Our path to Demand Driven Supply Chain

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Software giant, has a Supply Chain? Why?
Microsoft’s Hardware Journey

Microsoft Softcard for Apple II 1980

Microsoft Mouse 1983

Microsoft MacEnhancer 1985

Microsoft MACH 20 1988

Microsoft Keyboard 1994

Microsoft Sidewinder 1996

Microsoft Xbox 2001

Microsoft Xbox 360 2005

Microsoft Hardware story (courtesy pcmaq.com and pcworld.com)

Microsoft Confidential
Microsoft’s Hardware Journey

Microsoft Zune 2006

Microsoft Surface 1.0 2007

Microsoft Kinect 2010

Microsoft Hardware story (courtesy pcmaq.com and pcworld.com)
Microsoft’s Hardware Journey

- Custom Controllers
- Surface Hub
- Surface Studio
- Surface Book
- Surface Pro
- Surface Laptop
- Hololens
- Xbox Family

Microsoft's Hardware Journey
Background about operations
MSC Functions and Numbers

- Countries Served: >600+
- Number of Suppliers: ~$11B (includes component suppliers)
- Total Amount of Annual Spend: >$11B
- Number of Outlets: 30K+
- Number of Manufacturing Locations: 52
- Number of Manufacturing Locations: 13
- Est. FY16 Number of Retail and Commercial Sales orders: 3.5M+
- Est. FY16 Deliveries: 3.5M+
- Number of Active SKU’s: 3.5M+
- Units Manufactured & Shipped: >290M
- Number of Distribution Centers: >31,000
- Number of Distribution Centers: >31,000
- Number of Active SKU’s: >600+
# Changing Landscape

## Earlier
- One major event every year – The Holiday Season
- New product every 2-3 years
- 3-5 years average shelf life
- COGS as % of revenue: 20%

## 2015
- Multiple events and markets
- Multiple new products every year
- Shelf life 1-2 years
- COGS as % of revenue: 35%

## Pressures
- COGS Growth YOY 15% to 33%
- Inventory obsolescence

## Opportunities
- Build to Order
- Mass Customization

## Coping Mechanisms
- Build exactly to forecast
- Allocate product and capacities based on forecast / statistics
Manohar’s Personal Story 2014

Daughter + Microsoft = Perfect Gift

1. Buy a car
2. Visit the Microsoft Store
3. Take a picture

2 Months later

Lenovo Yoga
1DSC – One Devices Supply Chain
1DSC – Operating System for the Hardware Supply Chain

**LIFECYCLE**
- Envision a Product
- Engineering R & D
- Plan Product, Source parts
- Manufacture
- Deliver Product to Channel
- Purchase
- Activation
- Customer Issues
- Contact support to resolve
- Receive units
- Repair units
- Fulfil to customer
- Capture feedback
- Optimize & Predict

**SUPPLY CHAIN OS**

**ANALYTICS**
- NPI
  - Functional End to End First Pass Yield
- Sourcing
  - Spend
  - Supplier Quality
  - Supplier Compliance
- Planning
  - Demand Accuracy
  - Supply Fulfillment
  - Inventory Risk
- Manufacturing
  - Functional End to End First Pass Yield
  - Functional OBA
- GSC
  - Sales vs Forecast
  - Inventory Health
  - On time Delivery
- Returns / Care
  - Return Rate
  - CSAT
  - TAT
- Quality
  - Factory quality
  - Field quality
  - Repair quality
  - Quality excursions
- Financial performance
  - P & L
  - Inventory
  - OPEX

**SUPPLY CHAIN PARTNER SYSTEMS**
- CM-PLM
- CM-SFCS
- Deliver
- WMS
- TMS

**DESIGN TOOLS**
- MS Product
- CAD
- 1PDM

**SAP**
- Plan & Optimize
- Integration Network

**MAX (SUPPLY CHAIN ANALYTICS)**
- HD Insight
- Event Hubs

**UNIVERSAL STORES**
- Device Telemetry
- MS Store / CSS
- Jarvis
- Entitlement
Intelligent Supply Chain

LIFECYCLE

Envision a Product
Engineering R & D
Plan Product, Source parts
Manufacture
Deliver Product to Channel
Customer Purchase
Activation
Customer Issues
Contact support to resolve
Receive units
Repair units
Fulfil to customer
Capture feedback
Optimize & Predict

Supply Chain Data

External data

Digitized Infrastructure
Advanced Analytics and Machine Learning
Algorithmic decisions

Intelligent Supply Chain Cloud

• Data first
• Man – Machine harmony
• Analytical not operational

Data Driven Organization
Demand Driven Supply Chain
## Design and Development 2015

|-----------------------|--------|--------|
| Adhoc analysis of stock out impacts  
Possible solutions  
Excel simulation of TOC logic | 30 min conversation with Shane Kolar, Sr Director, Planning on how TOC could offer a robust solution | 1st workshop with CTO, IT GM, Planning Team |

<table>
<thead>
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<th>Aug 28 – Sep 13</th>
<th>Sep 14-18</th>
<th>Sep – Dec</th>
<th>Dec 16</th>
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| Analysis of current data  
1st version of simulator | Joint workshop with GRL, Illumati, Microsoft Planning and IT Teams on system design | System development and testing  
Simulation refinement | System Changes live in production with BTO, BTA logic |
## Implementation and Adoption 2016

<table>
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<tr>
<th>Jan - Mar</th>
<th>April - July</th>
<th>End of August</th>
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<tr>
<td>Pilot runs for BTO</td>
<td>Change Management</td>
<td>Mostly implemented for</td>
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<tr>
<td>Pilot runs for BTA for few product lines</td>
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<td>Finished Goods</td>
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**Implementation and Adoption 2016**
Results

Highest ever Inventory Turns for Microsoft

Working Capital Savings  ~ $250M
Service Levels Up  ~ 5%
TOC Based Supply Chain Solution Design
Simulation Model

- DCs
- Plants
- Products
- BOMs
- Customers
- Components
- Lead times
- Production capacities
- Demand

Processes modeled:
- Demand Forecasts
- Customer orders
- MTA, ATO, MTO
- Transport
- Assembly at plants
- Ordering/Replen of components at CMs
- TOC Best Practices

User Interface to Manage Scenarios

Embedded TOC Best Practices

Analyst

AnyLogic reports

Excel reports

Logs
Hybrid TOC Model

Demand is king, forecast is guide

1. **Set initial Target**
   - Set on-hand + on-target quantity target based on total demand within lead time

2. **Replenish product**
   - Place orders whenever On-Hand + On-Order falls below target

3. **Adjust Target**
   - **a. Could we have stocked out?**
     - Increase target if stock was in Red for a lead time duration (Too Much Red - TMR)
   - **b. Do we have too much?**
     - Reduce target if stock was in Green for a lead time duration (Too Much Green - TMG)
   - **c. Is forecast from step 1 significantly different from TMR, TMG or current target?**
     - Adjust to forecast

- **Forecast**: 1800
  - TMR: 1200
  - Target: 1800

- **Forecast**: 1500
  - TMR: 1200
  - Target: 1200

- **PO for 75 units**
Special Situations

Launch Business

100% Subcontracting model
- Forecasting needed to continue procurement
- Priority communication challenges

Varying and long lead times
- Product life cycle – 1 to 2 years
- Component lead time – 3 to 4 months

Demand peaks 5 to 10 x normal run rates
Frequent Demand peaks
Design and Development Cycle

- Analyze Patterns
- Implement in SAP
- Simulate Rules
Collaborative Supply Chain
Supply collaboration

MS Planner performs planning in Simulation environment

MICROSOFT

Planning in Simulation Environment

CM reviews and commits to Forecast

CM

CM systems to ingest forecast

CM to Commit to Forecast

Review plan Variances

MS transmits forecast to Vendor

MICROSOFT/CM

CM reviews and commits to Forecast

MICROSOFT/CM

Benefits

• Better traceability with automated waterfall reporting
• Discussion focused around exceptions
• High automated process
• Scalable to multi-tier
• Better visibility of consignments parts to CM as same process is being leveraged
• Color coding to denote priority
Ariba T2/T3 Supplier Orchestration

**Microsoft**
- ECC
- APO

**Ariba Network**
- Native Outbound Transactions cXML
- Native Inbound Transactions cXML

**Tier n-1 Supplier / CM**
- 4d. Copy of PO
- 6f. Copy of ASN

**Tier 2/3 Suppliers (via Ariba Portal or B2B)**
- 2b. Receive Consigned Material Forecast
- 3b. Send Forecast Commit
- 4b. Receive Standard PO
- 5b. Send PO confirmation
- 6b. Send ASN
- 10b. Goods Receipt
Microsoft Status: Ariba Supply Chain Collaboration

**Status:**
- Ariba Network is the backbone for Xbox and Surface line of products supply chain
- As of 3/17/17: 46 enabled suppliers out of which 35 transacting suppliers transmitting 118K+ of purchase orders worth $3.5Bil+

**Scorecard:**
- Efficiency and Speed Gains:
  - Supplier Supportability process improvement: 90%+ (1-2hrs to ~5min)
  - Planner’s Efficiency improvement: 95%+ (order follow-ups/expediting reduced from 1-2 days to 1-2 hours)
  - Supplier On-Boarding time improvement: 75% (on-boarding time reduced from 3-4 months to 3-4 weeks)

Microsoft Planning Team quote: “Today we successfully received automated (via Ariba) supportability from the supplier which took ~5 mins to approve, updated PREQS and create PO’s (vs. 1-2 hours leveraging the previous process)”
Future
Microsoft – E2E Supply Chain Process Overview Level 1

S&OP and Demand Planning
- Forecast (PFAM)
- Segmentation
- Forecast (SKU / DC)

Supply Planning
- Aggregated Planning*
- Forecast Consumption*
- Net Requirement
- Net Requirement (SKU / DC)
- Priority Calculation
- Unconstrained Net Requirement with priority

Response Planning
- Demand Prioritization
- Rough Cut Capacity Planning
- Build Plan collaboration
- Constrained Planning with prioritization
- Demand Supply match based on Priority
- Create Purchase Requisition

Collaboration
- Build Plan collaboration
- Supplier Commit
- PO Confirmation
- Production Order Status

Execution
- Goods Receipt
- ASN
- Component Consumption
- Purchase Order

Order Confirmation
- Back Order Processing
- Allocation Consumption
- Location/Product Substitution
- Sales Order* (Availability Check)
- Allocation (Channel) Planning

* BTA/BTX/ATO/CTO
** Based on Shortage Calc
Current: Manual, Subjective & Siloed

- Demand Planning
- Sell thru & Promotion Planning
- Demand Planning Tool
- Consensus Forecast

- Independent Planning
- Financial Forecast
- PoS
- PLM

After: Integrated, Objective & E2E

- Supply Planning & Collaboration
- SAP
- Tier2..n

- Sell thru & Promotion Planning
- CM
- Tier2..n

- Financial Forecast
- Master Data
- Historical Data

Future Architecture - IBP
Path forward

Simulation model to test rules at each implementation

Expand solution to component purchases

Expand solution to exchange and B-SKUs

Systemically communicate Build Priority with Suppliers

Work with SAP to include TSL priorities into Response and Supply Modules

Demand Driven MRP implementation in SAP