THE CHALLENGES OF MODEL-BASED DESIGN AND TRADITIONAL PLM

The world is changing rapidly and we can be part of that

Jos Voskuil's Weblog

PLM is changing and affects us all

www.virtualdutchman.com

- 1999 From TacIT knowledge to PDM/PLM
- 2004 Flying Dutchman

- 2008 Virtual Dutchman

- 2014 Digital Dutchman

- 2020 Not-so-Flying Dutchman

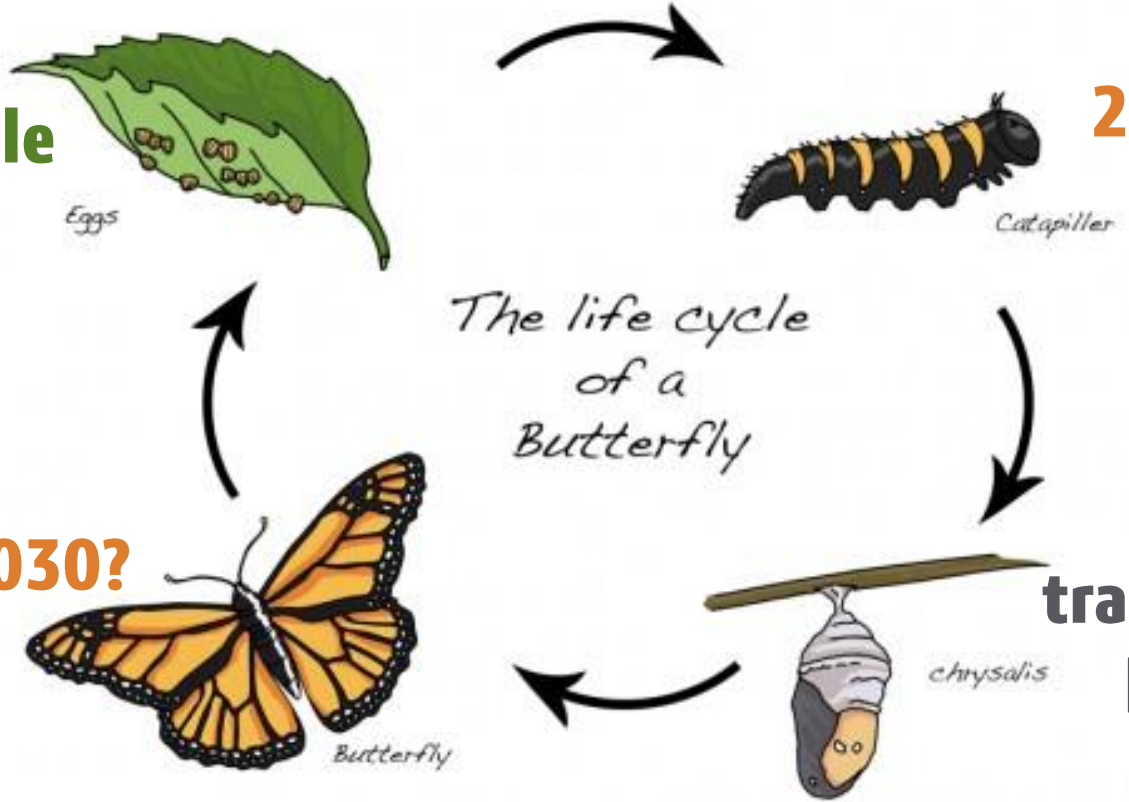
2 THEMES

2014 - 2020

Digitalization

Sustainability

Digital Transformation – the dream



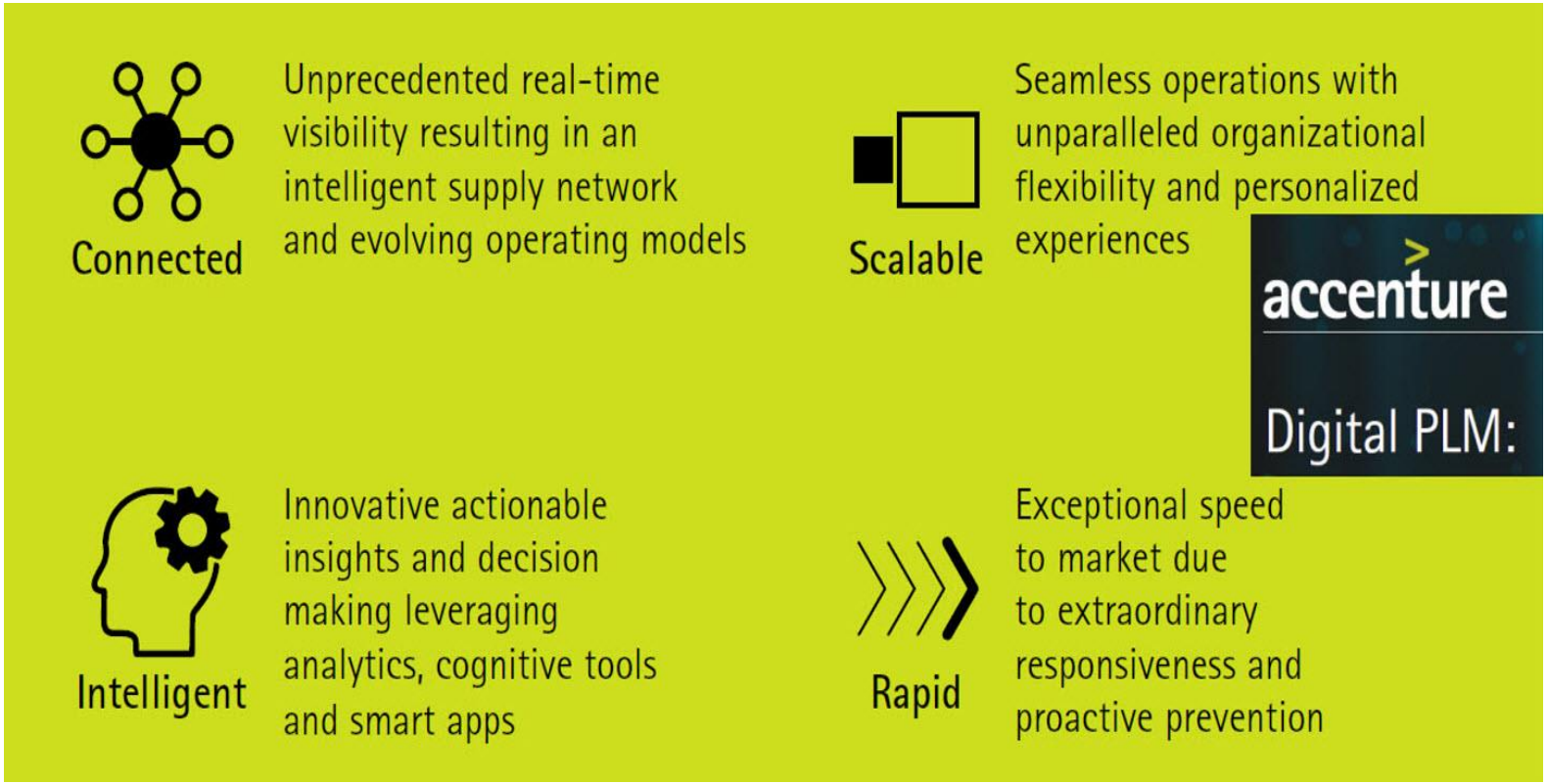
sustainable

2008 – now ?

2014 - 2030?

where transformation happens !

What is this digital transformation in PLM (2014)



What is this digital transformation in PLM (2015)

CIMdata Product Innovation Platform

Product Innovation Platform Compared to PDM		
	Legacy PDM	**Product Innovation Platform**
Lifecycle Scope	Product development	Full product lifecycle
Discipline Scope	Primarily mechanical	Systems—mechanical, electrical, electronic, software, control systems, manufacturing, and service
Information Scope	MCAD, documents, some parts and BoMs	All product items across all lifecycle disciplines
Supply Chain Scope	Limited supplier involvement	Full supply chain and customer support

A logical evolution ?

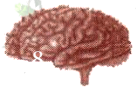
	Reactive	Repeatable	Integrating	Collaborating	Orchestrating
Key Business Indicators	Status Quo	Eliminate waste	Improving Product Quality and Cost	Efficient Product Innovation	Efficiently Expanding Product Diversity
Job Performance Metrics	Few or None	Time/Efficiency	Productivity and Scalability	Enable Performance Improvement	Enable Strategy Improvement
Processes and Practices	Ad Hoc	Robust	Across Internal Functions	Value-Chain Involved	Value-Chain Engaged
Technology	Disparate	Functionally Siloed	Coordinated	Connected	Adaptive
Organization	Tribal	"Territorial"	Digital Transformation		Cross-Value-Chain Through Life Cycles

Past Current Started Vision

From Coordinated to Connected

Coordinated:
Providing the right information at the right time in the right context

Connected:
Providing actual information for anyone connected in any context



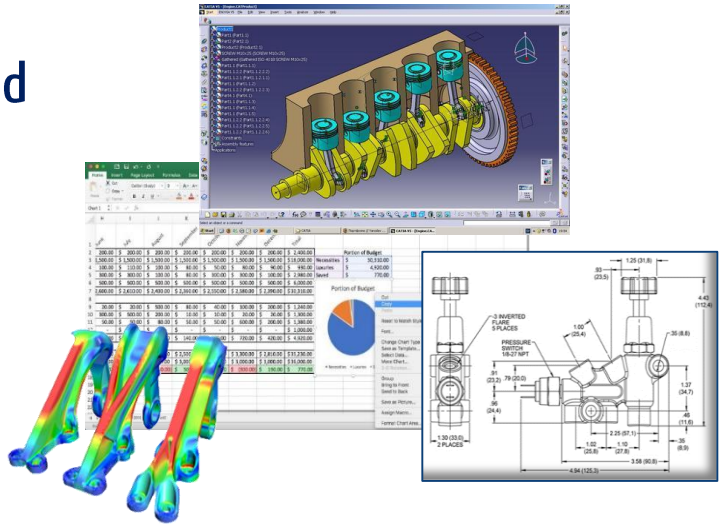
Coordinated

Providing the **right information** at the right time in the right context

Requires:

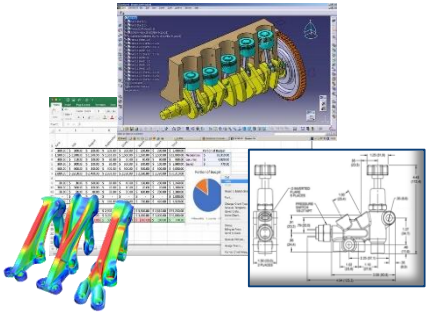
- An understanding/agreement what's needed

  Most of the time: **Delivered in documents**



Coordinated

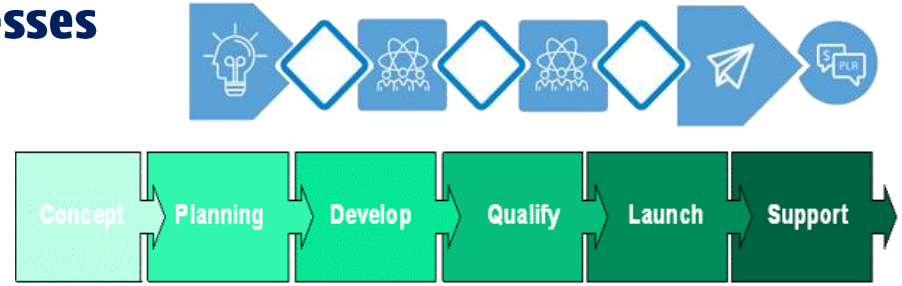
Providing the right information at the **right time** in the right context



Requires:

- Delivered in documents
- Activities that drive the delivery of the information

  Most of the time: **Predefined processes**



Coordinated

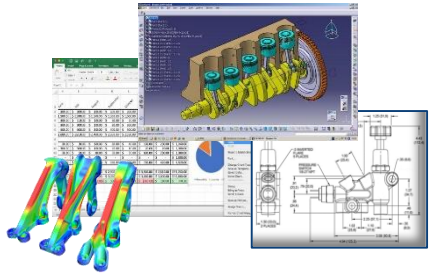
Providing the right information at the right time in the **right context**

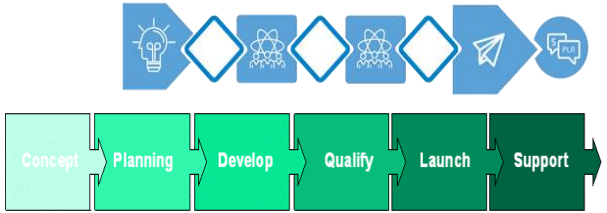
Requires:

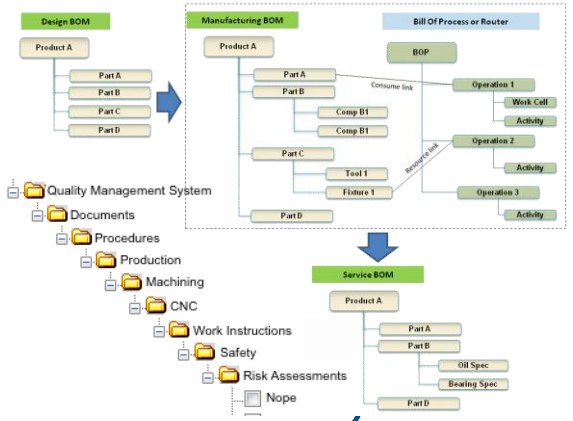
- Delivered in documents
- Predefined processes
- Placeholders where the information can be found

  Most of the time: **Folders or BOM structures**

- Or (*new*): Overlay platforms (digital thread / **Power'By**)



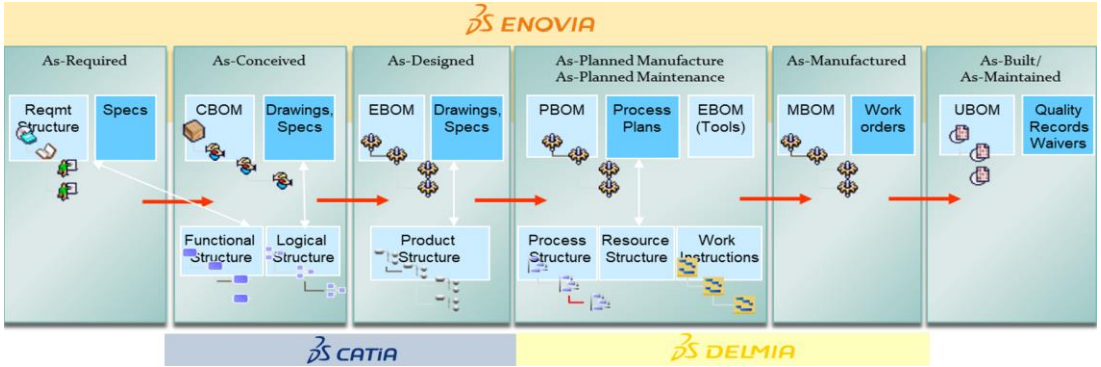




Coordinated in the context of Dassault Systemes

Providing the right information at the right time in the right context

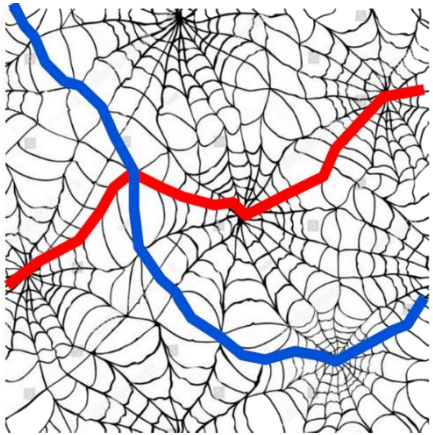
- Delivered in electronic files
- Predefined processes
- Using BOM structures



- These PLM systems provide a System of Record for the (mechanical) product relevant for regulatory compliance / configuration management

Connected

Providing **actual information** for anyone connected in any context

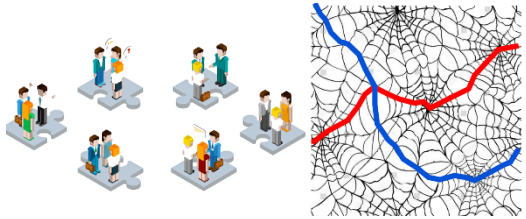


Requires:

- Data (sets) created by accountable persons
  To be: **Breaking silos – Think about consumers of data**

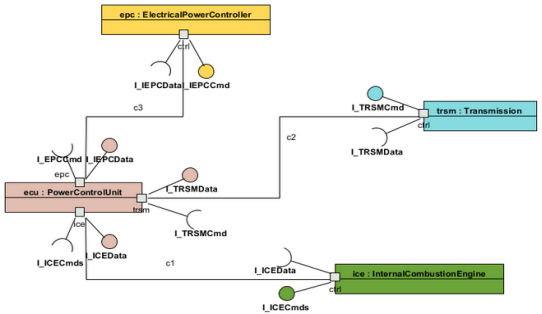
Connected

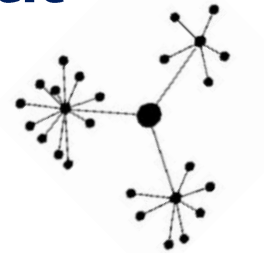
Providing actual information for anyone **connected** in any context

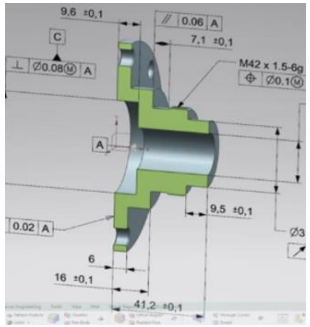


Requires:

- Breaking silos – Accountable persons for data
- **Other formats than documents / files**
  To be: Using Models & Parameters to share





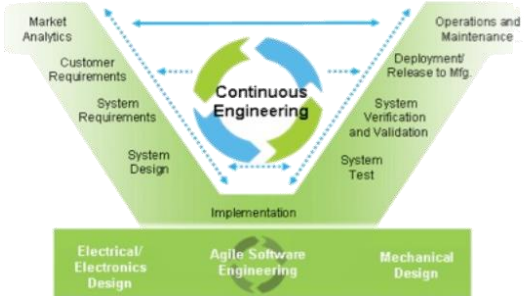


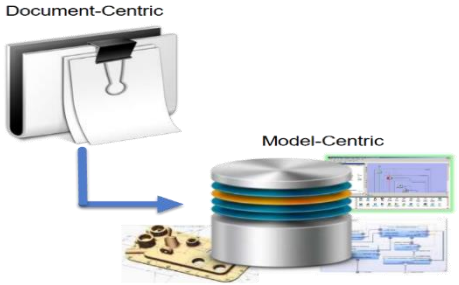
Digital Twin

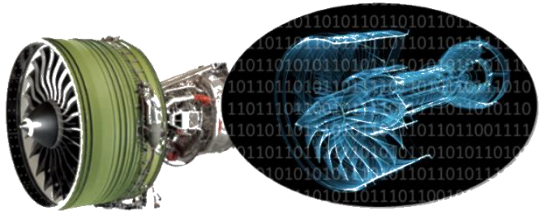
Modelica

Connected - using models

Connected Technology – the Digital Thread – three domains







Model-Based Systems Engineering

needed to define complex products / systems where hardware & software are involved.

Virtual product definition, simulation and testing before committing to the physical world

Model-Based Definition

Provide a digital continuity between engineering and manufacturing by using a shared parameter-driven 3D model

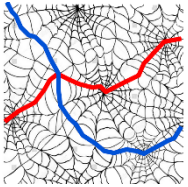
No more drawings – **P**roduct **M**anaged **I**nformation stored around a 3D Model

Digital Twin

Managing a virtual definition related to a physical product in order to analyze performance, predict maintenance and use collected data to improve products

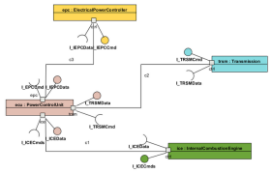
Connected

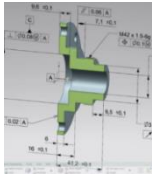
Providing actual information for anyone connected in **any context**



Requires:

- **Breaking silos – accountable persons for data**
- **Using Models & Parameters to share**
- Reliable data uniquely created and shared in open formats
  To be: **Using Master Data Management & Data Governance**





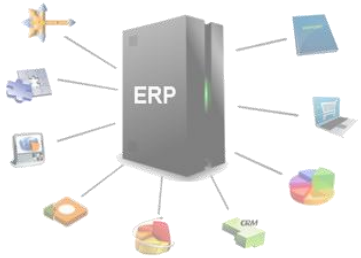
Connected

Providing actual information for anyone connected in any context

Microservices
APIs / Low Code platforms

Dashboards
Apps

CIMdata Product Innovation Platform

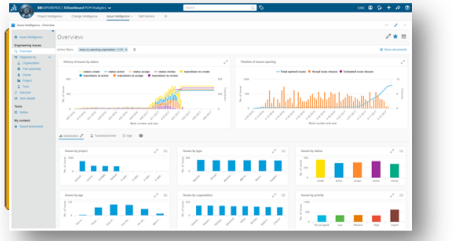


Systems of Engagement

Closer to customers, Empower employees, and Transform internal business processes

Connected in the context of Dassault Systemes

Providing actual information for anyone connected in any context



Microservices
APIs / Low Code platforms

Dashboards
Apps

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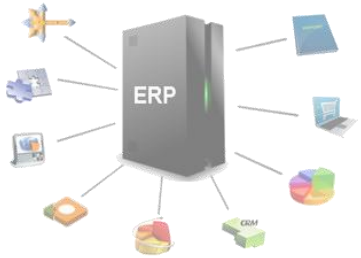
3DEXPERIENCE®

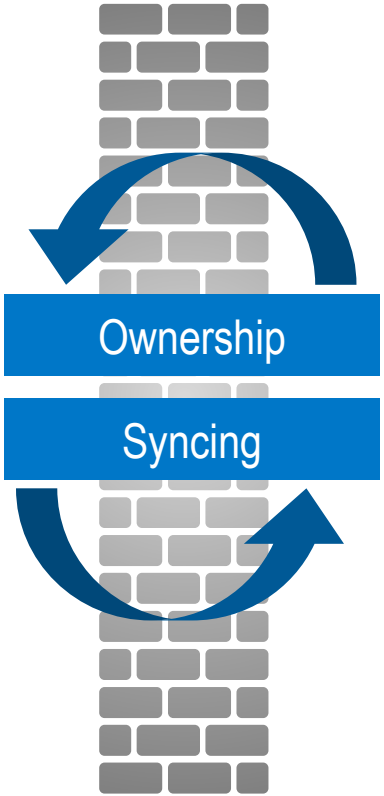


Systems of Engagement

Closer to customers, Empower employees, and Transform internal business processes

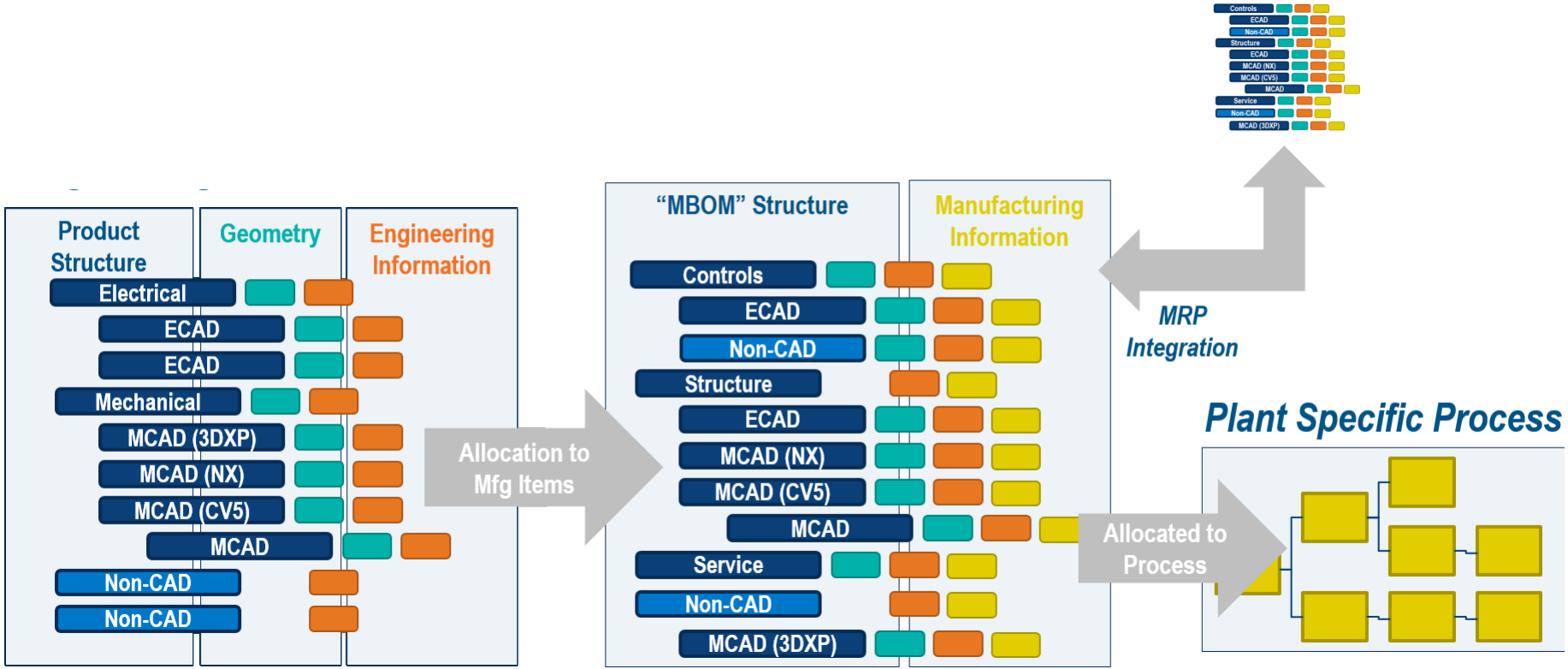
Coordinated: BOM and Design: CATIA V5 / V6

- Part numbers
- Quantities
- Release
- Cost
- Make/buy



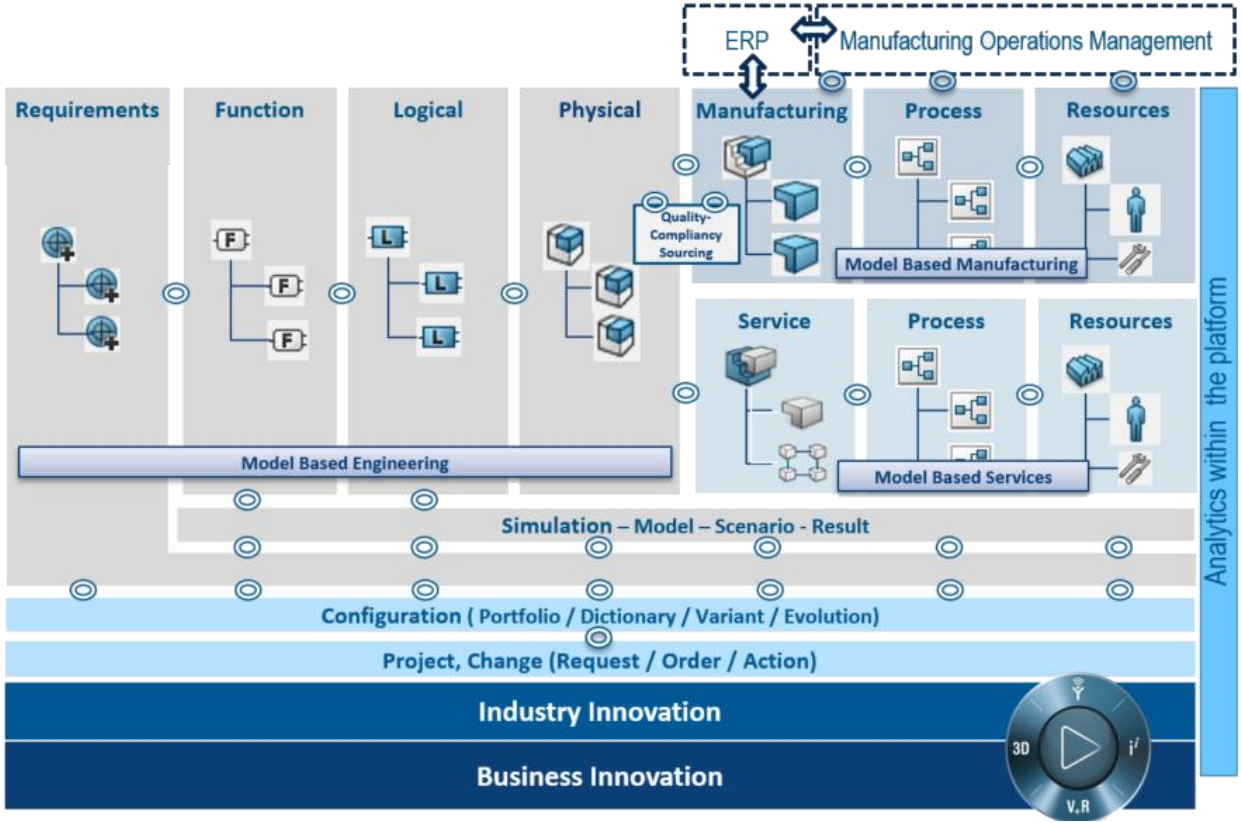
- Product tree
- Form, fit, function
- Packaging
- Reference instance
- Configured context

Connected: BOM and Design: Unified Product Structure



Model-Based connectivity

The 3DEXPERIENCE platform: the conceptual model



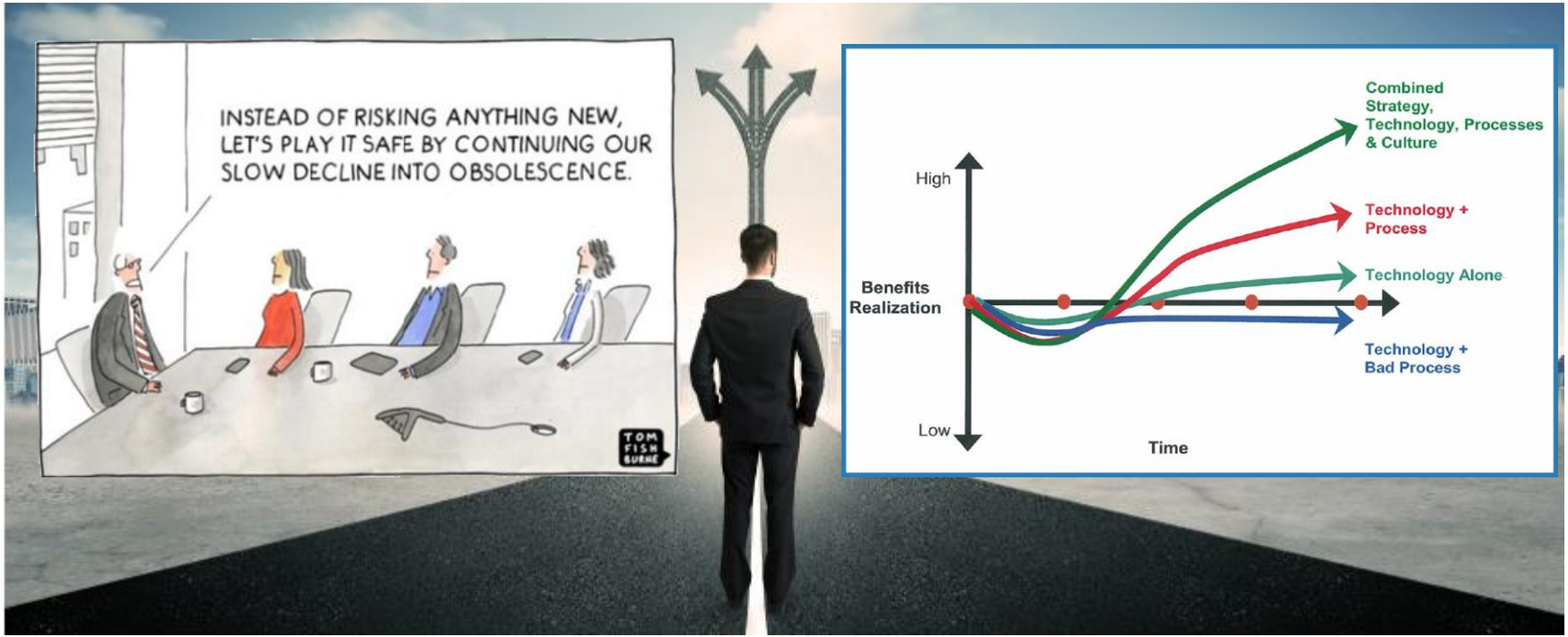
Openness

Digital Continuity

An infrastructure
of
connected models

It requires
new ways of working !

Digital Transformation: new ways of working



This is the main challenge: different processes, different people, different data

To get there: new types of businesses

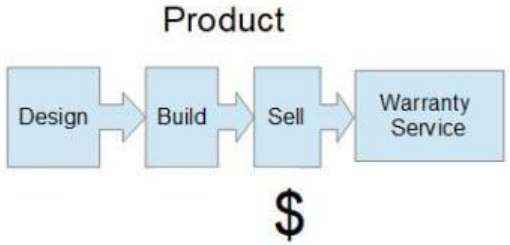
A connected enterprise allows the company to introduce new business models and enhance current go-to-market processes:

- Outcome based offerings, e.g.
  - Printing – pay per print/photo
  - Flying - “Power by the Hour”
  - Mobility – Mobility as a Service
  - Lighting – city / stadium LED lighting
  - Patient Care – MRI/CT- pay per scan

Different Processes

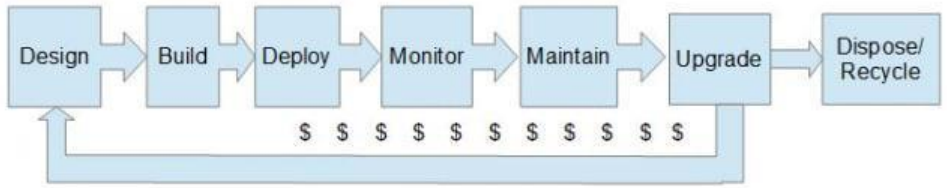
Current:

- Linear
- One time / big sell



Product As A Service – they become SYSTEMs:

- Iterative
- Continuous revenue stream



Business drivers:

- Higher customer satisfaction
  - Better products
  - More customer loyalty
- From CAPEX to OPEX

Image: Moving from Product to Product as a Service (Engineering.com)

Different Processes

Product as a Service

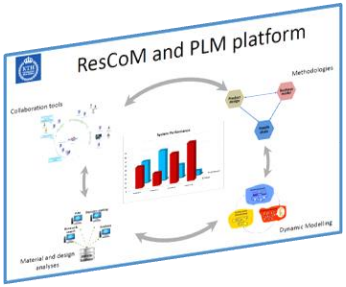
- Lifecycle ownership of materials
- Reducing waste / optimize reuse

Sustainability

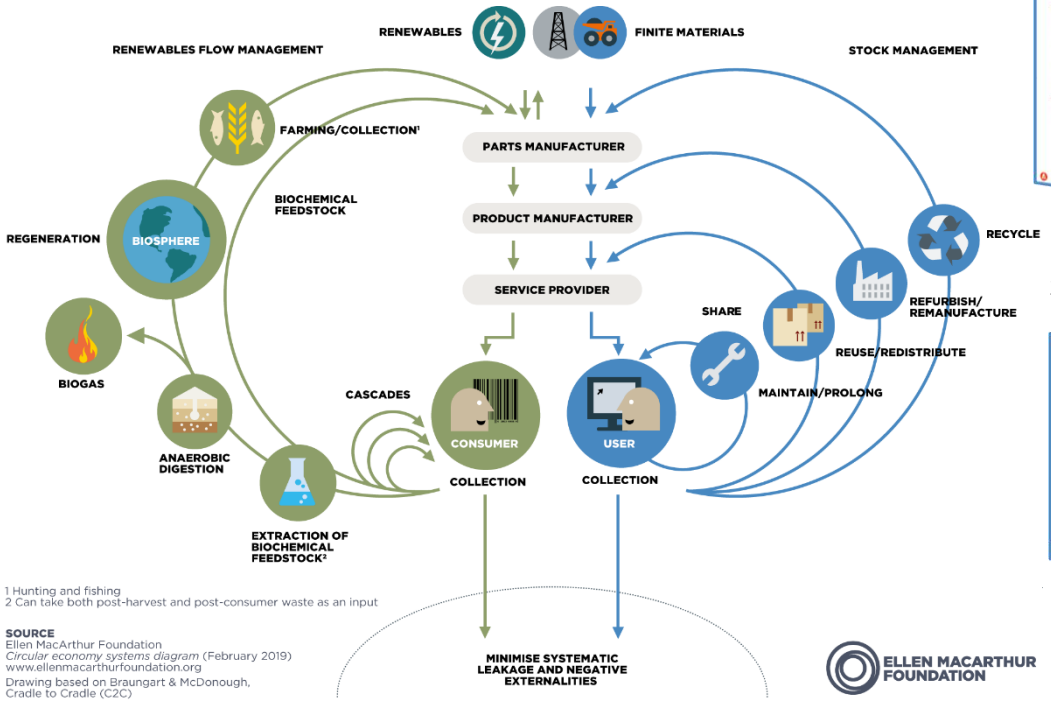
- Climate and Sustainability regulations will bring the biggest disruption for this decade
- Not only “Green Washing” Example: Electric Vehicles

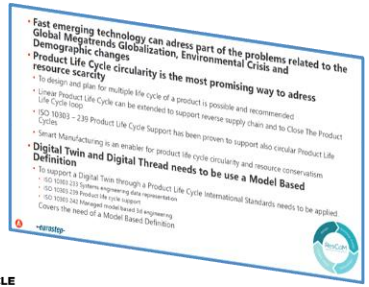
Sustainable Products as a Service requires a **Systems Approach**

2014 - Ella Jasmin



2015- Amir Rashid

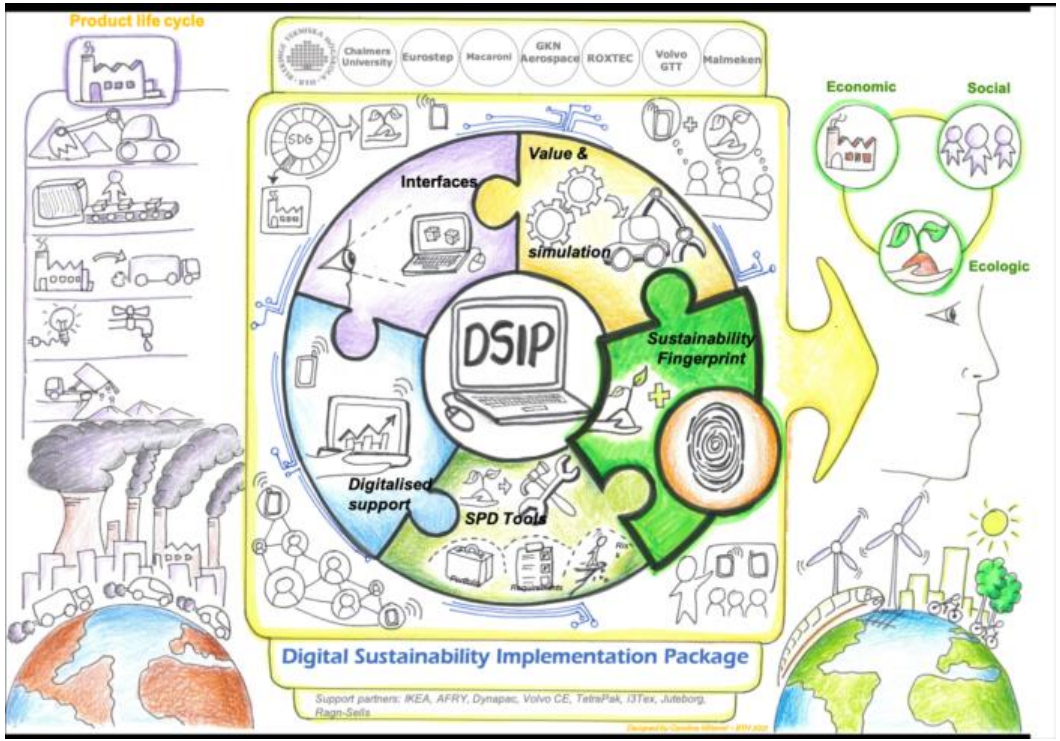




2017- Torbjörn Holm

2019- Graham Aid

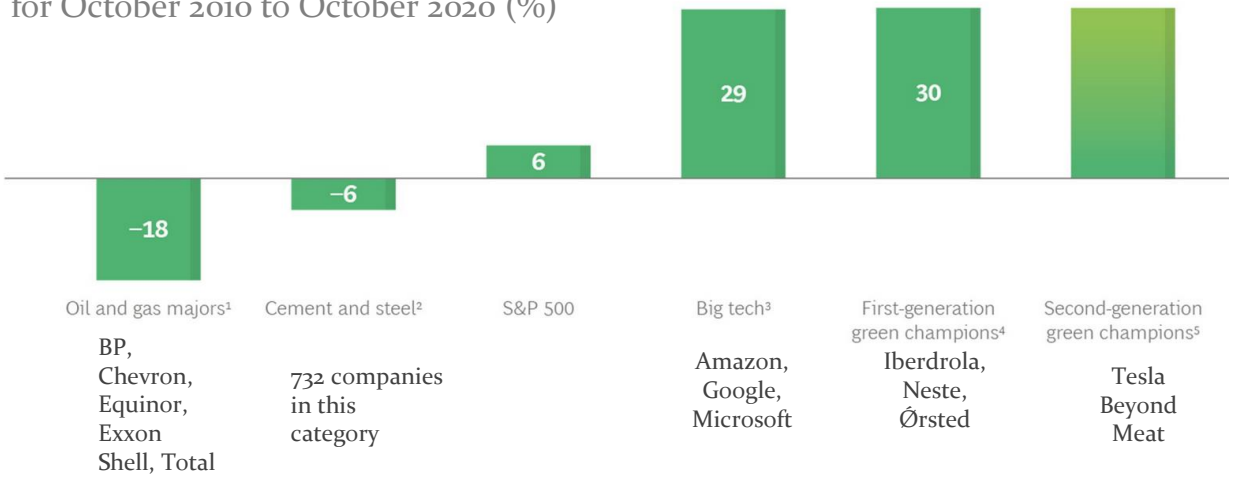
BLEKINGE INSTITUTE OF TECHNOLOGY – exploring sustainable design



- The purpose the **Digital Sustainability Implementation Package (DSIP)** is to enable a strategic sustainability approach early in the product innovation process.
- The DSIP package compile a knowledge platform, a data management platform and novel digital tools to evaluate, measure, estimate, predict, set requirement, and simulate expected sustainability performance for alternative product concepts early in the development.
- **A research project combining people, processes and tools.**

www.bth.se/eng/research/research-fields/strategic-sustainable-development/digital-sustainability-implementation-package-dsip/

The Next Generation of Climate Innovation

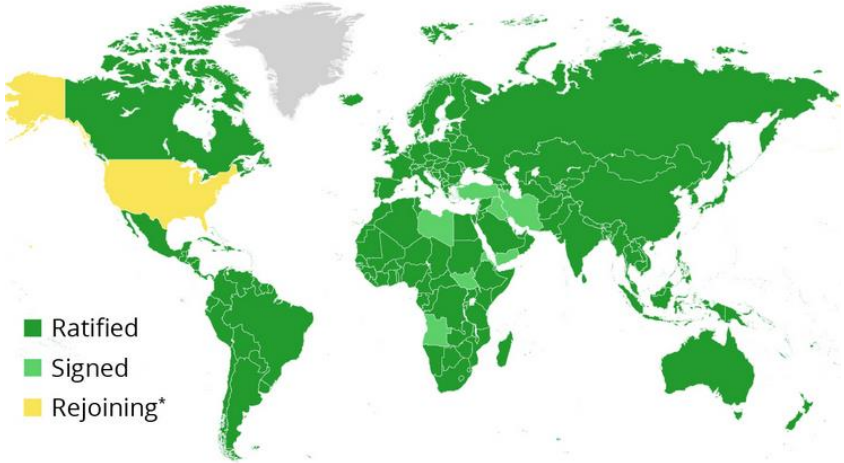


Disruptors are coming from outside
Incumbents can evolve in 2 directions or become extinct

Disruption is coming – System Thinking

The State of the Paris Agreement

Countries by their participation in the Paris Agreement (as of January 21, 2021)

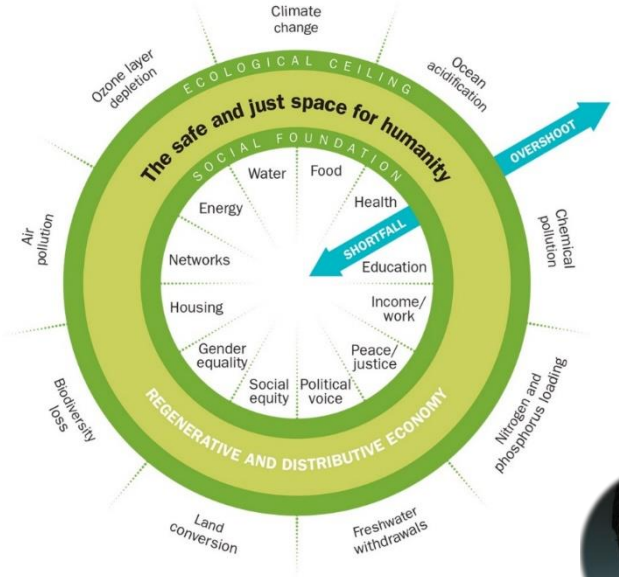


* On January 20, 2021, President Biden informed the UN Secretary-General of the United States' return to the agreement effective February 19, 2021.

Source: UNFCC

New Economical Models

the end of continuous growth



www.kateraworth.com/doughnut

Kate Raworth: making **economics fit for 21st century realities**

To summarize

Governments

- First time in history people are aware disruption is needed

To summarize

Individuals

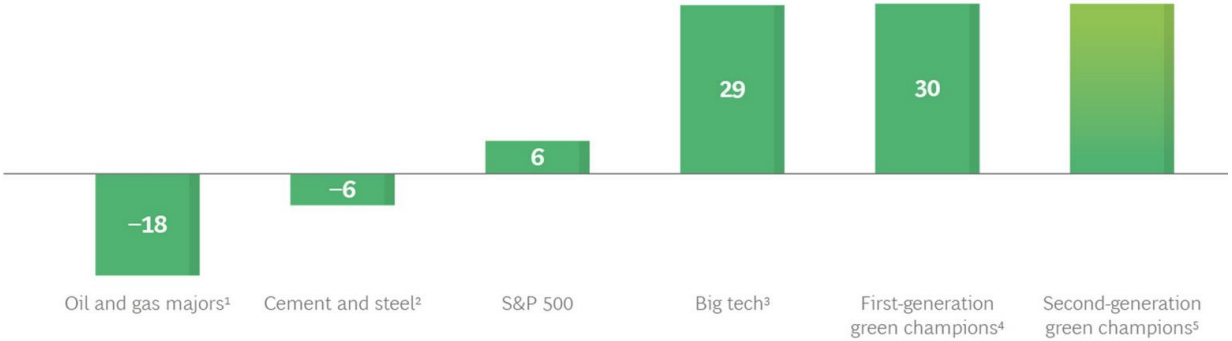
- First time in history people are aware disruption is needed

- Young generation more vocal / influencers → DIY groups

To summarize

Investors

- First time in history people are aware disruption is needed
- Young generation more vocal / influencers → DIY groups
- Investors change their targets (outside push)



To summarize - Businesses

- First time in history people are aware disruption is needed
- Young generation more vocal / influencers → DIY groups
- Investors change their targets (from outside)
- Can companies disrupt themselves?

To summarize

People

- First time in history people are aware disruption is needed
- Young generation more vocal / influencers → DIY groups
- Investors change their targets (from outside)
- Can companies disrupt themselves?
- You can't change people, but people change when observing a "burning platform"!

Who led the digital transformation of your company?

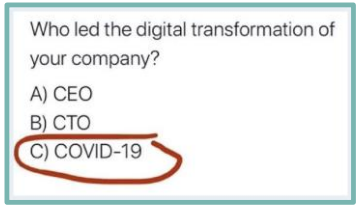
A) CEO

B) CTO

C) COVID-19

To summarize PLM practicians

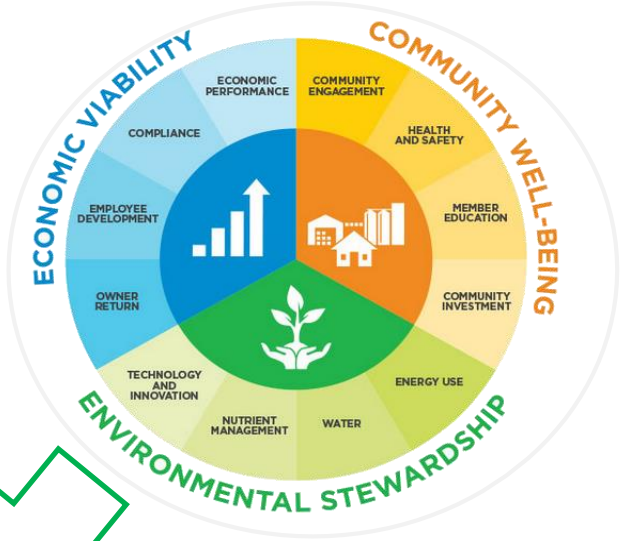
- First time in history people are aware disruption is needed
- Young generation more vocal / influencers → DIY groups
- Investors change their targets (from outside)
- Can companies disrupt themselves?
- You can't change people, but the people change their minds when observing a "burning platform"!
- The technology is there – people and new ways of working need to be developed/educated.



No time for Proof of Concepts, Learn by Doing!
This is our new PLM Value Equation

THANK YOU

Q & A



Digitalization

Sustainability