Demand Capacity Planning

Rickard Holm, Volvo Car Corporation

Odette SCM Group
Background Odette DCP Project

- Capacity Alignment is an issue in almost every business
  - capacities (production equipment, personnel, etc.) need to be aligned to fluctuation of market/customer demand
  - traditionally this process is done company internally without explicit involvement of external business partners
  - recent developments in the automotive industry (e.g. globalisation, platform strategies, longer machine running times) have increased the difficulties incorporated with the traditional approach Suppliers usually work in 3 or 4 shift operation 7 days per week
    => capacity increase is much more difficult

- Scope of the Odette Recommendation is a **collaborative, integrated** approach for Demand Capacity Planning that helps to overcome the weak points of the traditional approach and is the foundation for marketing simulations
Background Odette DCP Project

- When Odette started the DCP project, several companies (e.g. Audi/VW, DC (MCG), Ford, GM, PSA, Renault) had either already introduced or at least planned to introduce DCP solutions
  
  Example: GM Europe (system called CAMAS) started in 1999; in 2002: 1,800 suppliers and 50,000 part numbers

- Suppliers are interested to avoid heterogeneous individual solutions with every customer and need to see consolidated medium and long term demands for capacity management

- Customers are interested to minimise effort and time for roll-out of the DCP process to their supply base

- Conclusion: OEMs and Suppliers are interested to standardise the basic functionality and processes regarding DCP
Demand Capacity Planning (DCP) - Background
The Odette SCM Group

- Established in March 2001

- **Goal** of Odette SCM Group is to identify and tackle the reasons for slow implementation of SCM-concepts in automotive industry
  - bringing together the *know-how* and *experience*
  - create *recommendations* (SCMo & DCP)
  - enable *interoperability*

- This presentation refers to the recommendation for the SCM building block *"Demand Capacity Planning"* (DCP)
## Participants DCP Project

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<thead>
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<th><strong>OEMs</strong></th>
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<th><strong>Suppliers</strong></th>
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<th><strong>Organizations</strong></th>
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<tbody>
<tr>
<td><strong>Audi</strong></td>
<td>Roland Scheidler</td>
<td><strong>Faurecia</strong></td>
<td>Michel Godin</td>
<td><strong>Galia</strong></td>
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<tr>
<td><strong>BMW</strong></td>
<td>Jan Kühner (replaced Manfred Wiltschek)</td>
<td><strong>Siemens VDO</strong></td>
<td>Karlheinz Dietz</td>
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<tr>
<td><strong>DaimlerChrysler</strong></td>
<td>Andreas Basche</td>
<td><strong>Treves</strong></td>
<td>Hugues de Quercize</td>
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<td><strong>Ford</strong></td>
<td>Thomas Lieb</td>
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<tr>
<td><strong>GM</strong></td>
<td>Angelika Gillmann*, Peter Scherer</td>
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<td><strong>PSA</strong></td>
<td>Rob Exell</td>
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<td><strong>Renault</strong></td>
<td>Didier Canals</td>
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<td><strong>Volvo</strong></td>
<td>Rickard Holm</td>
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<tr>
<td><strong>VW</strong></td>
<td>Martina Hemken</td>
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<td><strong>Bosch</strong></td>
<td>Oliver Merle**</td>
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* no direct participation in meetings in 2002

** Project Leader
Goal and target of Odette DCP concept

- **Goal**: Improve the traditional, rather unstructured, cumbersome capacity planning activities significantly
  - no 100% solution

- **Target** of DCP
  - detect potential capacity shortfalls and under-utilization of capacities **in time**, efficiently and reliably
  - Structured and **efficient resolution procedure** once a serious future capacity shortfall is identified
Important elements Odette DCP process

- reliable, consistent and agreed medium/long term demand planning
  - As demand information will never be 100% perfect. uncertainty should be considered in an appropriate way
- suitable representation of capacity information
- open communication of suppliers and customers (e.g. transparency of shared relevant data)
- uniform/agreed demand and capacity definitions
- agreed collaborative business processes
Benefits of Collaborative DCP:

- Reduction of all extra costs associated with capacity shortfalls
  - premium freight
  - overtime and premiums
  - frequent production plan rescheduling
- No loss of customer orders and thus contribution margin
- Reduction of all cost associated with idle capacities
- Less administrative work in the DCP process
- Transparency and consolidated view of customer’s demand figures in shortage situation enables to take the right decisions/measures (right place, right time, right quantity,...)
Enable smooth and secure adjustment of capacities to the mid- and long-term oscillation/variation of demand

**Legend:**
- **demand**
- **declared capacity**

**reactive approach**
- supplier adapts capacity to strictly follow the demand fluctuations
  - alignment
  - limited collaboration

**pro-active approach**
- supplier offers capacity increment to enable simulation of marketing scenarios
  - alignment & signal to customer
  - collaboration
Scope of Odette DCP

users
- operations (logistics/production)
- production planning
- sales / purchasing, project mgmt.

examples for measures
- overtime, premium freight, banking
- additional shifts, small investments, large banking
- major investments (tooling, machines, etc.)

* Supply Chain Monitoring ** e.g. call-offs, VMI, Kanban

Odette SCM Group
Current Situation / Motivation for DCP
Customer Point of View

- **Experience:** severe capacity problems in certain areas of the automotive industry in the late 90s

- **Reasons:**
  - **Too late recognition**/communication of demand increase
  - **No reaction** of some suppliers on forecasted demand increases
    - no (proactive) capacity increase
    - no timely communication of capacity shortfall to effected customer(s)
  - **Slow** decision taking and resolution process
  - In bottleneck situations customer plants act uncoordinated
  - Suppliers often have too optimistic capacity assumptions

- **Result:** A significant number of cars was not build/sold due to unresolved capacity shortfalls
Current Situation / Motivation for DCP
Supplier Point of View (Multiple Customer)

Experience:

- **Severe capacity problems** in certain areas of the automotive industry in the late 90s
- Increasing difficulty and effort to build **realistic** medium and long term demand (sales/production) **forecasts**
- Significant **time lags** in the alignment of capacities to demand fluctuation

Reasons:

- Stability & reliability of demand (sales / production) planning (= basis for capacity planning) is rather low
- In general customers do not provide official demand forecasts with a time horizon of more than 12 months
- **Slow** and unstructured decision taking and resolution process
Current Situation / Motivation for DCP
Supplier Point of View (Multiple Customer)

Result:
- Capacity **shortfalls** / **under-utilization** of capacities
- High **risk** for suppliers to make significant investments
- Preferred strategy is to wait until a sufficient level of **confidence** is reached regarding the future demand
- Supplier demand capacity planning **not consistent** with customer planning
Current Situation / Motivation for DCP

Conclusion

- There is a strong **need for improvement** in the field of DCP:
  - better prevention
  - smart, lean, IT-supported, structured process for capacity alignment
  - integrated, collaborative approach based on sharing of common and consistent data

- The big car makers are already engaged in DCP concepts
  - Goal is to **reduce number and consequences of capacity shortfalls** significantly and all related expenditures and loss of profit margin
Basic Concept for DCP
Two Models of Demand Capacity Planning

Traditional Process (sequential)

- Demand (quantities & dates)
- Check if demand can be met
- Confirm or communicate “best can do” to customer

Integrated Process (parallel)

- Demand (quantities & dates)
- Supplier capacities (qty & dates)
- Autom. check demand vs. capacities
- Counter measures / action plan

Future requirement of OEMs ➔ Odette Focus

The integrated process also allows to roughly check feasibility of marketing scenarios (approximation) without further supplier involvement; identification of critical capacity constraints.

Established process
Basic Concept for DCP
Need for Demand Consolidation

1. inputs
   - Customer A forecast
   - Customer B forecast
   - expected new business
   - market research data
   - individual estimates

2. demand (quantities + dates)
   by item (e.g. partnumber or product group) for all customers

3. capacities (quantities + dates)
   by item (e.g. partnumber or product group) for all customers
Multi-Customer DCP
Separate, Customer-driven Solutions ...

demand (quantities+dates) by item (e.g. partnumber / product group)

capacities (quantities+dates) by capacity family (group of items)

... do not provide the consolidated view, suppliers need for DCP
Multi-Customer DCP
Interoperable DCP applications ...

demand (quantities+dates)
by item (e.g. partnumber / product group)

capacities (quantities+dates)
by capacity family (group of items)

... would provide the consolidated view across all customers for the suppliers
Basic Concept for DCP
Layer Concept

- DCP does not replace ERP systems
- DCP is a complement (add on) to existing backend systems

Legend:

= back-end system,

= DCP-Screen with customised view
General Considerations
Definition of Time Intervals - Example

Demand (input):
- Week: 1, 2, 3
- Month: 0, 1, 2, 3, 4
- Quarter: 8

Demand in DCP:
- Week: 1, 2

Capacity constraints in DCP:
- Week: 1, 2

Capacity constraint (input):
- Week: 0, 1, 2

Transformation based on production calendar:
- Standard time interval is “month”

Odette SCM Group
Alert Definition for “Capacity Alert”

- Supplier and Customer agree on Alert Thresholds

<table>
<thead>
<tr>
<th>demand / capacity ratio [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>140%</td>
</tr>
<tr>
<td>120%</td>
</tr>
<tr>
<td>100%</td>
</tr>
<tr>
<td>80%</td>
</tr>
<tr>
<td>60%</td>
</tr>
<tr>
<td>40%</td>
</tr>
<tr>
<td>20%</td>
</tr>
<tr>
<td>0%</td>
</tr>
</tbody>
</table>

- **red control limit**
  - critical situation (capacity shortage);
  - decision of adjustment measure is necessary

- **amber control limit**
  - tense situation;
  - analysis of situation is necessary to evaluate if adjustment measures need to be taken

- **blue control limit**
  - inefficient situation (under utilisation of capacity);
  - adjustment measures should be taken

- **green = safe situation**
  - no action necessary

Supplier and Customer agree on Alert Thresholds

- red = critical situation (capacity shortage);
  - decision of adjustment measure is necessary

- amber = tense situation;
  - analysis of situation is necessary to evaluate if adjustment measures need to be taken

- blue = inefficient situation (under utilisation of capacity);
  - adjustment measures should be taken

- green = safe situation;
  - no action necessary
### Basic Concept for DCP - DCP Dash Board

#### Demand Capacity Overview - Situation before measure taking

<table>
<thead>
<tr>
<th>Time period (e.g. months)</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
<th>M7</th>
<th>M8</th>
<th>M9</th>
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</thead>
<tbody>
<tr>
<td>Original Customer Demand (input)</td>
<td>400</td>
<td>500</td>
<td>550</td>
<td>450</td>
<td>500</td>
<td>600</td>
<td>700</td>
<td>700</td>
<td>700</td>
</tr>
<tr>
<td>Available Capacity (input)</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Available Capacity - Demand</td>
<td>100</td>
<td>0</td>
<td>-50</td>
<td>50</td>
<td>0</td>
<td>-100</td>
<td>-200</td>
<td>-200</td>
<td>-200</td>
</tr>
<tr>
<td>Contracted Capacity</td>
<td>600</td>
<td>600</td>
<td>600</td>
<td>600</td>
<td>600</td>
<td>600</td>
<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Contracted Capacity - Demand</td>
<td>200</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td>100</td>
<td>0</td>
<td>-100</td>
<td>-100</td>
<td>-100</td>
</tr>
</tbody>
</table>

#### Specific Adjustment Measures - defined by supplier without customer involvement

<table>
<thead>
<tr>
<th>Approval Procedure</th>
<th>Proposed Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date (latest)</td>
<td>Internal approval</td>
</tr>
<tr>
<td>M3</td>
<td>check</td>
</tr>
<tr>
<td>M2</td>
<td>x</td>
</tr>
</tbody>
</table>

**Banking Stock**

- 50 100 150 150 250 250 200 100 50 0

**Incremental capacity 1 (supplier only)**

- -50 0 50 -50 0 100 100 100 100

**Original Customer Demand (input)**

- 400 500 550 450 500 600 700 700 700

**Available Capacity + Increment_1**

- 450 500 550 450 500 600 600 600 600

**Available Capacity - Demand**

- 50 0 0 0 0 0 -100 -100 -100

**Contracted Capacity**

- 600 600 600 600 600 600 600 600 600

**Contracted Capacity - Demand**

- 200 100 50 150 100 0 -100 -100 -100

### Specific Adjustment Measures - collaboratively defined

<table>
<thead>
<tr>
<th>Approval Procedure</th>
<th>Proposed Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date (latest)</td>
<td>Internal approval</td>
</tr>
<tr>
<td>M6</td>
<td>approve</td>
</tr>
<tr>
<td>M4</td>
<td>inform</td>
</tr>
<tr>
<td>M2</td>
<td>x</td>
</tr>
</tbody>
</table>

**Demand Adjustment (collaboration)**

- 0 0 0 0 0 0 -100 -100 -100 0

**Incremental capacity 2 (collaboration)**

- 0 0 0 0 0 0 100 100 100 100

**Adjusted Demand**

- 400 500 550 450 500 600 -100 600 700

**Available Capacity + Increment_1+2**

- 450 500 550 450 500 600 700 700 700

**Available Capacity - Demand**

- 50 0 0 0 0 0 -100 100 0

**Contracted Capacity**

- 600 600 600 600 600 600 600 600 600

**Contracted Capacity - Demand**

- 200 100 50 150 100 0 0 0 -100

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**Supplier has closed the gap between available and contracted capacity.**

**Collaboration to close the remaining gap.**

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**Approval Procedure**

- Supplier has closed the gap between available and contracted capacity.
- Collaboration to close the remaining gap.
DCP Ways of capacity adjustments

Main interest of suppliers is to **adjust** their **capacities regularly** according to the fluctuations in demand

- **short term capacity adjustments**
  - production personnel: overtime; work on short time; allocation of operators to other production lines; anticipation/delay of training, maintenance
  - reduced / extended operation times for machines, etc.

- **medium term adjustments**
  - production personnel: hiring / dismissal of personnel; increase/decrease number of shifts; etc.
  - additional tooling, moulds and eventually other equipment

- **long term adjustments**
  - investment / desinvestment of production facilities including buildings, machines, equipment, direct and indirect personnel, supplier capacities, etc.
Basic Concept for DCP - Capacities are dynamic and must be regarded as a function of time.

- **Capacity family x [pcs./w.]**
  - Additional mould for plastic housing
  - Additional equipment for final testing
  - Installation of weekend shifts
  - Increase material supply for parts

**Reaction time** (time for decision taking, planning, implementation of measure) determines, when a capacity increase step materializes.
Basic Concept for initialization of DCP

1a. definition of capacity families

2a. declaration of capacities in DCP dash board

3a. mapping of demand structure to capacity structure

3b. mapping to “items” (e.g. product groups);

4b. transfer of demand information

5. Alert Calculation

6. Synchronisation of DCP dash board incl. proposal and agreement of measures

1b. demand information on part number level

2b. consolidation across customer plants
DCP process descriptions

DCP Process

- initialisation processes
- operative processes
- service processes
Integrated multi customer DCP

- Demand forecasts (quantities & dates)
- Consolidated demand forecasts (qty&dates)
- Check total demand vs. total capacities
- Internal counter measures / action plan
- Split and allocate capacities to customers
- Check demand vs. capacities by customer
- Counter measures / action plan
- Supplier
- Individual capacities (quantities & dates)
- Supplier
- Total capacity (quantities & dates)
- Supplier
- Capacity constraints as input for “what if scenarios” (optional)
- Supplier and/or customer
- Supplier with customer
- Supplier
- Odette SCM Group
DCP-documents

To be find at: www.odette.org
Tack för uppmärksamheten!