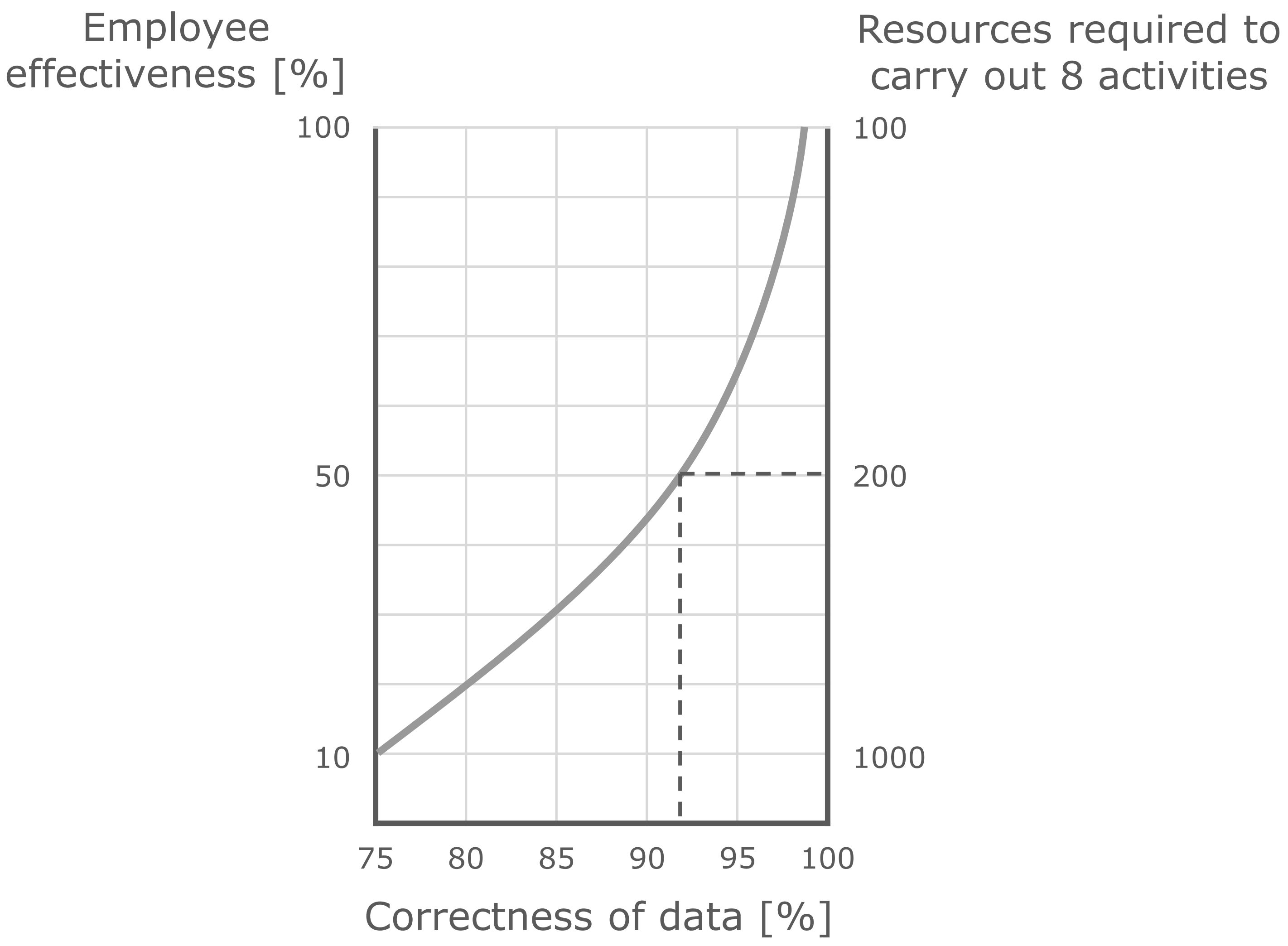
Brakes on car?

Particle filter in exhaust?

Power lines?

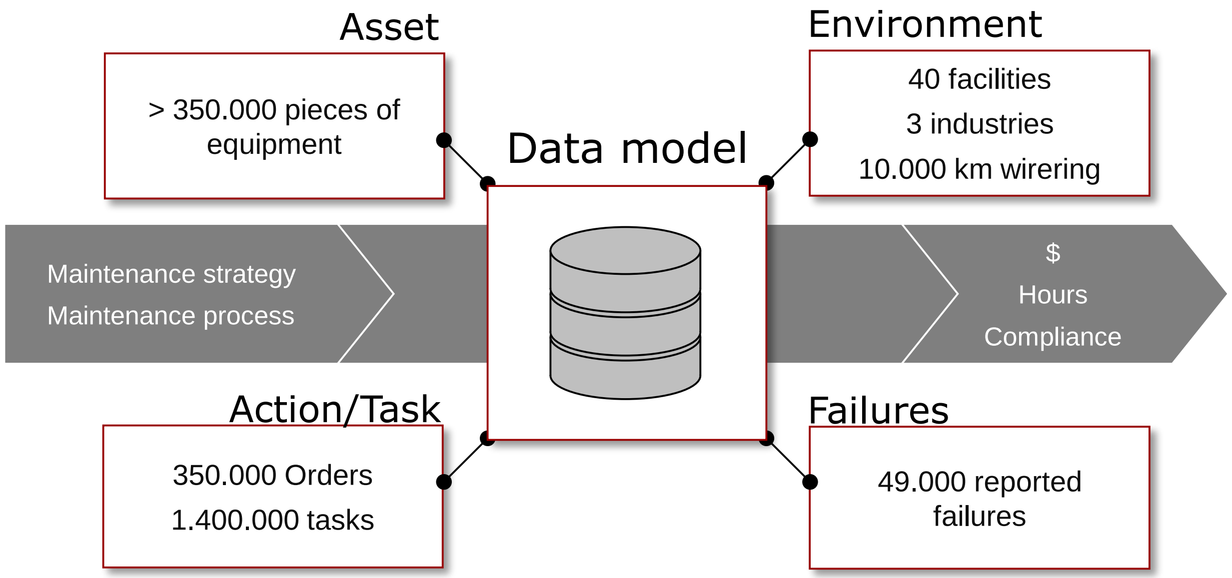
It is often a combination of cost, safety and environment

The impact of errors on resources



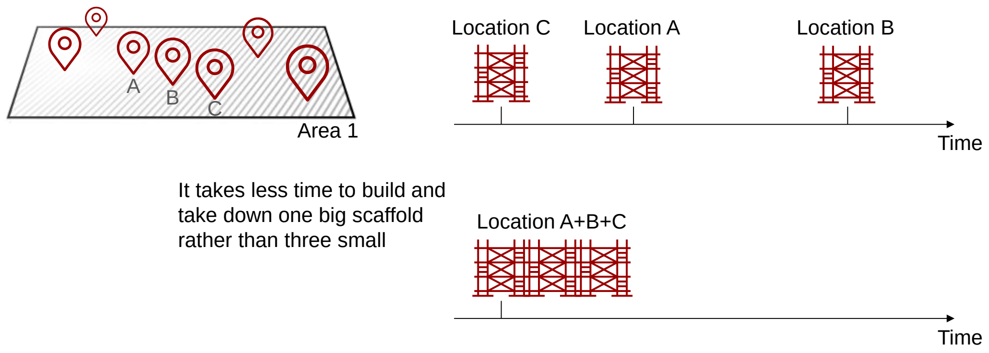
Our background - Where can we smell the money in maintenance

We have built a unique competence on structuring historical large maintenance data sets on complex assets to be used for improving availability and work efficiency

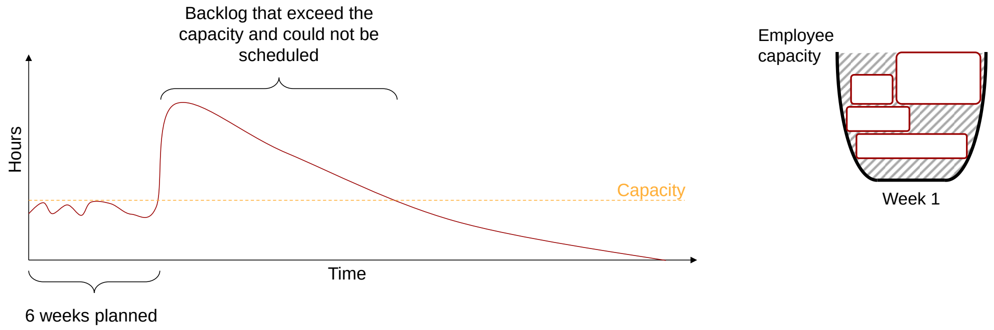


Are we good at Maintenance

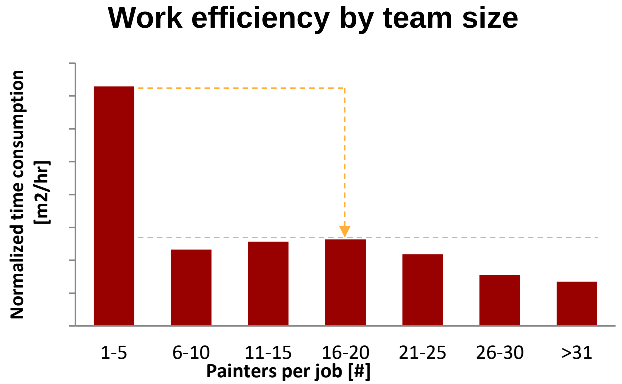
Poor planning leads to double work

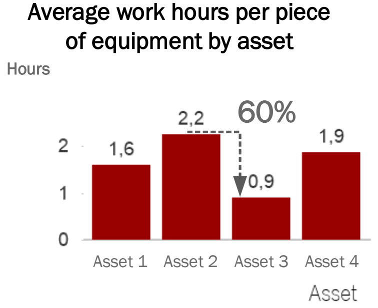


Resources are not optimally utilized

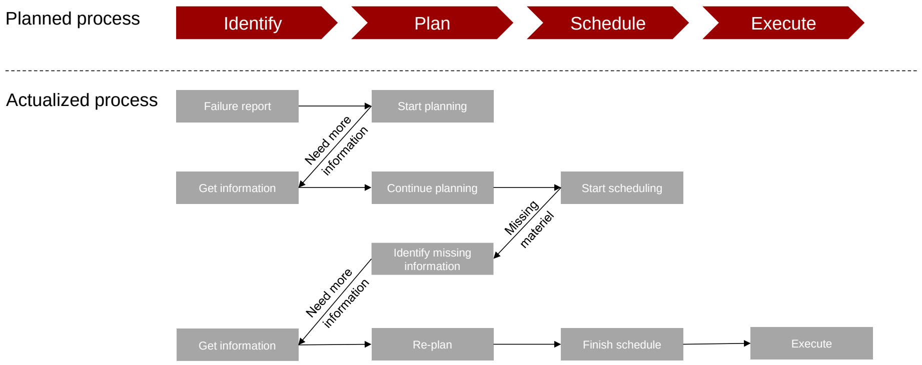


High performance difference

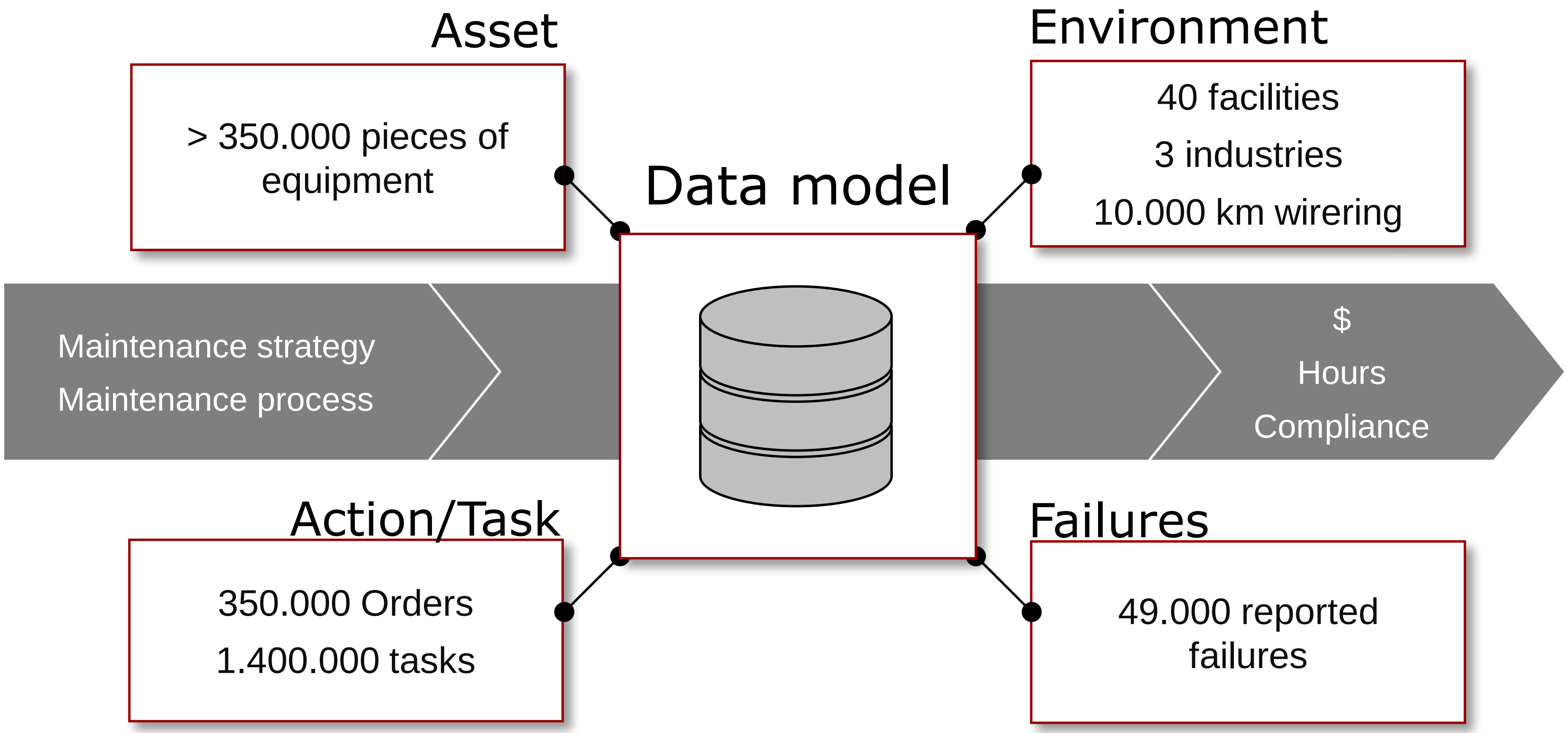




Not compliant

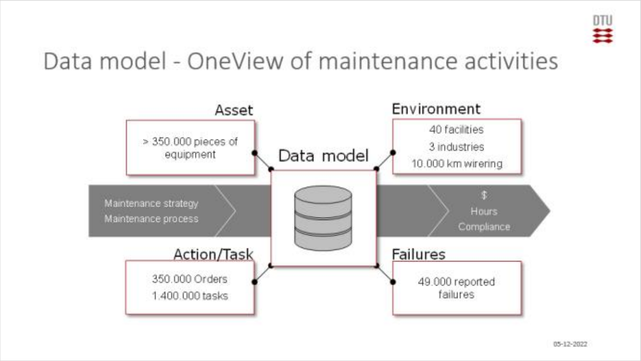


Data model - OneView of maintenance activities

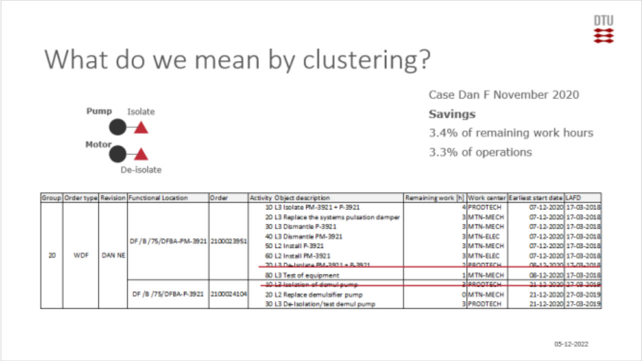


What can we do

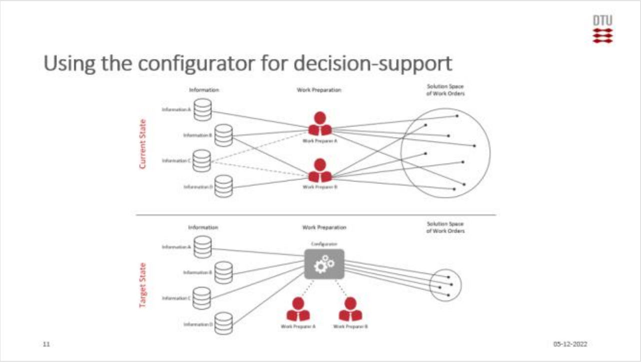
Data model



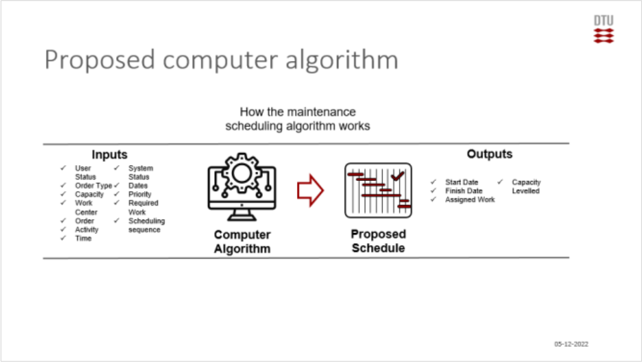
Clustering



Configurator

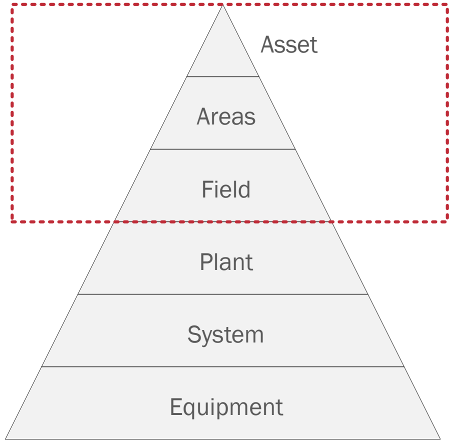


Scheduling algorithm

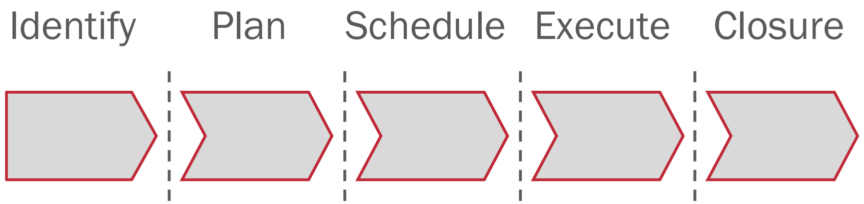


Why this data model

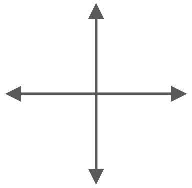
Physical dimension



Operation dimension

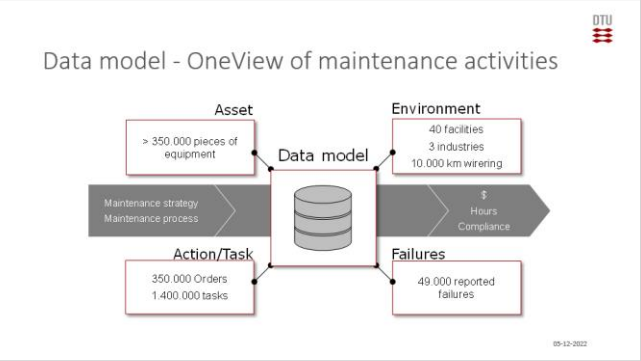


How we can navigate in the data model



What can we do

Data model



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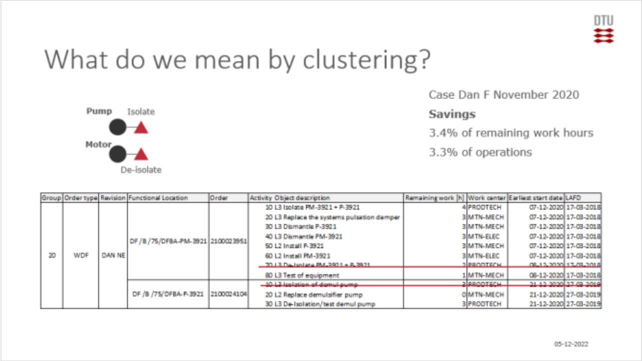
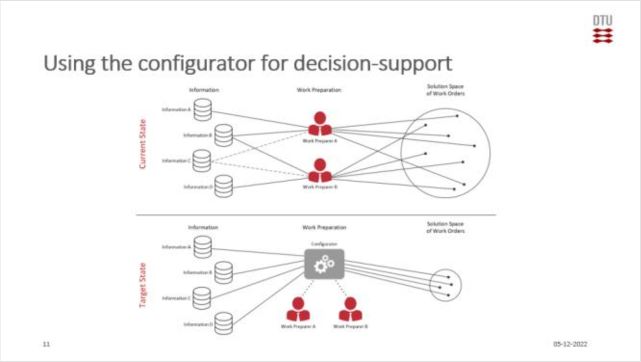
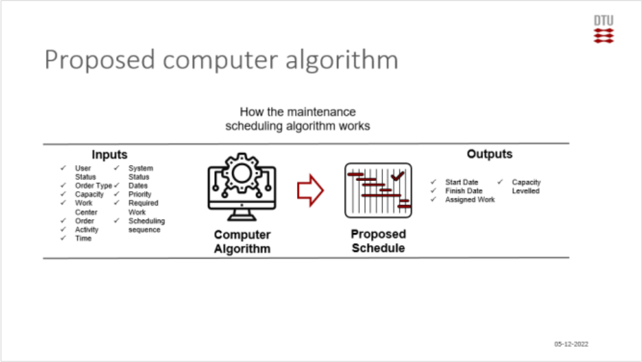


Group	Order type	Revision	Functional Location	Order	Activity	Object description	Remaining work [h]	Work center	Earliest start date	LAFD
20	WDF	DAN NE	DF /B /75/DFBA-PM-3921	2100023951	10	L3 Isolate PM-3921 + P-3921	4	PRODTECH	07-12-2020	17-03-2018
					20	L3 Replace the systems pulsation damper	3	MTN-MECH	07-12-2020	17-03-2018
					30	L3 Dismantle P-3921	3	MTN-MECH	07-12-2020	17-03-2018
					40	L3 Dismantle PM-3921	3	MTN-ELEC	07-12-2020	17-03-2018
					50	L2 Install P-3921	3	MTN-MECH	07-12-2020	17-03-2018
					60	L2 Install PM-3921	3	MTN-ELEC	07-12-2020	17-03-2018
					~~70~~	~~L3 De-Isolate PM-3921 + P-3921~~	~~2~~	~~PRODTECH~~	~~08-12-2020~~	~~17-03-2018~~
					80	L3 Test of equipment	1	MTN-MECH	08-12-2020	17-03-2018
			DF /B /75/DFBA-P-3921	2100024104	~~10~~	~~L3 Isolation of demul pump~~	~~3~~	~~PRODTECH~~	~~21-12-2020~~	~~27-03-2019~~
					20	L2 Replace demulsifier pump	0	MTN-MECH	21-12-2020	27-03-2019
					30	L3 De-Isolation/test demul pump	3	PRODTECH	21-12-2020	27-03-2019

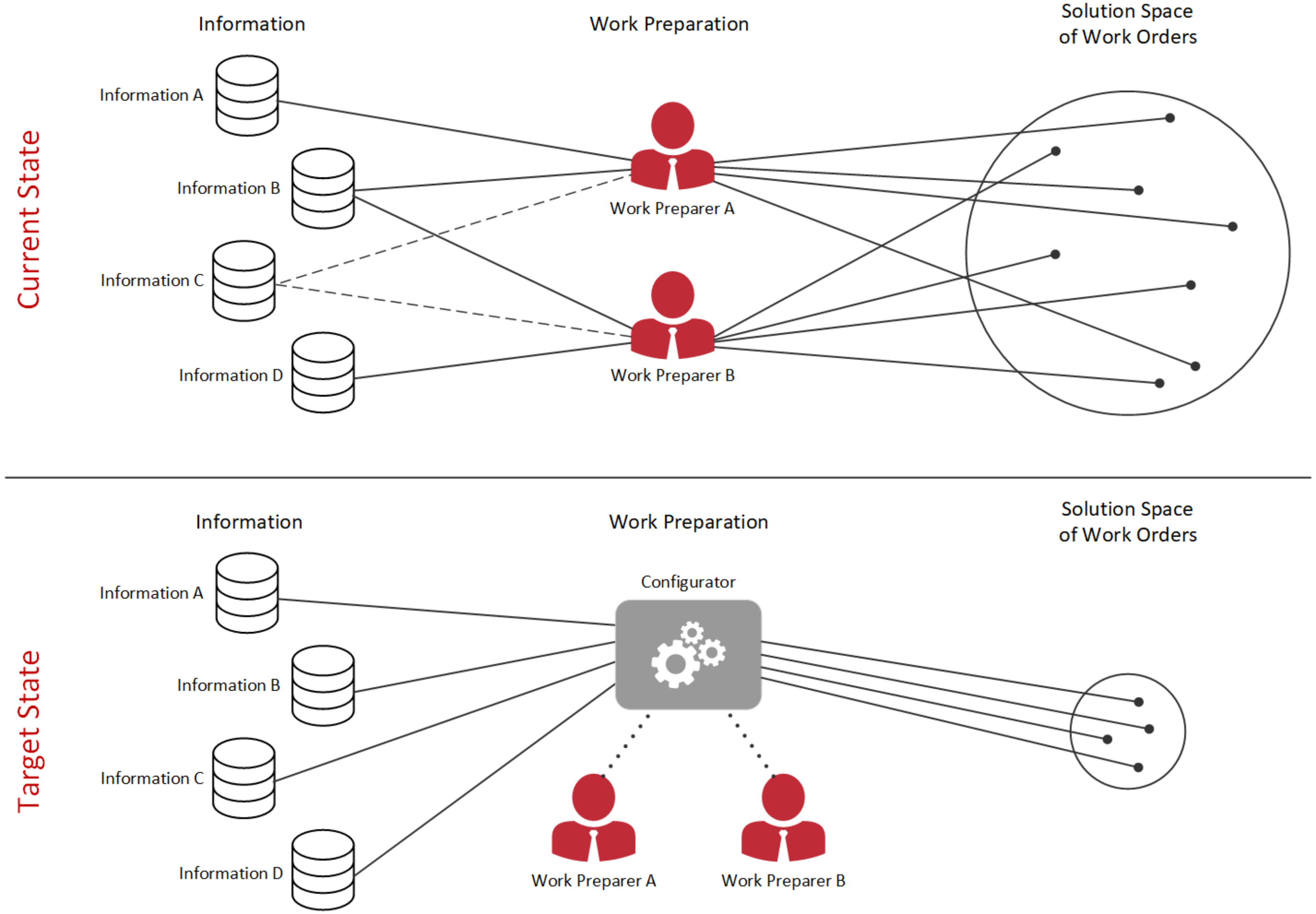
Configurator



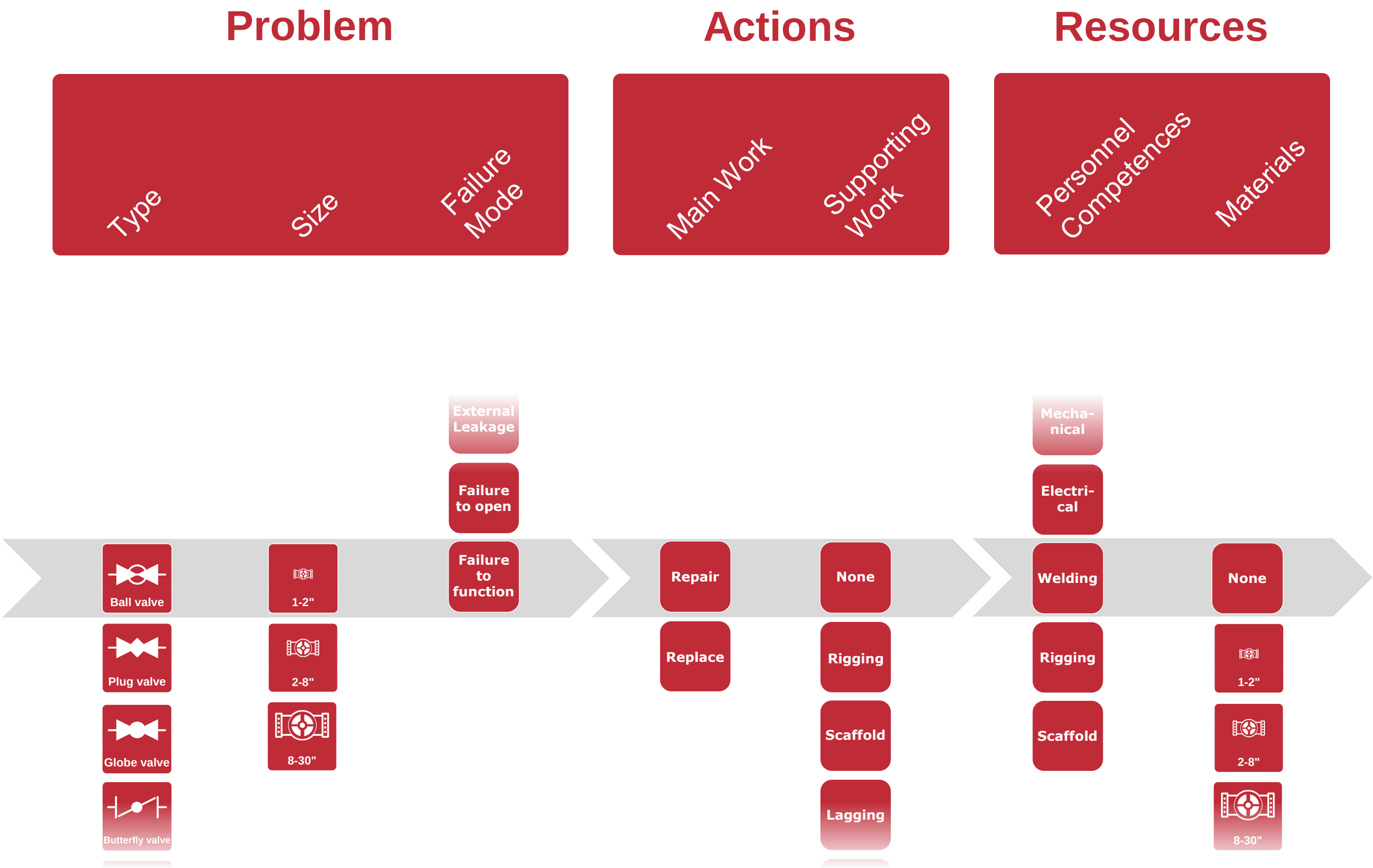
Scheduling algorithm



Using the configurator for decision-support



So how does this configuration concept work?

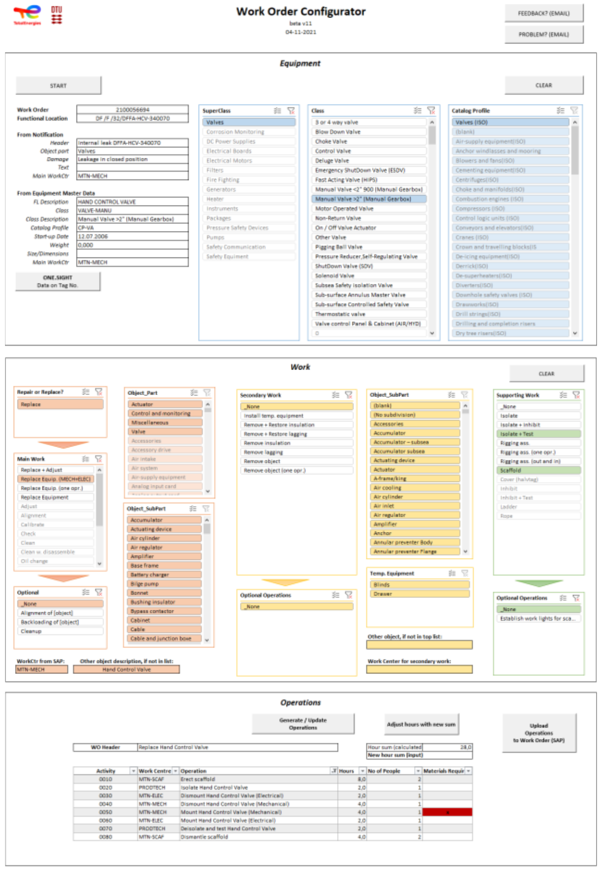


Operations	Work Center	Components
• Erect scaffold	MTN-SCAF	
• Isolate area	PRODTECH	
• Dismount valve	MTN-MECH	
• Mount new valve	MTN-MECH	100071214
• Test / QC	MTN-MECH	
• Deisolate area	PRODTECH	
• Dismantle scaffold	MTN-SCAF	
• Document work	MTN-MECH	

The configurator!

In daily use despite being a prototype.

31 employees given access to the configurator



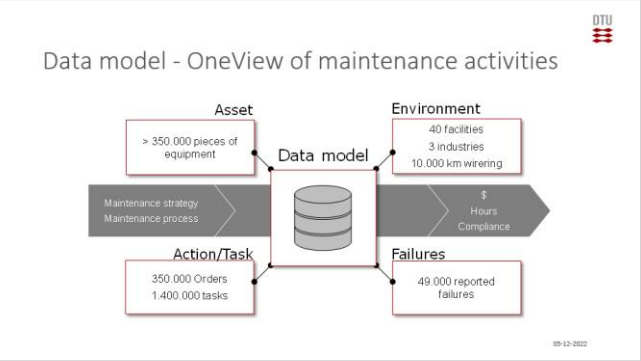
Can configure **>70% of equipment**

Can configure **>80% of work**

Integrated with SAP and other IT-systems

What can we do

Data model



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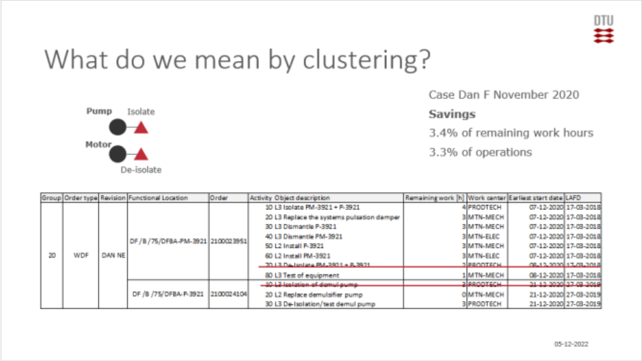
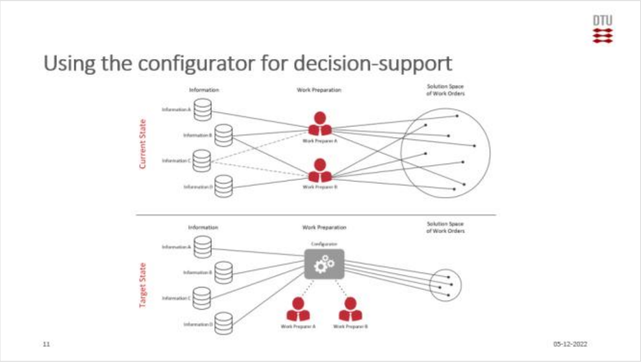
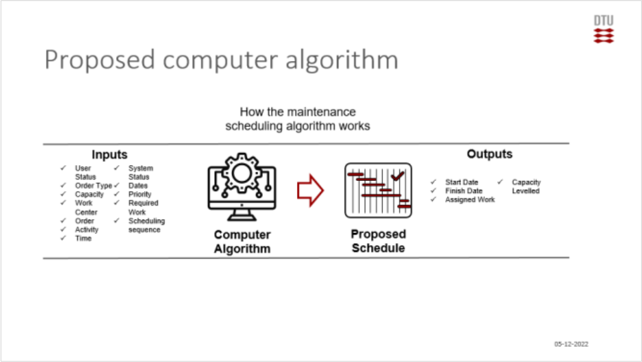


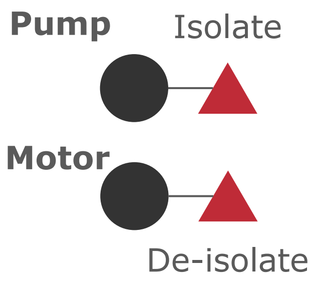
Configurator



Scheduling algorithm



What do we mean by clustering?



Case Dan F November 2020

Savings

3.4% of remaining work hours

3.3% of operations

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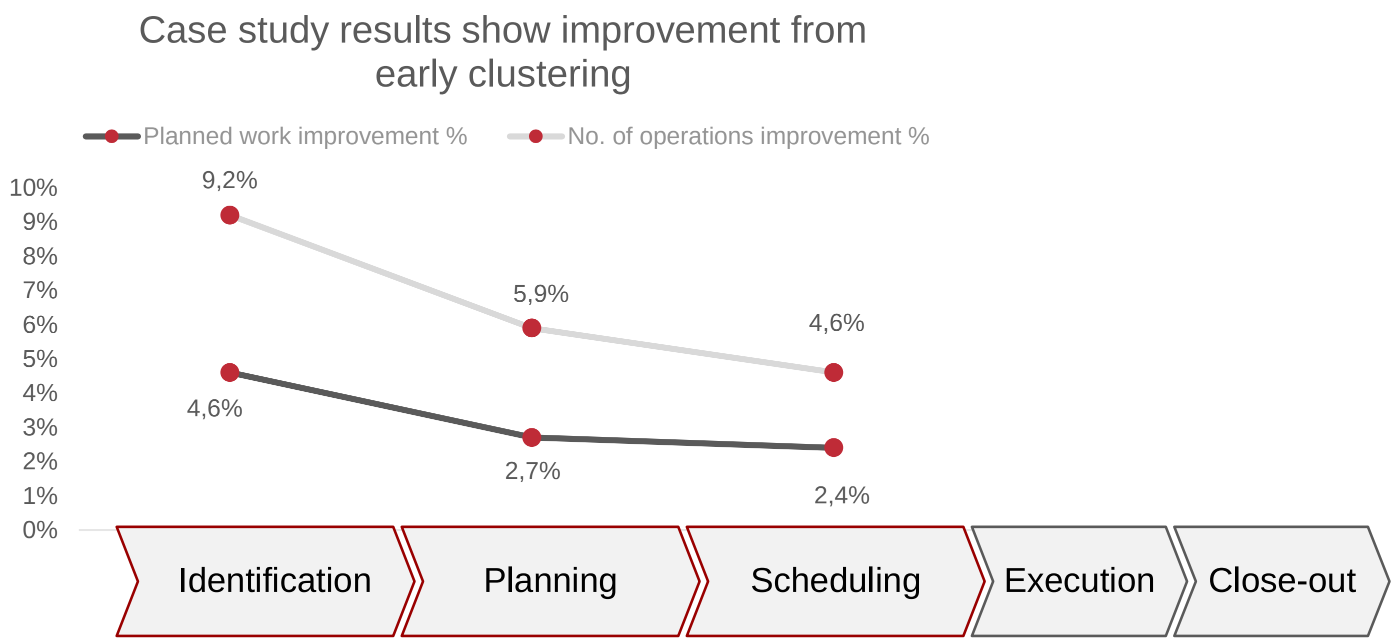
The timing of the decision

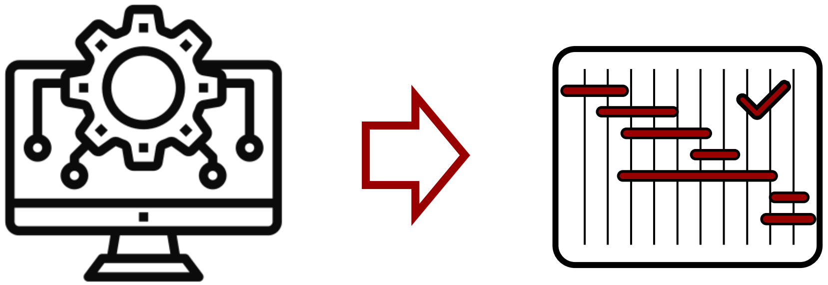


Proposed computer algorithm

How the maintenance
scheduling algorithm works

Inputs

- ✓ User Status
- ✓ Order Type
- ✓ Capacity
- ✓ Work Center
- ✓ Order
- ✓ Activity
- ✓ Time
- ✓ System Status
- ✓ Dates
- ✓ Priority
- ✓ Required Work
- ✓ Scheduling sequence



Computer Algorithm

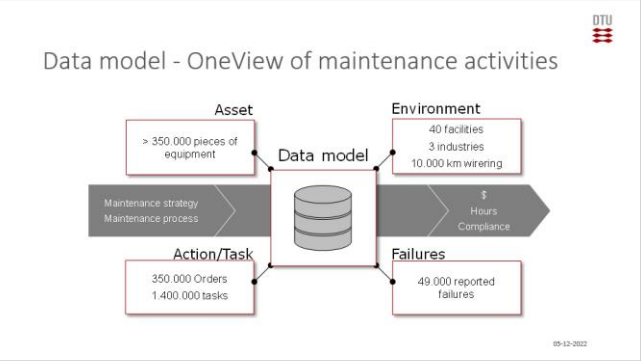
Proposed Schedule

Outputs

- ✓ Start Date
- ✓ Finish Date
- ✓ Assigned Work
- ✓ Capacity Levelled

What can we do

Data model



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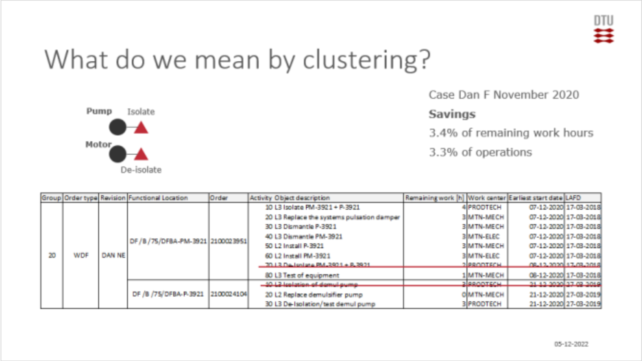

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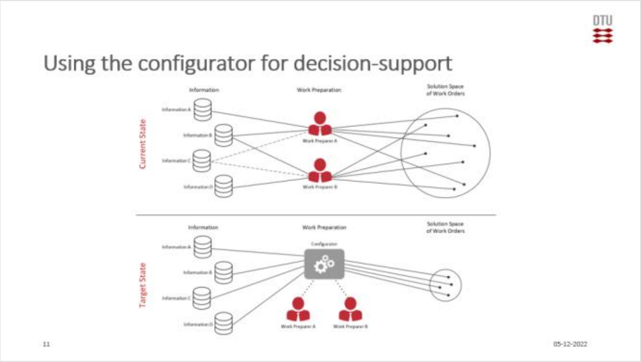
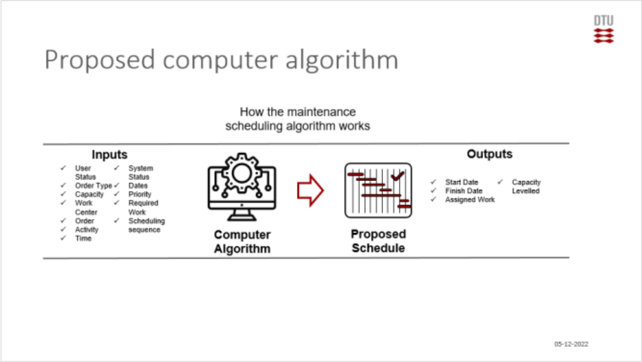
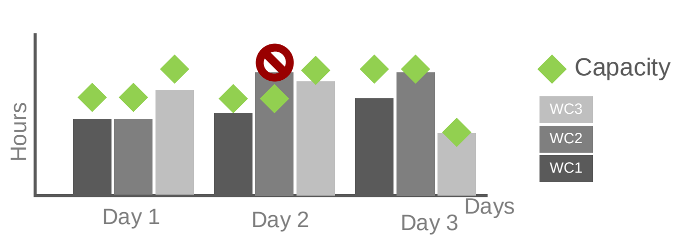


Scheduling algorithm

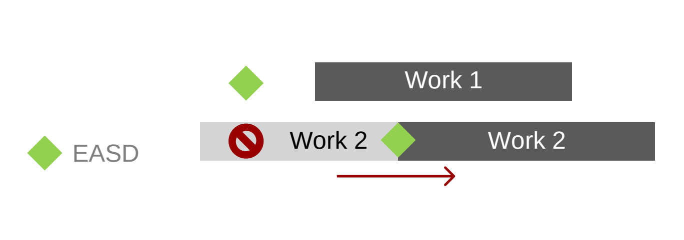


General requirements for scheduling maintenance jobs

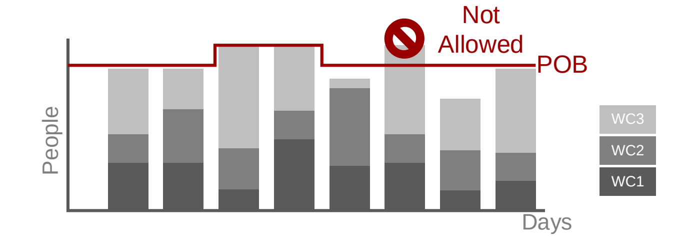
a) Management of resource allocation (limited to maximum capacity)



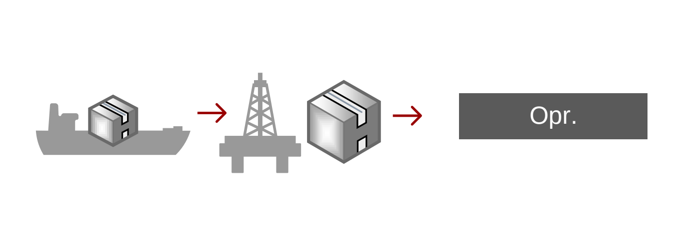
e) Management of start date



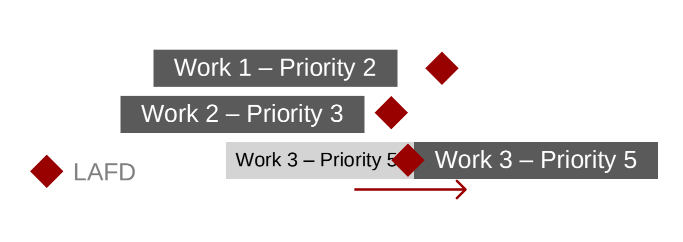
b) Management of offshore resources on board (limited to maximum capacity)



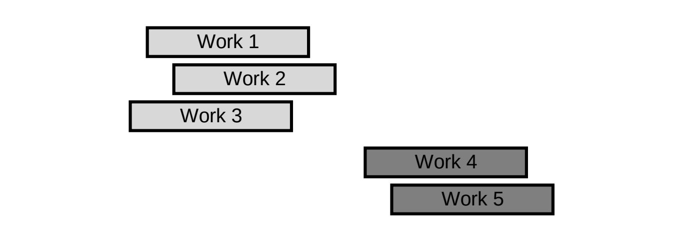
f) Management of material



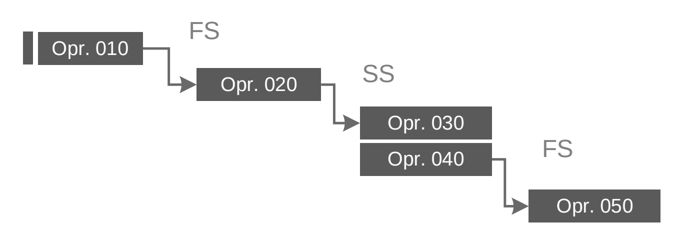
c) Management of risk for delaying the maintenance work



g) Grouping of similar works



d) Management of dependencies among operations



Legend
WC = Work Center
POB = People on board
LAFD = Latest allowable finish date
Opr. = Operation
SS = Start – Start relation (Preceding operation starts with the succeeding operation)
FS = Finish – Start relation (Succeeding operation starts when the preceeding is finished)
EASD = Earliest allowable start date

The Team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Kristoffer W. Sigsgaard


Simon Didriksen


Jingrui Ge


Kasper B. Hansen


Julie K. Agergaard


Christian B. Jespersen

Meet us at the Meeting Place