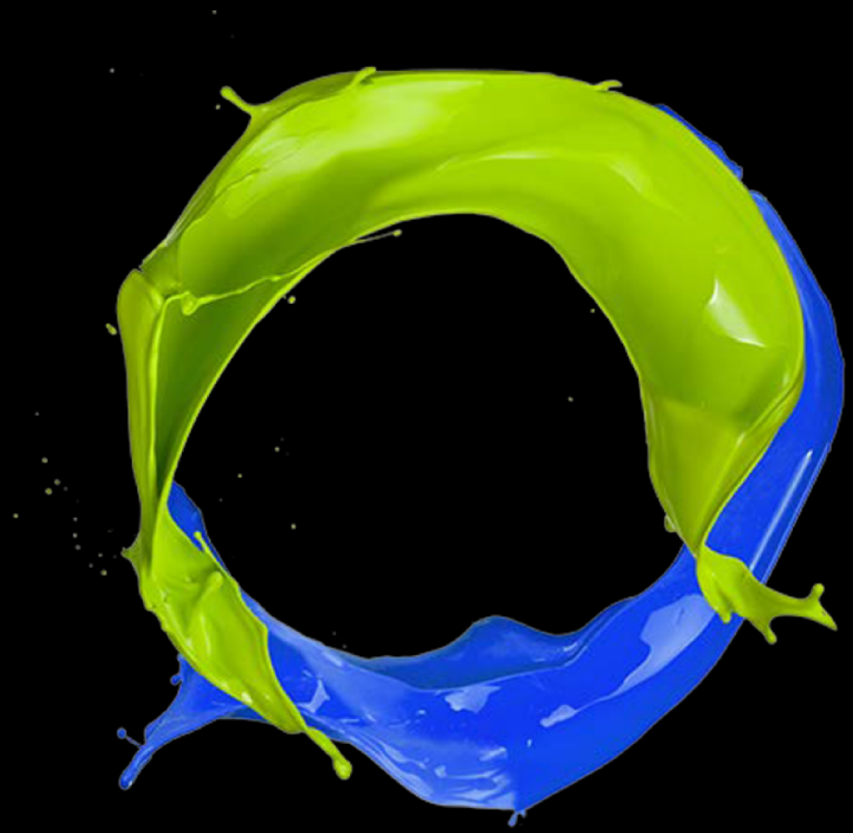
Deloitte.

BVL



Supply Chain Innovations – from demand driven to digital twin

By Götz G. Wehberg

Monchengladbach, 13. September 2018

Looking at ants at work, nature provides many good role models

Source: Wehberg 2018

Corporates are being challenged by megatrends and disruptions

Mega trends

Social trends

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

Tech trends

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

Disruptors

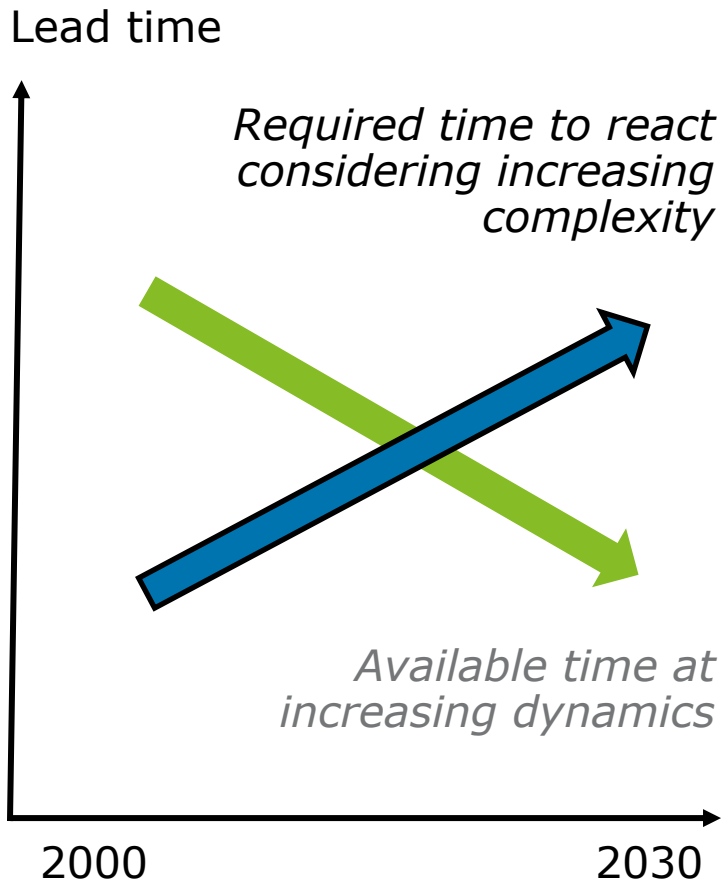
Extrinsic

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

Intrinsic

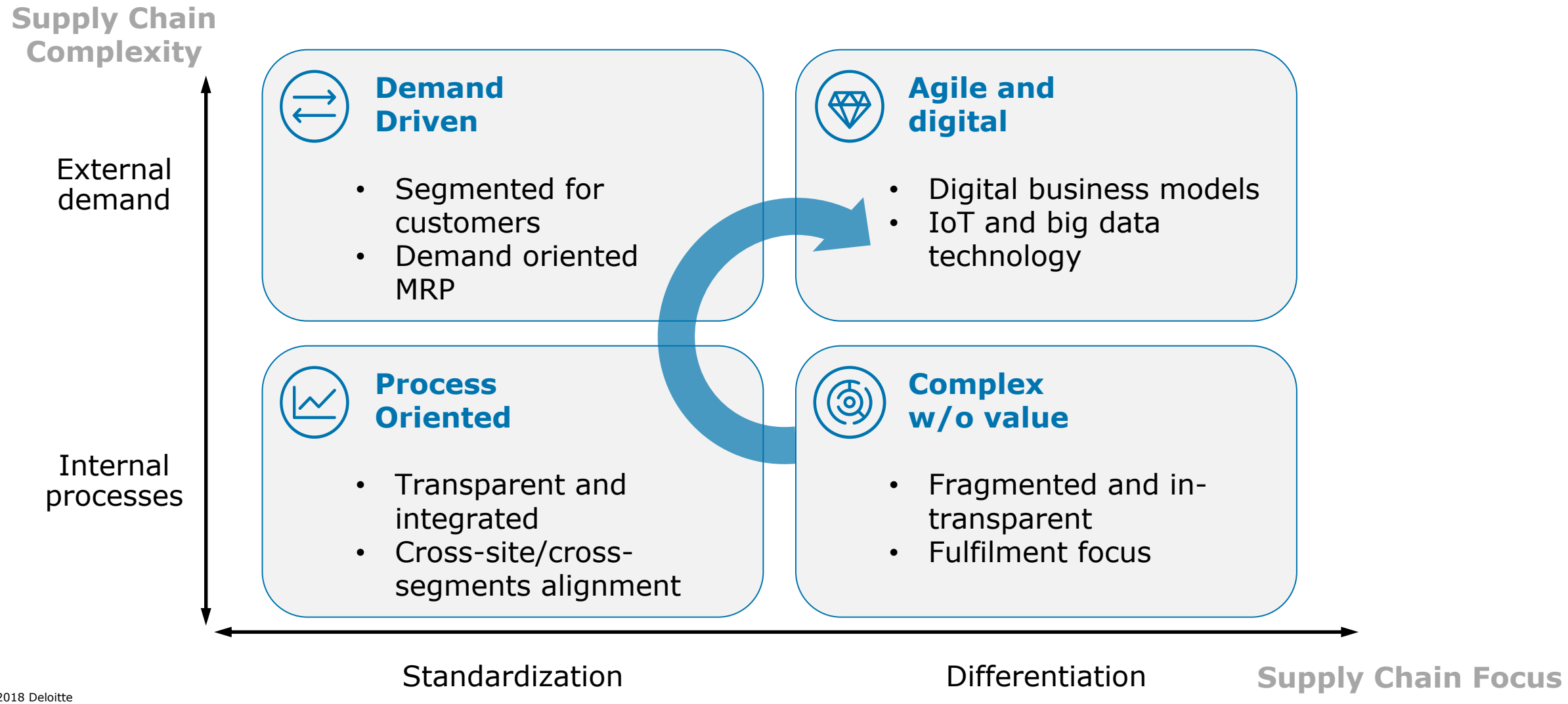
- Shut down of production
- Sickness of staff
- Bottlenecks of suppliers
- Electricity blackouts
- …

Challenges



Source: Wehberg 2015

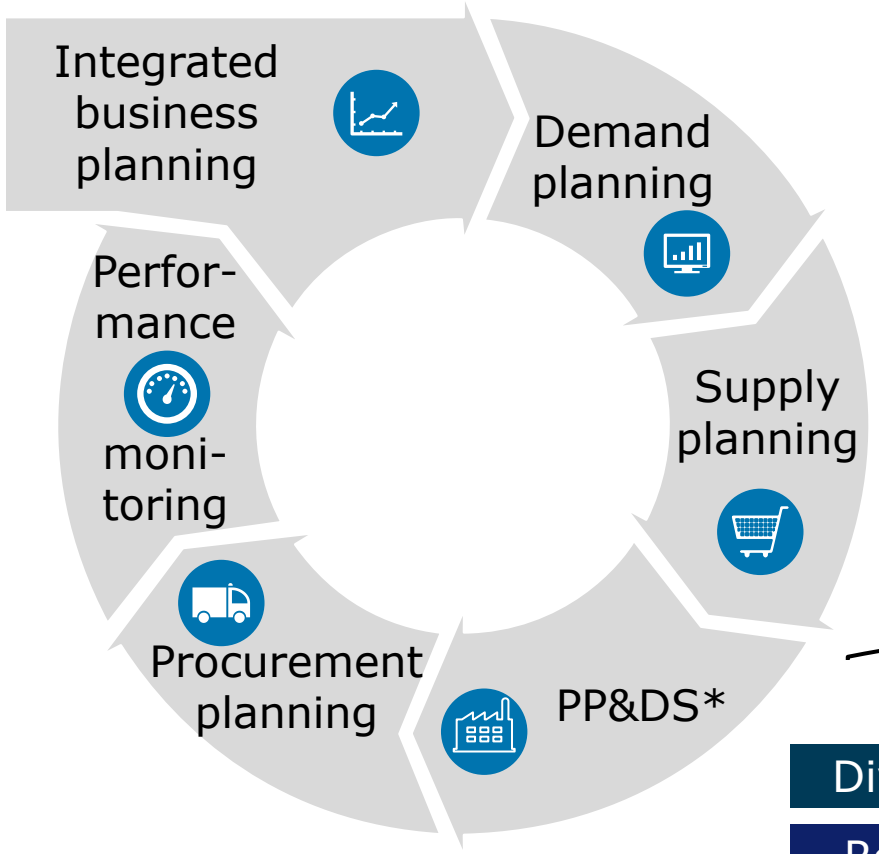
Supply chains have to be both demand driven and digitally enabled



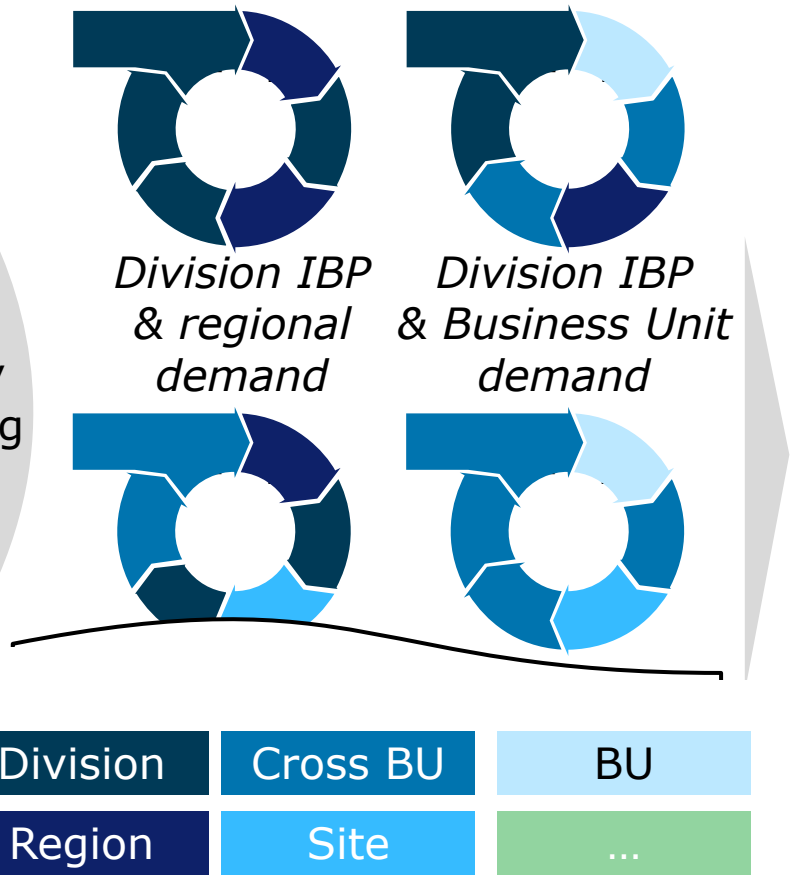
Source: Wehberg 2015

S&OP is a key element for defining the future supply chain

S&OP (simplified)



TOM** alternatives



Conclusions

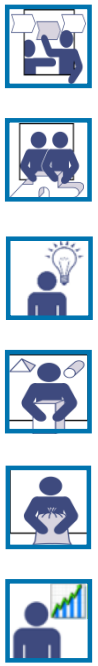
- Clear **ownership and integration** of S&OP process steps / components can help to optimize utilization of assets
- **One global planning process and tool** for cross site capacity planning and material allocation can reduce inventory levels and increase service levels
- Preparation of appropriate S&OP decisions with **customer insights** and **analytics** skills

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

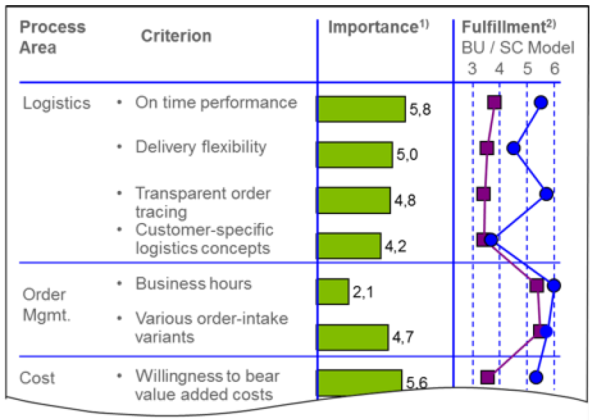
“Senator Card” for key customers secures market focus

Customer segmentation within the supply chain

CIM

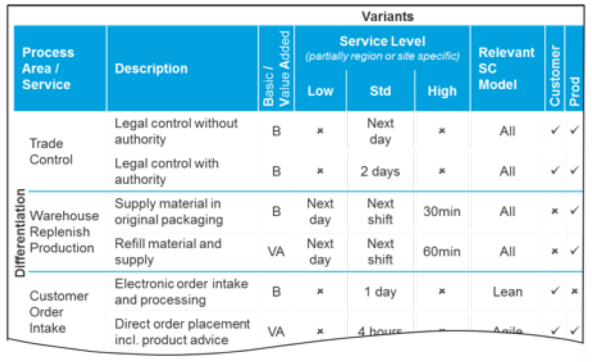


CIM specific service profile



SCM requirements of each customer interaction model

Service catalogue across CIMs



Variants

Differentiation	Process Area / Service	Description	Basic / Value Added	Service Level (partially region or site specific) Low	Std	High	Relevant SC Model	Customer	Prod
	Trade Control	Legal control without authority	B	×	Next day	×	All	✓	✓
		Legal control with authority	B	×	2 days	×	All	✓	✓
	Warehouse Replenish Production	Supply material in original packaging	B	Next day	Next shift	30min	All	×	✓
		Refill material and supply	VA	Next day	Next shift	60min	All	×	✓
	Customer Order Intake	Electronic order intake and processing	B	×	1 day	×	Lean	✓	×
		Direct order placement incl. product advice	VA	×	4 hours			✓	✓

Service differentiation for customer interaction models

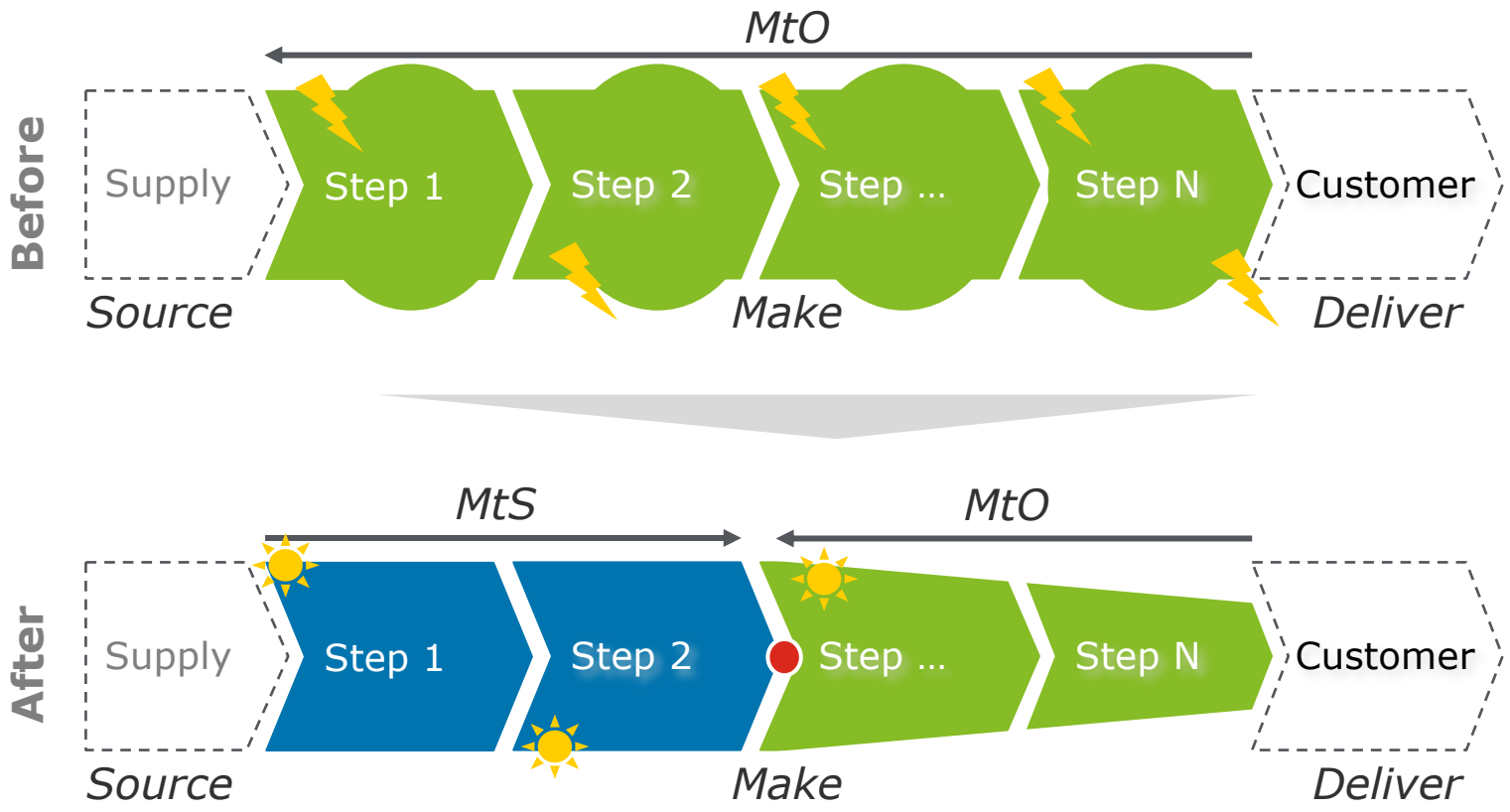
Conclusions

- 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**

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

Demand driven MRP help to cope with complexity on shop floor

Rationale for demand driven MRP

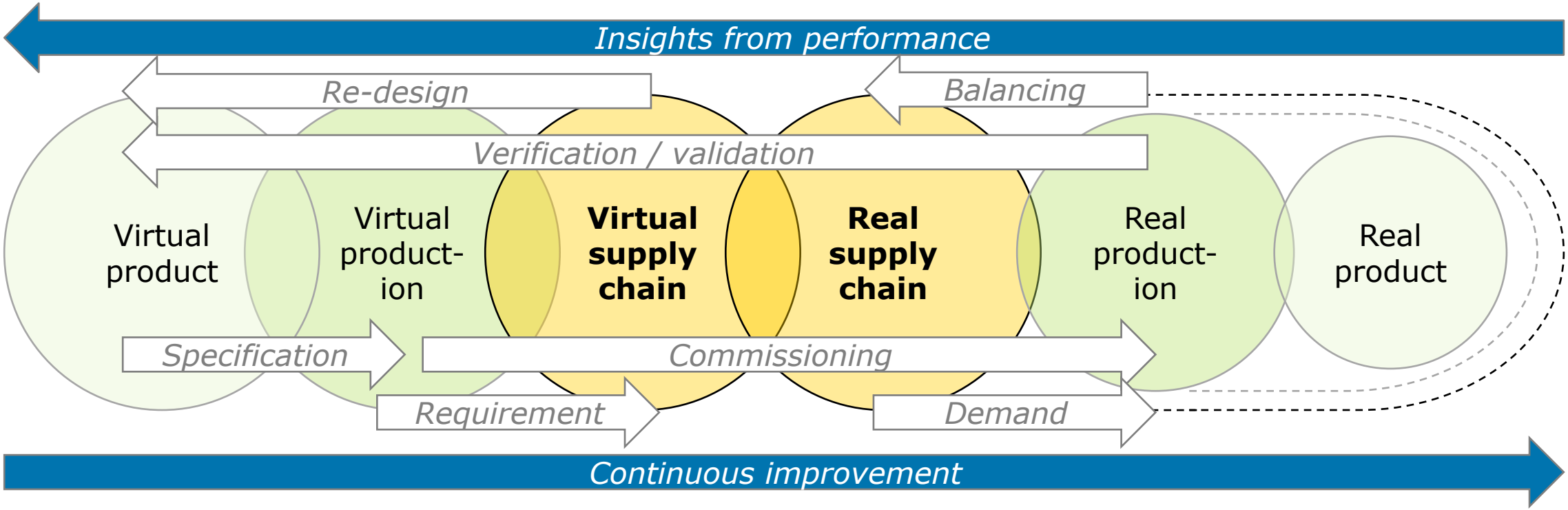


Conclusions

- 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

Source: Wehberg 2018 MtS: Make-to-Stock, MtO: Make-to-Order : Disruptions. :Alerts : De-coupling

Digital twins of supply chains enable a real-time optimization



Source: Wehberg 2018

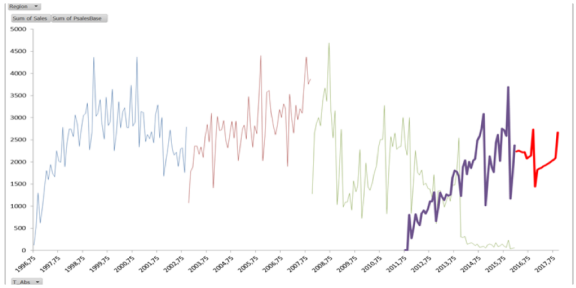
Key alerts for disruptors can be various and

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

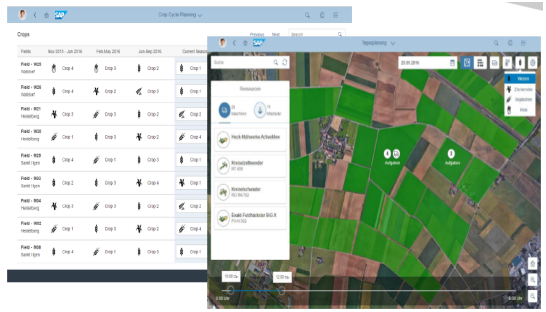


- Truck division of OEM
- **Estimate of future sales** for a product portfolio
- Non-linear model of **product lifecycle patterns/ predictions**

Spot welding robots

- Car production
- **Deep learning**
- Visualizing connec-tedness between factors and health
- **Prediction of unplanned shut downs** of welding assets

Seed production

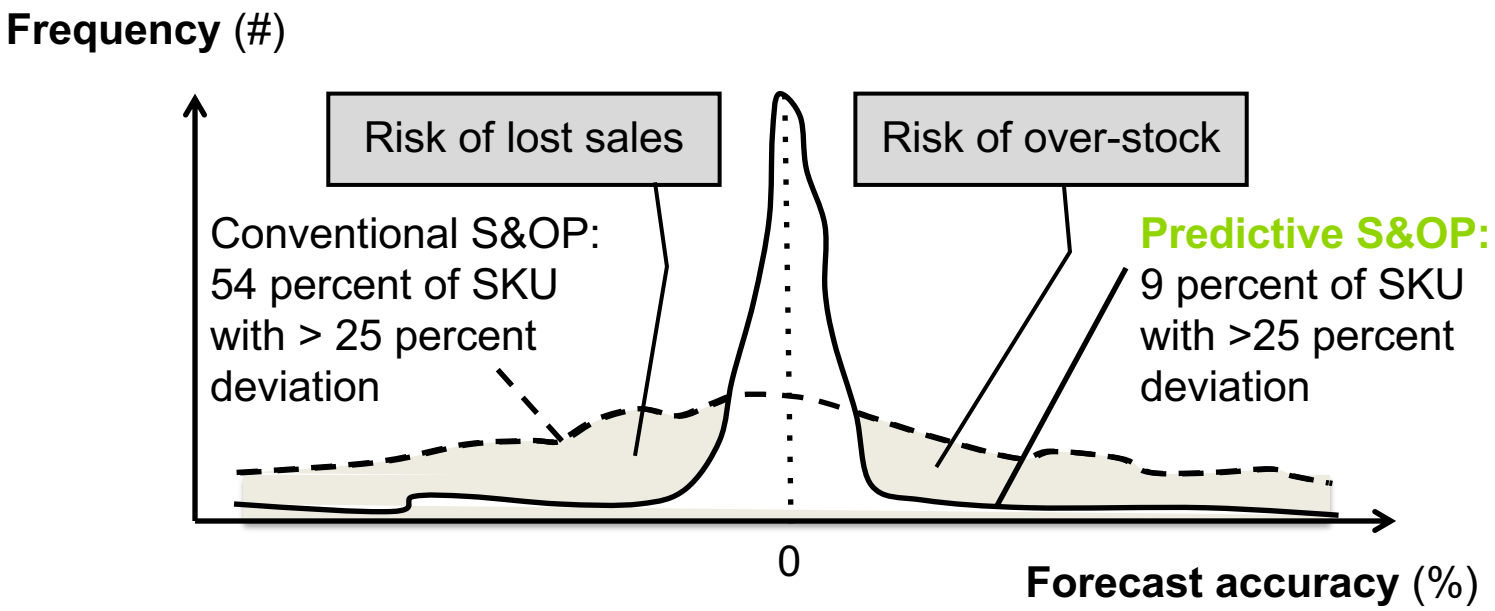


- Predictive S&OP based on **seed-to-harvest analysis**
- Humidity, grow levels, etc. constantly measured (IoT)
- **Forecast of harvest-ing date and output**

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

Predictive analytics is a key enabler

Predictive S&OP (example)



Prediction of disruptors → **Prediction of demand**

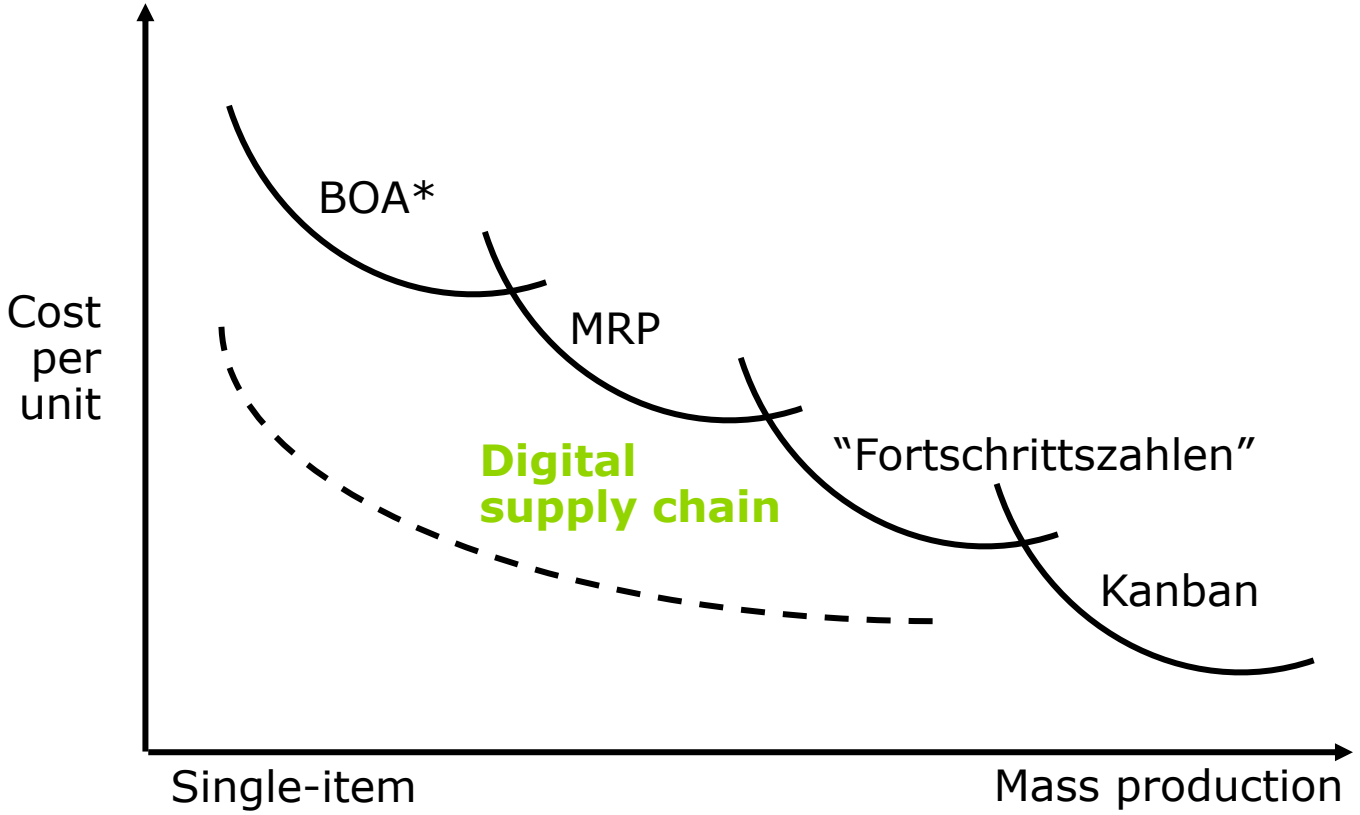
Conclusions

- 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

Source: Wehberg 2015

Digitalization of the supply chain offers TCO productivity

Benefit of digital supply chain management



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

Source: Wehberg 2015 * Load dependent order release

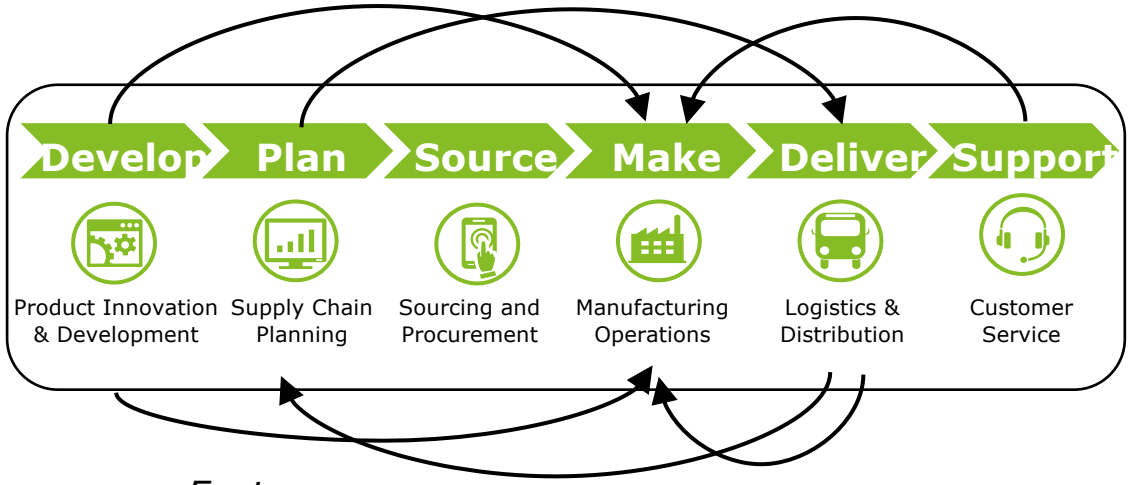
Linear nodes are collapsing into a set of dynamic networks

Traditional supply chain*

Make-to-use with 3D Printing

Analytics/sensor-driven suggested replenishment

Proactive sensing and quality control

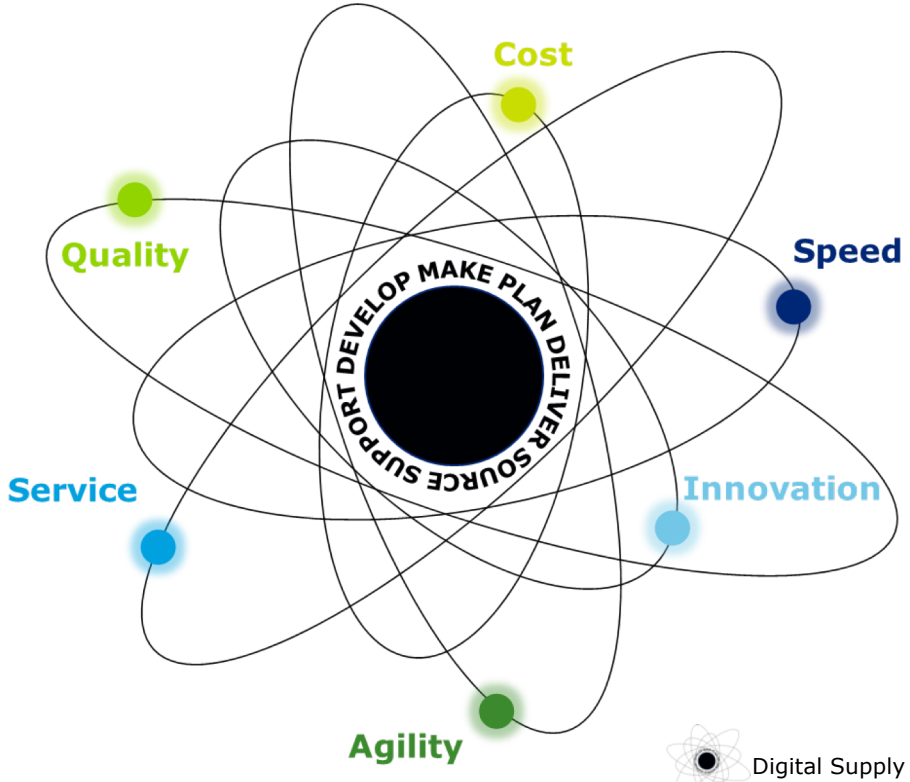


Fast deployment with cloud-based technologies

Product traceability and inventory control

Manage and monitor product quality information

Digital supply eco systems



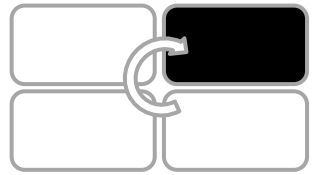
* Including conventional improvements

Digital supply chains are leveraging big data solutions

2018 Deloitte

Source: Turck et al. 2017

Lessons learnt from big data efforts



1. **Address Big Data opportunities from a business perspective** and, thus, consider the business case from the beginning, while leveraging new technologies

2. **Benefit from the creative momentum and innovation power of Big Data**, i.e. come with working hypotheses (e.g. cross industry / cross function) and brainstorm, however don't believe in templates and "one fits all"

3. **Think big** in terms of having the final Big Data architecture in mind, **start small** with respect to building use-case related IT infrastructure and **scale fast**, cross-BL and cross-functionally

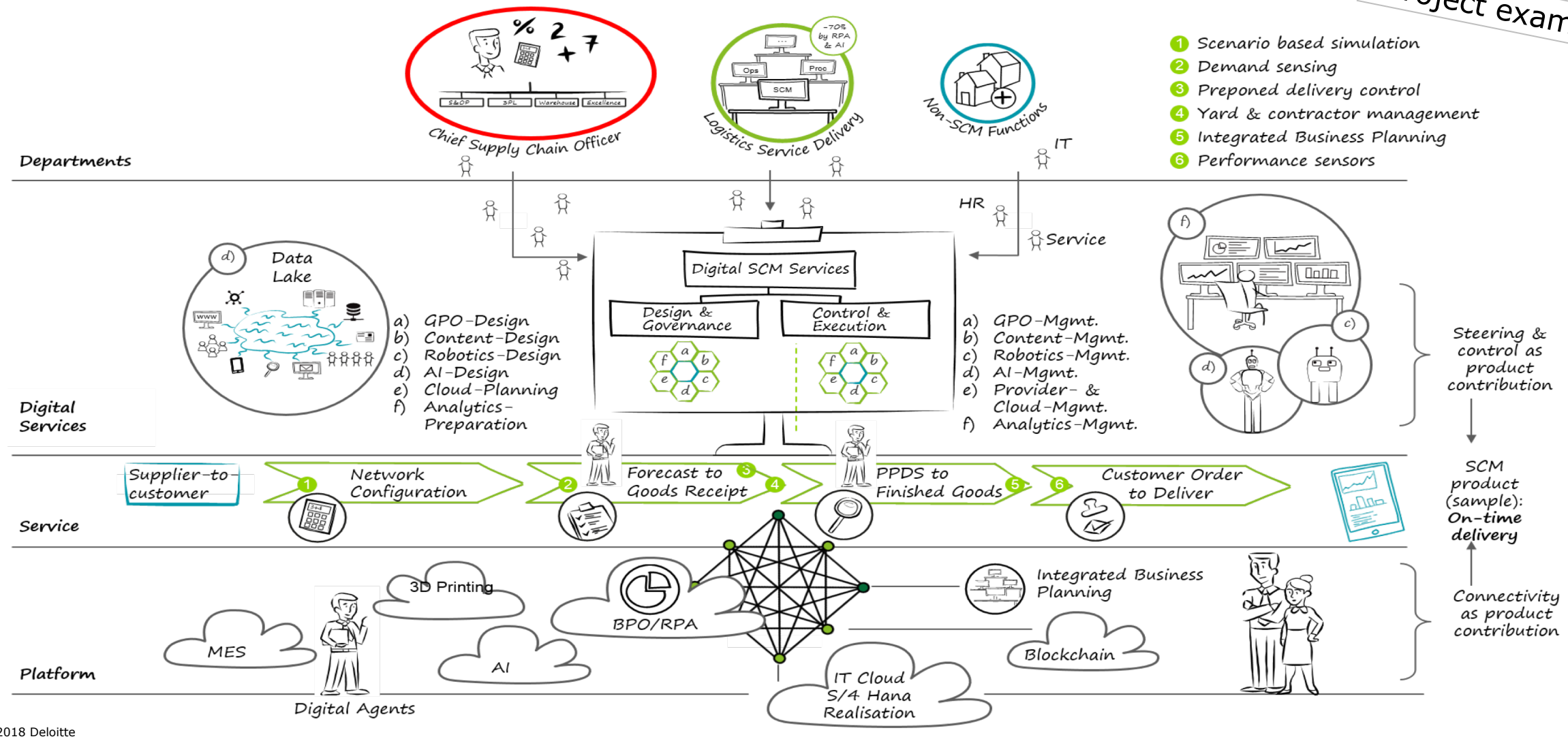
4. **Leverage on the vast portfolio of vendors, flexibly,** without limiting yourself through single partnerships or exclusivity. And contract on a "pay per use" basis, accordingly

5. **Manage change, proactively**, which means anticipate road blocks in terms of "not invented here" as well as "sharing makes me transparent and measurable"

Source: Wehberg 2018

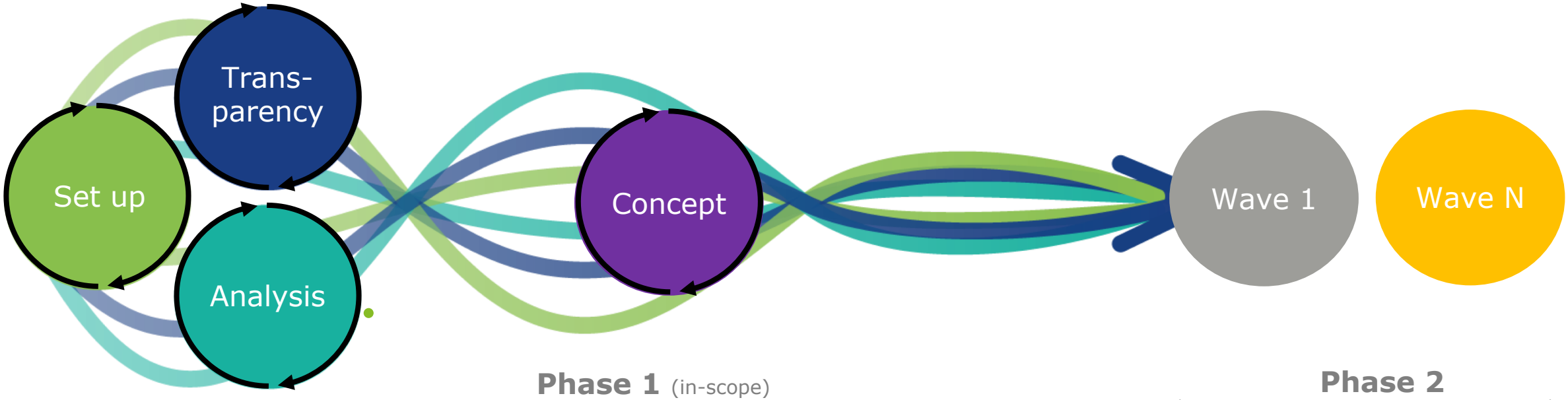
Supply chain organization of the future

Project example



Source: Wehberg 2018

Pre-defined sprints help to get started



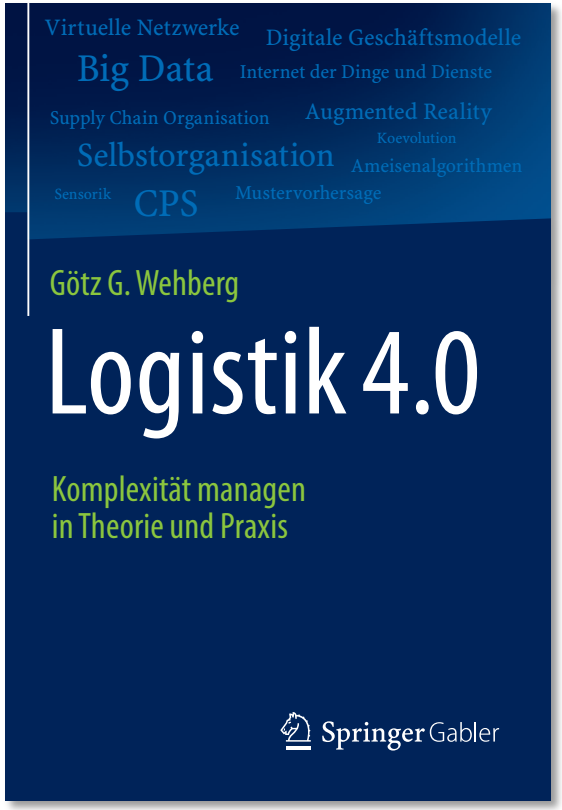
Phase 1 (in-scope) **Phase 2**

	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**

Sprints

Read more

Logistics 4.0



- Impact of digitalization on supply chain management
- 320 pages
- Springer Gabler 2015
- *2nd Edition „Digital Supply Chains" (English) is work in progress*

Triple Long Tail©

- Digitalization – Individualization as a weapon in competition
- 24 pages
- Cologne 2015

Deloitte.

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