

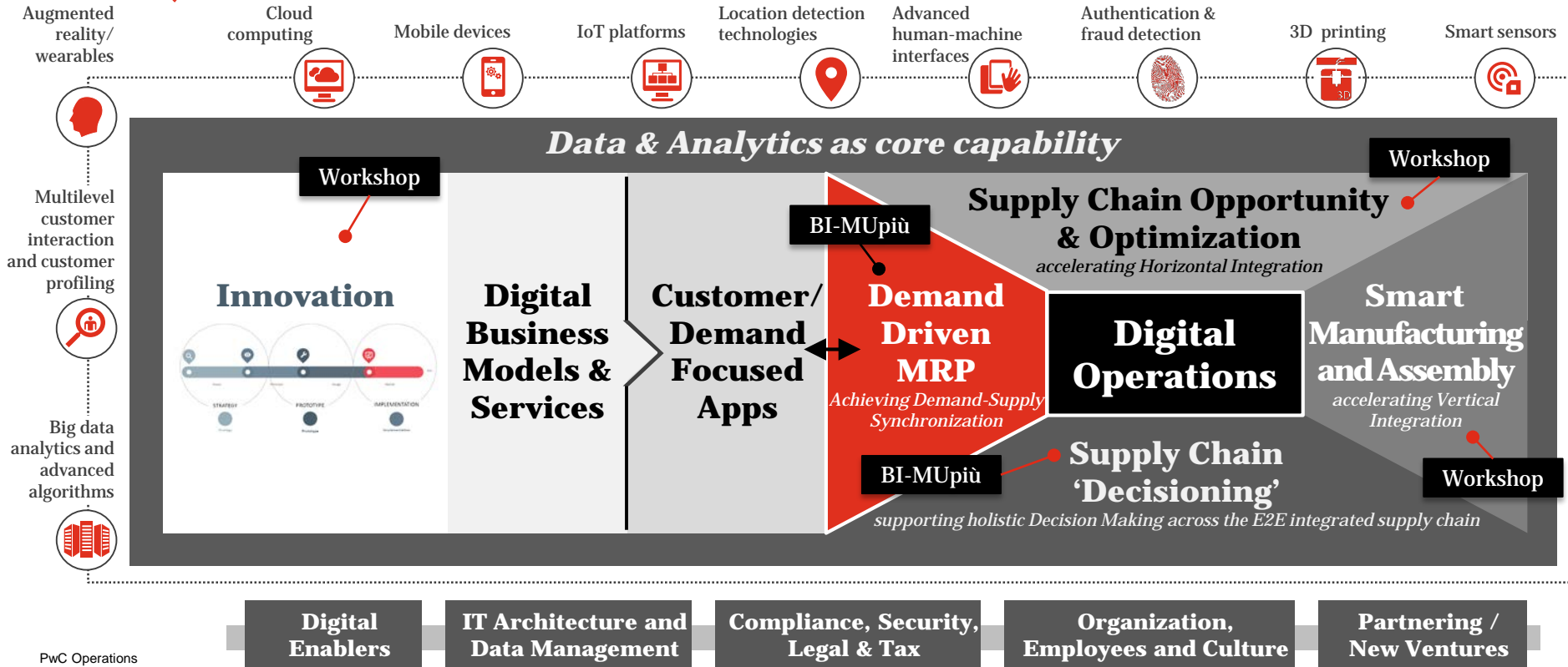
PwC Operations

Lean Manufacturing in the era of
Industry 4.0

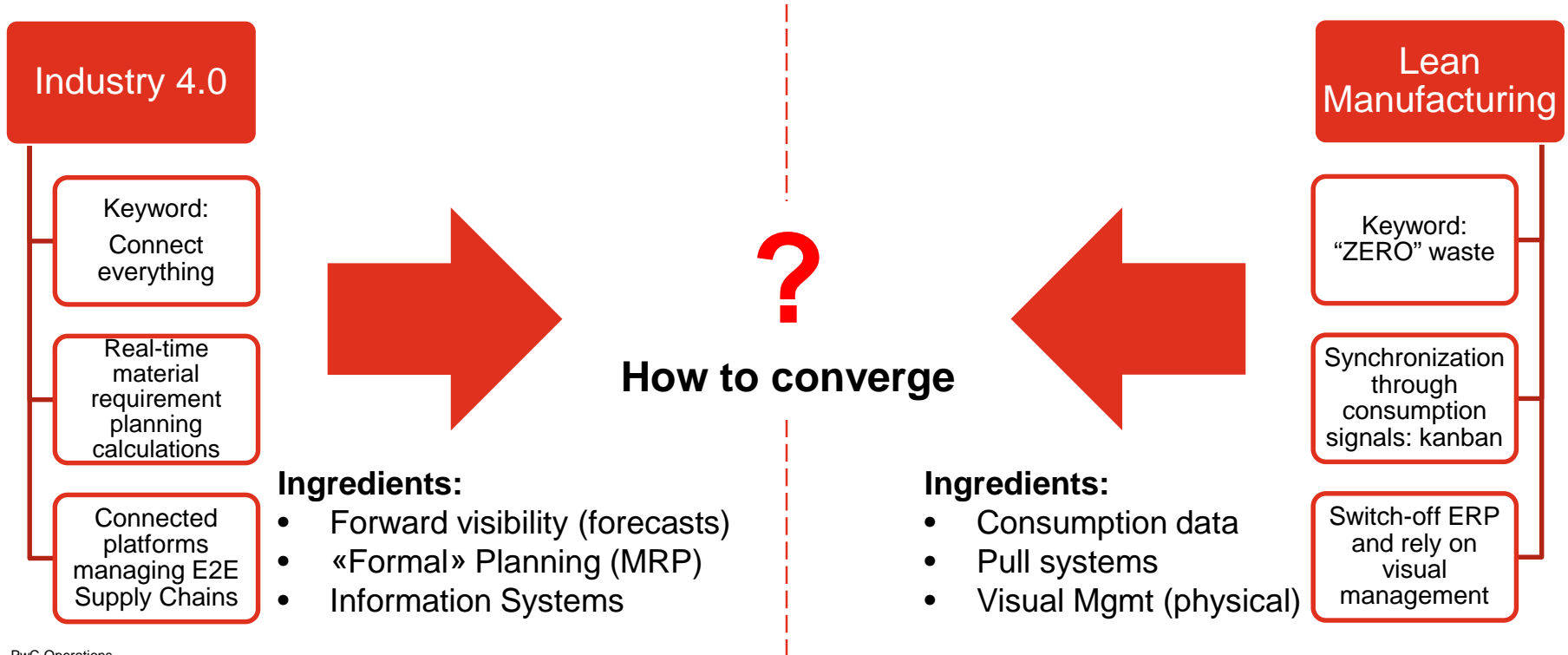
Ivan Lavatelli, Associate Partner



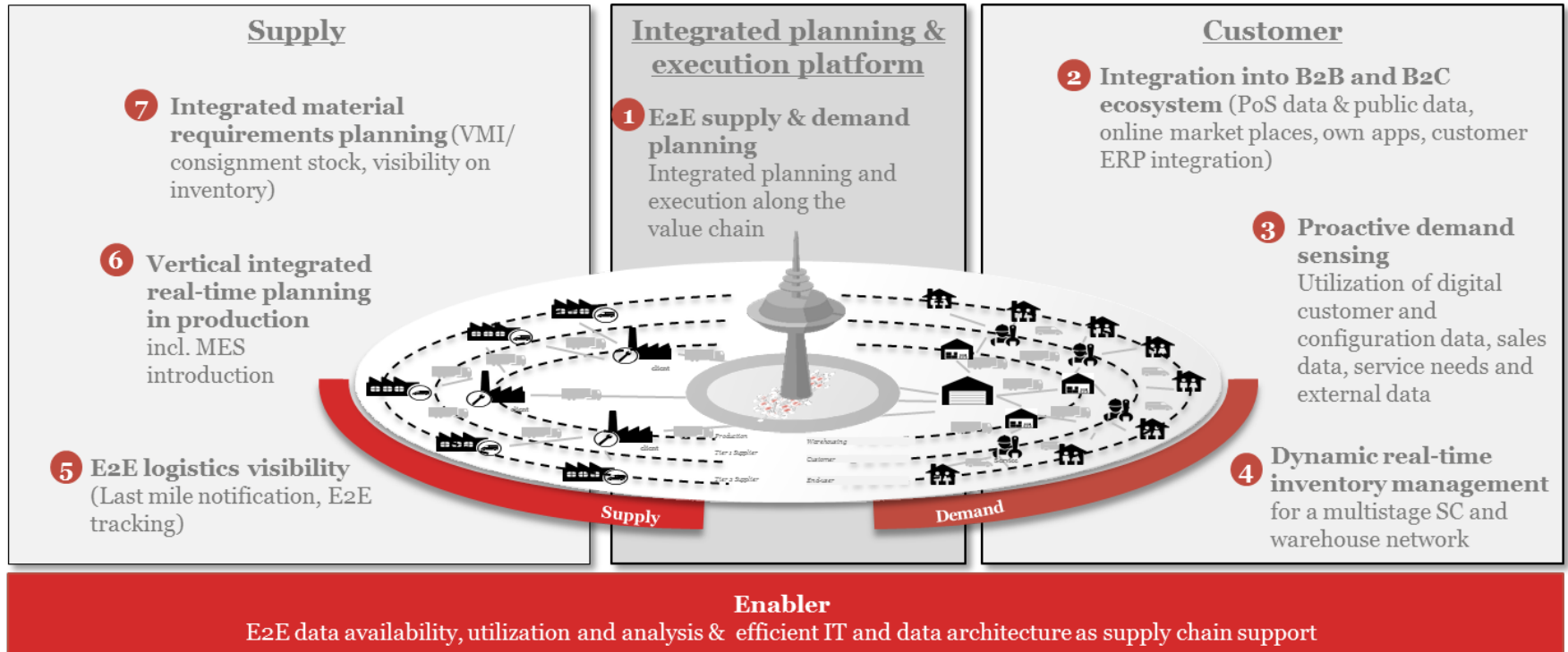
We are present at BI-MU 2018 with our offering on Innovation and Digital Transformation for Industrial Operations



Achieving Demand-Supply Synchronization: Current perspective



We all know that Digital Supply Chain Management must encompass both **Demand** and **Supply**...



... but very often the improvement activities focus on the Demand Planning side, and **the main challenges in Supply Planning are still unresolved**



Planning/ Scheduling adherence

Relatively poor
planning and schedule
stability/adherence;
High manual effort to
adjust existing plans
and schedules



Planning/ Scheduling effort

Significant staff resource
effort spent for supply
chain planning and
production scheduling
using manual planning,
processes, alerts and
data collection methods



Reliability

Delivery performance
below targets and
limited on-time-in-
full capabilities



Inventory

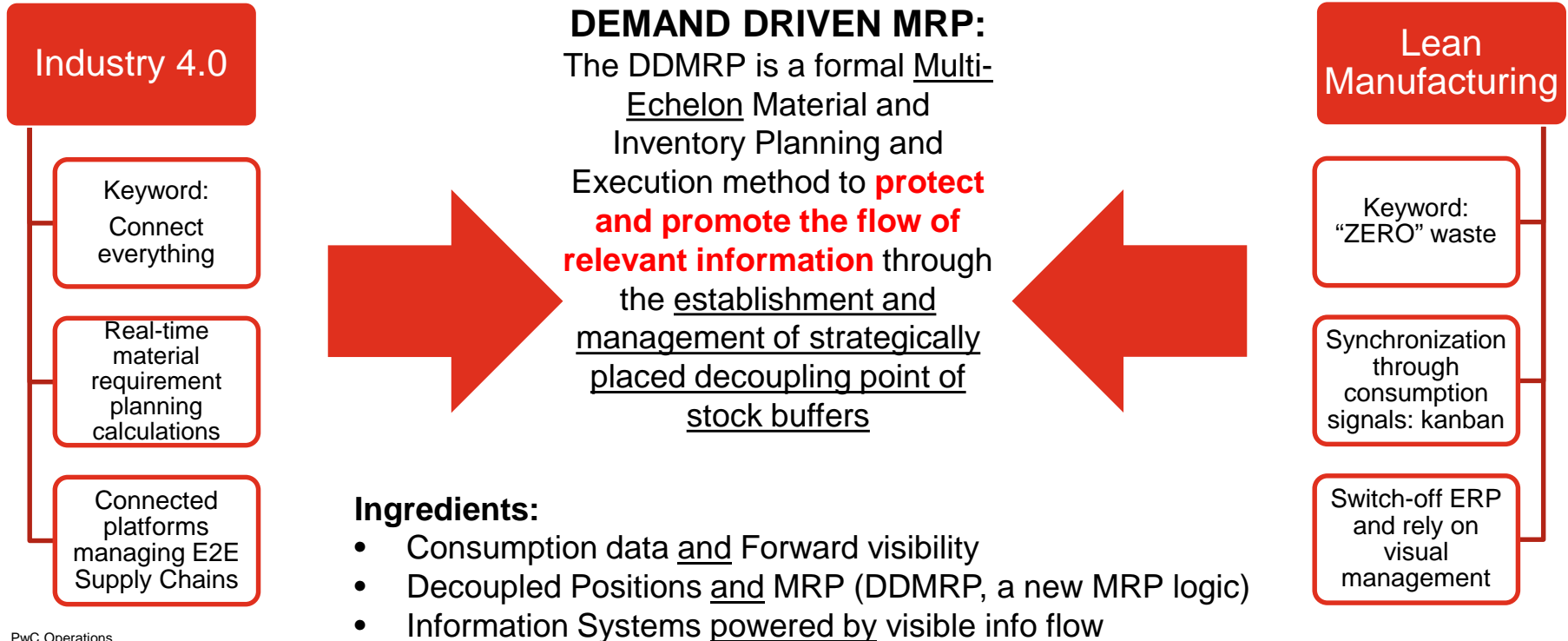
High inventory levels
due to siloed planning
(no multi-echelon
inventory optimization),
limited forecasting
capabilities and limited
end-to-end supply chain
visibility and
synchronization



Chronic and frequent shortages

Lack of availability of
parts, intermediate
items and finished
products, resulting in
accumulated delays in
manufacturing, late
deliveries and missed
sales

Our view on how to achieve Demand-Supply Synchronization: a **FRESH** perspective on Supply Planning and Execution



Lean (and other methodologies) can enrich 'traditional MRP': this is one of the premises of **Demand Driven MRP**

Innovative Supply Chain Planning and Execution

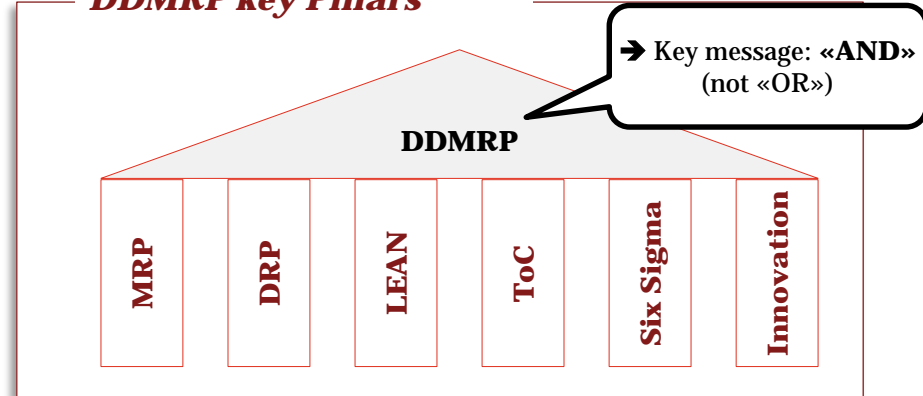
method: pilot applications in 2010, formalized in 2014, currently (2018) growing application base, expected to become mainstream in future years. Key points:

- Sales Orders-driven (**not forecasts**)
 - **Decoupling buffers** are “pre-filled” up to a **strategically** calculated level
 - Supply orders are issued **considering on hand + real customers orders only**
- **Proven Results: DDMRP outperforms traditional SC planning** (MRP-based or Lean-based) in nearly all contexts

Goals

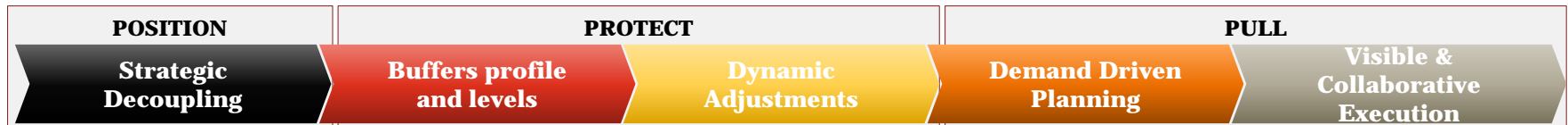
- Reduce cost while improving service level
- Improve Inventory turns
- Cope with Global Supply Network complexity
- Reduce lead times through the entire Supply Network

DDMRP key Pillars



Benefits

- Lower inventories (common range -15% to -30%)
- Higher Service Levels (On-Time Delivery to Commit, On-Time Delivery to Request)
- Lower order management cost



The 5 steps of Demand Driven MRP and key innovations (★)

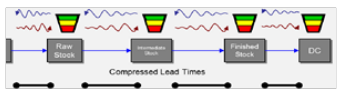
★ **Increased decoupling options** (generalization of MTS-MTO-ATO-PTO etc).
★ DLT(*): Decoupled Lead Time

Buffers depends on **ADU(**)**, DLTs(*), variability and lead time factors

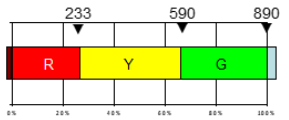
Buffers flex up/down (**daily**):
• **automatically** w/ADU (**)
• According to **known demand behaviours**

★ Supply Order generation triggered by Sales orders (**not forecast**)
★ **Decoupled explosion**

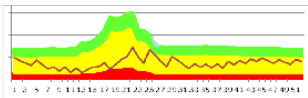
★ **Prioritized share** (distrib.)
• Priority-based execution (mfg)



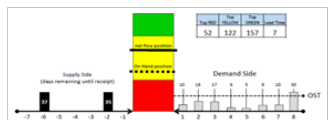
Decide **where** to decouple



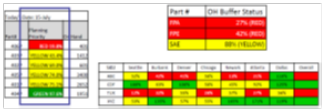
Decide **how much** to stock



Adapt buffers



Daily replenishment

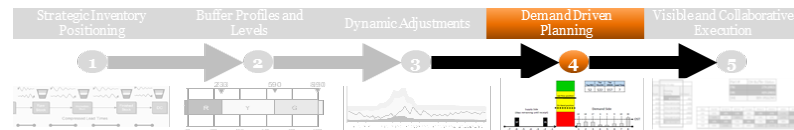


Real-time execution prioritization



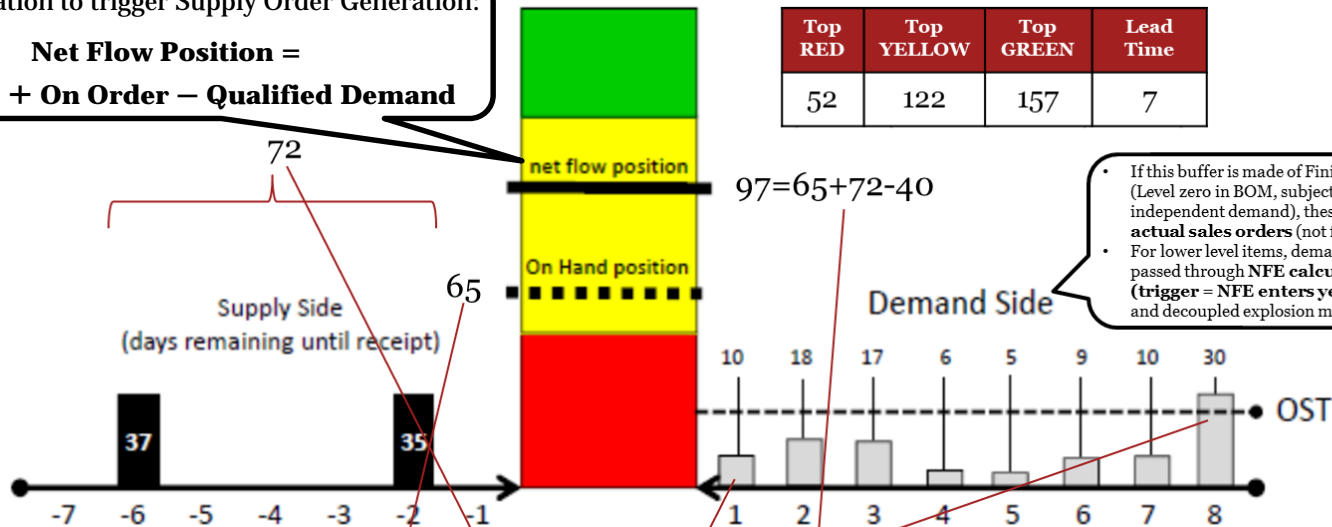
(*)Note: Decoupled LT: the longest unprotected path between decoupled positions

Where Lean meets MRP (and they both go beyond): Demand Driven Planning



Daily Calculation to trigger Supply Order Generation:

$$\text{Net Flow Position} = \text{On Hand} + \text{On Order} - \text{Qualified Demand}$$





















Top RED	Top YELLOW	Top GREEN	Lead Time
52	122	157	7

- If this buffer is made of Finished Products (Level zero in BOM, subject to independent demand), these would be **actual sales orders** (not forecasts)
- For lower level items, demand signals is passed through **NFE calculation** (trigger = NFE enters yellow zone) and decoupled explosion mechanism







$$97 = 65 + 72 - 40$$

Planning Priority	On Hand	On-Order	Qualified Demand	Net Flow Position	Order Amount	Request Date	Ending OH
61,8% (97/157)	65	72	40	97	60 (157-97)	Day 8	55

Demand Driven MRP succeeds in conjugating MRP and Lean...

	MRP (Push Model)	Lean (Pull Model)	DDMRP
Decoupling point	 Everything coupled (no strategic buffers)	 Everything decoupled (at every kanban loop level)	 Strategically decoupled
Buffer profiles and levels	 Not designed to manage stock position Safety stock against demand variability MRP nets to zero	 Two-bin/multi-bin kanban Supermarket of intermediate products	 Designed to manage stock position No safety stock DDMRP never nets to zero
Buffer adjustment	 Fixed buffer level	 Basically fixed buffer levels If buffers (# of kanban cards in the loop, colour levels in supermarket) need to flex, highly intensive manual work is required	 Dynamic buffer adjustment: buffer level is flexed up or down in anticipation of planned events or seasons
Production planning	 <u>Planned orders</u> create supply order in anticipation of need over a longer planning horizon Generates hundreds (if not thousands) MRP alerts/day (often planners supplement with excel tools)	 When consumption happens at buffer level, reorder is triggered regardless of demand situation (forecasts + confirmed orders)	 Only qualified <u>sales order</u> within short range horizon qualify as demand allocations
Execution	 Priority by due date	 Priority managed in FIFO order	 Priority by buffer status
ERP support and impacts	 Fully supported	 Mainly off-system	 Fully supported (growing maturity levels) & add-ons available

... and resolving the Supply Planning challenges

	DDMRP
Decoupling point	 Strategically decoupled
Buffer profiles and levels	 Designed to manage stock position No safety stock DDMRP never nets to zero
Buffer adjustment	 Dynamic buffer adjustment: buffer level is flexed up or down in anticipation of planned events or seasons
Production planning	 Only qualified <u>sales order</u> within short range horizon qualify as demand allocations
Execution	 Priority by buffer status
ERP support and impacts	 Fully supported (growing maturity levels) & add-ons available

Key Benefits

- = Shorter lead time
- = Shorter planning horizon

- = Inventory cost reduction

- = Right-size inventory
- = Better management of trade-offs between inventory investment and service level

- = More accuracy due to use of sales order instead of planned orders

- = More visibility on flow
- = Easier to manage, at reduced ordering cost
- = Easy to interpret signals on open supply priorities

- = Easy supply order generation and update of planning parameters

No more 'inexplicable' shortages



Inventory reduction from 15% to 30% at the same, or even better, service level



Higher responsiveness and reliability



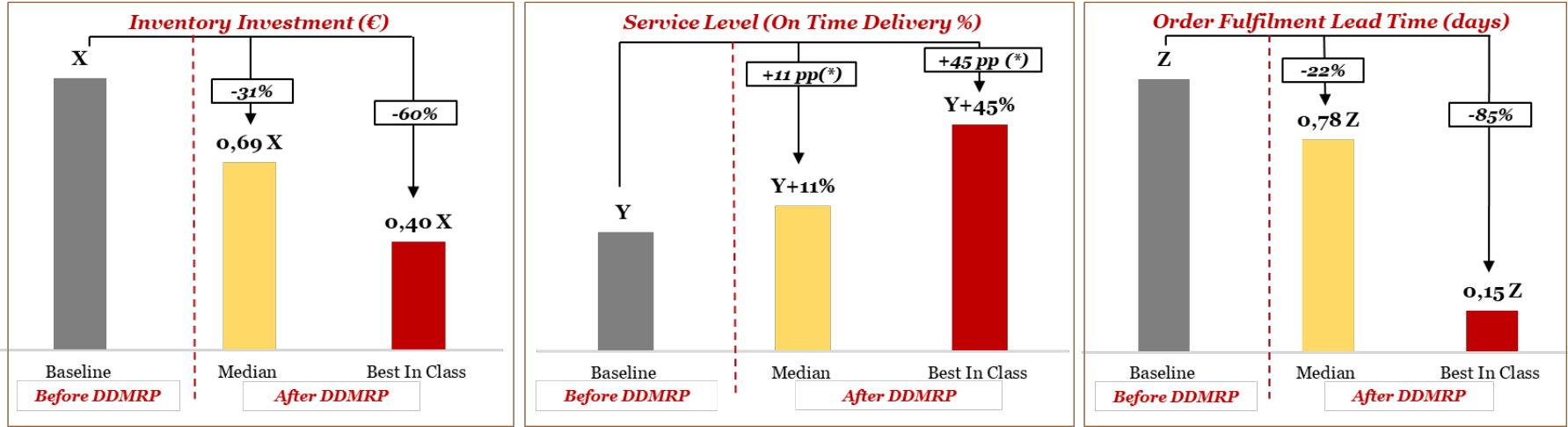
Diminished effort



Easy adherence



DDMRP: Early adopters and Results



Sectors

- *Automotive (tier 1s)*
- *Industrial Manufacturing*
- *Consumer Products*
- *Electronics & Technology*
- *BioTech & Pharma*
- *Aerospace*
- *Petro-Chemicals*
- *Retail & Luxury Goods*

More details on <https://www.demanddriveninstitute.com/case-studies>

Project Approach

(*) Contact us to book a free-of-charge company workshop

Preliminary Workshop (2 hrs)

1 week (*)

Understand applicability

PoV: Proof of Value

2-3 weeks

Evaluate **Potential** on Service Level and Inventory Turns improvement

PoC: Proof of Concept + Pilot

2-3 months

Apply the new logic and **get results**

Extension

0,5-2 years

Complete **Demand Driven** transition

Contacts



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