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

Advanced Planning System Provider

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

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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?

DDMRP Leverages decoupling points to make the planning problem easier!
What is DDMRP?: Inventory buffers

Define the order size and the order frequency

Provides inventory over lead time

Protect against variability

Buffer levels (in product unit)

Top Of Green
80

Top Of Yellow
100

Top Of Red
50
What is DDMRP?: Run chart

Example of DDMRP run chart

- Sum of TOPOFGREEN
- Sum of TOPOFYELLOW
- Sum of TOPOFRED
- Sum of NETFLOWPOSITION
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

<table>
<thead>
<tr>
<th>Annual revenues</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>$&lt;= 100 M</td>
<td>17%</td>
</tr>
<tr>
<td>$&gt; 100M &lt;= 500M</td>
<td>46%</td>
</tr>
<tr>
<td>$&gt; 10 B</td>
<td>29%</td>
</tr>
</tbody>
</table>
Could it work for my company: Legacy system

<table>
<thead>
<tr>
<th></th>
<th>MRP</th>
<th>APS</th>
</tr>
</thead>
<tbody>
<tr>
<td>service level</td>
<td>23%</td>
<td>7%</td>
</tr>
<tr>
<td>inventory</td>
<td>-23%</td>
<td>-13%</td>
</tr>
<tr>
<td>Customer lead time</td>
<td>-55%</td>
<td>-26%</td>
</tr>
</tbody>
</table>
Could it work for my company: Maturity level

<table>
<thead>
<tr>
<th></th>
<th>Company 1</th>
<th>Company 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service level</td>
<td>23%</td>
<td>6%</td>
</tr>
<tr>
<td>Inventory</td>
<td>-22%</td>
<td>-16%</td>
</tr>
<tr>
<td>Customer lead time</td>
<td>-47%</td>
<td>-29%</td>
</tr>
</tbody>
</table>
Could it work for my company?

It looks like it is applied *everywhere*!
Could it work for my company?

Can DDMRP handle my operational constraints?
Could it work for my company: Sourcing decisions

<table>
<thead>
<tr>
<th>Sourcing decision</th>
<th>All respondents</th>
<th>Respondents with sourcing decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderately Effective</td>
<td>27%</td>
<td>38%</td>
</tr>
<tr>
<td>Effective</td>
<td>54%</td>
<td>46%</td>
</tr>
</tbody>
</table>
Could it work for my company: shelf-life limitations

<table>
<thead>
<tr>
<th>Shelf-life Constraint</th>
<th>All respondents</th>
<th>Respondents with shelf-life limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderately Effective</td>
<td>29%</td>
</tr>
<tr>
<td></td>
<td>Effective</td>
<td>42%</td>
</tr>
</tbody>
</table>
Could it work for my company: Finite capacity

### Capacity Constraint

<table>
<thead>
<tr>
<th></th>
<th>All respondents</th>
<th>Capacity constraints respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderately Effective</td>
<td>15%</td>
<td>18%</td>
</tr>
<tr>
<td>Effective</td>
<td>58%</td>
<td>73%</td>
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</tbody>
</table>
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
<table>
<thead>
<tr>
<th></th>
<th>APS heuristic</th>
<th>APS solver</th>
<th>DDMRP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KPIs</strong></td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Easy to understand</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Easy to maintain</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Non-trivial solutions</td>
<td>✗</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Operational constraints</td>
<td>✗</td>
<td>✓</td>
<td>✗</td>
</tr>
</tbody>
</table>
DDMRP and the operations

Graph showing the frequency of the answer

Improvements in the operations with DDMRP

- Planning Stability
- Clear priorities
- Better control over the operations
- Smoother dependent requirements
- Relevant information

- Agree
- Neither Agree nor Disagree
- Disagree
- Cannot Say
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

Current literature available

MRP 1965

APS 1990’s

DDMRP 2011

Project scope

PhD thesis

Current literature available

1965

1990’s

2011

MRP

APS

DDMRP

Project scope

PhD thesis
Problem setting: DDMRP planning principles

- Only use Customer order
- Use forecasts
- Set up buffers according to anticipated future
- Quantity to replenish
- Adapt the system (Portfolio, capacity, buy-make) to the desired future

Order book
Cumulative leadtime
Long time future
Problem setting: Hypothesis of MRP

### MRP/APS
- 1 coupled plan
- Long leadtimes
- Variability passed on between levels

### DDMRP
- Multiple decoupled plans
- Shorter (decoupled) leadtime
- Reduced variability

- **Hypothesis are no longer valid**
- **Hypothesis are no longer valid**