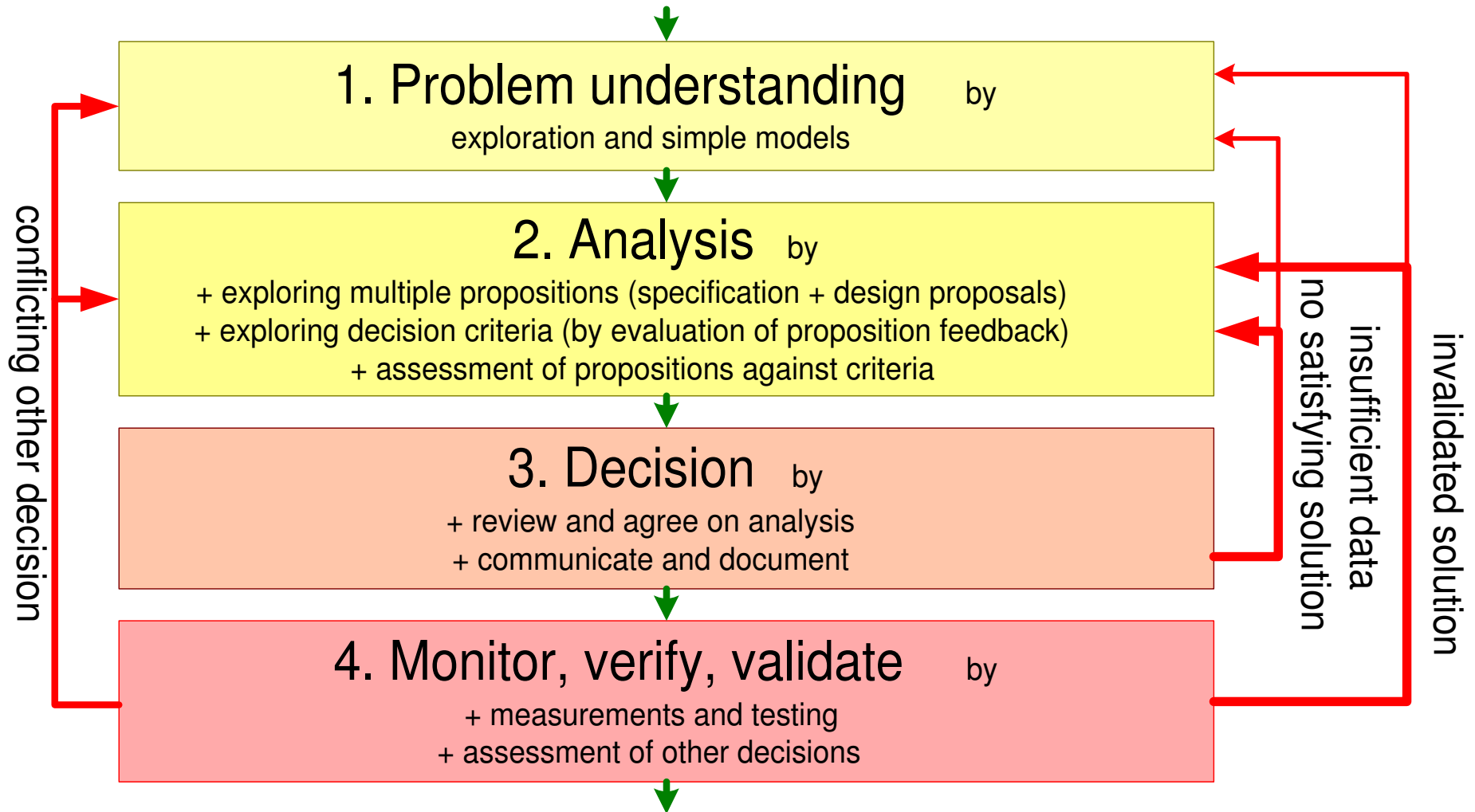




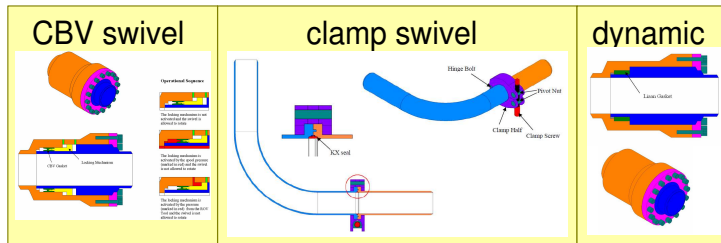
# Problem Solving Approach

vague problem statement



# Examples of Pugh Matrix Application

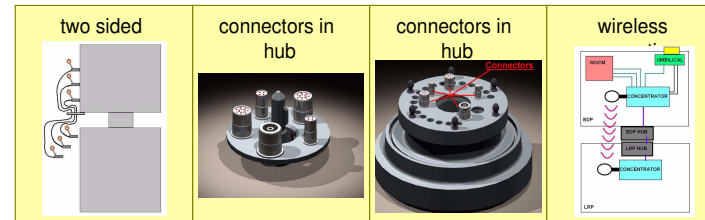
## Swivel concept selection



evaluation criteria	weight	CBV		clamp		dynamic	
<b>Maturity</b>	10	5	50	2	20	2	50
Development level							
<b>Cost</b>	20	4	80	2	40	5	100
Hardware cost							
Development cost		5	100	2	40	2	40
<b>Design robustness</b>	25						
Design life							
swivel cycles		5	125	3	75	3	75
pressure cycles		5	125	4	100	5	125
Pressure range							
internal		4	100	4	100	4	100
external	2	50	5	125	2	50	
Temperature range		4	100	4	100	4	100
<b>Installation</b>	20						
Initial installatio/retrieval		2	40	3	60	4	80
Connection/disconnection		2	40	4	80	5	100
<b>Operation</b>	25						
Swivel resistance		1	25	4	100	5	125
Spool Length Short		1	25	4	100	5	125
Spool Length Long		3	75	5	125	5	125
Hub loads		2	50	4	100	5	125
<b>Σ points</b>		985		1165		1290	

from master paper Halvard Bjørnsen, 2009

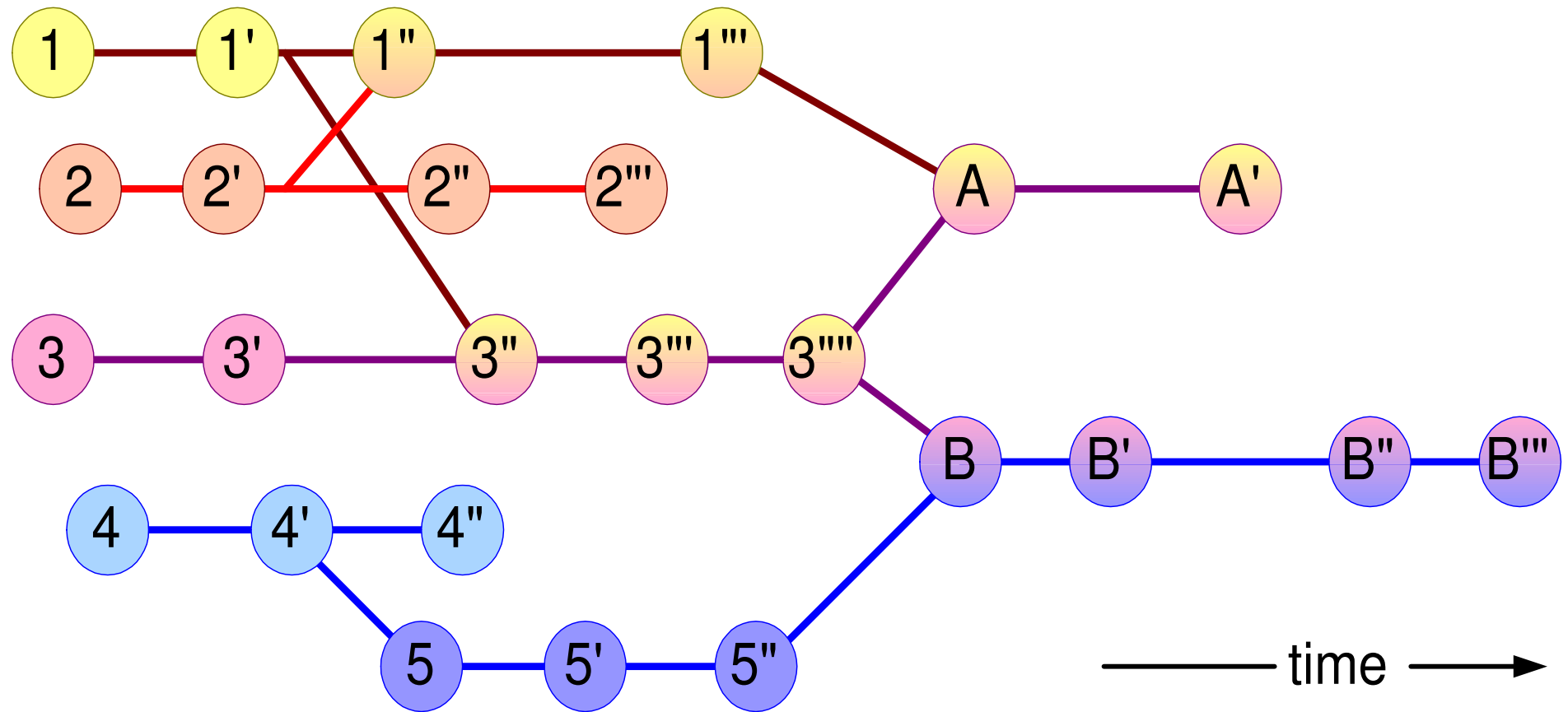
## EDP-LRP connection



Evaluation Criteria	Score	Concepts			
		1	2	3	4
Time to connect					
Need for ROV		-	+	+	+
Design		-	+	+	+
Robustness					
Connector design		-	<b>S</b>	<b>S</b>	+
Number of parts		-	-	+	+
Handle roll-off		+	-	<b>S</b>	+
Influence other		+	<b>S</b>	-	<b>S</b>
Redundancy					
Design		+	-	-	<b>S</b>
Interchangeability		+	-	-	-
Cost					
HW cost		-	-	-	-
Manufacturing cost		<b>S</b>	<b>S</b>	-	<b>S</b>
Engineering cost		+	-	<b>S</b>	-
Service cost		-	+	+	+
Maturity		-	-	<b>S</b>	+
<b>Σ -</b>		7	7	5	3
<b>Σ S</b>		1	3	4	3
<b>Σ +</b>		5	3	4	7
Pos.		3	4	2	1

from master paper Dag Jostein Klever, 2009

# Evolution of Design Options



# Conclusions

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Evolving multiple concepts increases insight and understanding  
(LEAN product development: set-based design, SE: Pugh matrix)

Articulation of criteria sharpens evaluation

The discussion about the Pugh matrix is more valuable than final  
bottomline summation

Delaying decisions may help to keep options (Lean Product  
Development: late decision making, finance: real options)