MIT Center for Transportation & Logistics

Demand Driven Materials Requirements Planning (DDMRP)

Can DDMRP be a game-changer in supply chain planning?

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Sponsors

OMPARTNERS

Advanced Planning System Provider

Demand Driven INSTITUTE™

Institute developing and promoting DDMRP

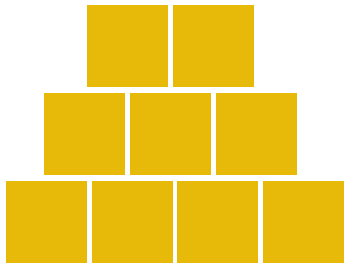
Industrial partner (investigating DDMRP)

Motivation: Can DDMRP be a game changer?

DDMRP average result :

-20%

inventory



13%

service level

-48%

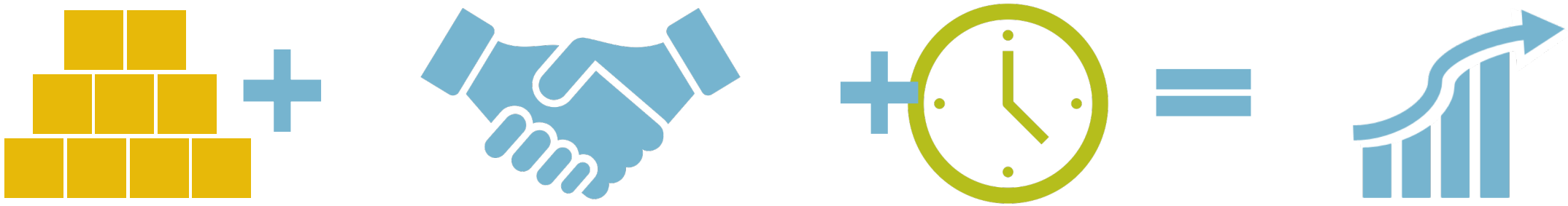
leadtime reduction

Can these numbers be achieved in all industries?

Motivation: Can DDMRP be a game changer?

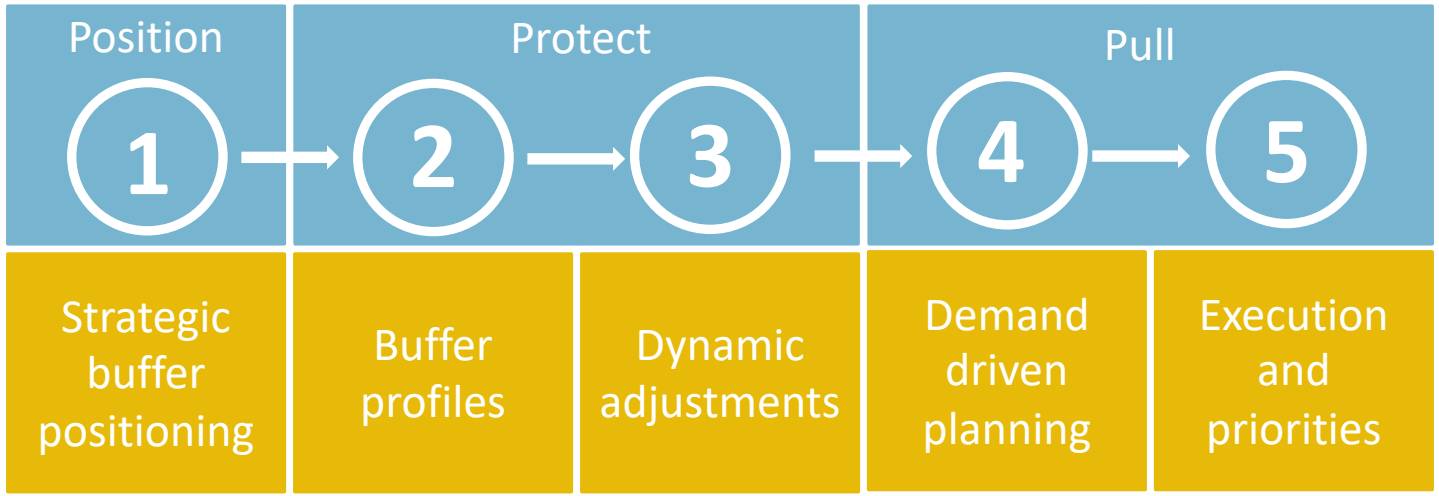
Financial impact:

inventory + service level + leadtime reduction = ROI

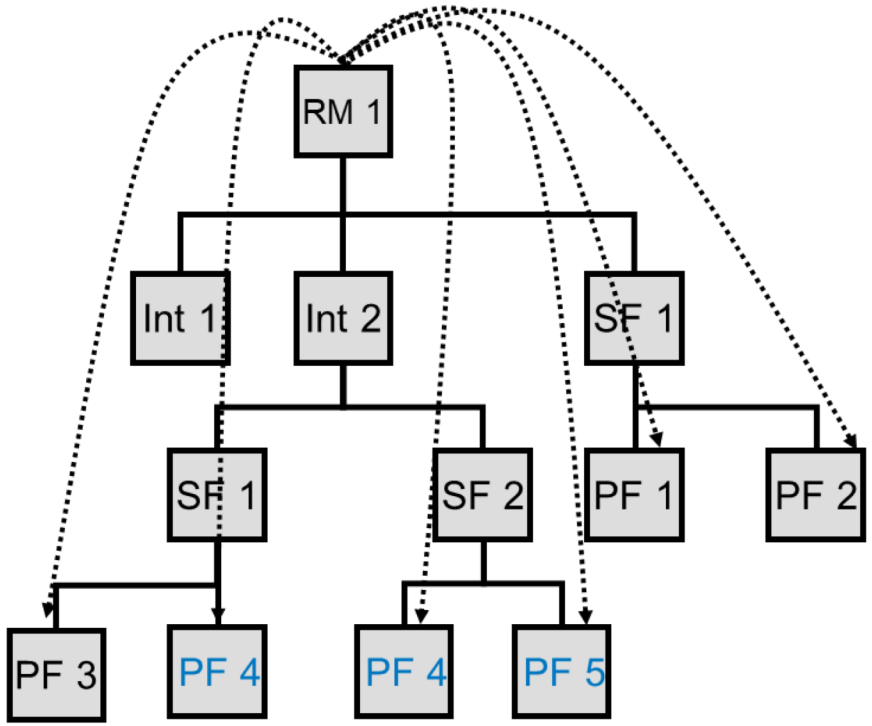


What is DDRMP?

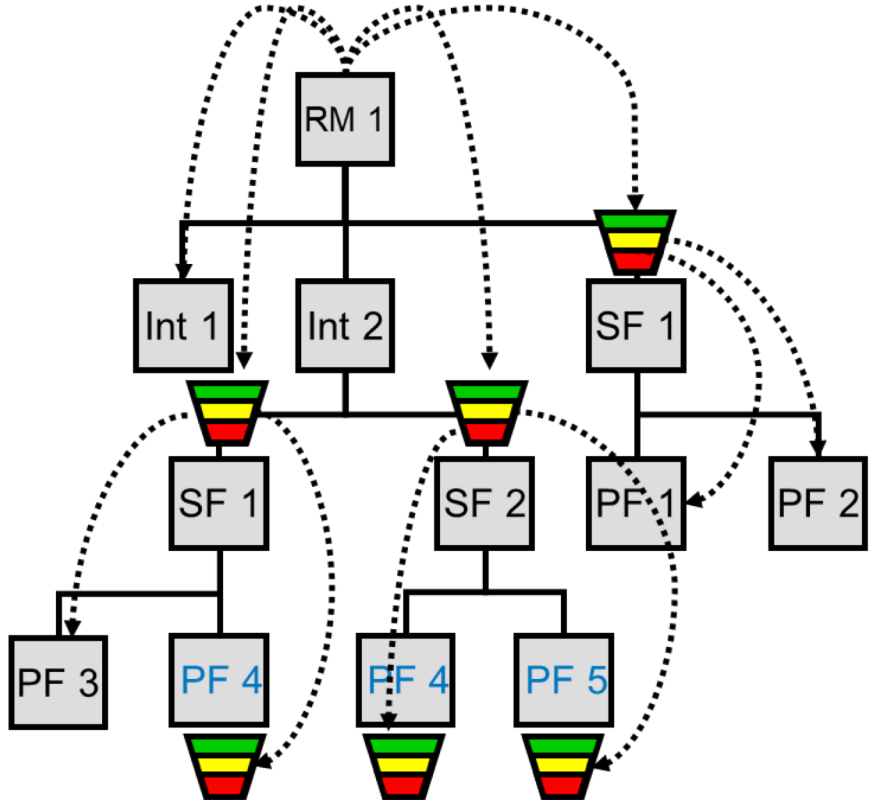
DDMRP is a multi-echelon supply chain planning approach that combines the best of lean, MRP, six-sigma and the theory of constraints



What is DDMRP?



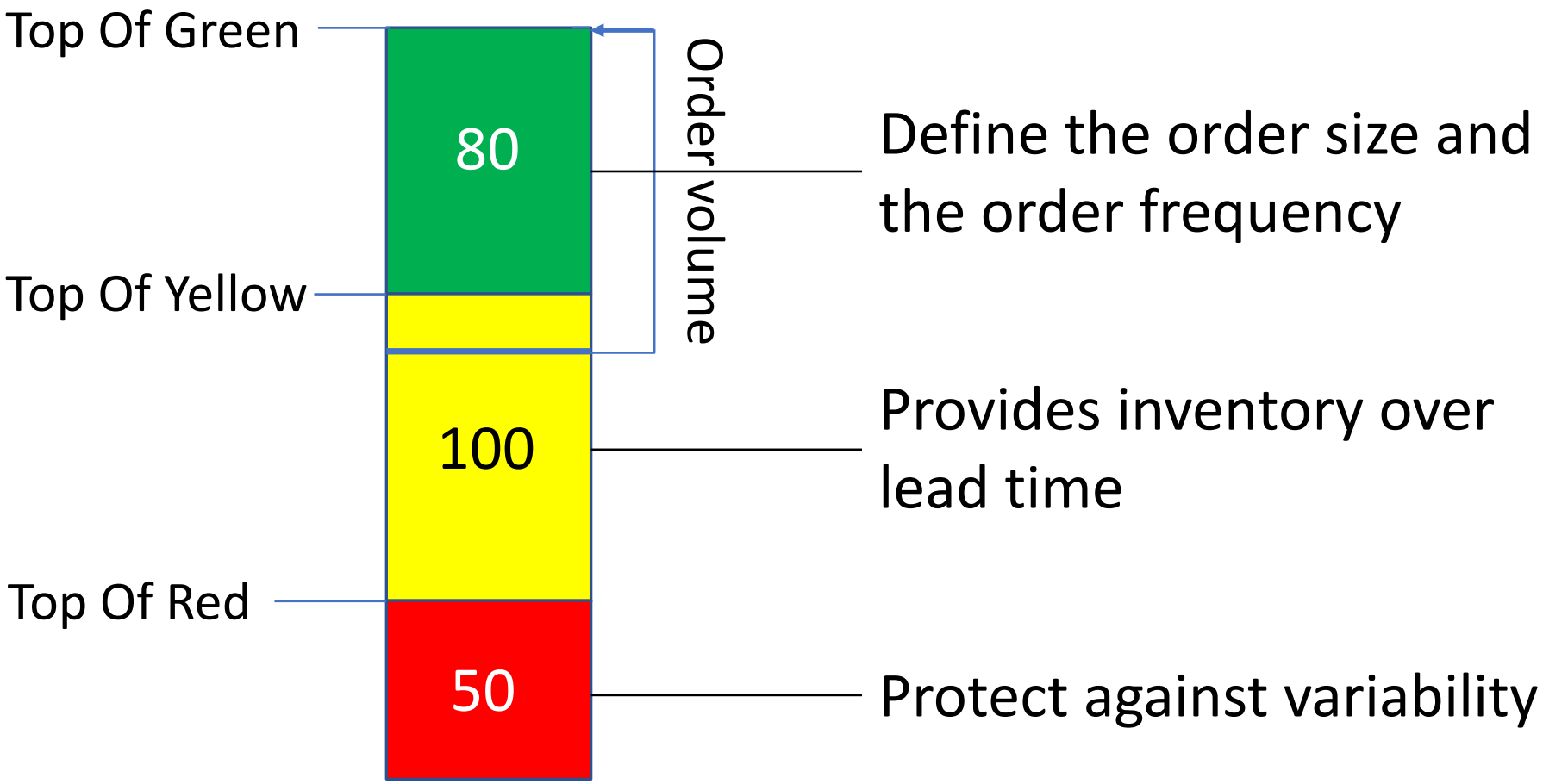
Coupled MRP



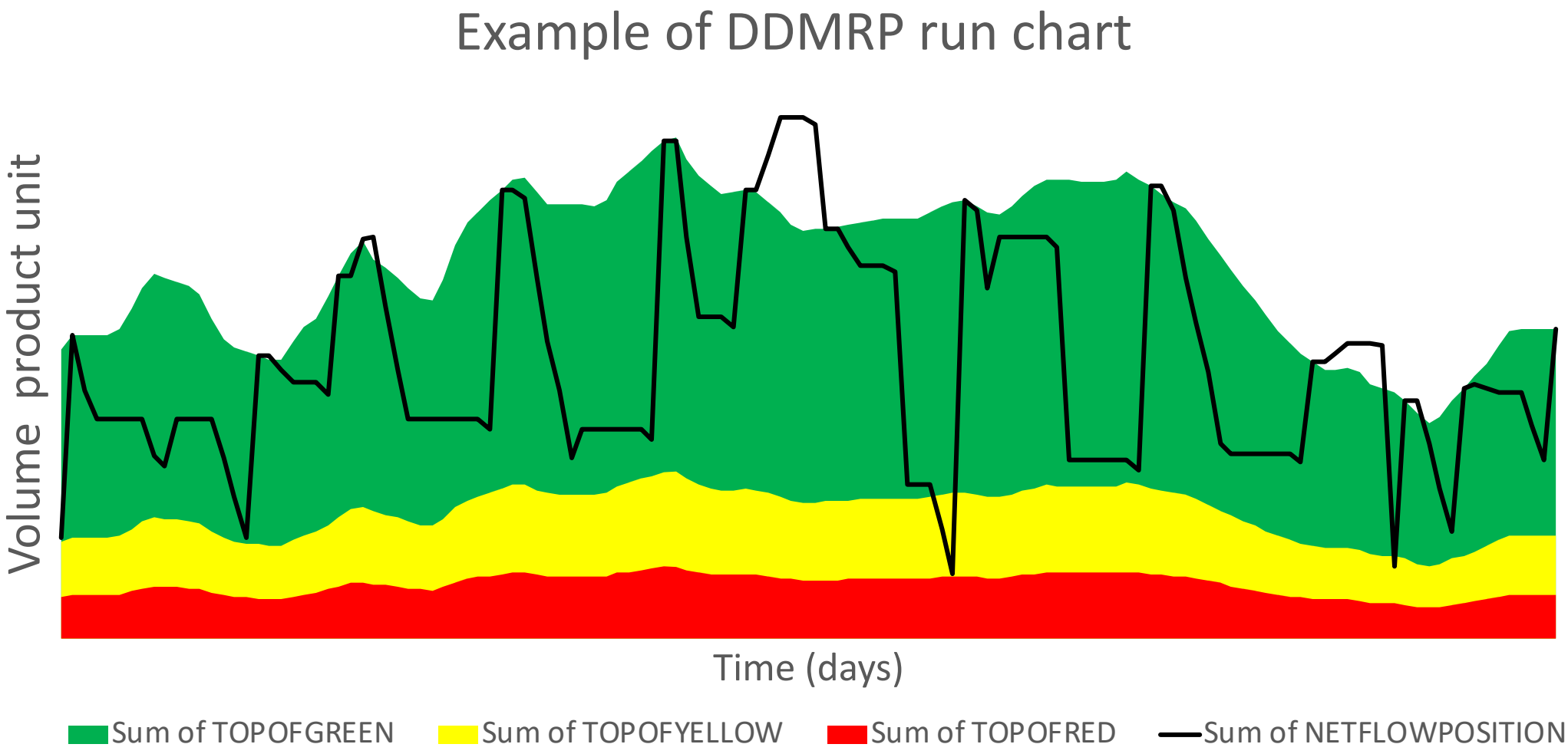
Decoupled DDMRP

DDMRP Leverages decoupling points to make the planning problem easier!

What is DDMRP?: Inventory buffers



What is DDMRP?: Run chart



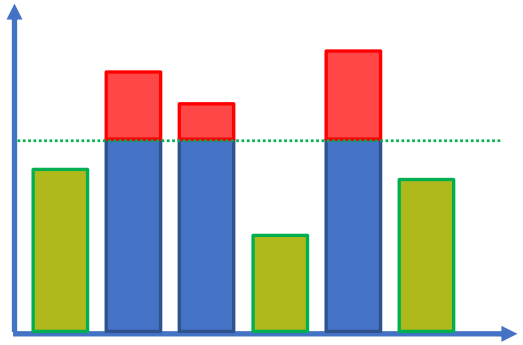
What is in for me?

Could that work in my company?

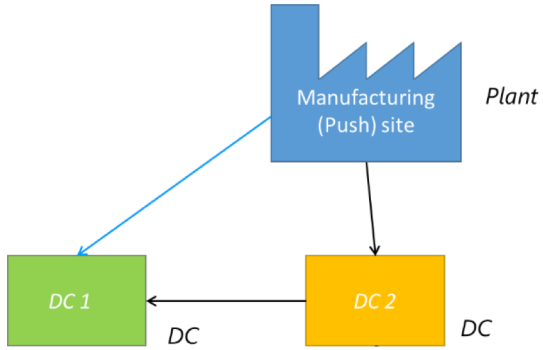
Problem Setting and Research Question

DDMRP uses decoupled points to create a more stable and suitable environment for MRP. Would that bring better results than a APS?

Capacity Constraint



Sourcing decision



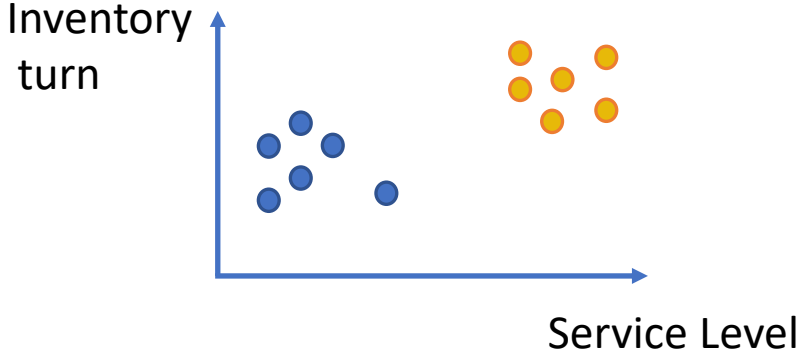
Shelf-life Constraint

Research Question: *What would be the added value of DDMRP in finite capacity planning under uncertainty?*

Methodology

Qualitative/ Quantitative part: What was the impact of DDMRP on companies that implemented it?

Simulation analysis: Let's compare KPIs of plans made with APS and DDMRP

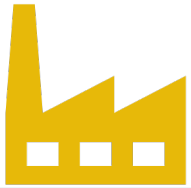
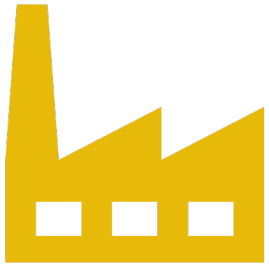
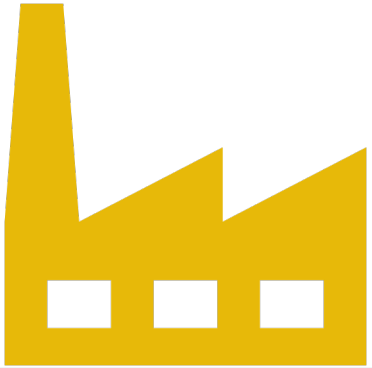


Interviews: A few companies, in-depth investigation

Survey: Many companies, targeted questions

Simulation: Comparing APS and DDMRP in a controlled environment

Could it work for my company: Size

			
Annual revenues	<= $100 M	> $100M <= $500M	> $10 B
Proportion	17%	46%	29%

Could it work for my company: Legacy system

	MRP	APS
service level	23%	7%
inventory	-23%	-13%
Customer lead time	-55%	-26%

Could it work for my company: Maturity level

		
service level	23%	6%
inventory	-22%	-16%
Customer lead time	-47%	-29%

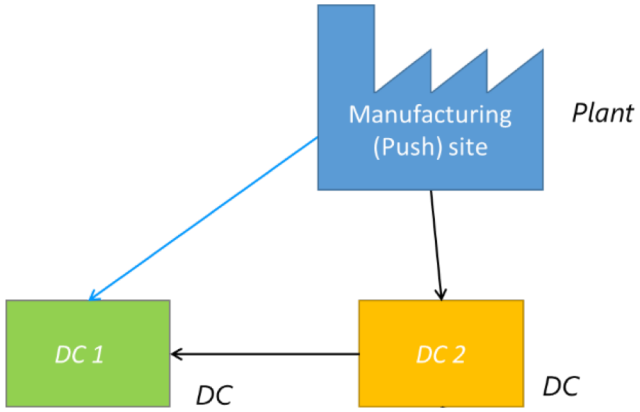
Could it work for my company?

It looks like it is applied everywhere!

Could it work for my company?

Could it work for my company: Sourcing decisions

Sourcing decision



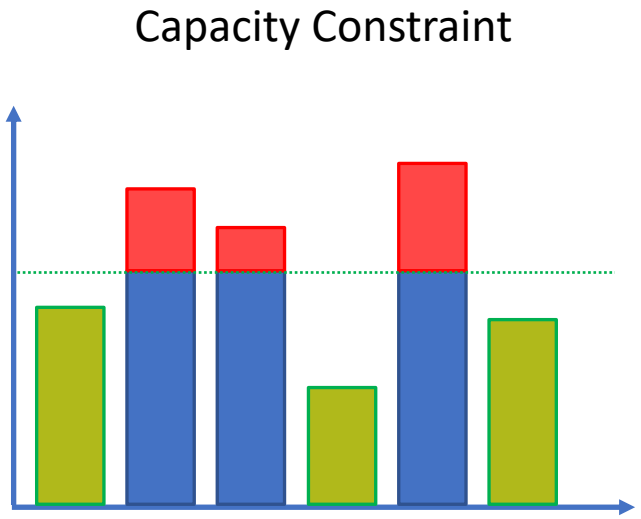
	All respondents	Respondents with sourcing decisions
Moderately Effective	27%	38%
Effective	54%	46%

Could it work for my company: shelf-life limitations

Shelf-life Constraint

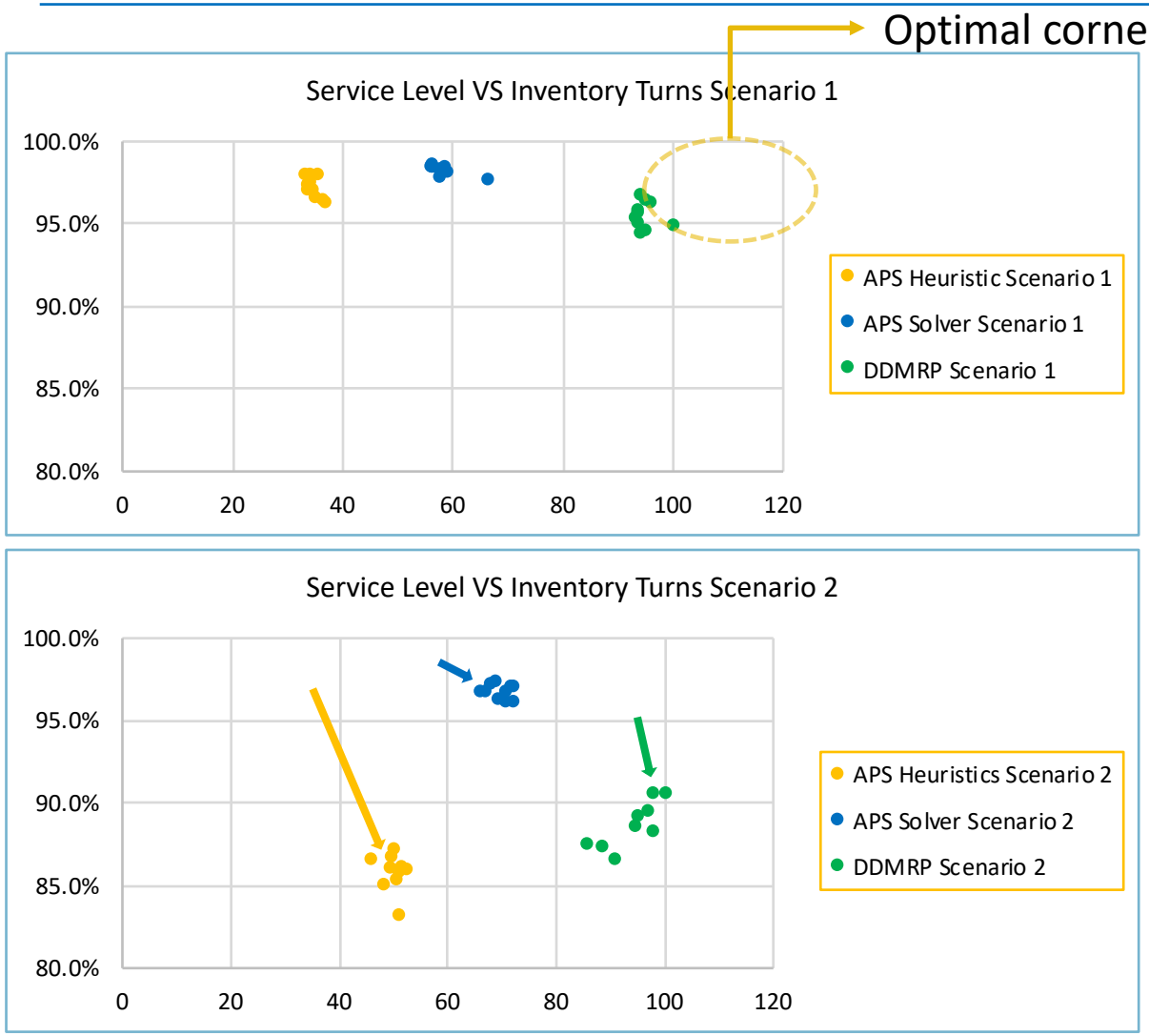
	All respondents	Respondents with shelf-life limitations
Moderately Effective	29%	38%
Effective	42%	46%

Could it work for my company: Finite capacity



	All respondents	Capacity constraints respondents
Moderately Effective	15%	18%
Effective	58%	73%

Could it work for my company: DDMRP or APS



DDMRP outperforms the heuristic-based planning

Results are similar to the solver

DDMRP is more robust to capacity constraint than the heuristic

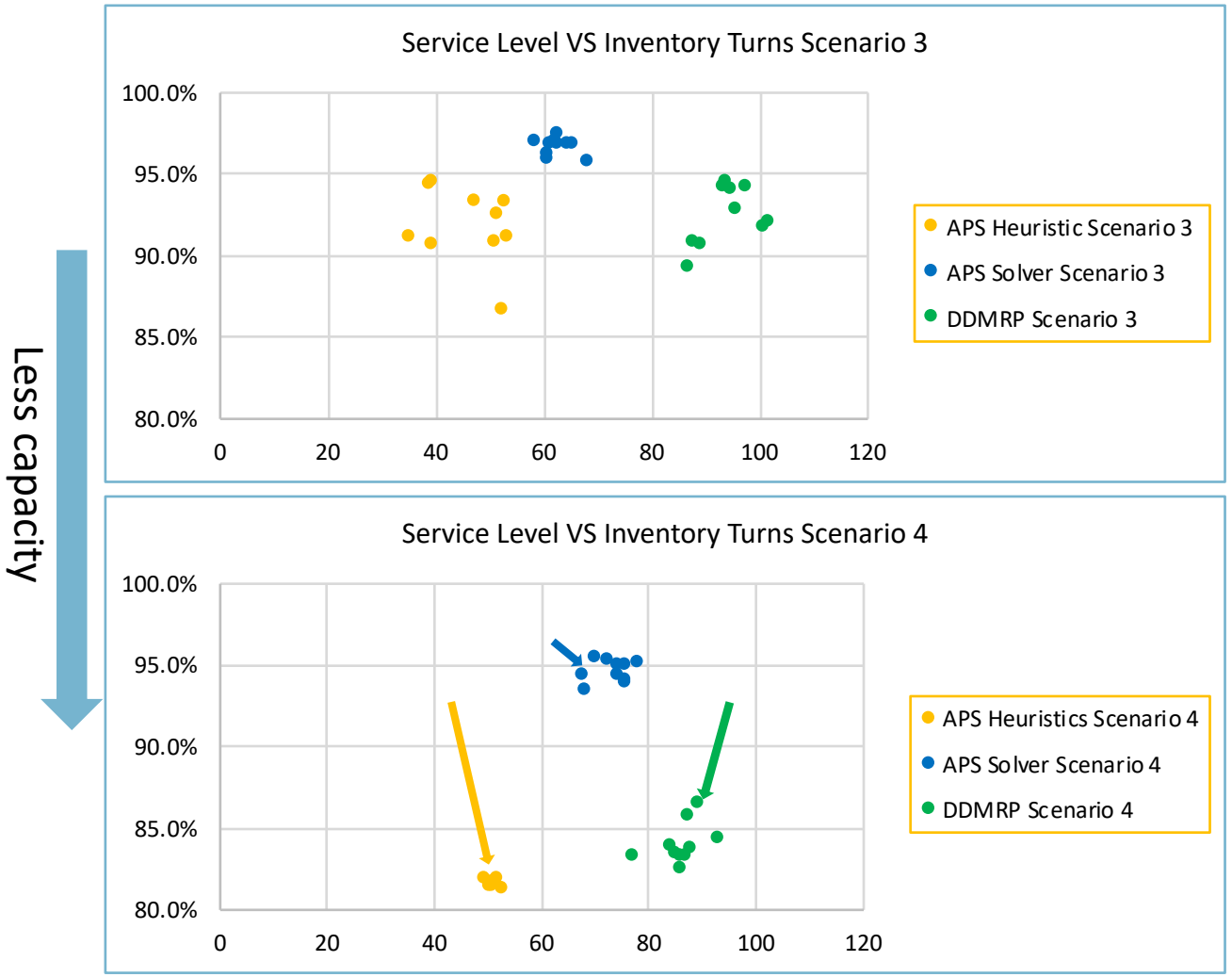
The solver is overall more robust

Could it work for my company: DDMRP or APS

DDMRP outperforms the heuristic-based planning

Results are similar to the solver

The solver is overall more robust

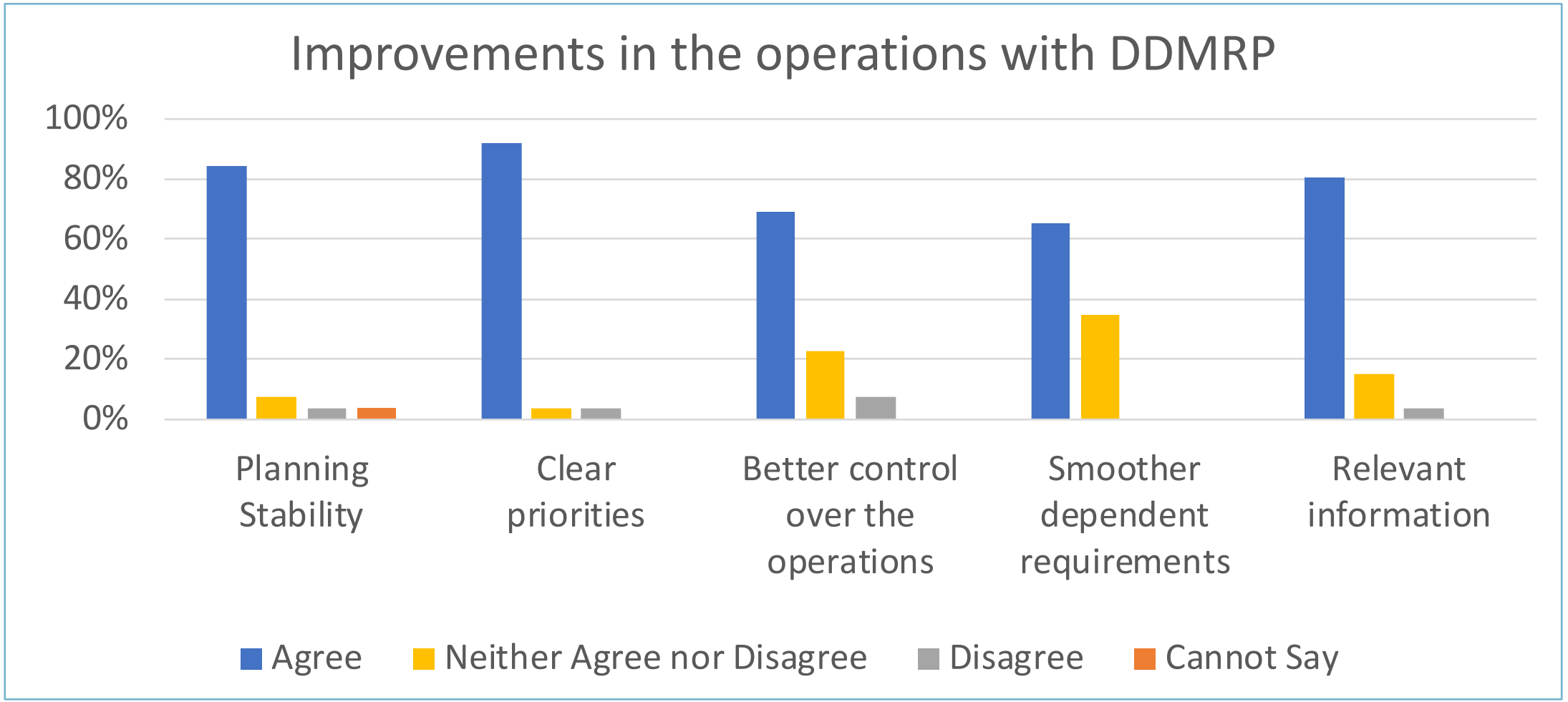


Could it work for my company: DDMRP or APS

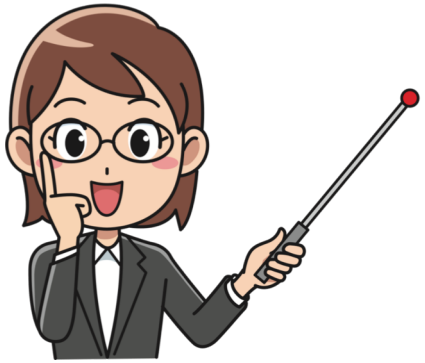
	APS heuristic	APS solver	DDMRP
KPIs	✗	✓	✓
Easy to understand	✓	✗	✓
Easy to maintain	✓	✗	✓
Non-trivial solutions	✗	✓	✗
Operational constraints	✗	✓	✗

DDMRP and the operations

Graph showing the frequency of the answer



DDMRP streamlines operations



Education program across the company

Educate everyone on the basic of flow

Align objectives

DDMRP implementations lead to streamlined operations across the internal supply chain

Could it work for my company?

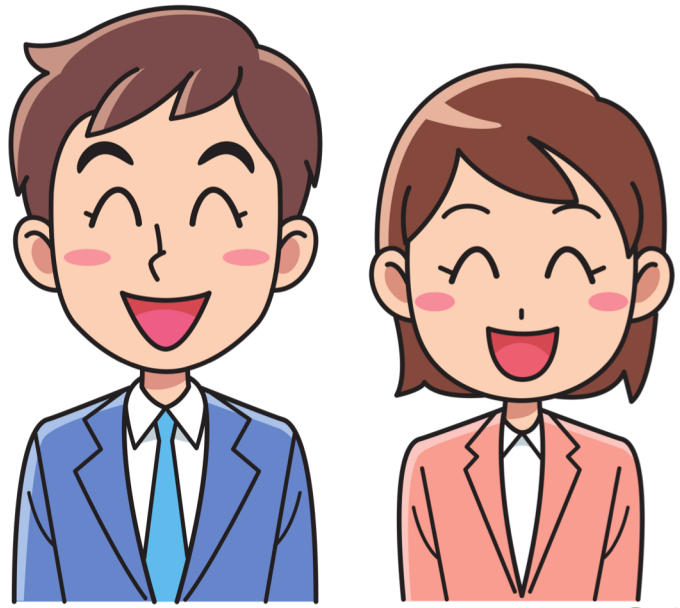
It seems like DDMRP can handle complex operational constraints!

Conclusion: What is the added value of DDMRP?

Easy planning method that can have a positive financial impact and provides a competitive edge

Provides results similar to a mathematical solver

Streamline the operations



Do you have any question?

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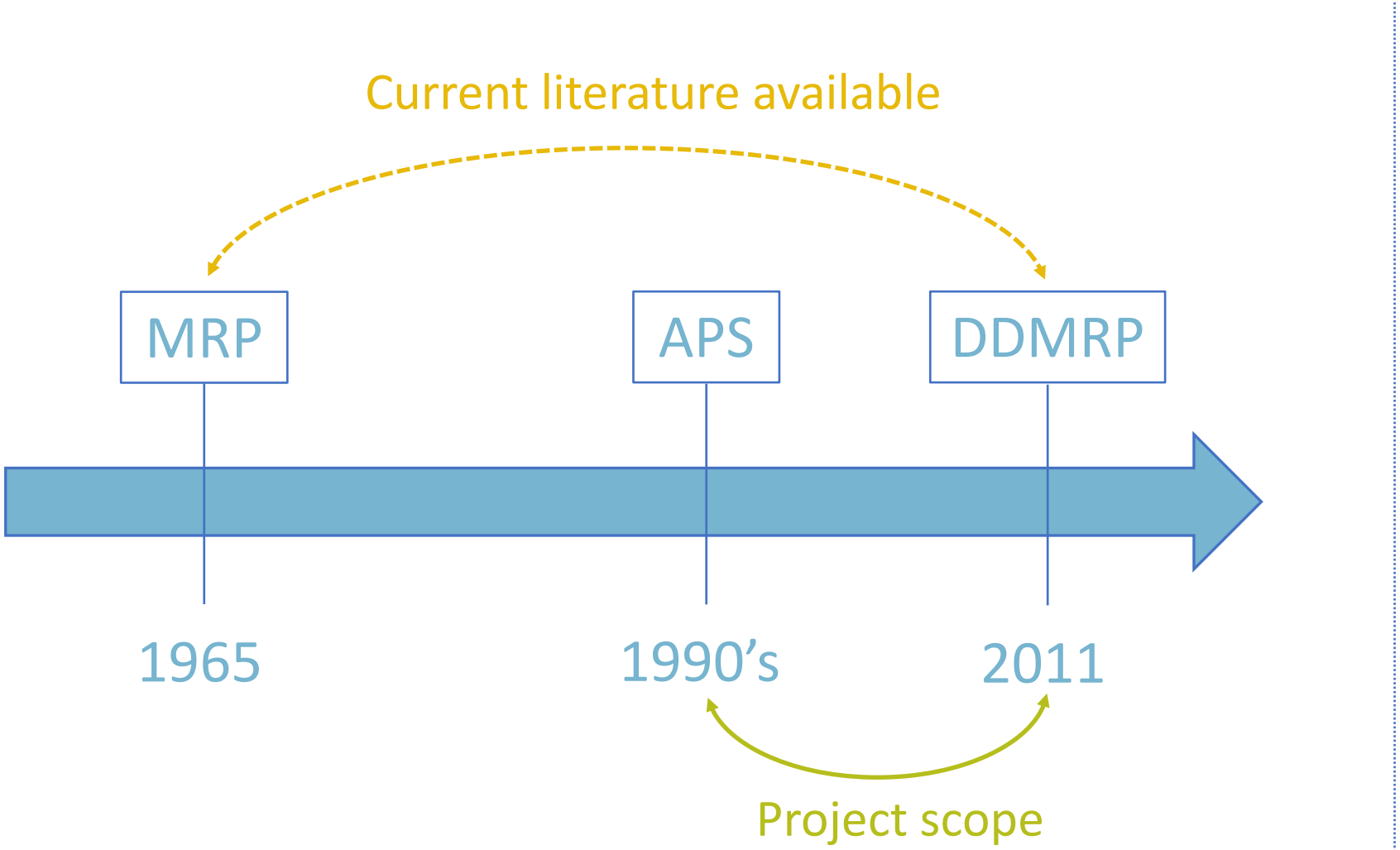
Literature review: Current state



Problem setting: DDMRP planning principles

Demand Driven Operating Model

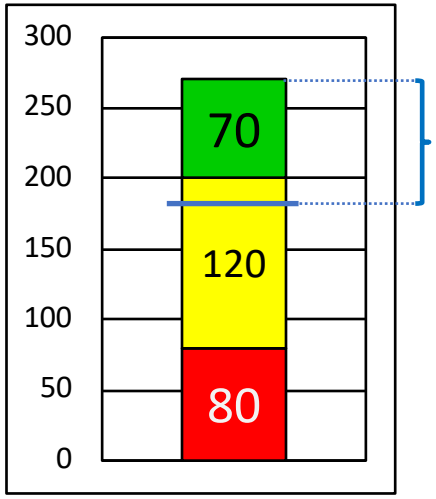
Demand Driven S&OP

Adaptive S&OP

Order book

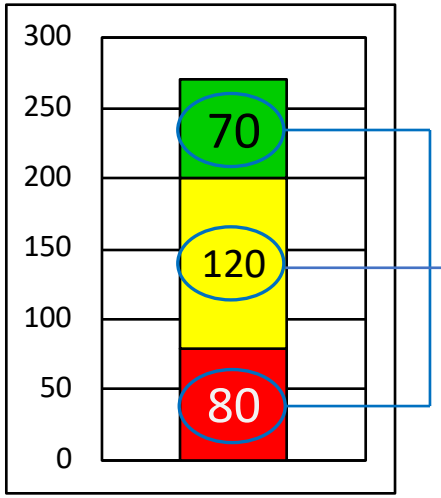
Cumulative leadtime

Long time future



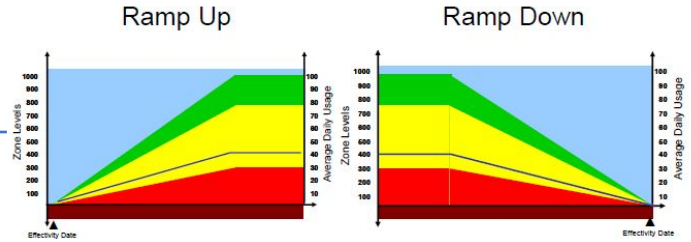
Quantity to replenish

Only use Customer order



Use forecasts

Set up buffers according to anticipated future



Adapt the system (Portfolio, capacity, buy-make) to the desired future

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Problem setting: Hypothesis of MRP

MRP requires stable demand signal and low operational variability.

MRP/APS	DDMRP
1 coupled plan	Multiple decoupled plans
Long leadtimes	Shorter (decoupled) leadtime
Variability passed on between levels	Reduced variability
✗ Hypothesis are no longer valid	✓ Hypothesis are no longer valid