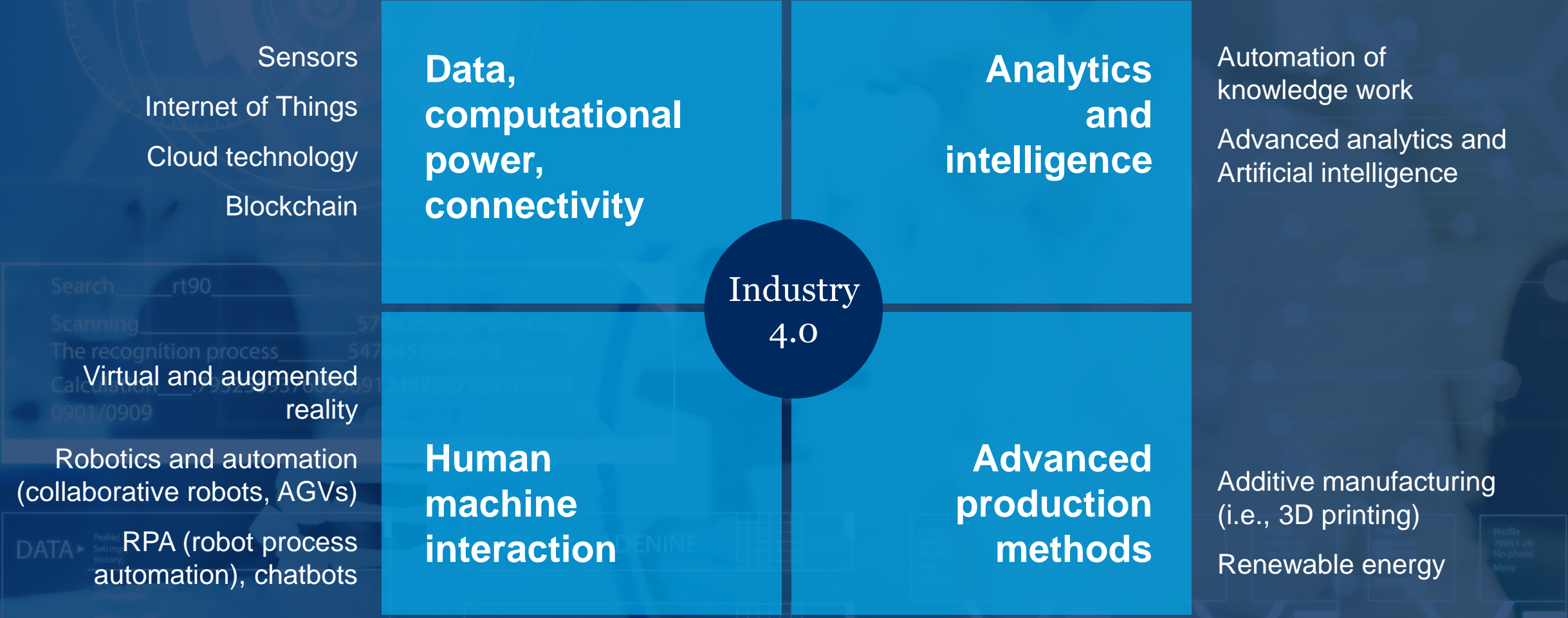# Transforming the supply chain in face of a changing global landscape

Leveraging Ops 4.0 to increase productivity and maximize the supply value chain

"Digital is like teenager sex: everyone talks about it, nobody really knows how to do it, everyone thinks everyone else is doing it, so everyone claims they are doing it"

Dan Ariely

Industry 4.0 is revolutionizing current supply chains along four dimensions...

Sensors

Internet of Things

Cloud technology

Blockchain

Data, computational power, connectivity

Analytics and intelligence

Automation of knowledge work

Advanced analytics and Artificial intelligence

Industry 4.0

Virtual and augmented reality

Robotics and automation (collaborative robots, AGVs)

RPA (robot process automation), chatbots

Human machine interaction

Advanced production methods

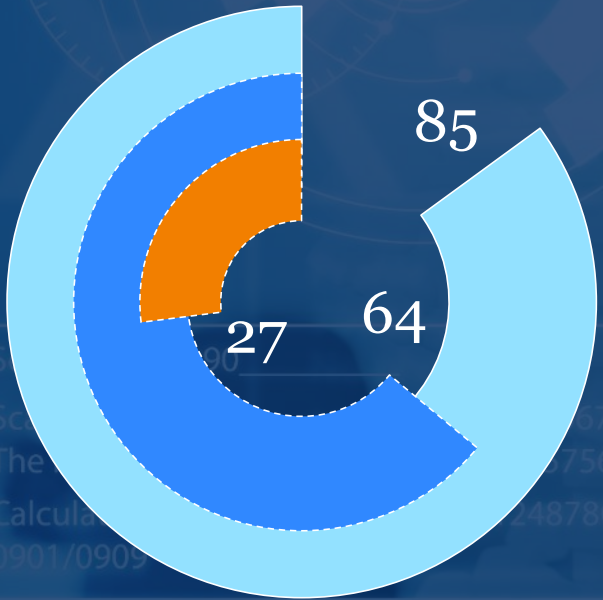Additive manufacturing (i.e., 3D printing)

Renewable energy

Top priority

68%

Industry 4.0 is a
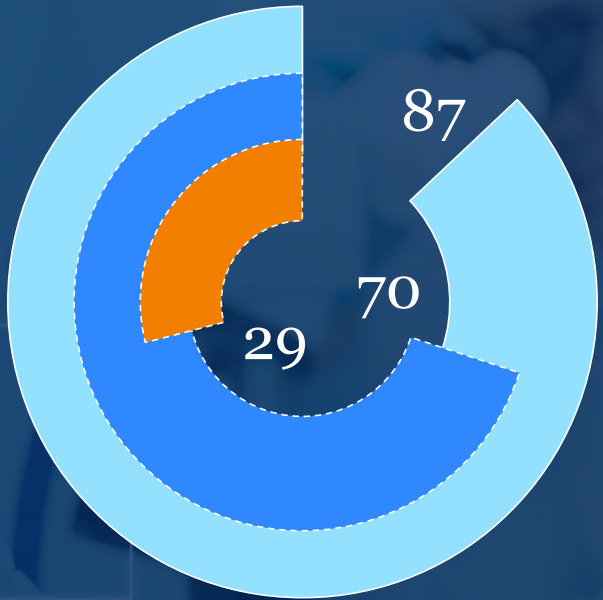top priority for
manufacturers

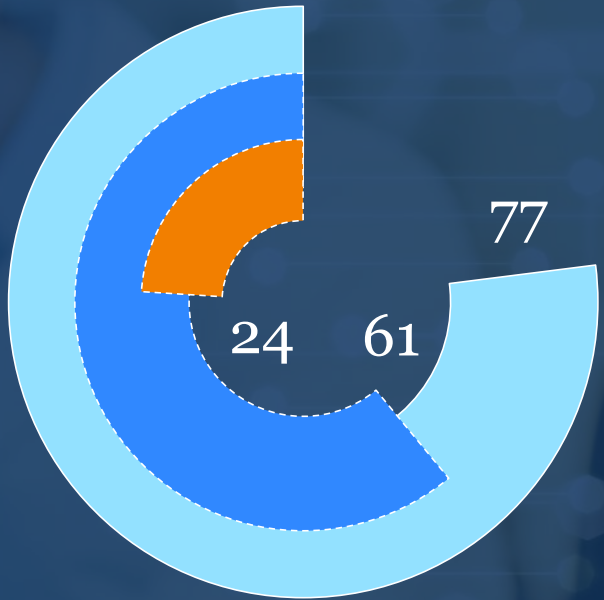# While industry 4.0 solutions are adopted consistently, most companies are not deploying at scale

○ Relevance ◎ Pilot phase (or advanced) ◎ Rollout phase

Connectivity
85
27 64

Intelligence
87
29 70

Flexible automation
77
24 61

Many digital innovations are also still emerging from "pilot purgatory"

Legend: ● Plan ● OM&D ● Enable

Adoption rate (y-axis)

1. Autonomous container
2. Human-free container ships
3. Fully autonomous (driverless) truck
4. Ergonomic exoskeletons
5. Automation of planning/machine-learning
6. Augmented reality assistance for truck driving and delivery activities
7. Drones for delivery
8. Real-time and mobile S&OP
9. Micro-segmentation
10. Automated profit-optimization in planning
11. Early warning system for SC risks and deviations
12. Nearly autonomous truck and truck convoying systems
13. Cloud logistics platform
14. 3D printing for slow movers
15. Joint planning in cloud
16. Predictive shipping
17. Delivery to trunk of car

18. Closed-loop planning
19. Dynamic end-to-end network optimization and warehouse design
20. Data mining and automated root-cause analysis for performance management
21. Range imaging sensor systems
22. Fully automated ITEM picking / Robotics
23. Real-time performance transparency and target adjustment
24. Real-time re-planning
25. Uberization of transport
26. Gesture and motion tracking
27. Wearable user interfaces/Smart glasses
28. Optimizing shipping by influencing customer order behavior
29. Analytical evaluation of manual inputs to demand forecasts
30. No-touch order processing

31. Predictive maintenance and augmented reality maintenance assistance
32. ATP based on real-time constraints
33. Real time point-of consumption inventory tracking
34. Predicting optimal delivery times
35. Information platforms
36. Smart shelves
37. Smart packaging
38. Online auction of logistic capacity
39. Location and condition control
40. Predictive analytics in demand planning
41. Fully automated CASE picking/ Robotics

42. Use of demand probability distributions
43. Advanced Warehouse Resource Planning & Scheduling
44. GPS-based map generation & customer location determination
45. Asset utilization & yard management for logistics assets
46. Onboard units for economic driving
47. Advanced Transport Management Software (TMS) and dynamic routing and load identification
48. AGV-based goods-to-man solutions

49. Smart public and personal parcel lockers
50. Automated replenishment
51. Vehicle tracking and data mining

52. AGV solutions for internal transport
53. Online order monitoring

We surveyed **76 Supply Chain experts** with a combined prof experience of **1000 years** from different industries on
- Current state in cycle
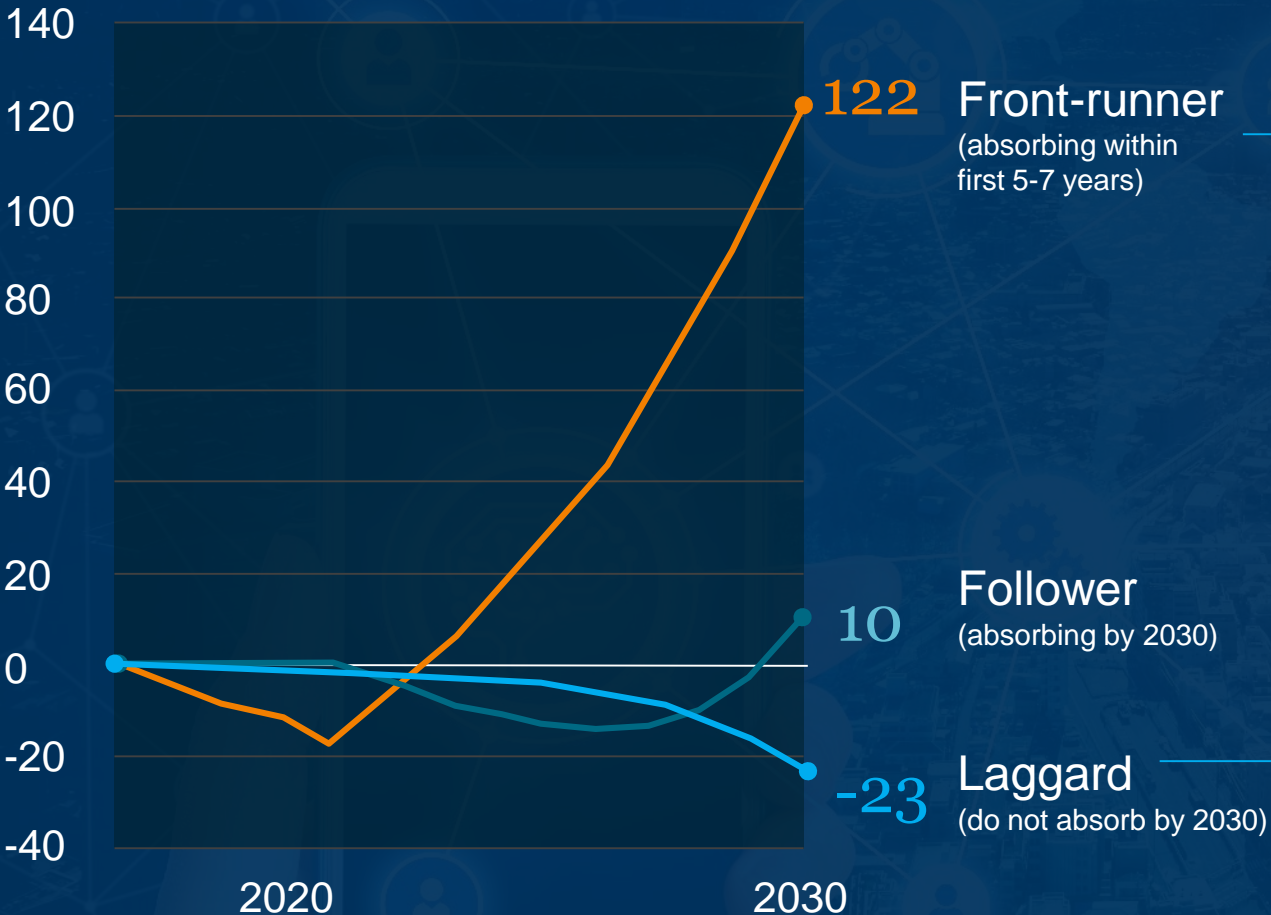- Time to broad use/pilot

Cycle stages (x-axis):
1. Vision
2. Technological pre-requesites developed
3. Innovation developed
4. Pilot use
5. Selective use
6. Broad use (or failure)
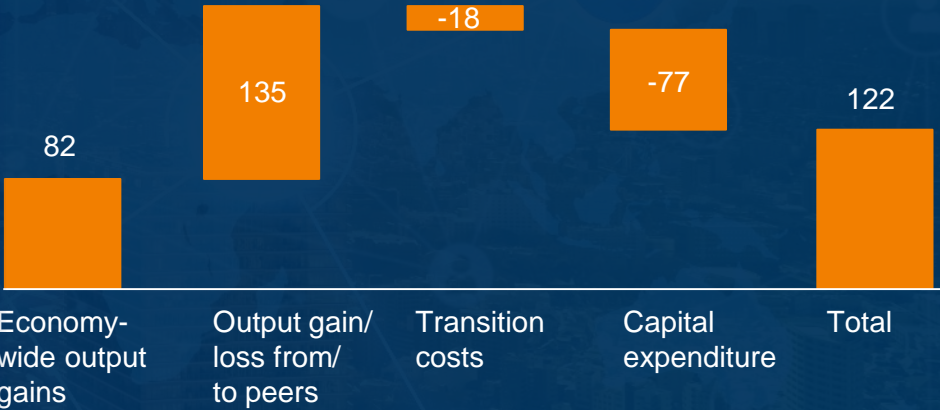— Cycle stages

Broad use / Failure

Early 4IR technology adoption pays off

Front-runners are expected to significantly outperform followers and laggards

Relative changes in cash flow by AI-adoption cohort
Cumulative % change per cohort

122 **Front-runner**
(absorbing within first 5-7 years)

10 **Follower**
(absorbing by 2030)

-23 **Laggard**
(do not absorb by 2030)

Front-runner breakdown
% change per cohort

Economy-wide output gains	Output gain/loss from/to peers	Transition costs	Capital expenditure	Total
82	135	-18	-77	122

Laggard breakdown
% change per cohort

Economy-wide output gains	Output gain/loss from/to peers	Transition costs	Capital expenditure	Total
11	-49	-4	19	-23

4IR Lighthouses apply digital tools at scale to significantly increase their performance

Lighthouses

Phoenix Contact
Industrial
Automation, DE

Sandvik Coromant
Industrial Tools, SE

Procter & Gamble
Consumer
goods, CZ

Siemens
Industrial Automation
Products, CN

Tata Steel
Steel Products, NL

Danfoss
Industrial Equipment, CN

BMW Group
Automotive, DE

Fast Radius with UPS
Additive
Manufacturing, US

**Johnson & Johnson
DePuy Synthes**
Medical Devices, IR

Haier
Home Appliances, CN

Schneider Electric
Electrical
Components, FR

Bayer
Division
Pharmaceuticals, IT

Bosch
Automotive, CN

Saudi Aramco
Gas Treatment, SA

Foxconn Industrial Internet
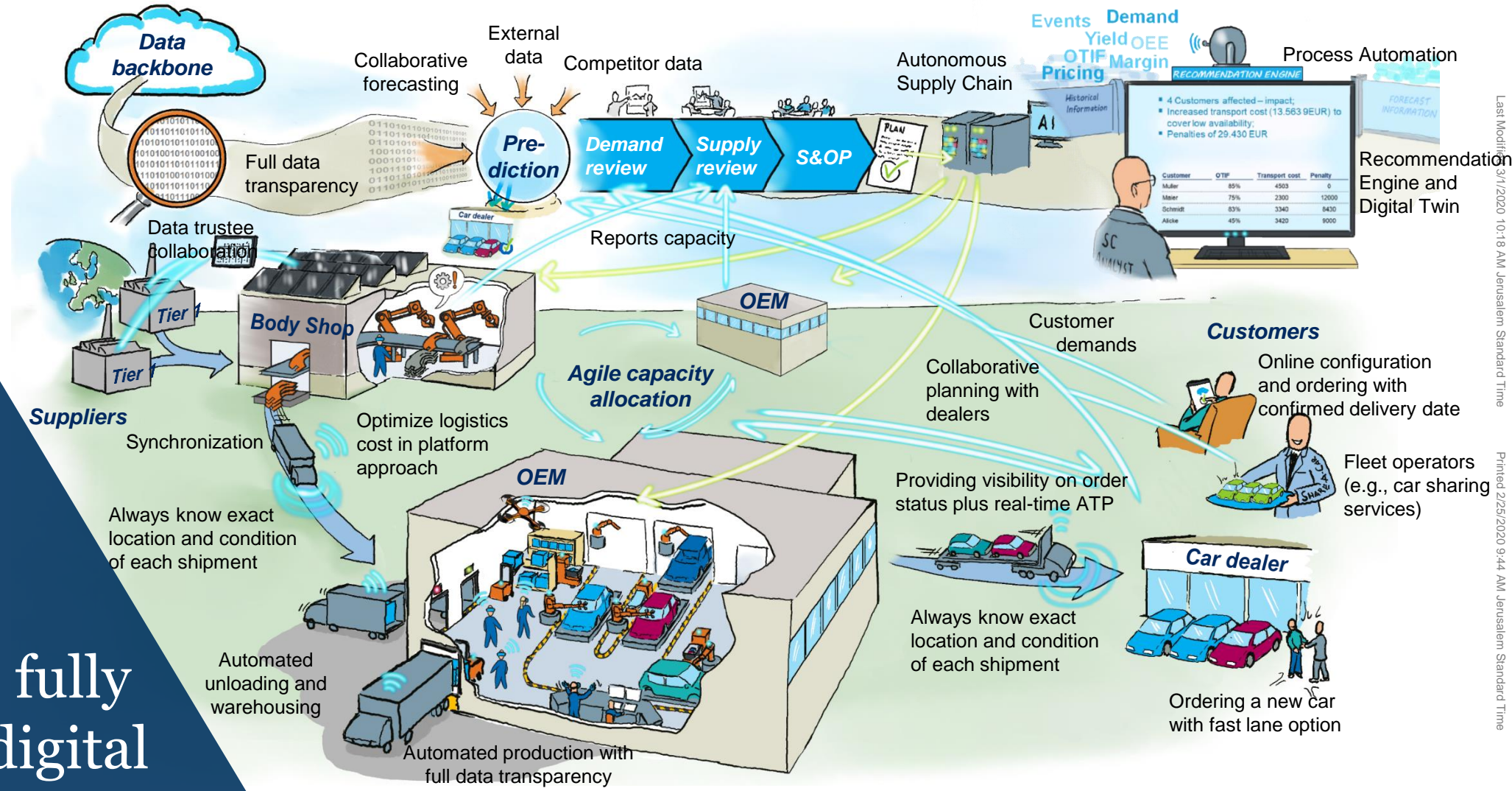Electronics, CN

Rold
Electrical Components, IT

Most advance lighthouses are focusing on integration, digitalization and customer back optimization of connected end to end value chains

ILLUSTRATIVE EXAMPLES

End to end digital integration

Era of functional excellence

Early digitization

Today

Manufacturing

Continuous improvement	Lean and / six sigma	Standardized business process	Manufac-turing excellence	Digital performance management	**Machine learning** for plant steering

1990 — 2000 — 2010 — 2020

Statistical forecasting	Supply chain segmentation	Multi-echelon supply chain optimization	S&OP	Integrated business planning (IBP)	**Customer back machine learning** forecasting

Supply chain

CUSTOMER BACK
end to end value chain
CONNECTED
in real time, using
INTELLIGENT
algorithms to
optimize profit

all improvements aim to meet customer need

fully integrated, seamless flow of data and real time KPI transparency

AI engines optimizing profit per unit through trade-offs decisions (e.g., OEE vs. inventory cost)

...Creating a fully integrated, digital supply chain (e.g .automotive)

Our research on lighthouses show 6 factors that make them scale successfully during the transformation phase

4IR strategy linked to creation of business value with clear business case

10-15 use-cases are run in parallel with 15+ in the pipeline

Agile working mode and minimal incremental cost to add a use-case

Capability-building via digital academy and model factories

Workforce engagement leaders take active change agent roles and all employees are involved

IoT architecture built for scale-up All data pooled into one data lake and interfaces between applications are standardized.

Case
example

The vision: Quantum leap in customer experience enabled by improvement in business processes

CUSTOMER JOURNEY IMPROVEMENT

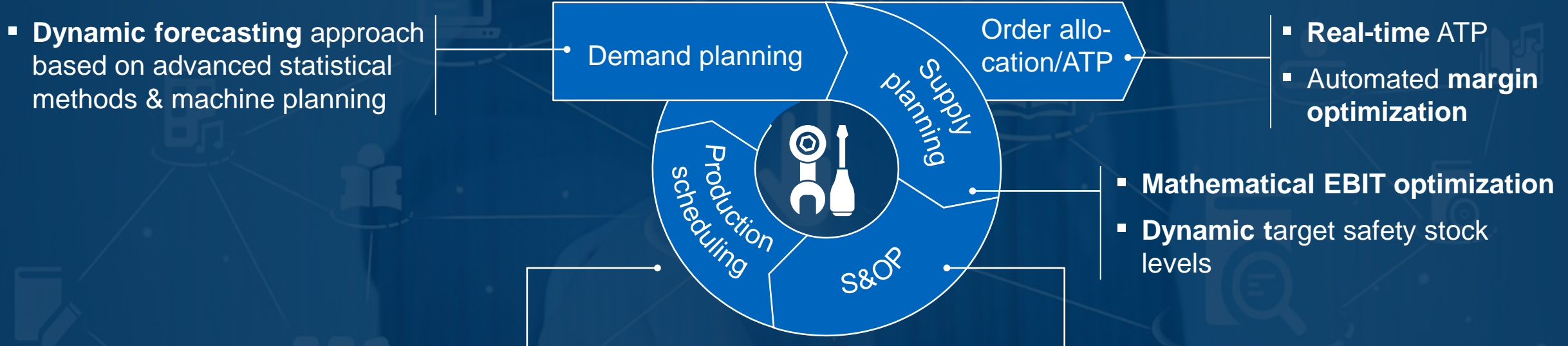**Seamless online process for ordering, tracking and queries / complaints**

INTERNAL BUSINESS PROCESS OPTIMIZATION

Connected and intelligent S&OP with smart inventory management, production scheduling and demand forecasting

Approach: End-to-end digital optimization from demand planning to order fulfillment

End-to-end planning dashboard

- **Dynamic forecasting** approach based on advanced statistical methods & machine planning

Demand planning

Order allo-cation/ATP

Supply planning

Production scheduling

S&OP

- **Real-time** ATP
- Automated **margin optimization**

- **Mathematical EBIT optimization**
- **Dynamic** target safety stock levels

- **Mathematical EBIT optimization**, accounting for uncertainty
- **Dynamic rescheduling** with **scenario analyses**

- Optimization engine for supply and demand matching
- Scenario-building capabilities for alternative plans assessment

Seamless and automated interfaces

SAP	Prod. control system	WMS	TMS	...

To implement, we set up a Digital studio with a diverse team of business experts and digital specialists

- Cross functional teams **include business and digital roles**
- Working **across business silos** (e.g., marketing & sales and production)
- **Product owners**
- **Agile and digital training** on digital roles

Squad 1
Squad 2

Done | Doing | To do | Story | Back log
Back log | To do | Done

UX Designer
Front End design
Scrum master
Marketing and sales
User testing
Consultants
Product owner
Product owner
Supply chain
Scrum master
Modellers (Advanced analytics)
Production
Srum master
Planning
Marketing and sales
Consultants
Finance
Product owner
Marketing and sales
Front end designer

Order portal development
Planning and scheduling improvement
Credit / Payments

Legend:
- Product owner
- Digital and agile roles
- Designers
- Data scientists
- IT Consultants
- Subject area experts from business

Delivering tangible results to the business every 2 weeks

Business leaders showcase solutions developed, **Customers experience** new features and provide feedback towards next release

Visible value dashboards

Agile working boards

Business End users and managers

E2E optimization creates impact across the entire value chain

+3%
Profit increase

20+pp
Improvement in service levels

>7MEUR
Working capital savings

~20%
Improvement in forecasting

>90%
Plan adherence

Improve customer experience

Simplified and more agile processes

Transforming the supply chain in face of a changing global landscape

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