



RDVELHO

SSF

creating
an intelligent
world

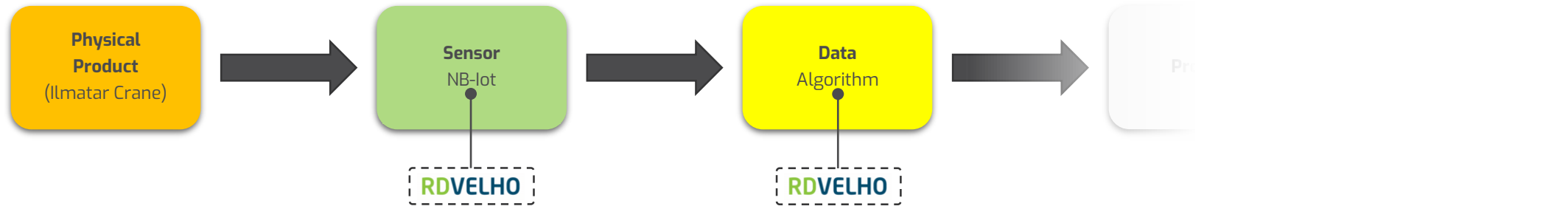
Digital twin loop using Rule Based System Design Automation

Lassi Sutela, 20.11.2019

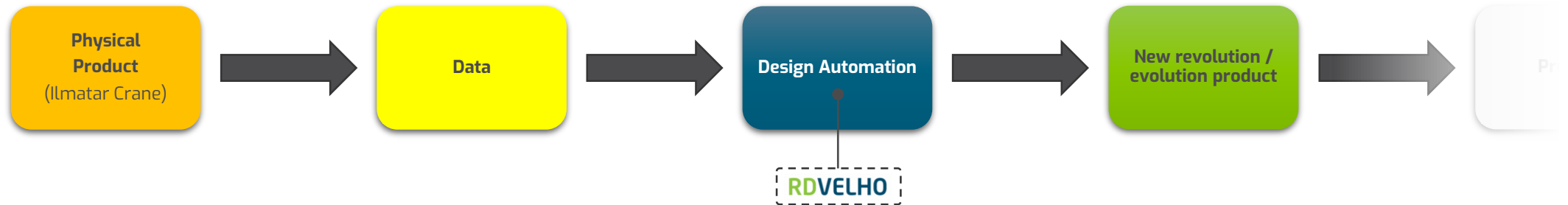
Demo Day 2, Business Finland funded DigiTwin research project

RD Velho at Digitwin project

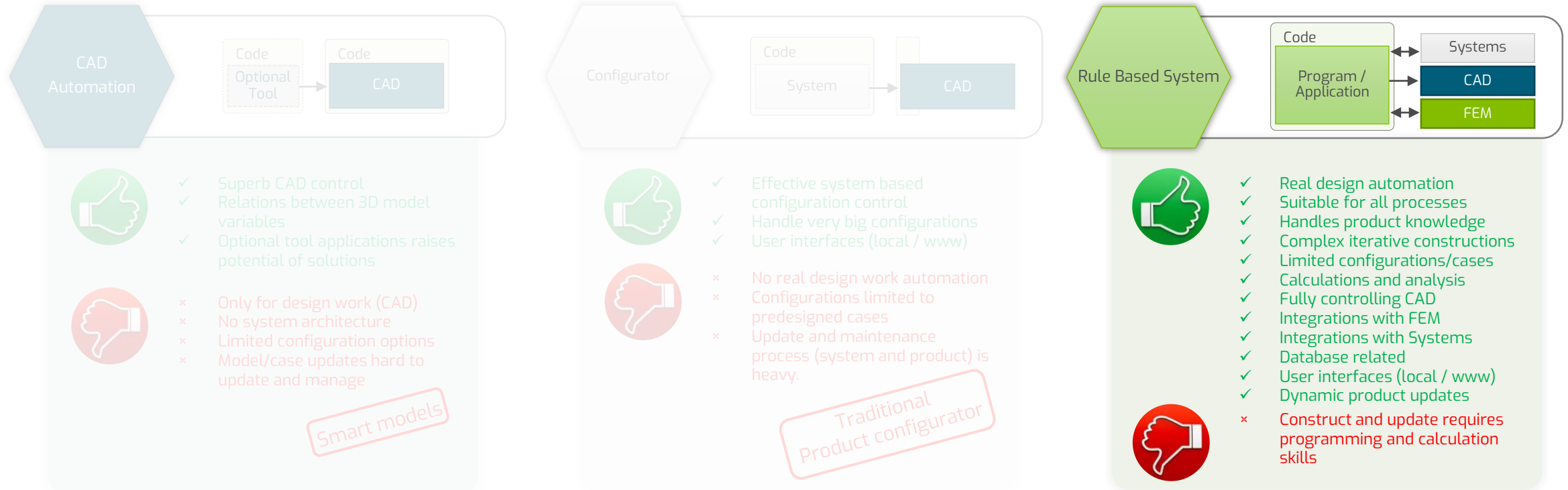
- Data : NB-Iot + Algorithm development



- Design Automation : New revolution/evolution product from usage data

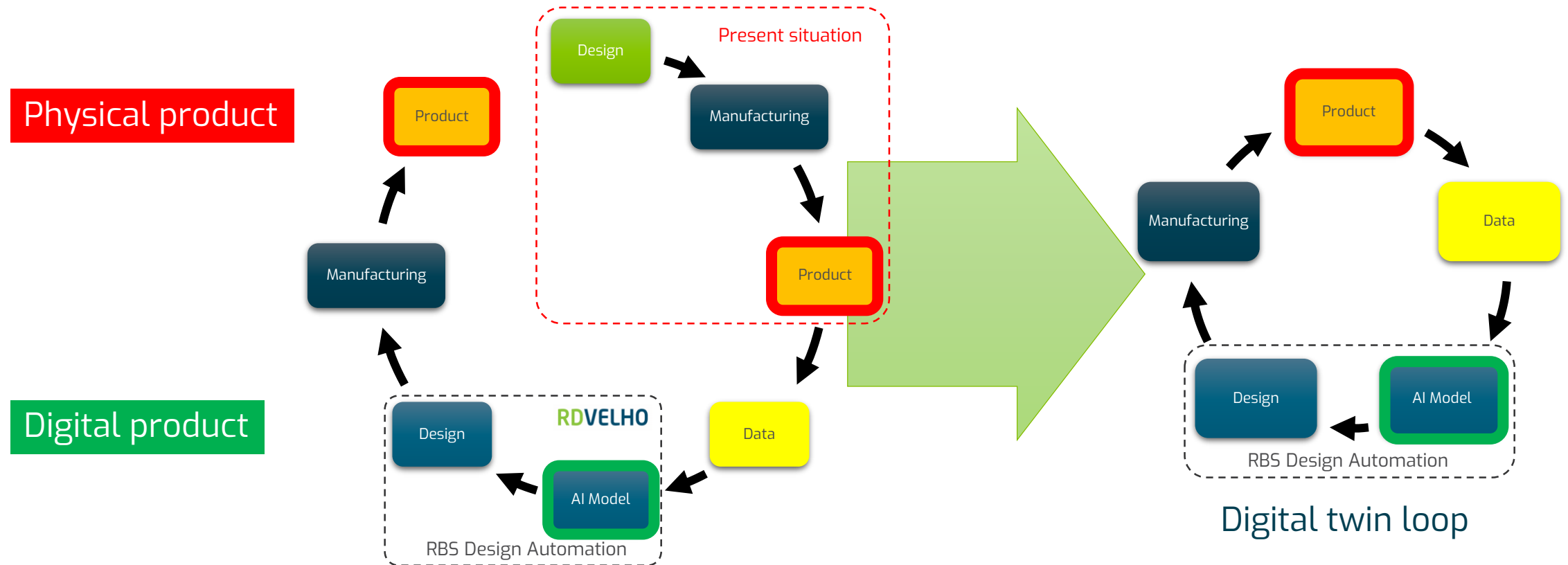


RBS Design Automation



- RBS (=“Rule Based System”) Design Automation handle product’s knowledge via independent software/application.
- RBS Design Automation holds all the information: *how the product is designed* (= “**AI Model**”)

Forward to Digital twin loop using RBS Design Automation



Demo

Demo

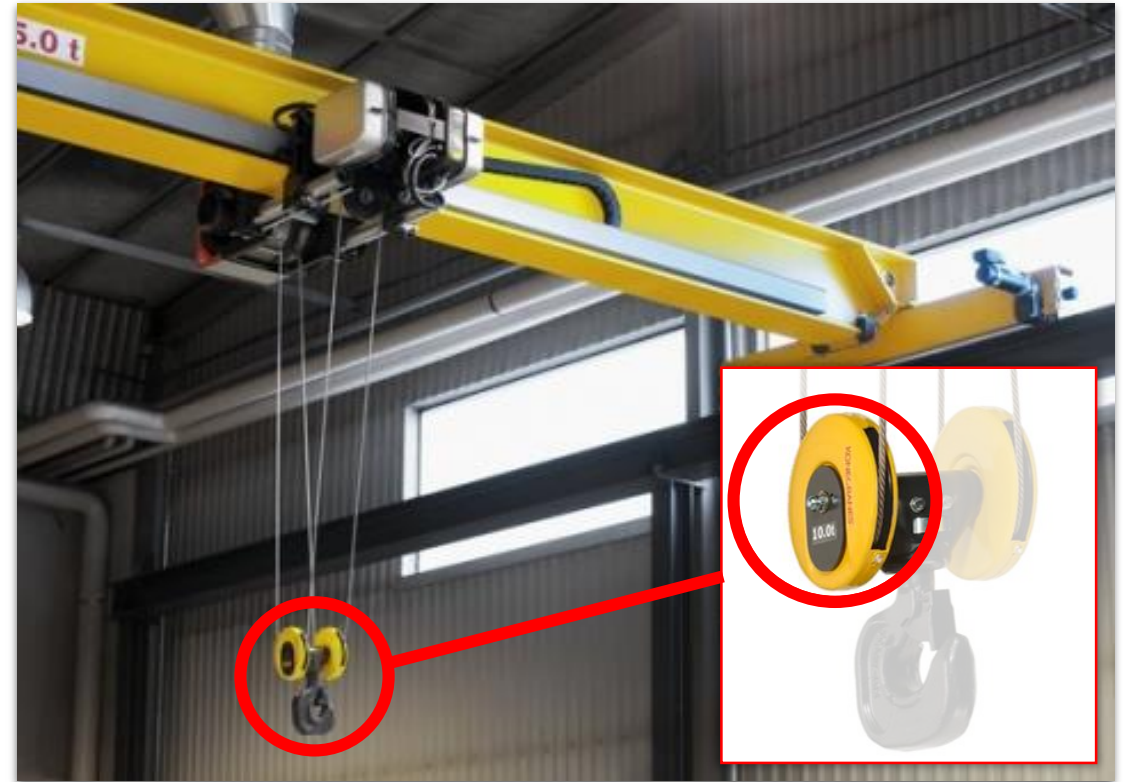
Demo

Demo

Demo

Design automation demo

- Product: Aalto University “Ilmatar”
- Usage data: Aalto University “Ilmatar”
- Part: Sheave
- Important part in whole construction
- Traditional way to design sheave lean on iterative process, witch include various phases and actions
- Design based on represent scenarios and cases.
- Customer requirements are fitted to previous cases



Design automation demo - Functions

2. Data from Aalto "ilmatar" crane



1. Original design

Input:

- Specs/values of "Ilmatar" crane

Output:

- Material/structural analysis
- Calculated geometry
- Selected component information

3. Data analysis

Input:

- Data from Aalto "Ilmatar" crane

Output:

- Usage analysis
- Result; estimation of usage years

4. New design

Input:

- Data analysis result
- Design base

Output:

- Material/structural analysis
- Calculated new geometry
- Selected component information

RBS Design Automation

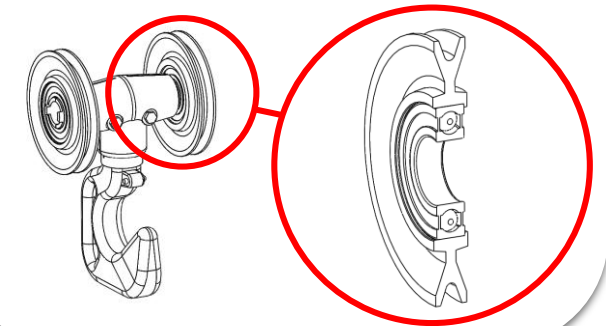
5. Design work (Solidworks)

Input:

- Geometry variables/values
- Design base

Output:

- 3D models (Sheave, Bearing)
- 2D documents



Data from Aalto “ilmatar” crane

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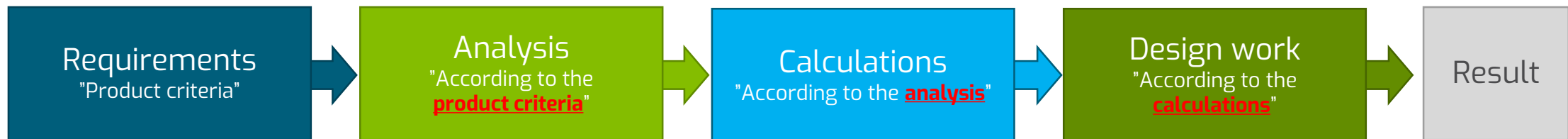
Two changes : 1.) work process

Traditional way

- Iterative loops
- Product design is build from estimations of the product criteria
- Process could easily take days or even months



Design Automation (RBS/AI) Iterative loop



- No iterative loops
- Product design is build exact from the product criteria
- Whole process is done only in couple of minutes

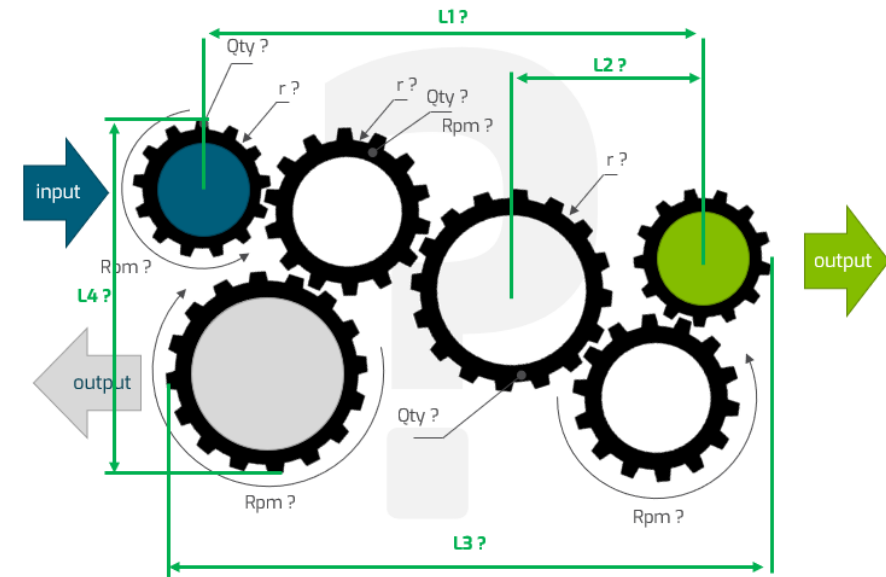
Two changes : 2.) product optimizing

Traditional way

- Iterative constructions are VERY challenging, time consuming and expensive to do in traditional way (“manually”).
- It is very rare to achieve optimal result in high level iterative product via traditional way.

Design Automation (RBS/AI)

- Every component in product is calculated. Also every component has relations to each other, so iterative construction is solved via calculating on top level of the components.
- To solve very complex iterative construction using RBS –based Design Automation is done in seconds.



Technology's effects at different areas

Designer work/skill requirements

- Work focuses more and more to handle products knowledge and product development
- Most of the formal design work is done by automation
- More meaningful challenges
- Calculations and programming skills raises more important requirement than 3D modelling

Business and company

- Most important thing: *knowledge* transfer from people to company's asset (to the system)
- Pricing and business models changes
- Possibility to offer custom product at bulk products price ^{*}
- Totally new and advanced positions in global market

(^{*} = related to manufacturing costs)

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