

A View on Industrial Internet of Things (IIoT)

D. Vanderbist 29/07/2018

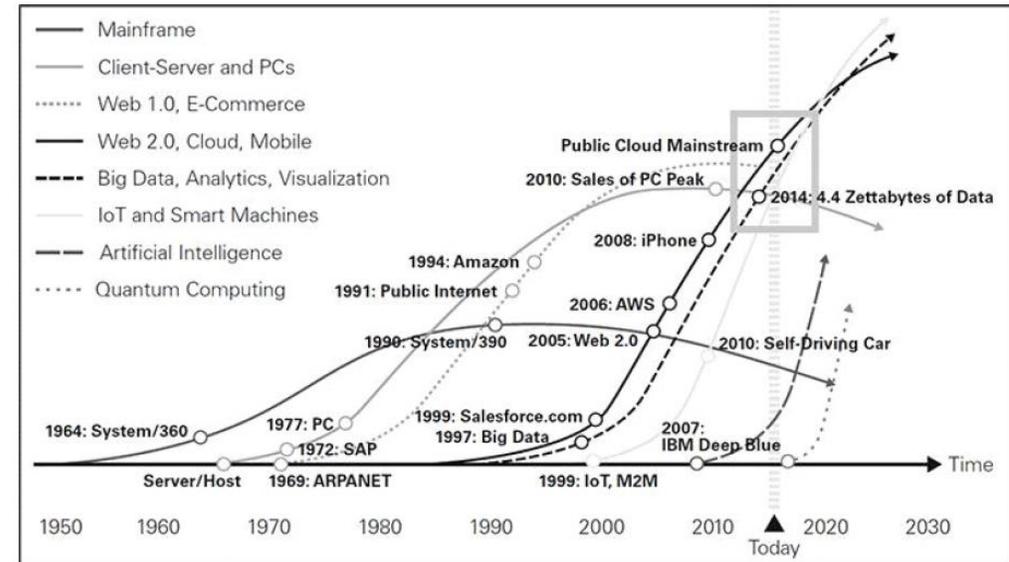
ERIC SCHAEFFER

INDUSTRY X.0

REALIZING DIGITAL VALUE
IN INDUSTRIAL SECTORS

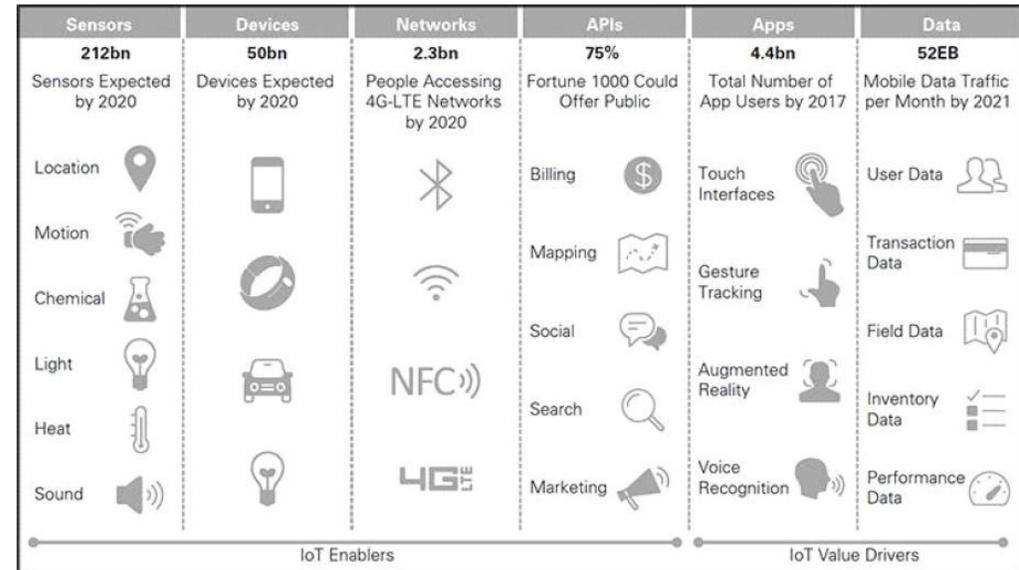
Transformation: IIoT

- From **dumb low-margin products** for **anonymous markets** towards markets driven by **inter-personal relationships**, **software connected living products**.
- **IIoT = Industrial Internet of Things:** Creates, via connected technologies and various platforms, highly efficient relationships between products, machines, services, and sites, but also between customers, workers, managers, suppliers and partners.
- Bridge between the **digital and physical enterprise**



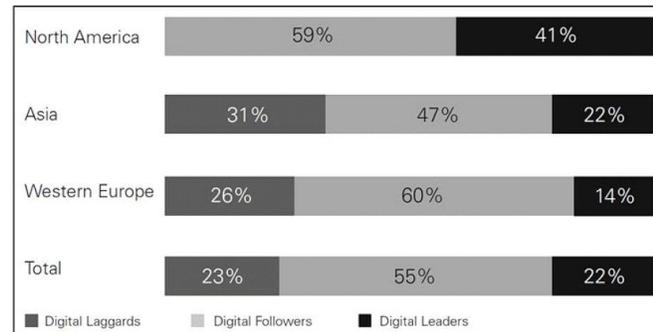
Transformation: Drivers

1. Pervasiveness of **connected technology** creates context
2. Smart products, pushed to become Living Products
3. Ecosystems and services drive value.
4. **Hyperpersonalization** and new experiences disrupt.
5. **As-a-service business** models emerge: CAPEX vs OPEX
6. New technologies will disrupt further.
7. Security and data privacy ensure resilience and fairness.

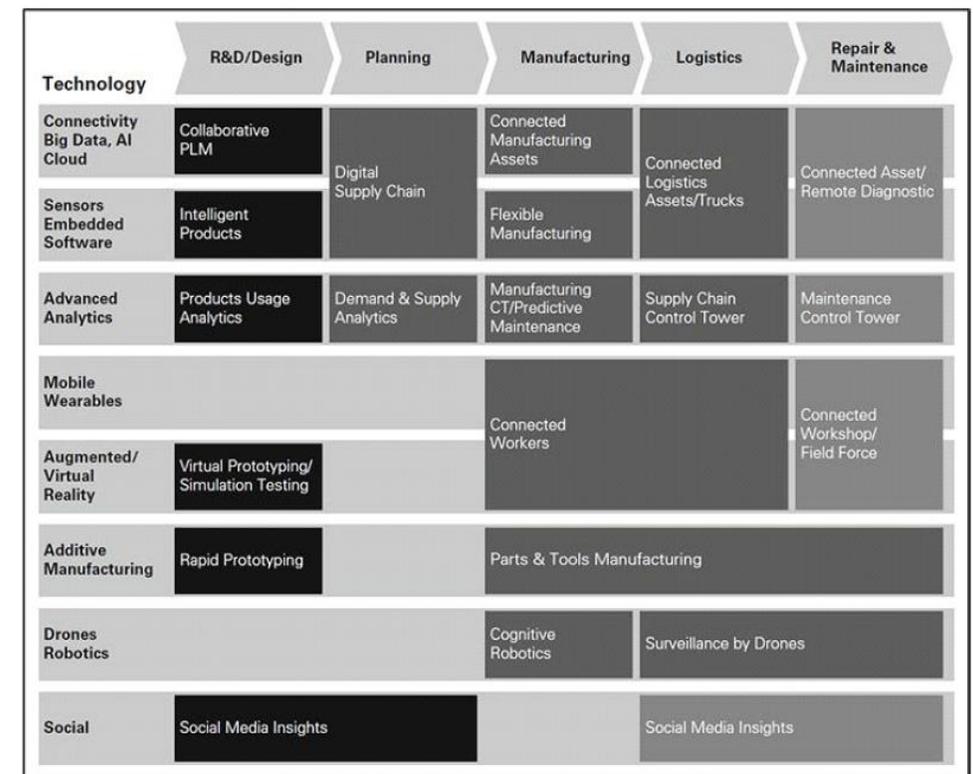


Transformation: R&D

- Smart factories **will not emerge** from isolated beacon projects. Requires radical R&D investments
- **Liquid fulfillment:** The customer is expecting the “product for me” i.e. “lot size one” which cannot be solved by traditional manufacturing processes
- Some economies are lagging:



R&D Focus:

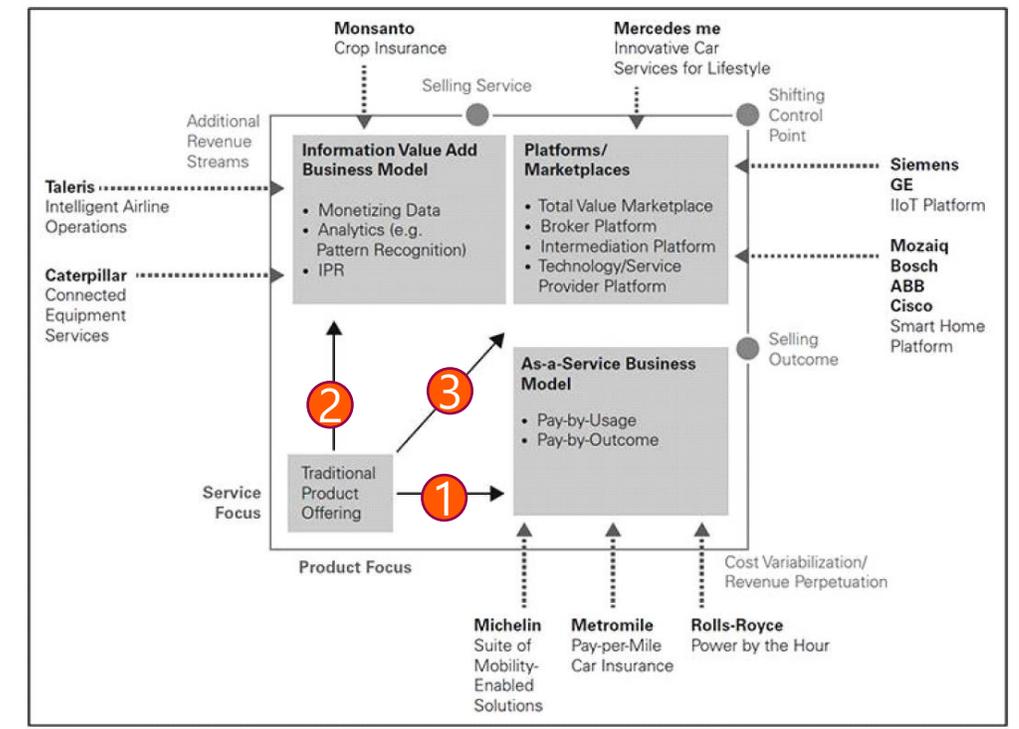


Takeaways

1. The industrial sphere is undergoing a profound, even dramatic change. Its drivers are many, among them the *pervasiveness of connected technology*, platforms and data optimization, *hyperpersonalization*, and *as-a-service business models*. And we are just at the beginning of the change.
2. *Tightly connected industrial manufacturing processes* are going to go mainstream soon. The *Industrial Internet of Things (IIoT)*, will digitally orchestrate factory floors, physical products, workers and more, unleashing enormous value.
3. Critical to success in this new digital industrial world will be the deployment of the *right technology, preparation of the digital workforce*, intelligent orchestration of both, and embedding of enterprises in the right ecosystems of business partners.

The Outcome Economy: The Why behind the Buy

- From "the end of the product" towards "usage economy"
- Outcome Economy means eventually all consumers and businesses want to buy outcomes, not physical hardware.
- The cold product turns into something **emotional**: a customer experience.
- You need:
 - **Sensors** to know if the outcome is met and to measure your own cost.
 - **Technology** and products that can deliver the outcomes
- The consumer will not own the product anymore he will own the right of the outcome.
- Example: from selling airplane engines to "power by the hour"

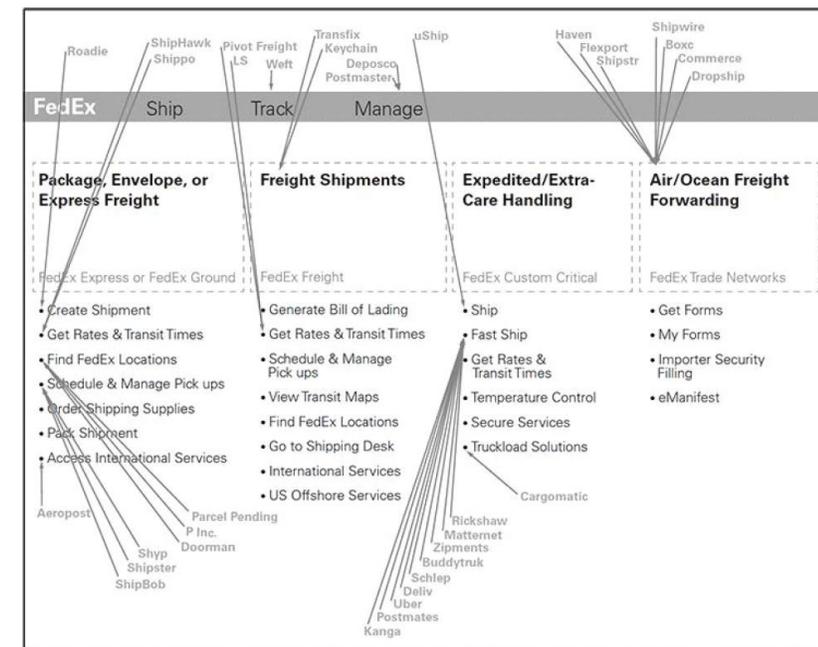
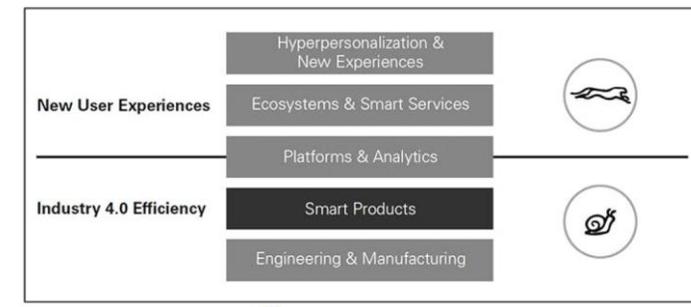


Axes:

1. As-a-service
2. As-a-info
3. As-a-outcome

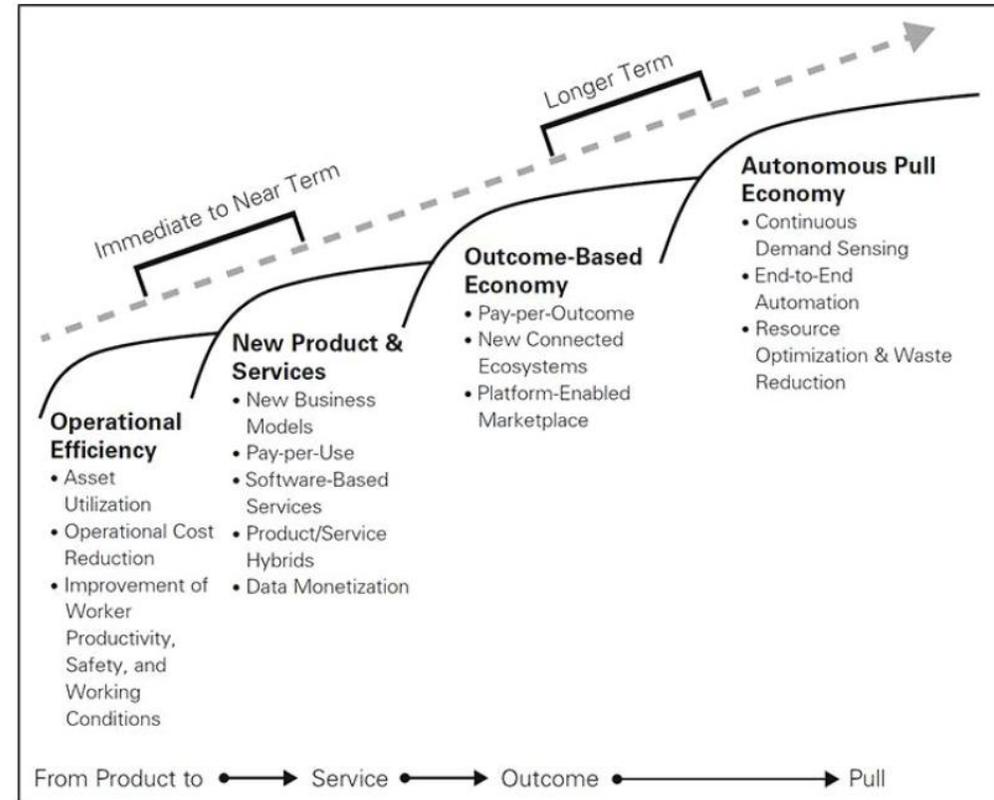
The Outcome Economy: Living Products

- Connected smart products are at the core of the change
- “Pay-by-the-X” examples:
 - TeatreNeu theater seats were fitted with optical sensors recording how often audience members laughed. Each instance of laughter appeared on the bill at a price of 30 cents each
 - Philips new service sells a certain amount of light rather than bulbs or other luminaires.
- Organizational impact:
 - The client is not interested in **departmental silos** he want an outcome. Companies are often to fulfill order by department. A client order might be cross department.
 - **Business processes should not be organized according to company structure** but according to business flow across participating departments
 - Example: FedEx challenged by start-ups at each of its activities. **Start-up are small and nimble to react quickly to market changes.**



The Outcome Economy: Marco-Economics

- Socio-politics:
 - **Outcome economy relies** on unhindered movement of data, intellectual property protection, cross-border tax treatment, complex entities, new types liability and warranty rights
 - Companies will need more and better data to calculate costs: **from controlling margin on goods sold to calculate competitive service prices**
- 4 step to realize an outcome economy:
 - Operational Efficiency: from the shop-floor to the top-floor, automated manufacturing and efficiency through process connectivity
 - New Products and Services: business focusing on the client side of the supply chain for clients with an appetite for intelligent connected devices
 - Outcome-Based Focus: connected products with services attached to it
 - Fully Automated Industry: digitally orchestrated smart manufacturing processes



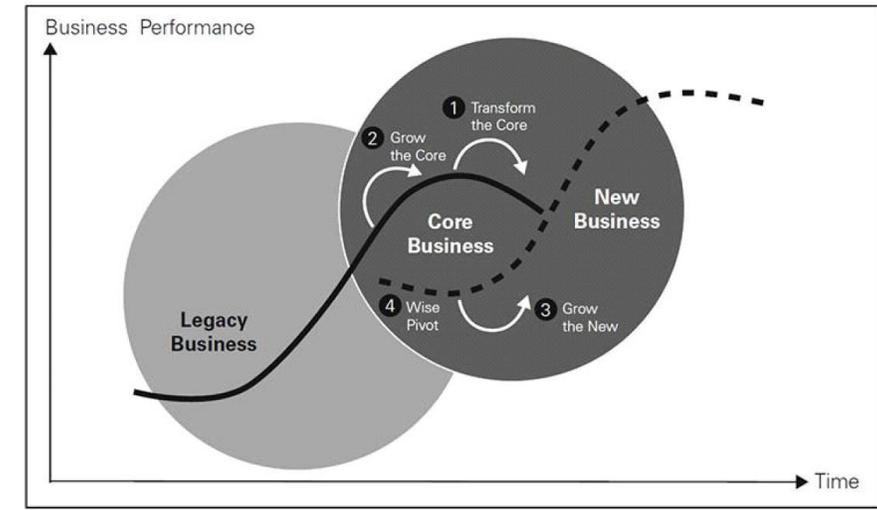
Takeaways

1. The *Industrial Internet of Things (IIoT)* will drastically change the way companies work internally, work with each other, and sell to customers.
2. This will lead to "*the end of the product*" and *the rise of a new kind of economy, the Outcome Economy (or "usage economy")*. In this new world, tried-and-tested industrial hardware products are not only eclipsed by their much more profitable service qualities, the user experience and the ecosystems they operate in: They are also commercialized on a per outcome basis. It is the combination of living products and as-a-service business model that make the outcome economy.
3. This will be the era in which industrial companies move away from *rigid business silos to more agile ecosystems* and alliances with surprising partners. If they don't, they won't survive in the long run.

Digital Value: Paths for Growth and Maturity

Digital Value per Sector:

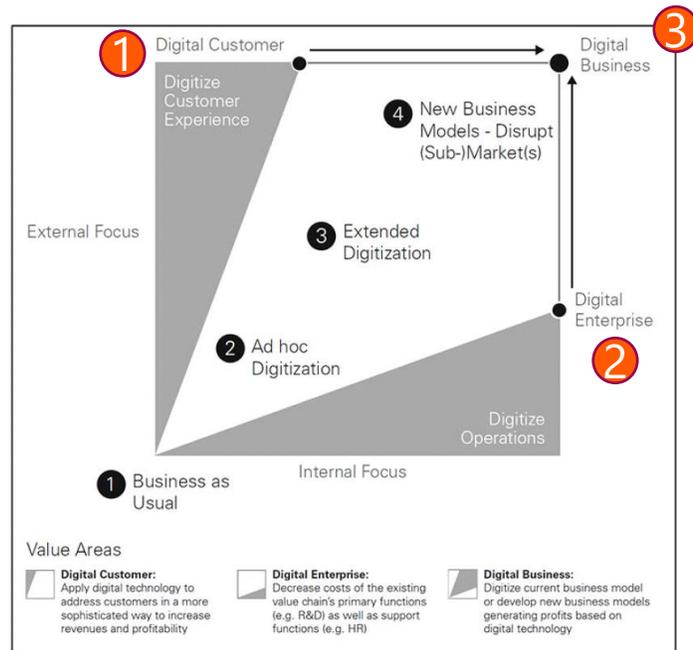
Sector	Connected Products/Digital Services	Business Outcomes
Connected Health	Monitoring and Treating Illness	Up to 20% Reduction in Disease Burden
	Improving Wellness	\$80-600 per Year in Wellness Benefits per User
Connected Home	Core Automation	17% Time Saved from Relevant Activities
	Energy Management – Home	20% Energy Savings
	Safety and Security	10% Reduction in Property Damage Incidents
Connected Office	Human Productivity – Activity Monitoring	5% Productivity Improvement
	Human Productivity – Augmented Reality	10% Productivity Improvement
	Energy Monitoring – Offices	20% Savings
Connected Factory	Operations Optimization	5-12.5% Cost Reduction
	Predictive Maintenance	10-40% Cost Savings
	Inventory Optimization	20-50% Cost Reduction
	Health and Safety	10-25% Savings
Connected Operations	Operations Optimization	5-10% Increase in Worksite Productivity, 10-20% of Consumables, 10-20% of Personnel
	Improved Equipment Maintenance	3-5% Productivity Gain, 5-10% of Equipment Costs, 5-10% of Equipment Maintenance
	Health and Safety Management	10-20% Decrease in Health and Safety Costs
Connected Transport	Safety and Security – Personal Transportation	25% Improvement
	Passenger Vehicles Maintenance/Replacement	10-40% Reduction in Maintenance and 3-5% Longer Vehicle Life
	Aerospace Equipment and Maintenance	10-40% Reduction in Maintenance, 25% Fewer Delays, 3-5% Longer Aircraft Life
Connected City	Air and Water Monitoring	15% Reduction
	Adaptive Traffic Management	10-15% Less Time in Traffic, 10% Reduction in Congestion from Smart Parking
	Autonomous Vehicles (Fully and Partially)	~40% Accident Reduction, 10-15% Fuel/CO ₂ Savings
	Resource/Infrastructure Management	35% Fewer Electric Outages, 50% Reduction in Water Leaks, 10% Reduction in Theft



Rotate to the new before it is too late!

- Law of diminishing returns
- Product/Service maturity levels

Digital Value: Digital Economy Potential



Axes to get to a Digital Economy:

1. Digital Customer
2. Digital enterprise
3. Digital Economy

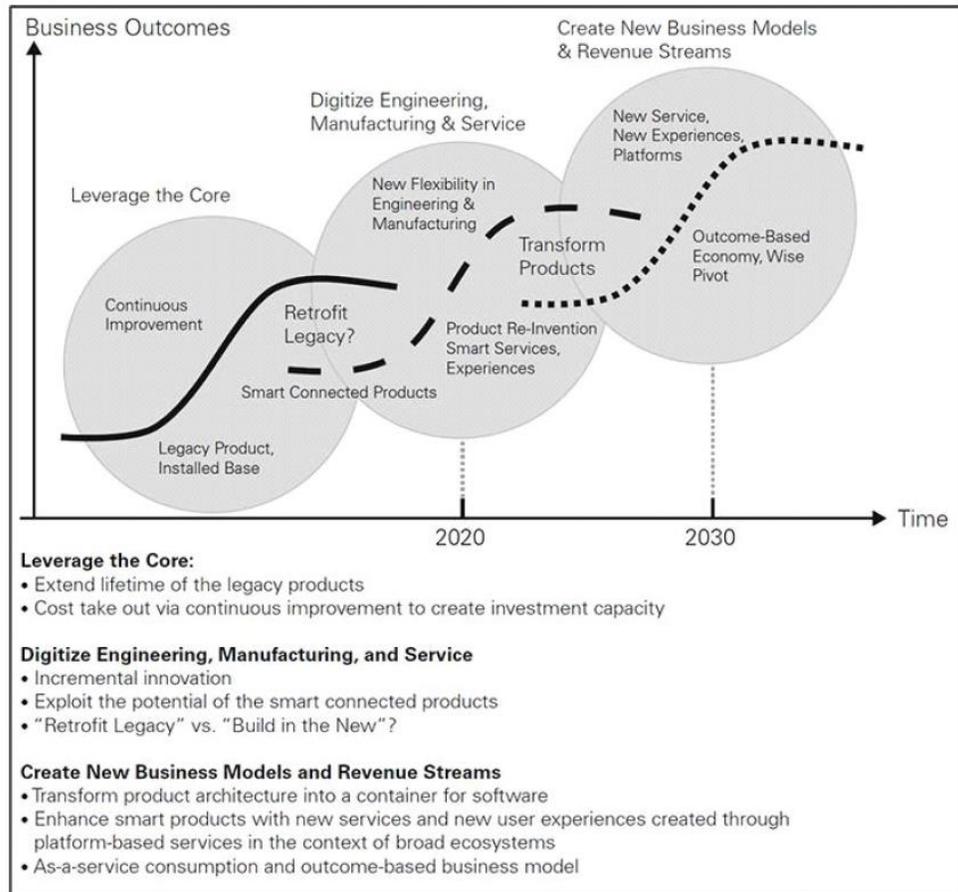
Digital Value Potential:

Research & Development	\$115m	Manufacturing & Supply	\$415m	Marketing & Sales	\$715m	After-sales	\$225m
Analytics-Based PLM Improvement	65	Digital Supply Chain Management	125	Predictive & Personalized Offers	235	Predictive Maintenance	30
Virtual Product Development & Prototyping	50	Digital-Enabled Manufacturing	250	Digital-Enabled Lead Management	195	Personalized After-sales Offers	90
		Asset Efficiency	40	Analytic-Based Media Spend Optimization	100	Digitization of Face-to-Face Experience	10
				Centralized Digital Content Management	100	3D Printing of Spare Parts	5
				POS Digitalization	25	Over-the-Air Features	25
				Online Sales	55	Digital-Enabled Workforce	30
						After-sales Online Store	35
		Support Functions		\$345m			
				Digital-Enabled HR			10
				Digital-Enabled Procurement			75
				Digital-Enabled IT			180
				Digital-Enabled Finance			80

■ Revenue Impact = EBITDA Potential of 13.0% (\$650m)
 ■ Cost Impact = EBITDA Potential of 23.3% (\$1,165m)



Digital Value: Pivot Timely!



The right pivots:

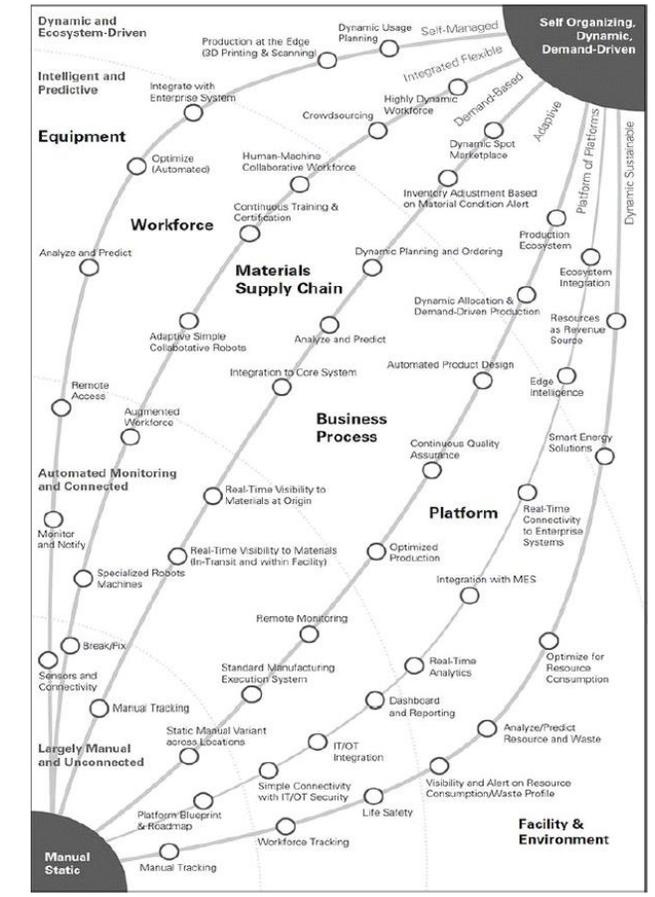
- Don't do business as usual
- Partial Digitization and New Digital Business Models – Do Both
- Unlock Digital Opportunities

Takeaways

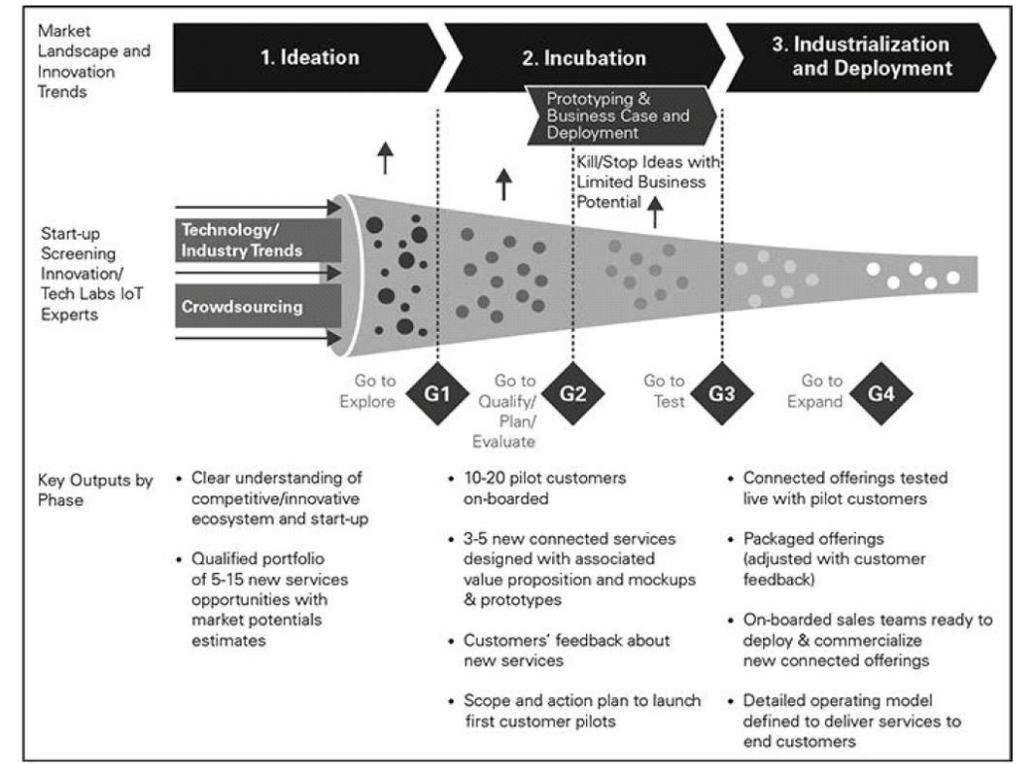
1. *Business as usual is over.* Manufacturing companies can reap huge immediate and future financial rewards from digitizing their whole value chain. Society as a whole will also massively benefit via enterprises' external value spread.
2. *Understanding value is critical* for an industrial business in devising a digitization strategy. Different values accrue from digitizing at different speeds. Different functions in different industrial sectors contain digital value pools of widely varying depth.
3. Although new digital business models have yet to deliver on their promise, only those companies investing ahead of existing and *emerging competitors will capture the potential and establish leadership.*

The Journey: Old to New World

From the **old-world** to the **new-world**:

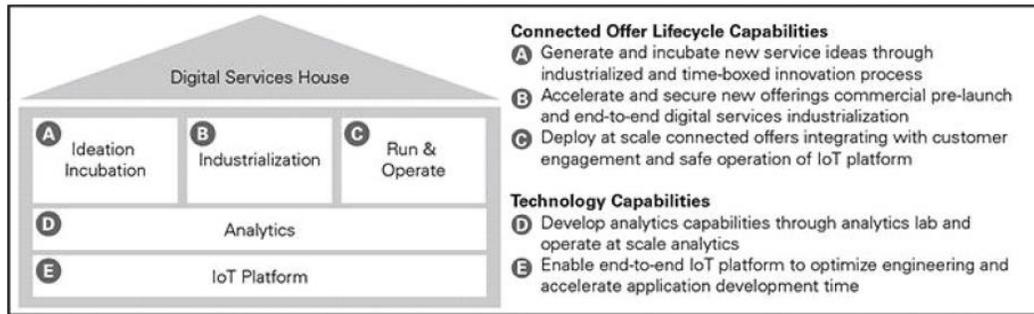


How to go **from a pilot to new service**:



The Journey: Defining new Business Services

Digital Innovation as Service (DIaS):



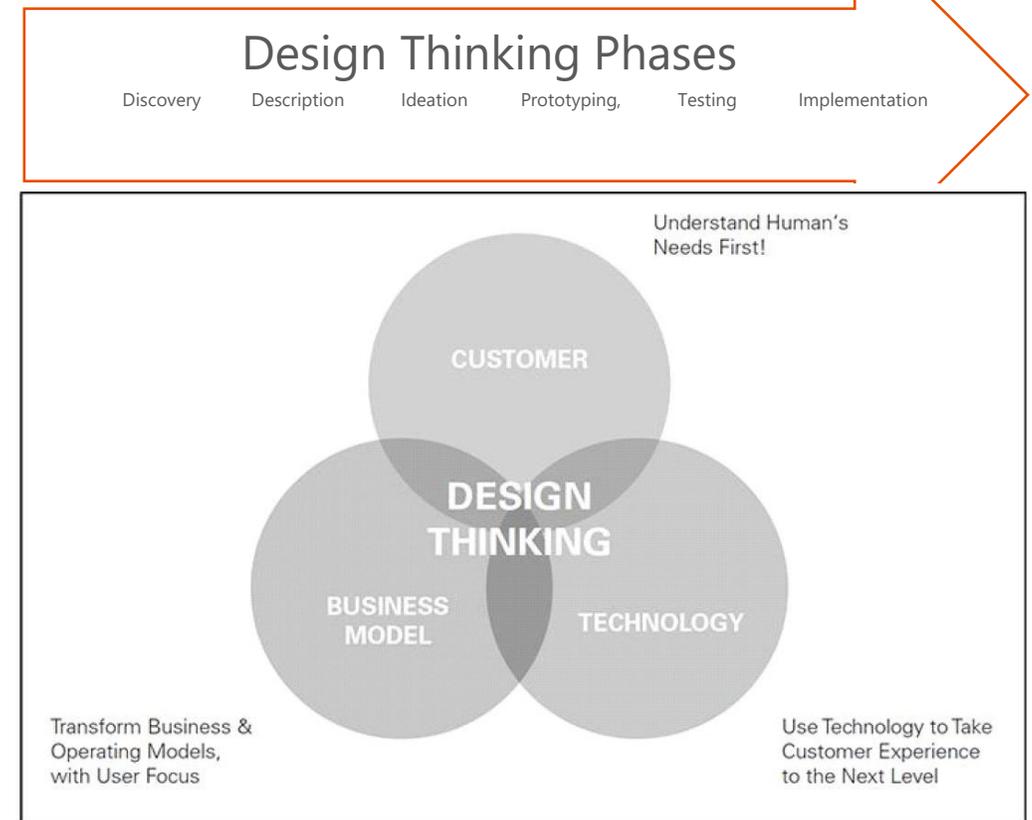
Get going:

- Start-up mentality: **fail fast – fail often**
- Be adaptive: **Plan – Do – Act – Check** cycles to get iteratively better and better

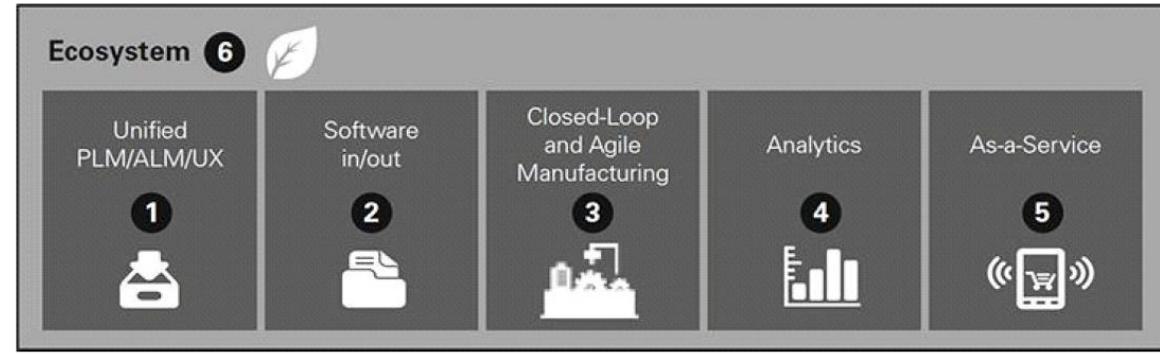


Design Thinking:

speeds up the creation of new services



The Journey: 6 Must-Have Capabilities



1. Synchronize your lifecycle clocks:

- Product Lifecycle Management (PLM)
- Shop floor machines and other productive assets will age more slowly than the software that steers them. Thus requires more integration and synchronization of hardware and software development cycles
- From PLM to DPLM or Digital PLM

2. Embed software intelligence and connectivity

- Enable dumb product to interact with their environments

3. Use analytics to get insight and decision support

- Combining data gathered by connected products and other data sources.

4. Render your manufacturing facilities agile.

- Predictive maintenance and automatic issue detection
- Sensors and control mechanisms now embedded in most machinery

5. Push for transition to as-a-service business models

- "Everything-as-a-service"

6. Create ecosystems and run them.

- No single company will be in a position to own the whole digital value chain in
Multidimensional: ecosystems of suppliers, customers, governments, ...

The Journey: Pitfalls

1. Applying **"traditional" product innovation approaches** in a situation that requires, instead, a dramatic re-think.
2. Developing IIoT initiatives that prioritize **technology before** exploring and validating **the business case**.
3. Choosing ecosystem partners without **developing adequate participation models**.
4. Investing too heavily in technology solutions and not enough in **business capabilities**.
5. Underestimating the **criticality of analytics and data**.
6. Underestimating the impact of a Connected Business transformation on the **operating model**.

The Journey: Roadmap

Roadmap:

Phase 1: Launch a First Pilot and Create the Foundations (4-6 Months)

1. **Ideation / Incubation / Fast prototyping process** – and ability to create value / work together – but with a limited scope
2. In parallel, shape the **IloT-vision** and partnership approach. Decide on
 - scope of customer experience, digital manufacturing, new services and business models
 - business capabilities to be implemented
 - enablers to be developed, such as analytics or an IloT platform.
 - a global business case and business roadmap for digital service capabilities
 - your preferred partnership model

Phase 2: Industrialize – Grow (12-16 Months)

1. Set up the **key required partnership** capabilities (e.g. IloT digital factory)
2. Making sure to **track outcomes and delivered value**, start to implement and execute business and technology capabilities such as
 - ideation
 - incubation and fast prototyping
 - industrialization
 - analytics

Phase 3: Scale (12-24 Months)

Jointly managed across the full digital services initiatives portfolio.



Takeaways

1. *Digitally transforming your company is a challenging task* that may look like a scary upheaval of all functions.
2. No perfect or predefined roadmap exists, but that doesn't mean to do nothing. Figuring out the perfect and detailed roadmap for your company is near to impossible and of little value. *Set the high-level directions for your company and dive in.*
3. *Start-up-style rapid experimentation is the way to go.* The rule of "deploy if successful, move on to the next idea if not" is standard in these firms. There should ideally be multiple rapid-experimentation sites across your enterprise to get the digital ball rolling.
4. There are *six core "no-regret" capabilities* to be targeted for the first steps towards a full-blown IIoT-powered enterprise: synchronizing the lifecycle clocks, embedding software intelligence and connectivity, using data analytics, rendering manufacturing facilities agile, understanding business as a service, creating and running smart ecosystems.
5. *Try out each of these six "no-regret" capabilities and then combine.* The benefits will only increase as you do so. This will contribute to quick wins and long-term success

Data Analytics: Data Value Chain

From data to information. **Raw data has now value.** Industrial Analytics Opportunities:

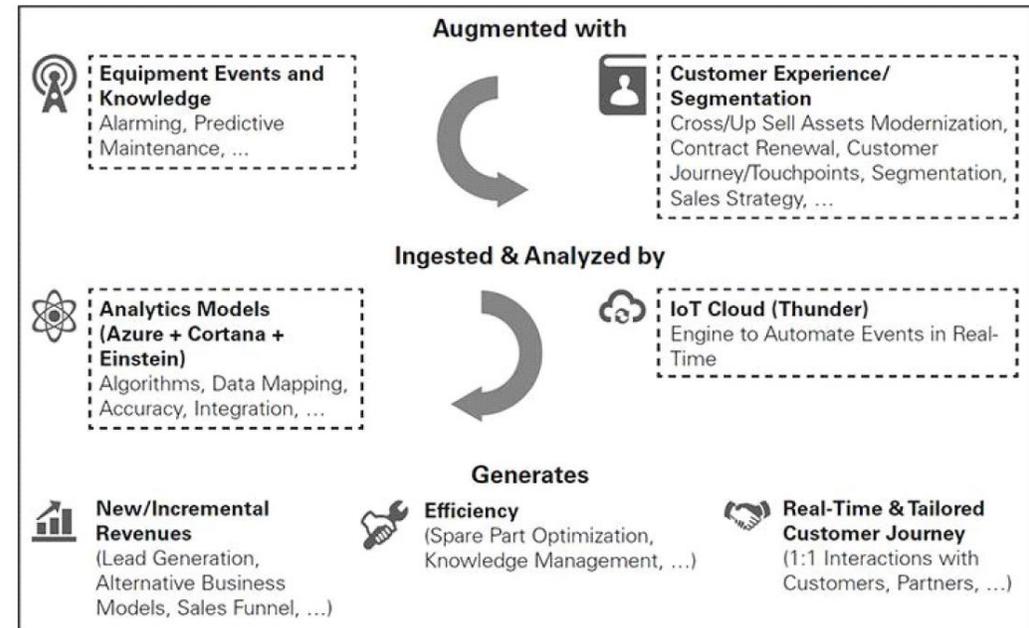


Customer Insight Driven	Supply Insight Driven			Aftersales			Asset Management
Innovation & Product Engineering	Manufacturing	Materials/ Supply Int'l	Logistics	Warranty & Quality	Spare Parts	Customer Services	
Control Tower (Demand Sensing, Inventory Optimization, E/MOQ)							
Connected Business Analytics (Analytic Specific Solution Covering Process End-to-End)							
Product Portfolio Optimization	Digital Manufacturing Cockpit	Inventory Optimization (Part of CT)	Flow Path Optimization	Warranty Analytics	Spare Parts Forecasting	Predictive Maintenance Solution for Fleet Management	Root Cause Analytics
R&D Control Tower	Root Cause Analysis for PRD Quality	E/MOQ (Part of CT)	Service Level Optimization	Warranty Fraud Detection	Spare Parts Inventory Optimization	Customer Service Analytics	Predictive Maintenance Optimization
Development Time/Cost Analytics	Predictive Asset Maintenance	Replenishment Optimization		Warranty Early Warning	Spare Parts Pricing Optimization	Dealer Performance Analytics	Asset Reliability
Size & Pack Optimization		Contract Management		Early Anomaly Detection for Connected Products			Field Force Optimization
PRD Complexity/ Parts Rationalization		Procurement Analytics					
Embedded Software Analytics							

Data Analytics: Using the Power of Data

1. **Optimized customer experience:**
connected products know what is now and what is next
2. **Optimized product performance:**
precise predictions about when each part will need to be inspected, maintained or replaced.
3. **Optimized workforce efficiency:**
efficient people
4. **Optimize operational efficiency:**
efficient schedules.
5. **Optimize the portfolio of new products and services:**
new customer propositions

IoT Lead Generation:
Anticipate customer's demand



Data Analytics: Technological Evolution

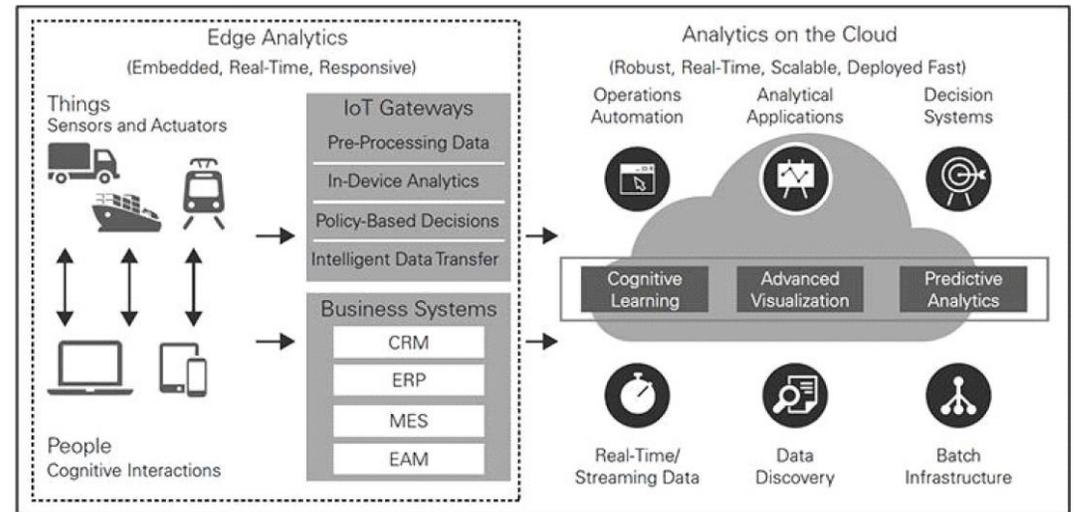
From Mere Monitoring to a Real Predictive Maintenance Practice

Data Analytics Strategy:

- the remote processing power of cloud computing
- emergence of advanced software analytics
- self-regulating sensor-and-actor networks
- the trend towards "connected everything"
- social media data drives real-time marketing

Edge Computing:

- Deploy analytics close to the data generating equipment. Data crunching no longer in the back office.
- A decentralized data analytics landscape.
- Due to its low-transport latency, edge computing can deliver better accuracy and timeliness.
- Data privacy and security regulation also come into play here.

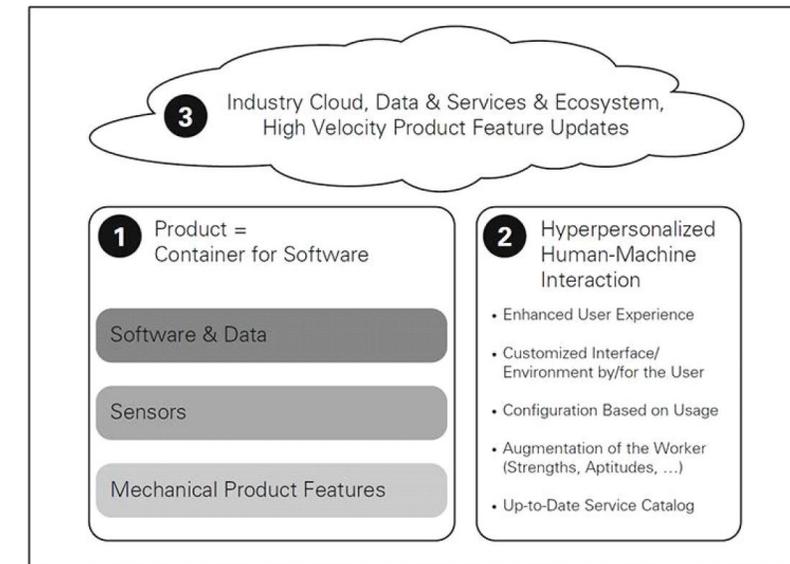
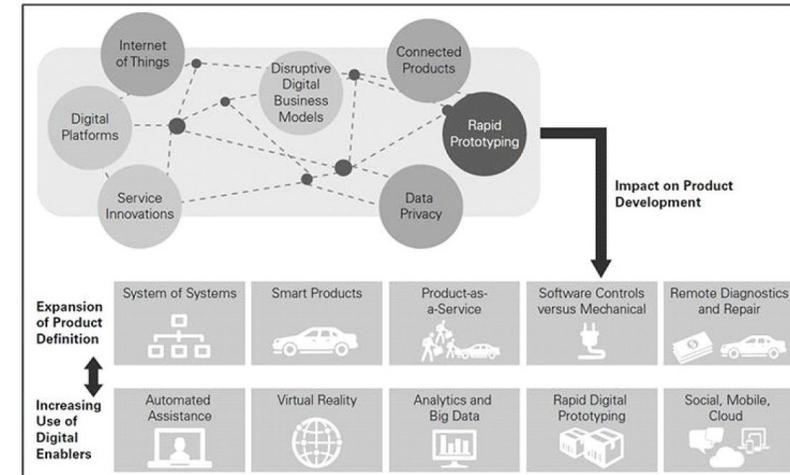


Takeaways

1. *Data and the operational and commercial insights extracted from it* are going to be the lifeblood of the industrial sector in the 21st century.
2. All companies have a wealth of unleveraged legacy data. *Enriching this data will drive significant value* in five main areas: (a) customer experience, (b) product performance, (c) workforce efficiency, (d) operational efficiency, and (e) portfolio optimization of new products and services.
3. *Start progressively exploiting operational data hidden in your existing IT systems.* Once the first pilots have delivered value, integrate external data. As your products become smarter and more connected, make the direct link.
4. *Launch small, safe analytics pilots focused on specific use cases.* Do so in as many areas of your company as possible and scale your data platform as soon as success clicks in.
5. Set up a **cross-enterprise analytics capability** to support all these initiatives within your company. Leverage data analytics service providers to accelerate the process and run pilots targeting both top-line and bottom-line opportunities.

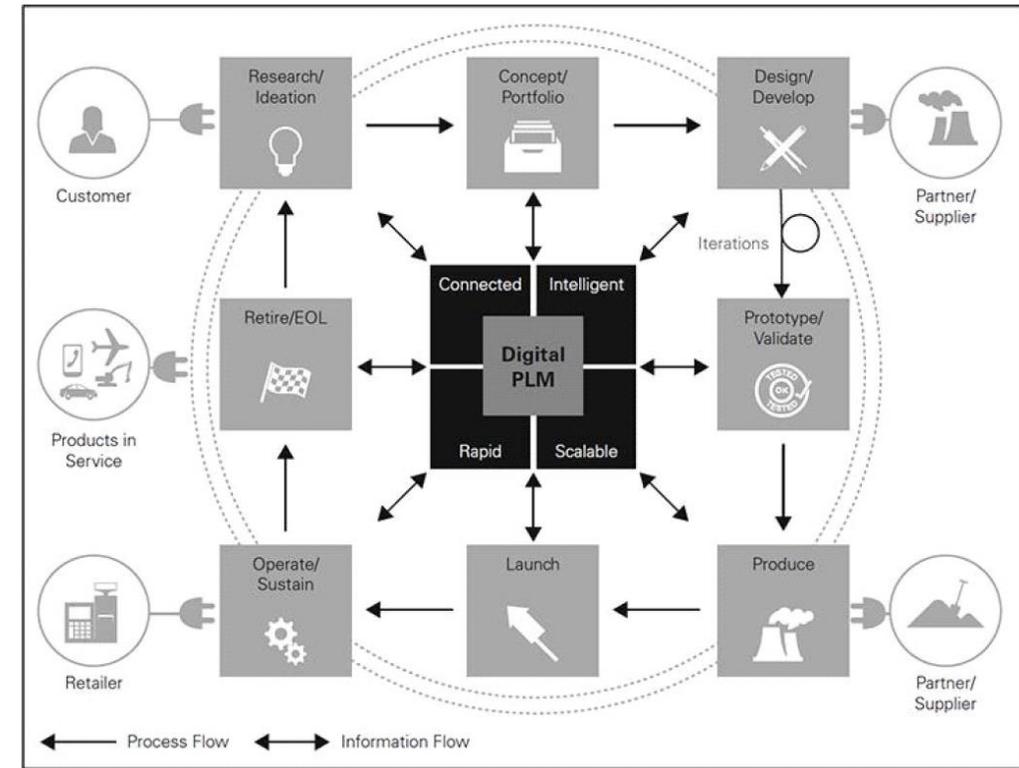
Digital Product Development: Living Products

- DPLM = Digital Product Lifecycle Management
- Dumb vs. Connected vs. Living
 - “Dumb”: static and detached pieces of physical hardware
 - “Connected”: objects, devices and machines equipped with sensors, controlled by software and connected to the Internet
 - “Living”: duplex connection sensor data out and changed configuration – behavior in. Object tied into feedback loops with their users and their creators

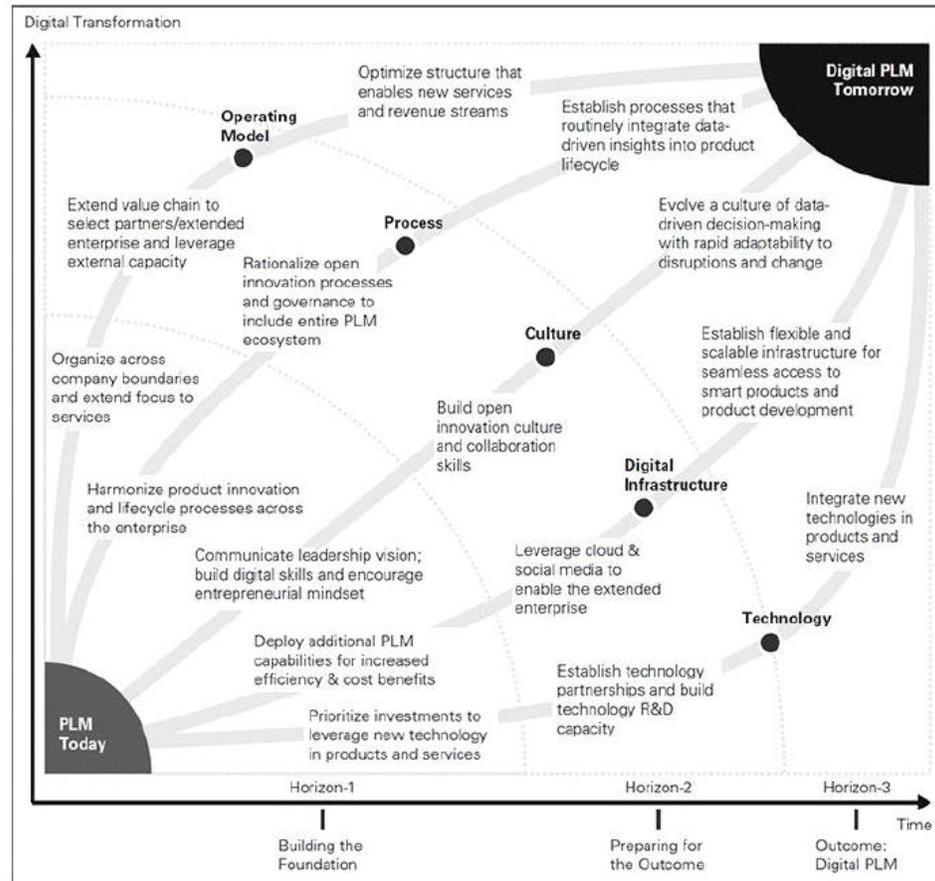


Digital Product Development: DPLM Cycle

- DPLM Environment:
 - **Rapid.** minimum response time between different enterprise functions
 - Design-Prototype-Test loops
 - Simulation-led design
 - Prototyping : 3D-printing
 - **Scalable:** expansion and contraction
 - Liquid: lot-size-one to lot-size many
 - **Intelligent.** Processes linked with powerful analytics tools to exact product or service features
 - Permanent reinvention, reconfiguration, hyperpersonalization, and real-time adaptive user experience
 - **Connected:** holds together the whole PLM approach.
 - From ideation, concept, design, prototype, validation, manufacturing, usage and support
- The business will eventually itself be embedded in an ecosystem of external suppliers, partners, sub-contractors and customers.
- **Digital twins** of physical products: the data representation in analytics of a physical product
- 4D Design: 3D Printing + Self Assembly



Digital Product Development: DPLM Roadmap



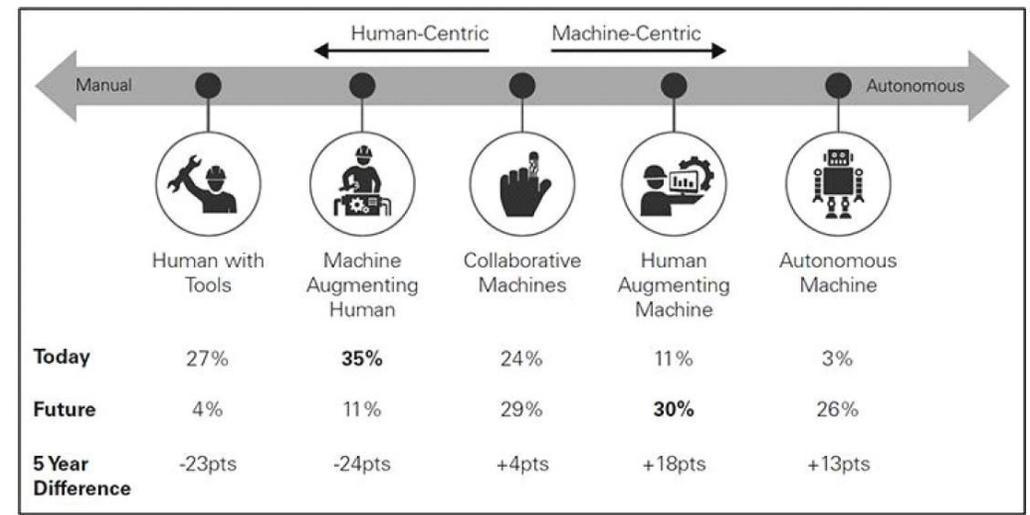
Takeaways

1. The entire process chain around developing and designing industrially manufactured items is redefined by *the emergence of the smart and connected product*.
2. *Strengthen your software capabilities*. There will be more and *more software embedded in your products*. Software-enabled services and user experience will be critical, you need to build at pace your software capabilities.
3. A robust Digital Product Lifecycle Management (DPLM) must be the starting point for product development in the emerging era of *data-driven Living Products*. Set up the right DPLM capabilities: *agility, scalability, software intelligence, and unified data connectedness*.
4. Synchronize, but do not lock together, the two clocks – and ensure that marketing optimizes the resulting propositions and improvements with regard to the customer.
5. End-to-end. Let your DPLM run through your whole business and become its DNA.

Connected Workforce: Humanoids and Robots

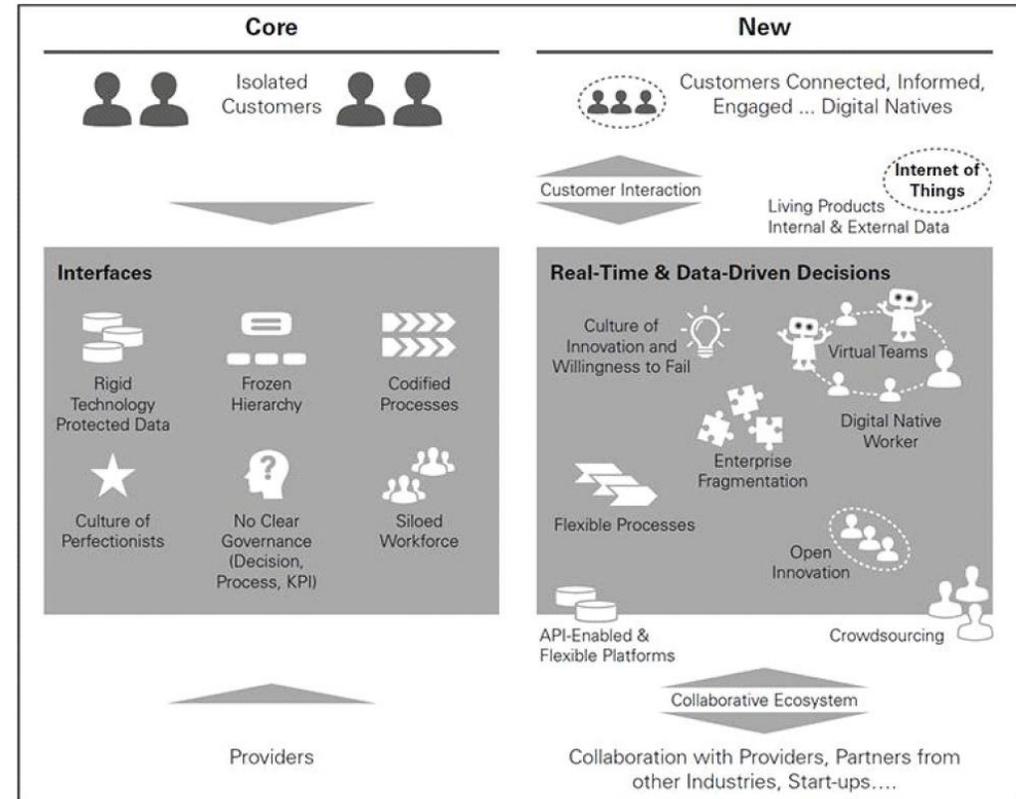
- The **connected industrial worker** will be a highly productive, data-based decision-maker and supervisory presence
- Shop floors will host a **blended workforce**, humans and machines jointly delivering outcomes neither could produce alone.
- **Human ability will not be supplanted by machine capacity**, it will be complemented by it.
- **Humanoid vs. Robots:**
 - Humanoid: AI enhanced with human brain power
 - Robot: human extended with robotic physical or AI processing power

Cobots:
symbioses between
humans and robots



Connected Workforce: New Work Organization

- Connected workers must **iterate, adapt, and be flexible**
- **Digital environments** require more flexibility and speed in thinking and acting than analogue environments.
- The ability to work by modes of iteration, adaptation and even experimentation will become important capability.



Connected Workforce: Management Trust Issues

Managerial Trust Issues around Machines:

- Managers at all levels believe machines will make them more effective and their work more interesting. Yet only a few managers would readily trust the advice of intelligent IT systems in making business decisions in the future.

The new style manager should:

- **Treats Intelligent Machines as Colleagues**
- Focuses on Judgment Work
- **Does "Real" Work – Passing off Administrative Tasks to AI**
- Collaborates Digitally across Boundaries
- Works Like a Designer

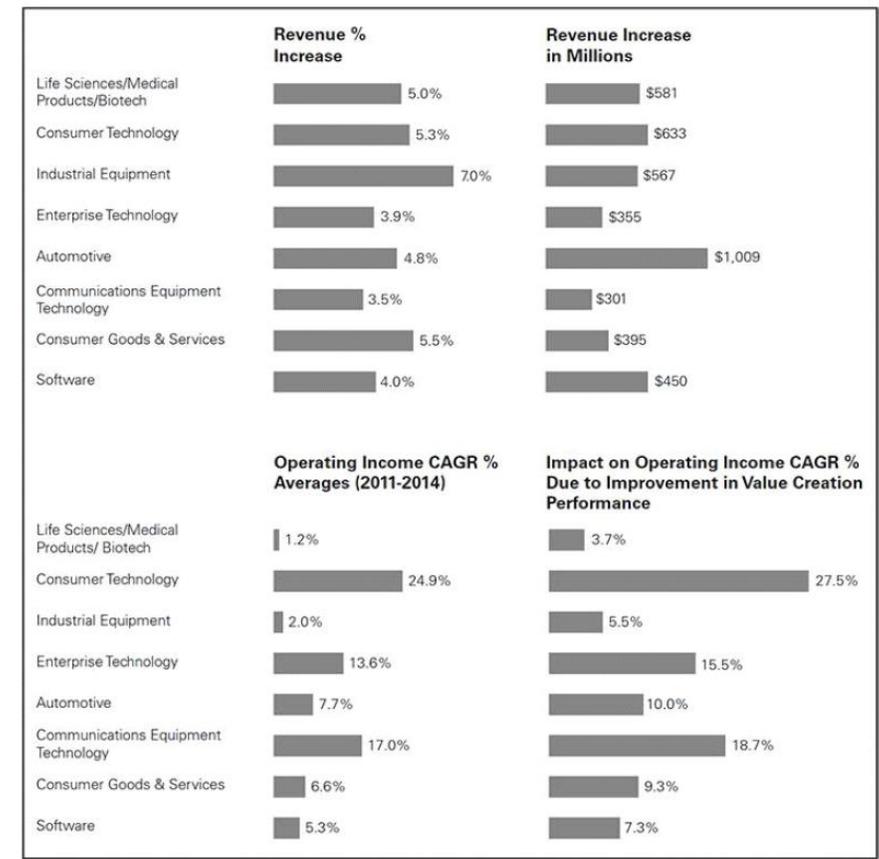
Takeaways

1. The industrial worker of the future will be a data-based decision-maker and supervisory presence on the factory floor, in the engineering centers or on the field servicing products.
2. All business roles and functions will be affected as *cobots and artificial intelligence* will permeate the enterprise resulting in a *blended workforce* from the shop floor to the boardroom.
3. Don't wait – proactively manage this revolutionary change in your company.
4. *Craft new training and recruitment strategies now* – start-up skilling your workforce and recruiting the talent now as the right skills will be in short supply. Explore new digital workforce models such as crowdsourcing.
5. Focus on your line managers, they will be critical in seeding and steering the change of your entire workforce while undergoing significant changes themselves.

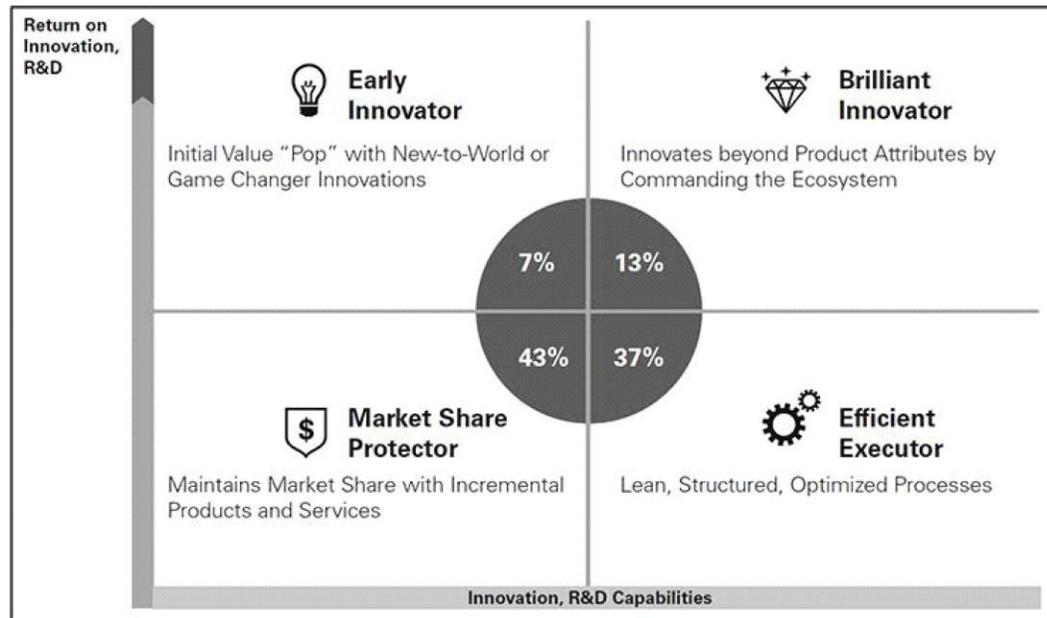
Innovations in the New: Let Them Come – We'll Build IT

- No longer bigger, better, faster products and services but more accurate: anticipating what customers require, even before the customers sense it themselves
- Old-Style – New Style Innovations:
 - Old-style is only supply side driven. "What can we do to get buyers to like what we already have by tweaking the offering?" = Demand-driven approach to innovation
 - New-style is disruptive "What can we do to disrupt – to give clients what they don't yet know they want?" = Outcome-Economy driven
 - From "Build it and They Will Come" vs. "Let Them Come and We Will Build it"

Impact on innovation approach:



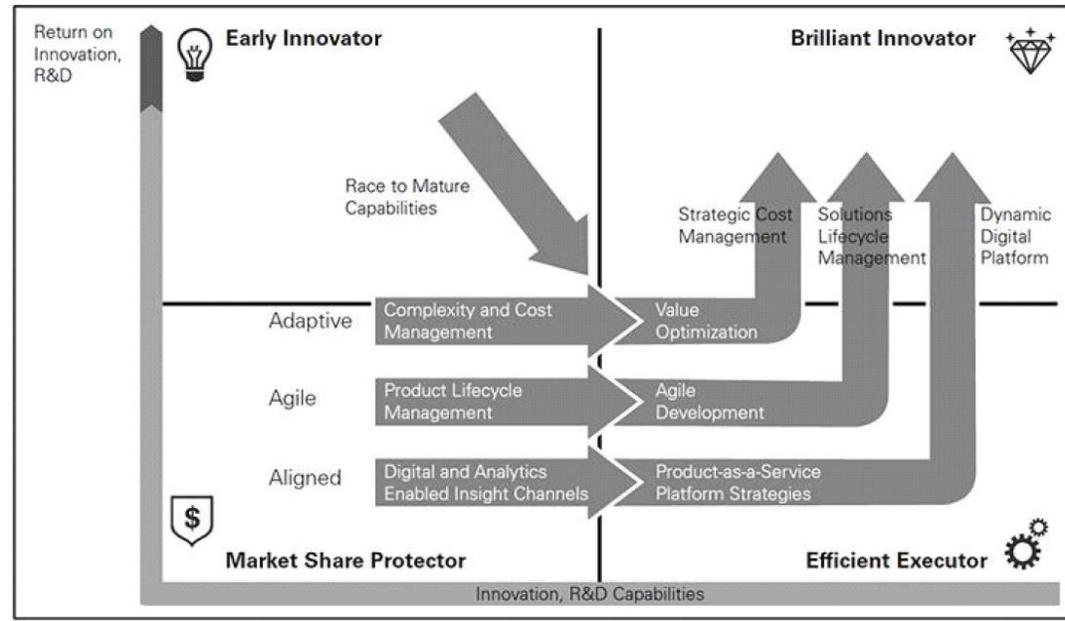
Innovations in the New: Innovator Types



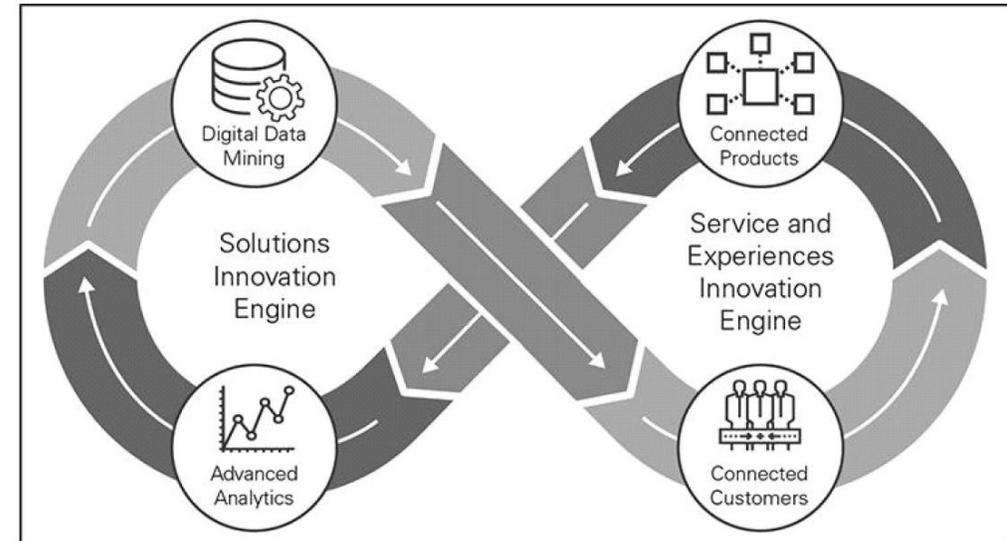
- **Market Share Protector.**
 - This describes a business basically following the old innovation rulebook, spending on research and development fairly moderately, just enough to come up with enough product and service innovations to defend a status quo market share.
- **Efficient Executor.**
 - This is an enterprise with significantly more innovation efficiency thanks to a much more stringent policy towards streamlining innovation processes
- **Early Innovator.**
 - This is a business with agile and responsive start-up-style innovation processes, leading to breakthrough innovations resulting from a "light-bulb moment."
- **Brilliant Innovator.**
 - It combines the Efficient Executor's systematic innovation efficiency with the Early Innovator's innovative power and resulting return levels.

Innovations in the New: Innovator's Road Map

Become a **Brilliant Innovator**



Solution and Services Innovations in Concurrency



Innovations in the New: The Incubator

- Align your **business strategy** and your incubator strategy:
 - The **degree of freedom** is significantly wider for an incubator than traditional R&D or innovation functions, but it is essential to define innovation priorities.
 - Incubation needs to be focused to **avoid being pulled in too many directions**.
- Position your incubator at the **proper level within the organization**:
 - The service needs to directly report to a **company's innovation board structure**.
- Develop the **ecosystem with the right partners**:
 - Collaborate with universities, other start-ups and third parties that complement them and supplement **capability gaps**.



Takeaways

1. Experience beats product. Improved customer experience is where companies in the industrial sector have seen the greatest success from innovation in recent years.
2. New approaches to innovation can drive significant financial returns especially in sectors such as industrial equipment, consumer goods and consumer electronics.
3. Most industrial companies have very similar innovation investment profiles. *The difference comes from the "how" rather than the "what."*
4. Open up to the outside. A new view of competitors and the ability to work in *more open and fluid ecosystems are key.*
5. *Brilliant Innovators* are solution-centered, powered by insights, drive pivotal leadership and operate at multiple speeds.

Eco-Systems: What?

Ecosystems:

- Is a company's **competitiveness network**.
- Are networks (often open) of strategic business partners with the common aim of **driving growth and fostering innovation**
- Collaborate in order to **innovate more quickly**, to amalgamate **complementary capabilities** and to **react to fast-moving consumer and business markets**

Leveraging start-up power:

- Good ideas put to best use fast:
 - Innovation is key for start-ups, but so is go-to-market activity.
- Good ideas exist already in a Start-up
 - It is actually difficult to imagine any problem not already being addressed by a start-up somewhere today,

Eco-Systems: How?

Lessons Learned	
Set the Direction	<ul style="list-style-type: none"> • Clear definition of a 4-5 year future state is critical to the success of the overall ecosystem incubation
Executive Sponsorship	<ul style="list-style-type: none"> • Strong, committed executive sponsorship of the governance structure • Process that allows for quick decision-making and issue resolution
A Hands-on Steering Committee	<ul style="list-style-type: none"> • The governance structure should help with the execution of the Ecosystem Strategic Partnership strategy, e.g. identifying and facilitating other ecosystem participants
Diversify KPIs	<ul style="list-style-type: none"> • Define metrics and KPIs that measure the success of the Ecosystem Strategic Partnership over time; do not rely on sales numbers only
Channels, Channels, Channels	<ul style="list-style-type: none"> • Activate the channels from the very top; have a holistic approach to a client problem, industry channels, and operational group
Solution Roadmap	<ul style="list-style-type: none"> • Do not build a large portfolio of solutions; validate hypotheses with clients, industry SMEs, etc. before development; refine before investing in full-on development to increase solution ROI • Consider customer proof of concepts a solution as part of the contract
Manage Global Scope	<ul style="list-style-type: none"> • Don't spread resources too thin too early • Prioritize and manage geographic scope with global support teams
Early Wins/Intercept Inflight Opportunities	<ul style="list-style-type: none"> • Secure early wins to build and hold momentum and "mindshare" within each organization
Flexible Operating Model	<ul style="list-style-type: none"> • Define a flexible operating model to remain responsive to market • Ongoing joint innovation performance tracking and program management process
Change Management/Cultural Alignment	<ul style="list-style-type: none"> • "One team" philosophy (process, metrics, attitude) • Treat the Ecosystem Strategic Partnership like a newly created business unit • A vision that allows the Ecosystem Strategic Partnership to focus on high-value activities that will drive results

Open-Innovation-as-a-service:

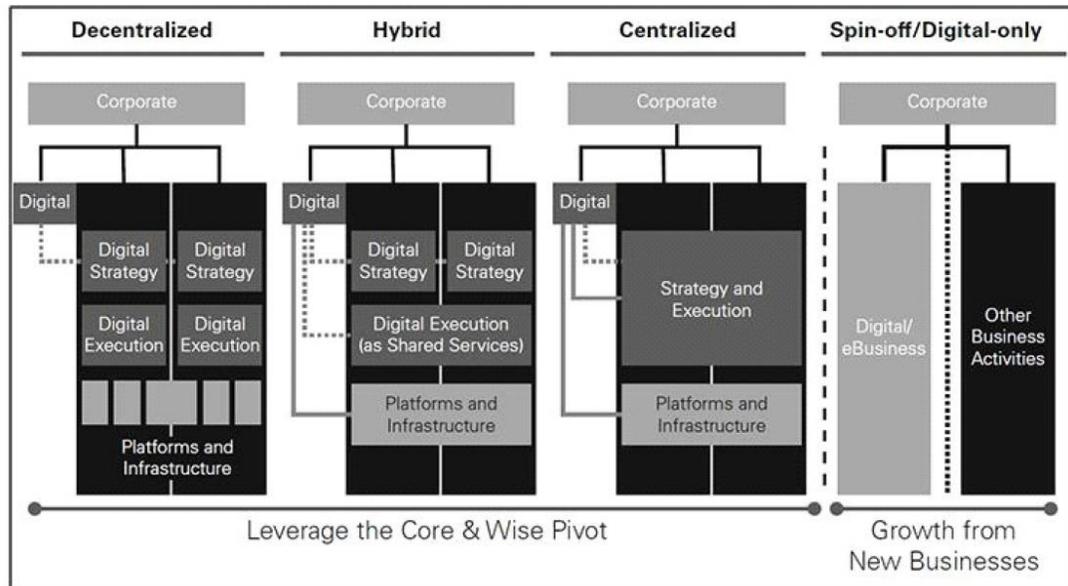
- **Define the Possible:**
 - a business objective is stated.
- **Prove It Matters:**
 - proof of concept proposals are funded and the innovation teams can start to engage
- **Make It Real:**
 - Deploy the solution in the real world with all its complex factors playing

Three Stages of Maturity:

- **Connected product:** a product or some form of connected machinery
- **Smart service:** platforms provides analytical algorithmic power to filter valuable insights from incoming product data.
- **System of systems:** The aggregator platforms offer all participants even bigger service opportunities.

Eco-Systems: Business Models

Making way for new business models:



Asset-Heavy vs. Asset-Light networks

Enterprise Type	Structure		Examples	
	Hierarchical Organization + Physical Assets	Platform Ecosystem	Companies	Platform
Asset-Heavy			Daimler Siemens GE Samsung	Moovel MindSphere Predix Tizen
Mixed			Apple Amazon Xiaomi	App Store App Store MI App Store
Asset-Light			Google Uber Airbnb Priceline	Google Play Uber App Airbnb App Booking.com

- **Asset-heavy:** find it difficult to quickly accumulate enough organizational capital to run a ecosystem external or semi-external partners
- **Asset-light:** find it difficult to manage bits of the ecosystem they do not fully control.

Eco-Systems: Recommendations

Ensure:

- **Openness:** software platform ecosystems need standardized modules for developers to remain inventive (e.g. API's)
- **Pricing sophistication:** traditional business models may make managers reluctant to give product or services away for free, such practices can be highly successful from a platform perspective.
- **Flexibility and agility:** be aware how big its business could grow and how fast. Ecosystem must be flexible to quickly adapt to new trends in the market or new entrants to the ecosystem.
- **Personalization:** Targeting individuals and organizations across all channels at scale relies on mass personalization.
- **Cybersecurity:** customers need to be sure the right safeguards are in place and their privacy is uncompromised.

Takeaways

1. Data-driven smart services will shape the New of the industrial world. They will allow for new hyperpersonalized and context-specific user experiences created through the connection of smart products with platform-based services using the power of broad ecosystems.
2. *Ecosystems and platforms* are becoming innovation and growth engines for most manufacturing enterprises. This change will be fast, disruptive and redefine the rules of competitiveness.
3. *Hold on to your data. In a data-driven economy, it becomes a product in itself* – one with immense value.
4. *Ecosystem yourself.* Competition between products and companies will be replaced by competition between fluid digital platform driven ecosystems. Start connecting your enterprise and products to the outside.
5. *Anticipate and lead from the front in the move towards an ecosystem.* Setting up partner ecosystems and embedding your organization in them takes time, cuts through the organization and implies a profound change in mindset. It will not happen by itself.



Final Remarks

Observations:

- From push to pull economy
- Technology makes manufacturing easier
- Business as usual seizes to exist

