Digital Supply Chain
Leveraging IoT for Managing Supply Chains in Complex Times

BVL@Deloitte Digital Factory
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Starting point

Corporates are being challenged by some megatrends and an increasingly number of unforeseen disruptions, both question traditional ways of managing supply chains

Mega trends	**Disruptors**	**Challenges**

Social trends

- Mass customization
- Service competition
- Scarcity of resources
- Sustainability
- …

Tech trends

- Internet of things
- Network connectivity
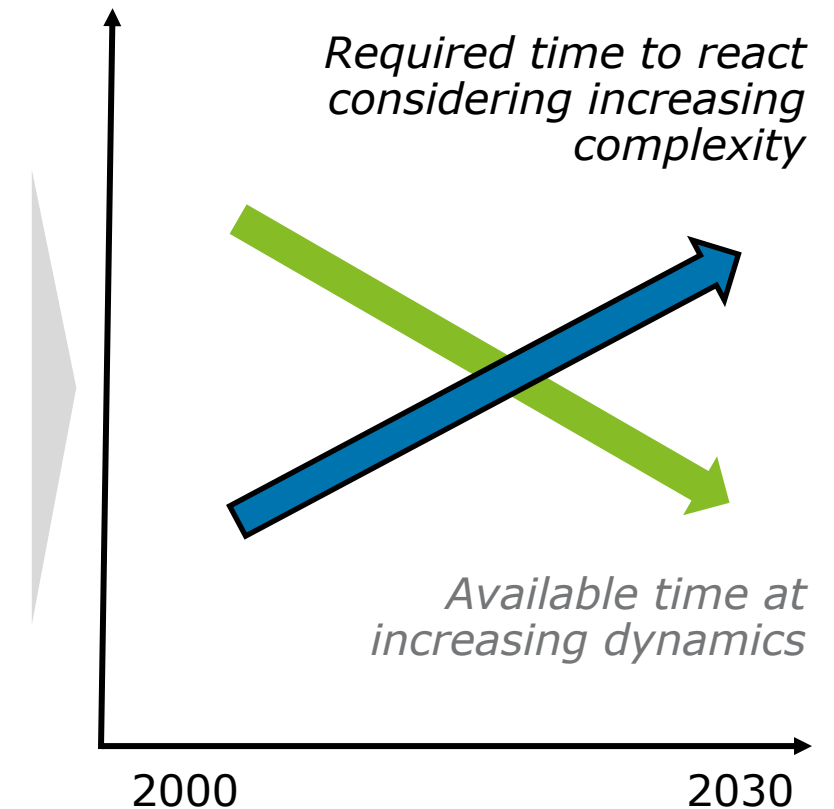- Sensors and actors
- Big data
- Data security
- …

Extrinsic

- Rush orders
- Change requests
- Infrastructure break-downs
- Bio-catastrophes
- Terror attacks
- …

Intrinsic

- Shut down of production
- Sickness of staff
- Bottlenecks of suppliers
- Electricity blackouts
- …

Lead time

Required time to react considering increasing complexity

Available time at increasing dynamics

2000   2030
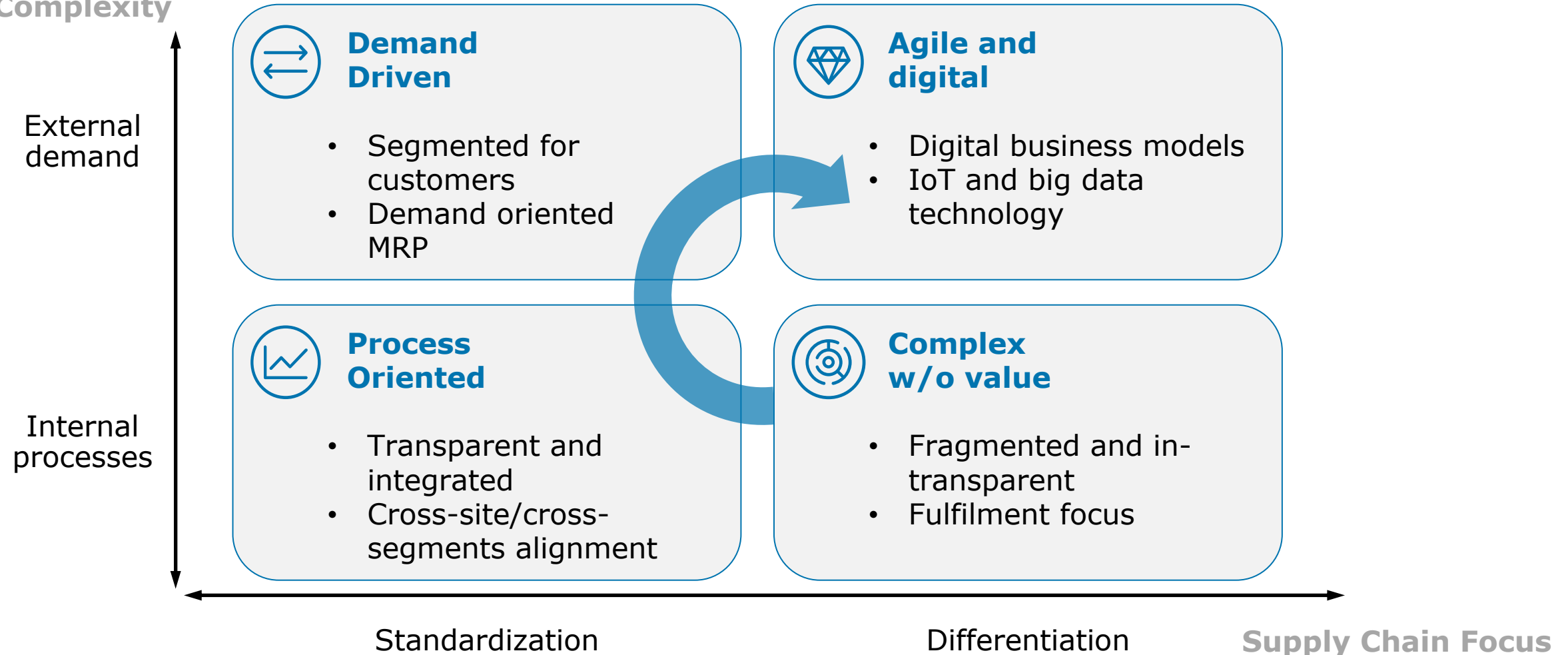
Point of view

From a our perspective, corporates shall aim at maturing their supply chain towards both a demand driven as well as digitally enabled organization

Supply Chain Complexity

External demand

Demand Driven

- Segmented for customers
- Demand oriented MRP

Agile and digital

- Digital business models
- IoT and big data technology

Internal processes

Process Oriented

- Transparent and integrated
- Cross-site/cross-segments alignment

Complex w/o value

- Fragmented and in-transparent
- Fulfilment focus

Standardization

Differentiation

Supply Chain Focus

Source: Wehberg 2015

Point of view
A state-of-the-art S&OP is an essential lever to create value and is an important fundament to consider dynamic balancing mechanisms
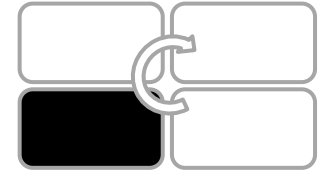
S&OP process

Conclusions

Define solutions for escalated strategic risks or issues, and decide and sign-off **final S&OP plan** (or algorithms)

4 **S&OP Executive** Review

Review current **demand** considering disruptors, and develop one (dynamic) demand forecast

Review **draft S&OP plan** while ensuring that operational plan best achieves the financial targets for the business

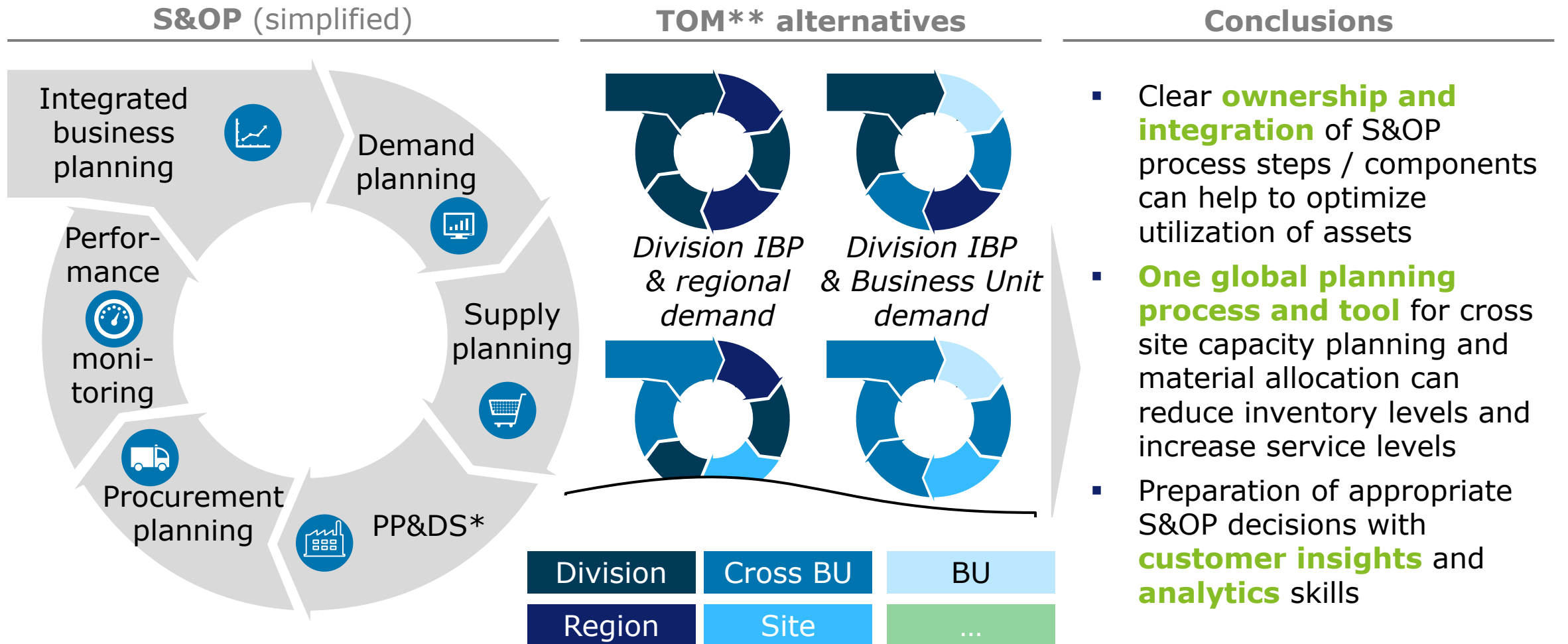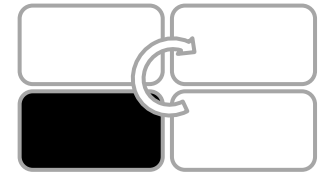**3** **Pre S&OP Financial** Review

1 **Demand** Review

2 **Supply** Review

Develop scenarios on how **supply** can best meet market demand (e.g. through alerts or early warning indicators)

- Increase **operating margin** through e.g. reduction of cost-to-serve
- Maximize **growth** through better revenues and service levels
- Reduce working capital to optimize **asset efficiency**
- Support **sustainability** with globally harmonized processes and one planning tool

Point of view

The S&OP is a key element for defining the future supply chain organization, next to the supply chain governance and other key supply chain processes

S&OP (simplified)

- Integrated business planning
- Demand planning
- Supply planning
- PP&DS*
- Procurement planning
- Perfor-mance moni-toring

TOM** alternatives

Division IBP & regional demand

Division IBP & Business Unit demand

Division	Cross BU	BU
Region	Site	...

Conclusions

- Clear **ownership and integration** of S&OP process steps / components can help to optimize utilization of assets

- **One global planning process and tool** for cross site capacity planning and material allocation can reduce inventory levels and increase service levels

- Preparation of appropriate S&OP decisions with **customer insights** and **analytics** skills

Source: Wehberg 2015   * Production planning & detailed scheduling   ** Target Operating Model (examples).

Point of view

Introducing a "Senator Card" for key customers will increase value added of corporates` supply chain management and support customer retention
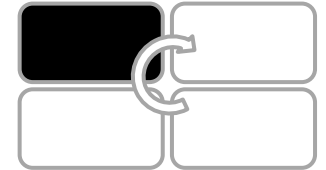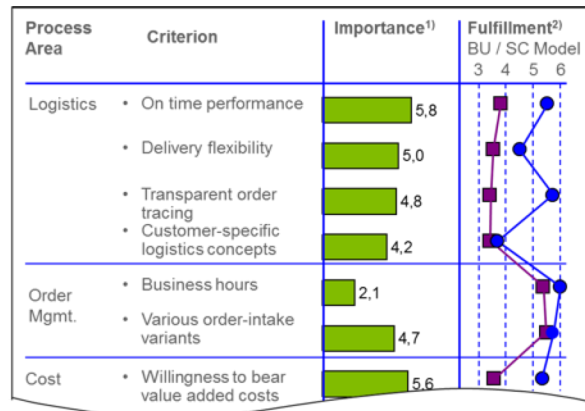
Customer segmentation within the supply chain

Conclusions

CIM

CIM specific service profile

SCM requirements of each customer interaction model

Service catalogue across CIMs

Service differentiation for customer interaction models

- Customer segmentation can help to **buffer disruptions** and avoid negative impact for A-customers

- **Customer Interaction Models** (CIM) can be defined from a supply chain point of view

- **Service levels per CIM** (e.g. a "senator card" for A-customers) can be defined in addition to logistics segments (ABC-RSU)

- Key challenge is to create **transparency at distributors**

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Source: Wehberg 2018   CIM: Customer Interaction Model (e.g. value chain integrator, product/process innovator, etc.)

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Point of view

Introducing a demand driven MRP will help the supply chain to cope with both the increasing number of disruptions and volatile demand
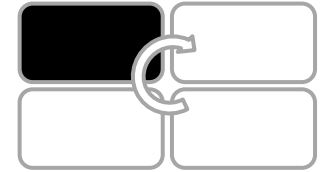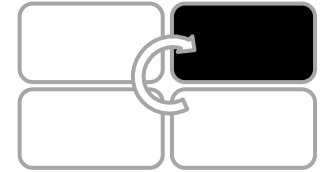
Rationale for demand driven MRP
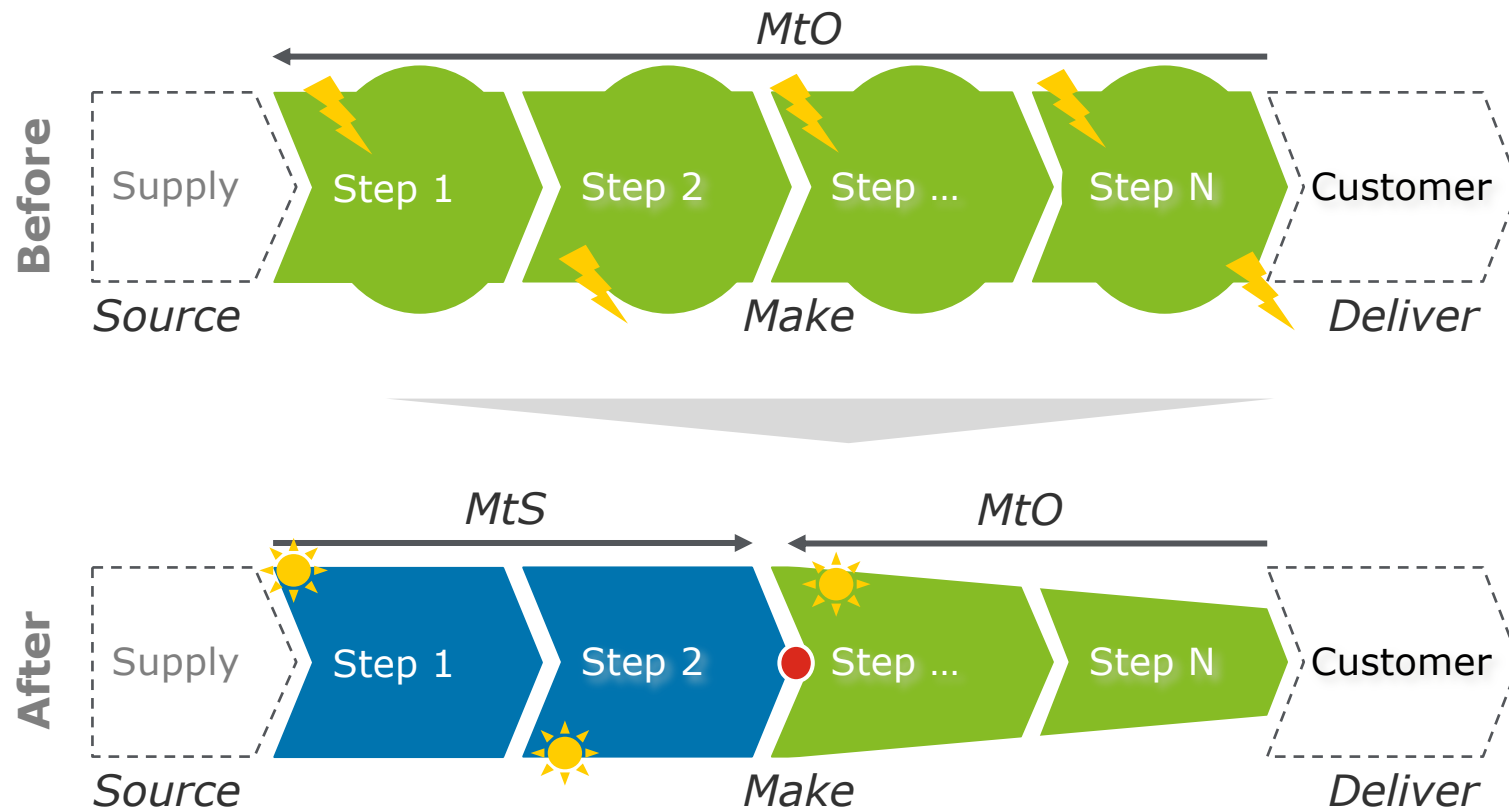
Conclusions

- Increasing number of disruptions causes **bullwhip effects**
- **Demand oriented MRP projects** (based on pull logic) have been initiated
- **Dynamic adjustments** of MtS and **alerts** help to align supply and demand
- **Postponement** options to be reviewed
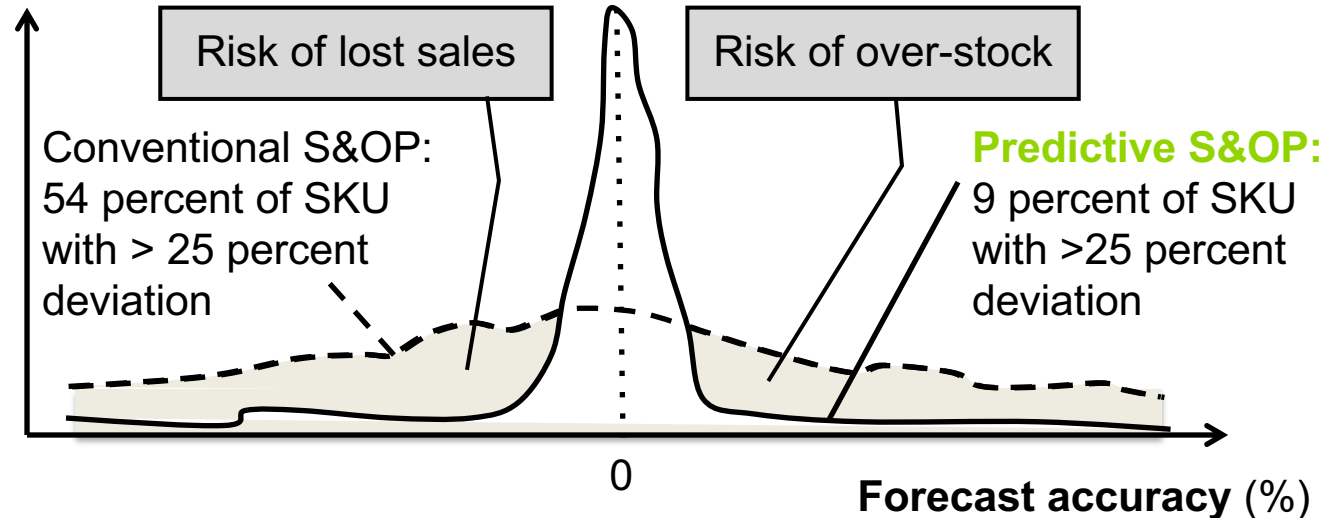- Demand oriented MRP **to be aligned with overall S&OP cycle** of the supply chain

⚡: Disruptions.   ☀:Alerts   🔴: De-coupling

Point of view

Predictive analytics is a key enabler to make a comprehensive demand driven strategy work and avoid over-stock

Predictive S&OP (example)

Frequency (#)

Risk of lost sales

Risk of over-stock

Conventional S&OP:
54 percent of SKU
with > 25 percent
deviation

Predictive S&OP:
9 percent of SKU
with >25 percent
deviation

0

Forecast accuracy (%)

Prediction of disruptors

Prediction of demand

Conclusions

- Identify disruptors through Celonis driven **process mining**

- Leverage **latest analytics technology** (e.g. machine learning and artificial intelligence)

- Explore underlying drivers or **route causes** in order to enhance forecast accuracy

- Consider predictions within S&OP cycle and enable **short-term adaption mechanisms** and enhance flexibility, autonomously

Point of view

Key alerts for disruptors can be various and are being build up in terms of automatic mechanisms for dynamic balancing with our proven analytics method
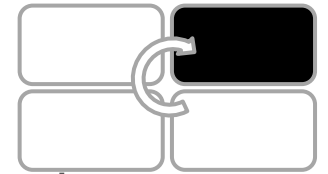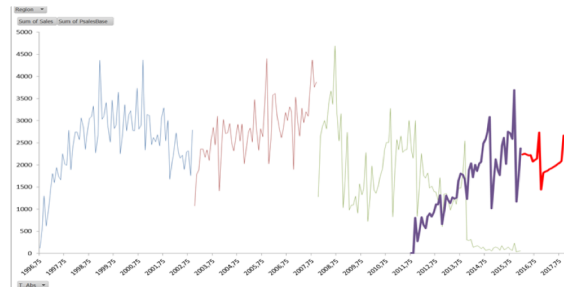
Project examples

Car distribution

- German OEM
- **Accelerating the order-2-deliver** (O2D) process with near real-time information
- Car itself used as part of IoT to track O2D/ **enhance S&OP**

Truck lifecycle

- Truck division of OEM
- **Estimate of future sales** for a product portfolio
- Non-linear model of **product lifecycle patterns/ predictions**

Spot welding robots

- Car production
- **Deep learning**
- Visualizing connec-tedness between factors and health
- **Prediction of unplanned shut downs** of welding assets
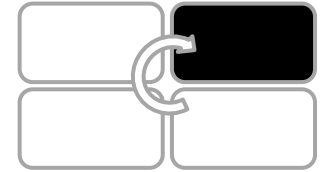
Seed production
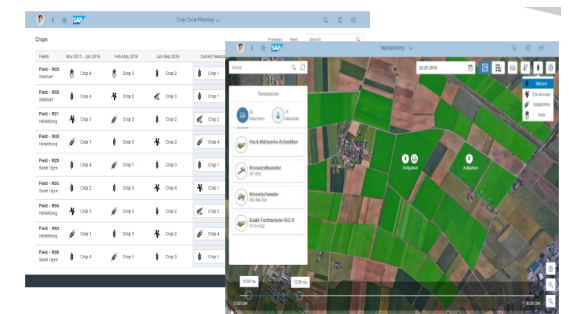
- Predictive S&OP based on **seed-to-harvest analysis**
- Humidity, grow levels, etc. constantly measured (IoT)
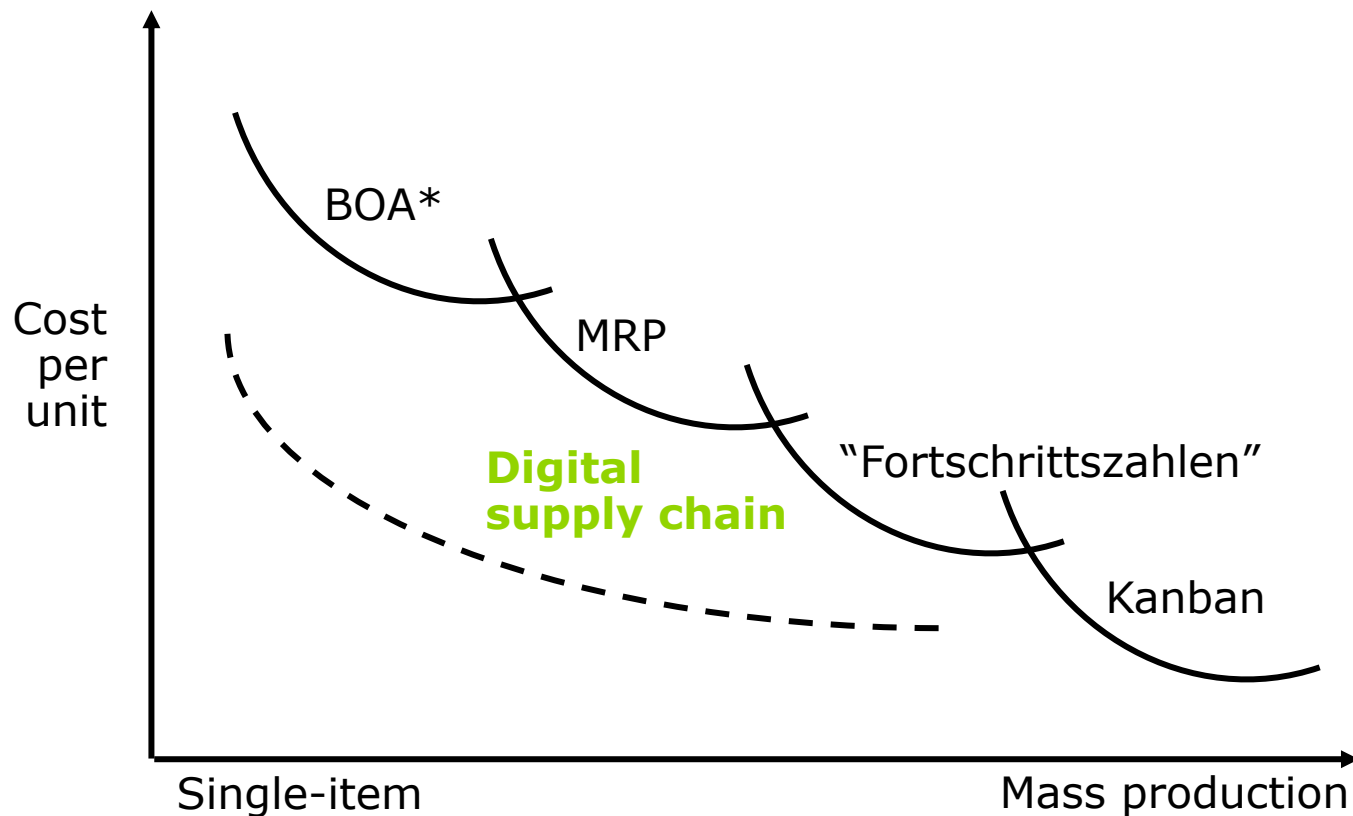- **Forecast of harvest-ing date and output**

Integrate IoT-based early warning of disruptions (e.g. Mindsphere and Leonardo) into the S&OP (IBP alerts)

Point of view
The digitalization of the supply chain offers additional benefits in terms of TCO productivity and flexibility
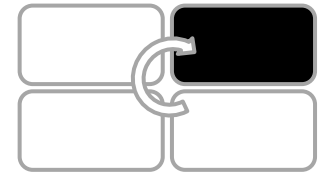
Benefit of digital supply chain management

Chart showing Cost per unit (y-axis) vs Single-item to Mass production (x-axis), with curves labeled BOA, MRP, "Fortschrittszahlen", Kanban, and a dashed line labeled "Digital supply chain"*
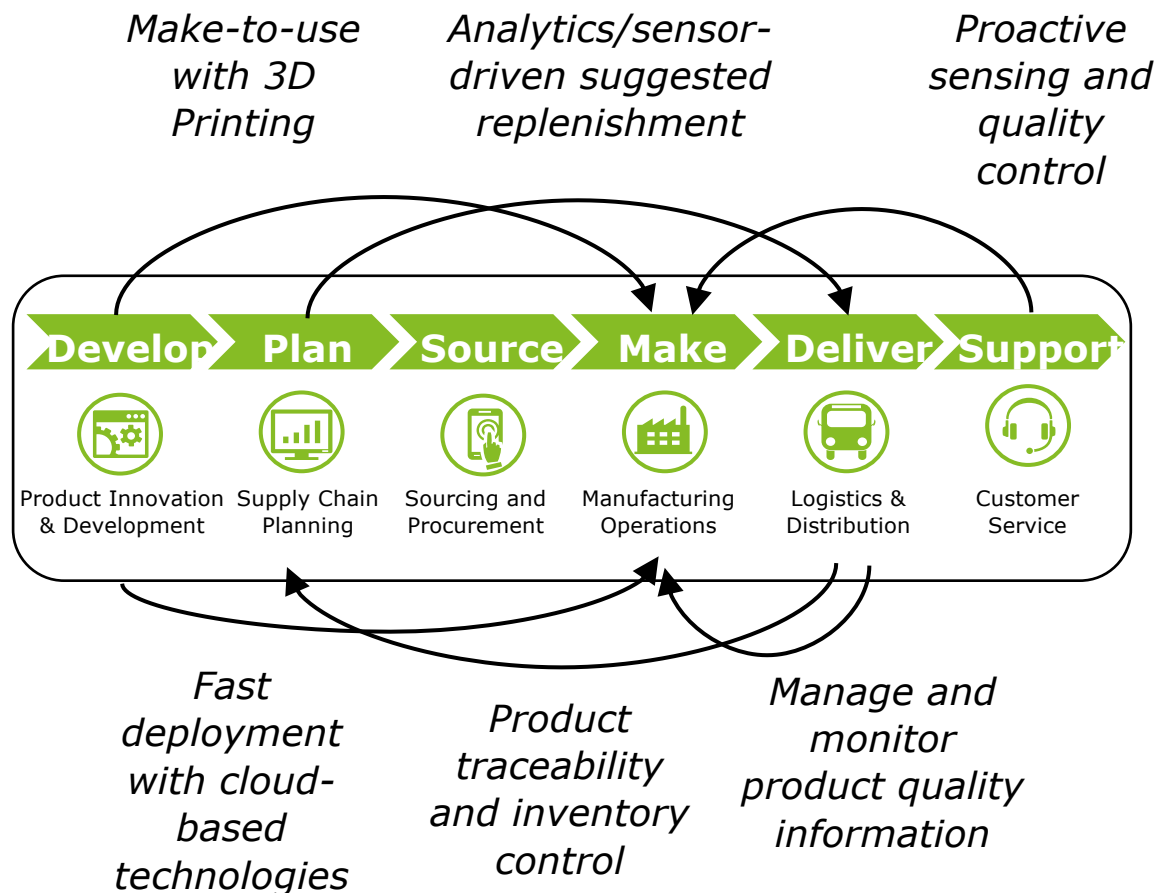
Conclusions

- **Combine demand driven approaches** with latest digital technology
- Align supply chain efforts with factory development and **PPDS evolution**
- **Identify disruptors** and apply predictive analytics to understand underlying drivers
- Leverage **Hana based data lake potential** and beyond
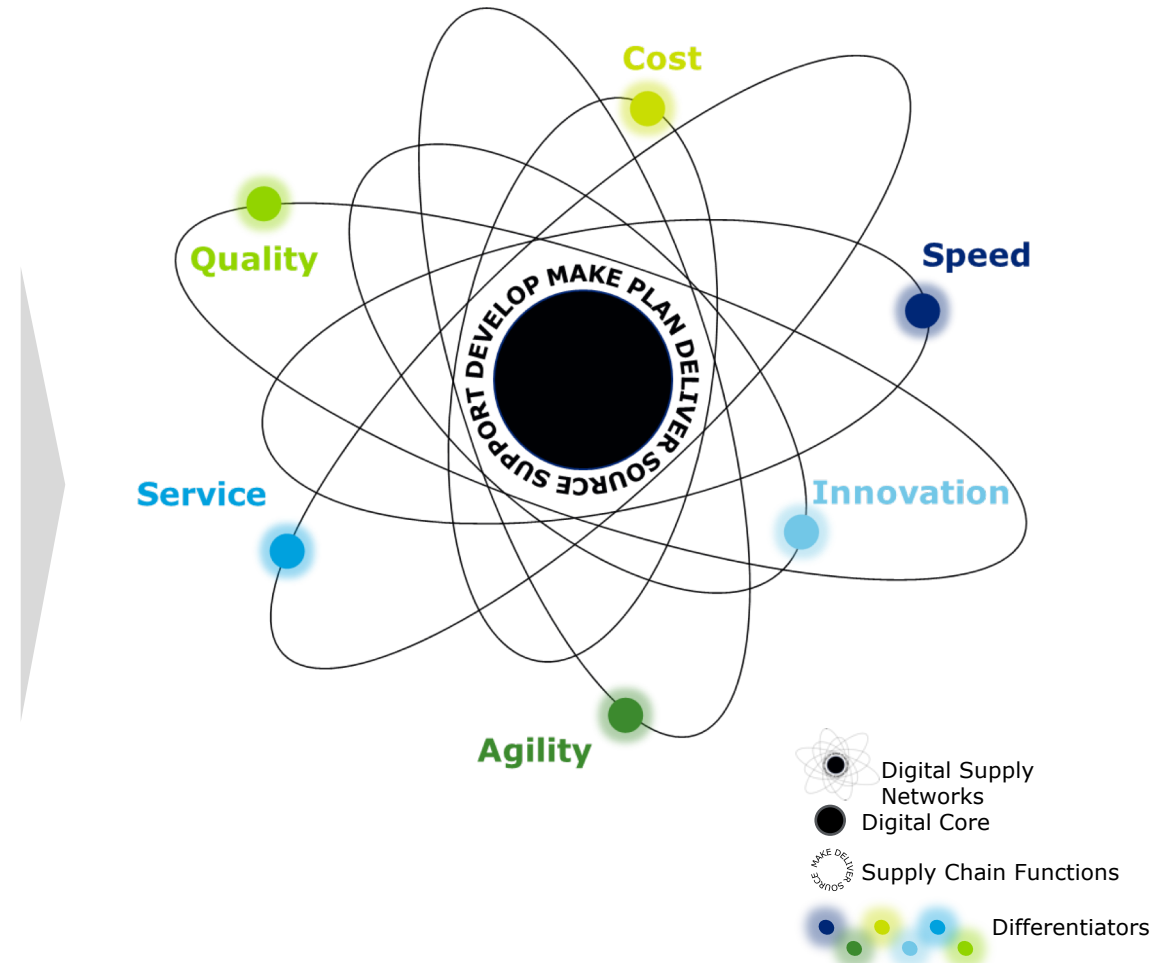- Evolve **predictive S&OP** continuously

Point of view
Traditionally, linear supply chain nodes are collapsing into a set of dynamic networks, allowing dramatically increased differentiation

Traditional supply chain*

Make-to-use with 3D Printing

Analytics/sensor-driven suggested replenishment

Proactive sensing and quality control

Develop > **Plan** > **Source** > **Make** > **Deliver** > **Support**

Product Innovation & Development

Supply Chain Planning

Sourcing and Procurement

Manufacturing Operations

Logistics & Distribution

Customer Service

Fast deployment with cloud-based technologies

Product traceability and inventory control

Manage and monitor product quality information

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Digital supply eco systems

Cost

Quality

Speed

DEVELOP MAKE PLAN DELIVER SOURCE SUPPORT

Service

Innovation

Agility

Digital Supply Networks

Digital Core

Supply Chain Functions

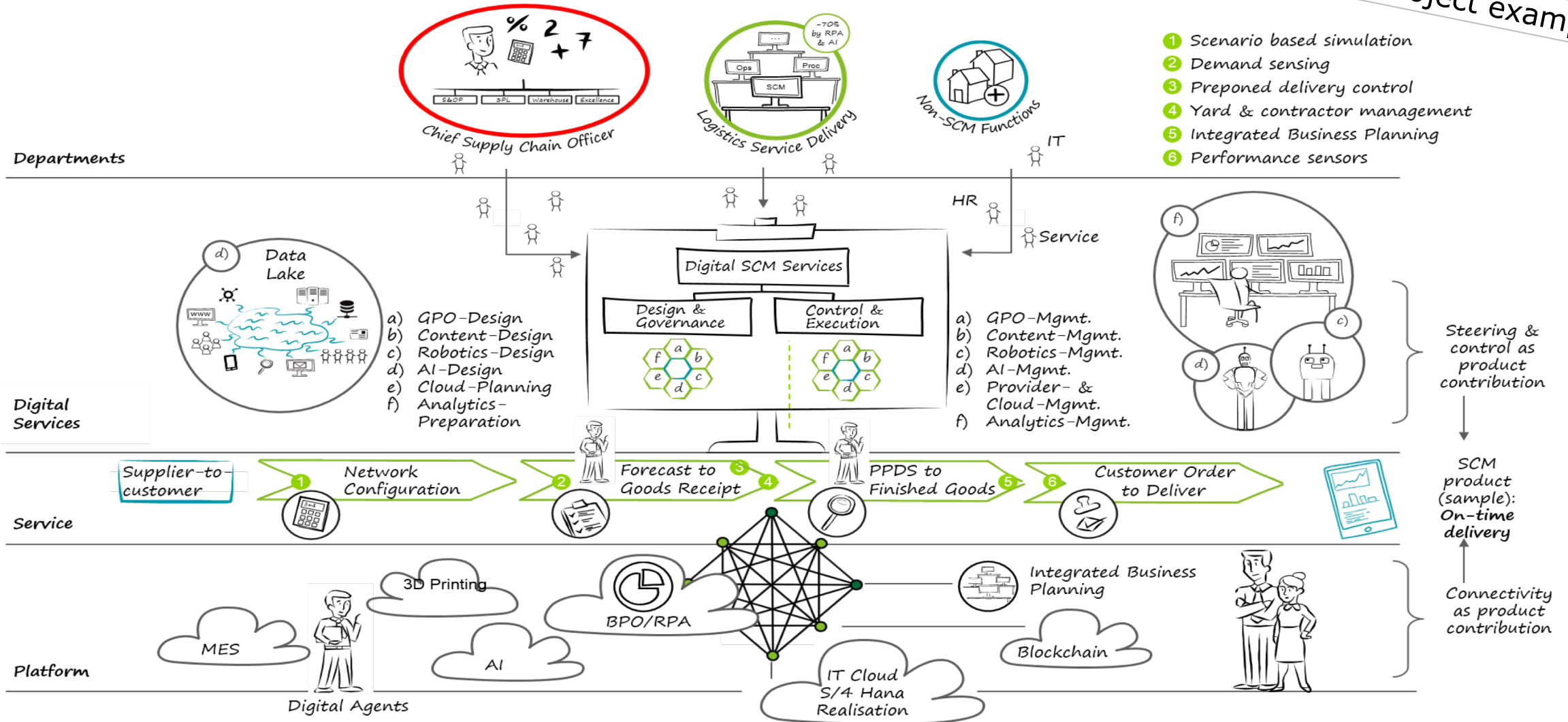Differentiators

* Including conventional improvements

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Point of view

The supply chain organization of the future is a kind of CIO type of organization with strong IT capabilities and significantly less resources
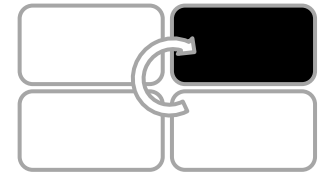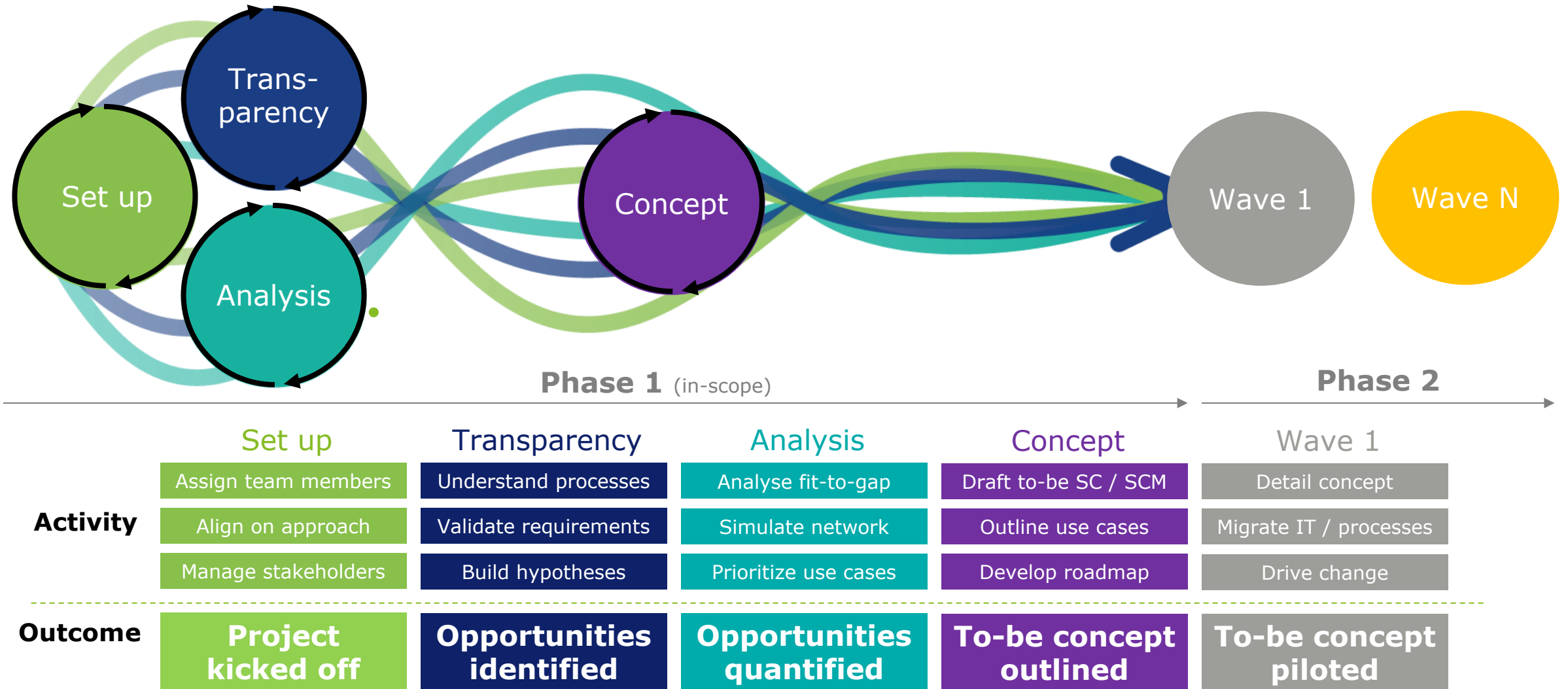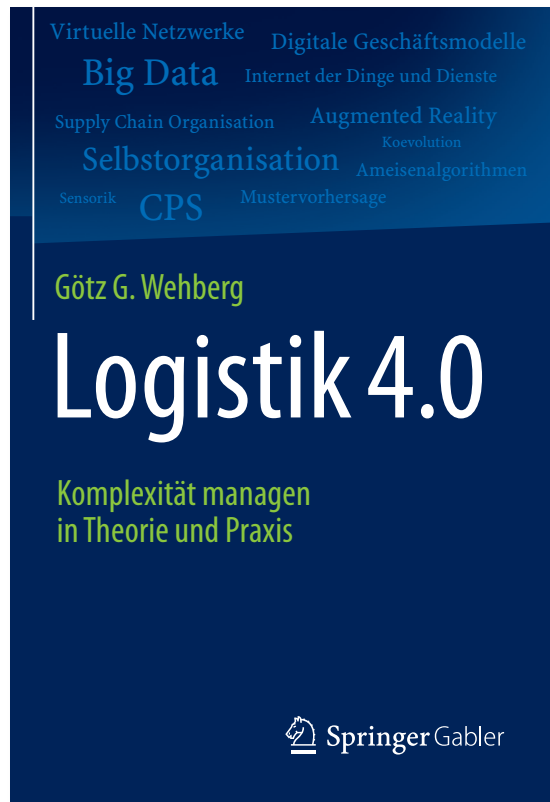
The approach

A project can be performed in pre-defined sprints, considering both relevant demand driven as well as digital improvement scenarios

Phase 1 (in-scope)   **Phase 2**

	Set up	Transparency	Analysis	Concept	Wave 1
Activity	Assign team members	Understand processes	Analyse fit-to-gap	Draft to-be SC / SCM	Detail concept
	Align on approach	Validate requirements	Simulate network	Outline use cases	Migrate IT / processes
	Manage stakeholders	Build hypotheses	Prioritize use cases	Develop roadmap	Drive change
Outcome	**Project kicked off**	**Opportunities identified**	**Opportunities quantified**	**To-be concept outlined**	**To-be concept piloted**

The approach
Read more about Logistics 4.0 and the Triple Long Tail©

Logistics 4.0	Triple Long Tail©

- Impact of digitalization on supply chain management

- 320 pages

- Springer Gabler 2015

- *2nd Edition „Digital Supply Chains" (English) is work in progress*

Deloitte.

Götz G. Wehberg

Die Triple Long Tail-Strategie

Digitalisierung – Individualisierung als Waffe im Wettbewerb

- Digitalization – Individualization as a weapon in competition

- 24 pages

- Cologne 2015

Deloitte.

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