



HUNTSMAN Supply Chain Transformation

Enriching lives through innovation

Carol Ottaway, Vice President Supply Chain
Huntsman Performance Products

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Agenda

- Who is Huntsman?
- Assessment of the End-to-End Supply Chain
- The Transformation Journey
- The Current State and Key Deliverables
- Lessons Learned
- Questions

Huntsman Divisions

HUNTSMAN

Enriching lives through innovation

Polyurethanes

MDI

Polyols

PO/MTBE

TPU

PU Systems



Performance Products

Amines

Surfactants

Maleic Anhydride

Upstream

Intermediates



Advanced Materials

Composites

Adhesives

Resins



Textile Effects

Dyes

Chemicals

Apparel

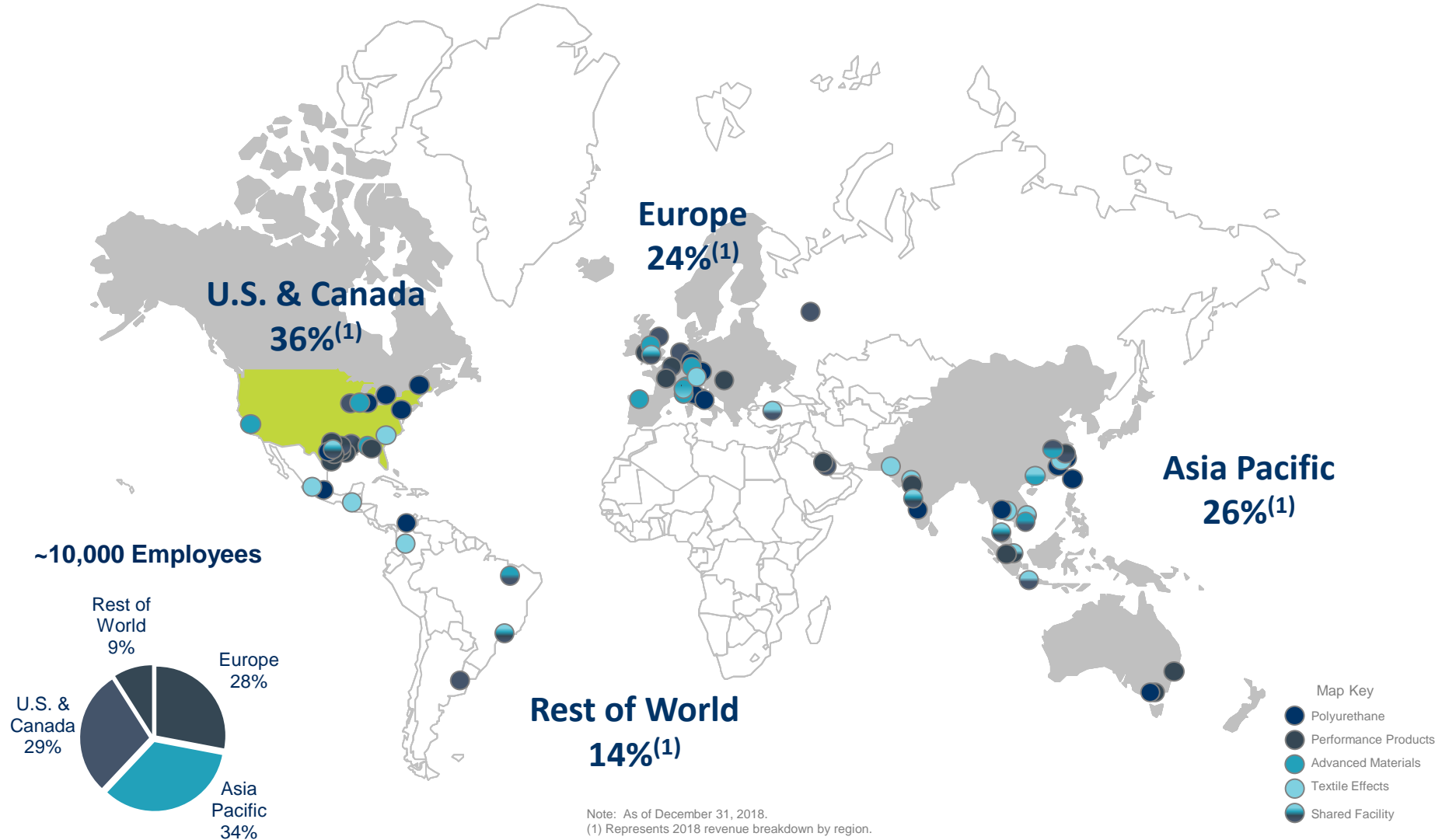
Home & Institutional

Technical Textiles



Global Presence

Operating >75 Manufacturing, R&D and Operations Facilities in ~30 Countries



Performance Products

Our Products

Performance Products brings together innovation and world-leading process technologies to produce approximately 1,000 components used to formulate products that enhance people's lives:



- **AMINES:** One of the largest global producers of specialty amines used in composites, coatings, fuel and lube additives, and gas treating
- **SURFACTANTS:** Integrated producer of a wide range of products for home and personal care, oil field, agriculture, and process industries
- **MALEIC ANHYDRIDE:** A leading global producer and supplier into areas such as unsaturated polyester resins, food, oil additives and coatings
- **ETHYLENE AND DERIVATIVES:** Highly integrated manufacturer of ethylene, ethylene oxide and ethylene glycol



AMERICAS

- Chocolate Bayou (Texas)
- Conroe (Texas)
- Dayton (Texas)
- Freeport (Texas)
- Geismar (Louisiana)
- Mexico City (Mexico)
- Pensacola (Florida)
- Port Neches (Texas)
- São Paulo (Brazil)
- The Woodlands (Texas)

EUROPE / MIDDLE EAST

- Everberg (Belgium)
- Jubail (Saudi Arabia)
- Llanelli (United Kingdom)
- Moers (Germany)
- Petfurdo (Hungary)

ASIA PACIFIC

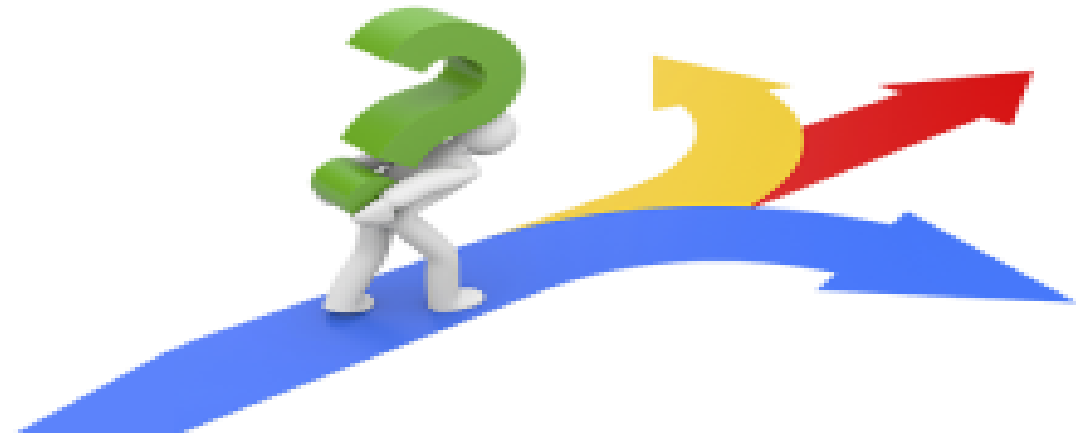
- Ankleshwar (India)
- Botany (Australia)
- Brooklyn (Australia)
- Jurong (Singapore)
- Mumbai (India)
- Shanghai (China)

- Manufacturing locations
- Regional offices
- R&D centers

End to End Supply Chain

Facing reality; How to move forward and which way?

- Slow decisions making
- Silo and parochial behaviors
- Multiple systems i.e. excel
- Poor data management
- *And many people doing a lot of manual intensive work*



Many Paths Taken

Each focused-on elements of the E2E, *BUT* more was required.....



Illustration by Krieg Barrie

- Global S&OP implementation
- Inventory Optimization
- Supply Network Optimization
- Monthly Planning to Weekly Planning
- And a few “crises”
 - i.e. Force Majeure

Step Change Required

Alignment of People, Processes & Systems

To deliver agreed objectives year on year in a **sustainable** manner requires **optimization** of business processes followed by **institutionalizing** the same through education, training and systematization



- Real Time, Reliable, Decision Making with full impact analysis
- Improved OTIF delivery and equitable supply across all customers
- Fast and accurate Response to Changing Market Demands
- Highlight and resolve cross regional demand conflicts early and clearly
- Stabilize Manufacturing to better utilize capacity
- Cross Functional and Cross Regional Collaboration

Why we picked Reveal

High level strategy
Executive focused
Recommend –
not execute

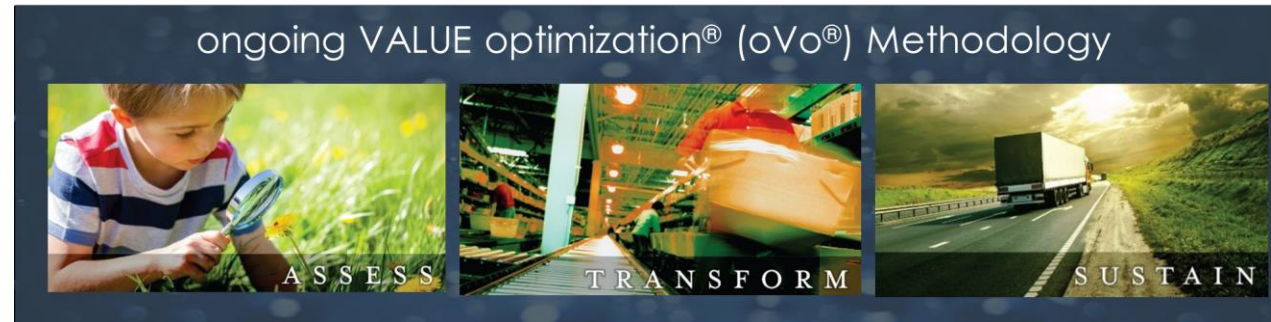
Supply Chain Practitioners
Strategic and Operationally focused
SAP-centric Education

General consulting
IT / management focused
System integrators

McKinsey
BCG
Bain



PwC
EY
Accenture
NTT Data



Some consulting firms provide high-level supply chain strategy, with no technical execution. Others provide technical integration, with no support for business functions. **Reveal** works differently.

We identifying the root causes of barriers to effective digital transformation and maximize the value of a company's existing SAP investment. We improve processes by leveraging best practices and significant experience. Success measures are mapped to KPIs, and ROI increases are both tangible and sustainable. Organizations become Intelligent Enterprises driven by data they trust to help drive growth.

The Supply Chain Wellness Assessment

- The **analysis** is a cold, hard look at your live SAP data - allowing the information to tell us the story
- The **focus** is to review the existing challenges and business needs to see how well SAP is used to balance demand and supply
- The **purpose** is to find value opportunities / end state focuses and provide a roadmap on how to get SAP to work for you
- The result is the actions needed to drive bottom line business value targets
- The **approach** reviews end-to-end Supply Chain and provides executive feedback on the findings and the way forward to optimize the supply chain
- The **result** is the actions needed to drive bottom line business value targets



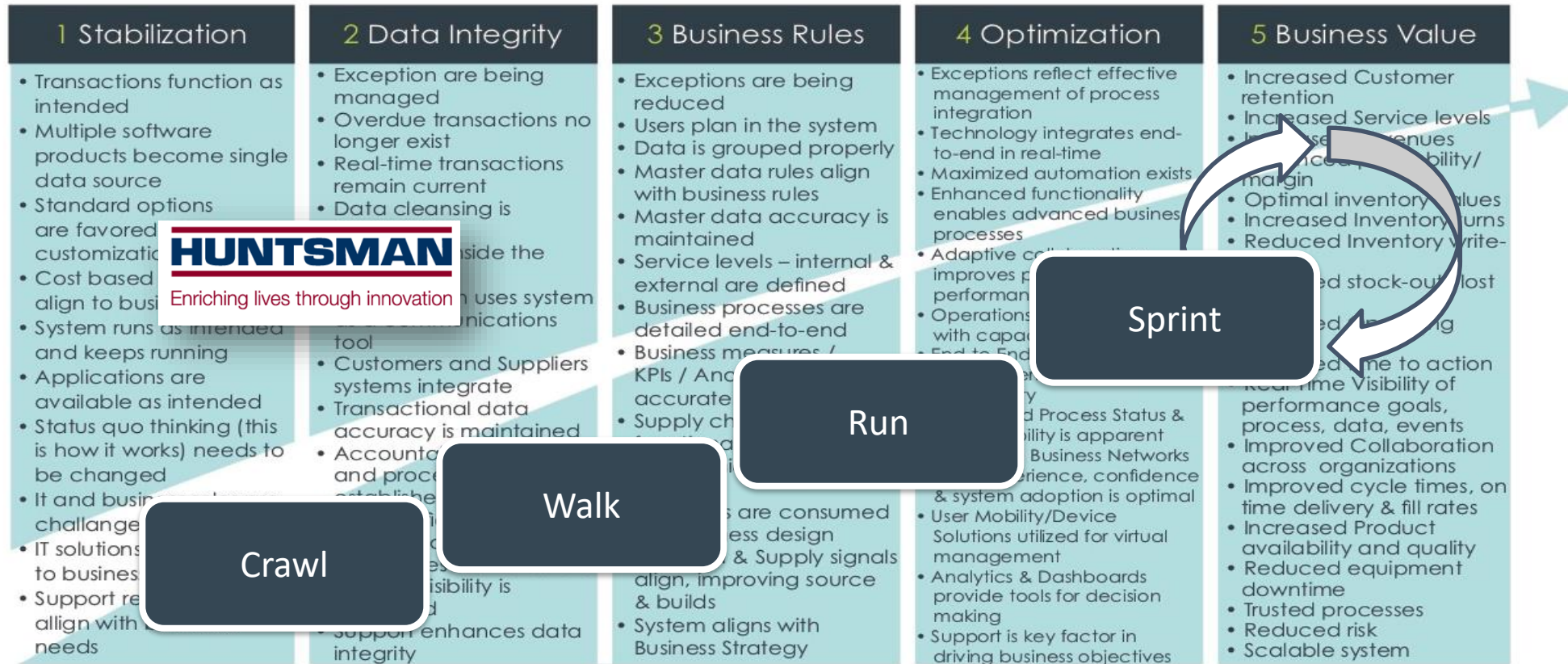
What we found...

HUNTSMAN

Enriching lives through innovation



RESULTS: Business Maturity® Continuum

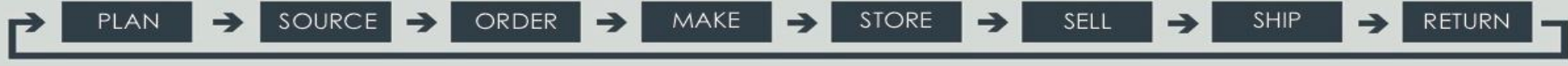


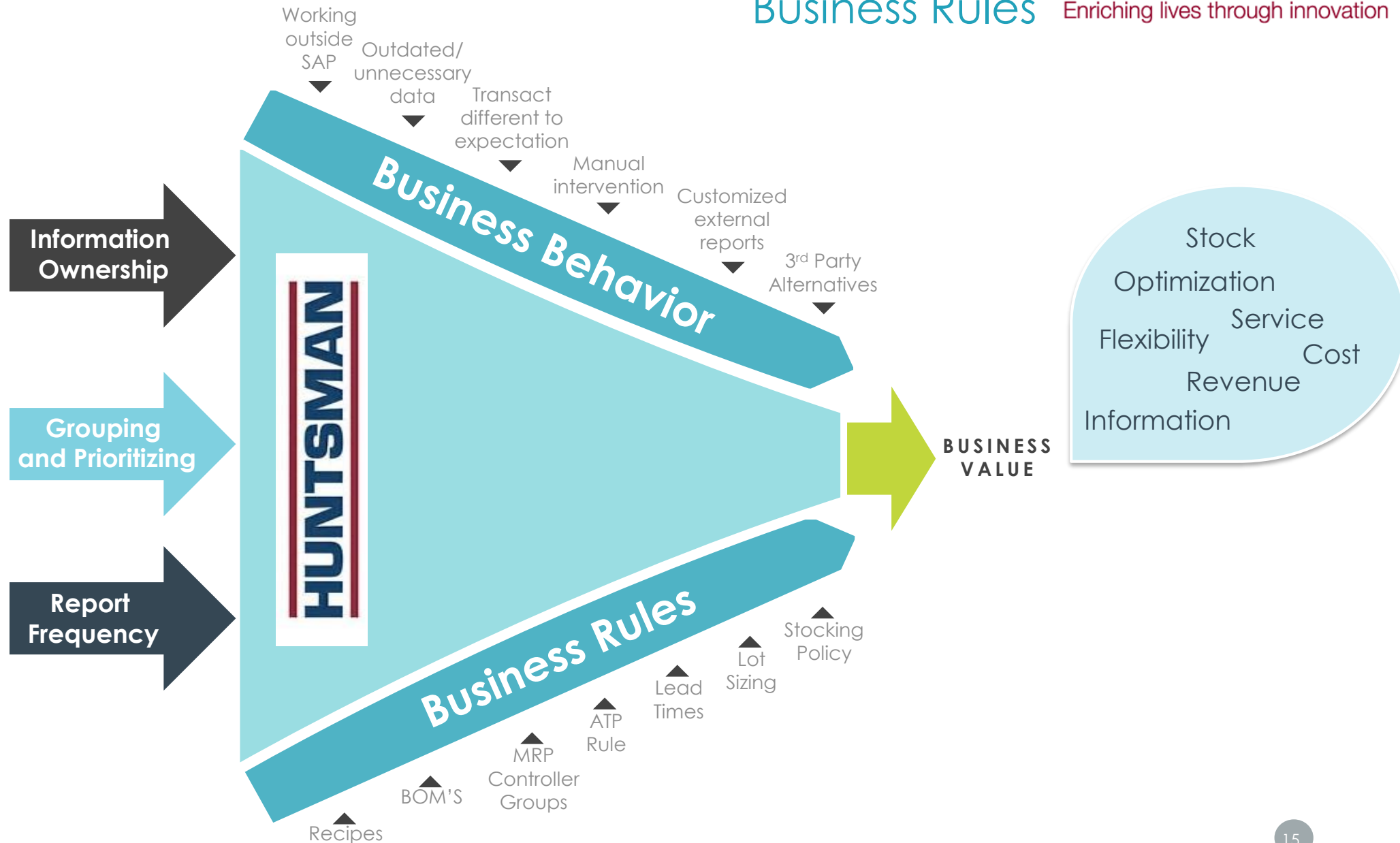
SUSTAINABLE BUSINESS THROUGH ACCOUNTABILITY, GOVERNANCE, PLATFORM and SUPPORT

Ensure the transitions work as intended and that Master and Transaction data is relevant and clean with consistent processes adopted to maintain it. Get all core processes in the system. - **PLAN** and **EXECUTE**

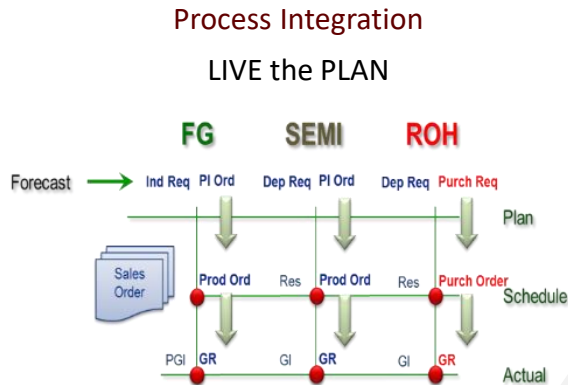
Get the system to work for you, not you for the system. Integrate and Control processes through monitoring, collaboration and automation in the system. - **SENSE** and **RESPOND**

Get the system to work for your business. Achieve value targets, manage by exception, adapt processes, realize benefits, set new VALUE targets. - **MEASURE** and **ADAPT**





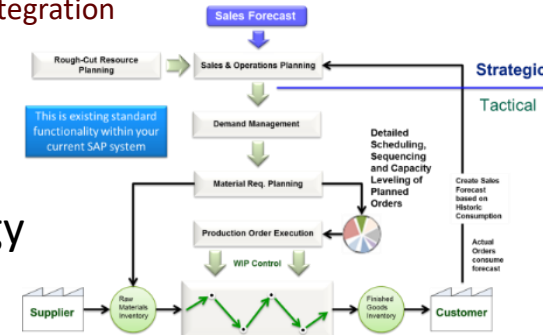
SOLUTION: The Big Picture



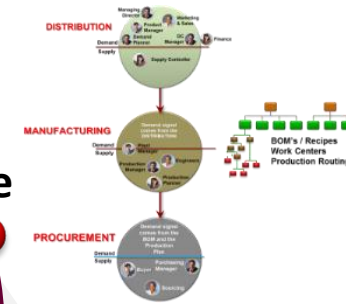
Technology

- One Truth
- Cross Functional
- Planning Tools
- Transactional Tools
- Execution Tools
- Analytic Tools
- Real Time Data

Functional Integration



Performance Integration



Process

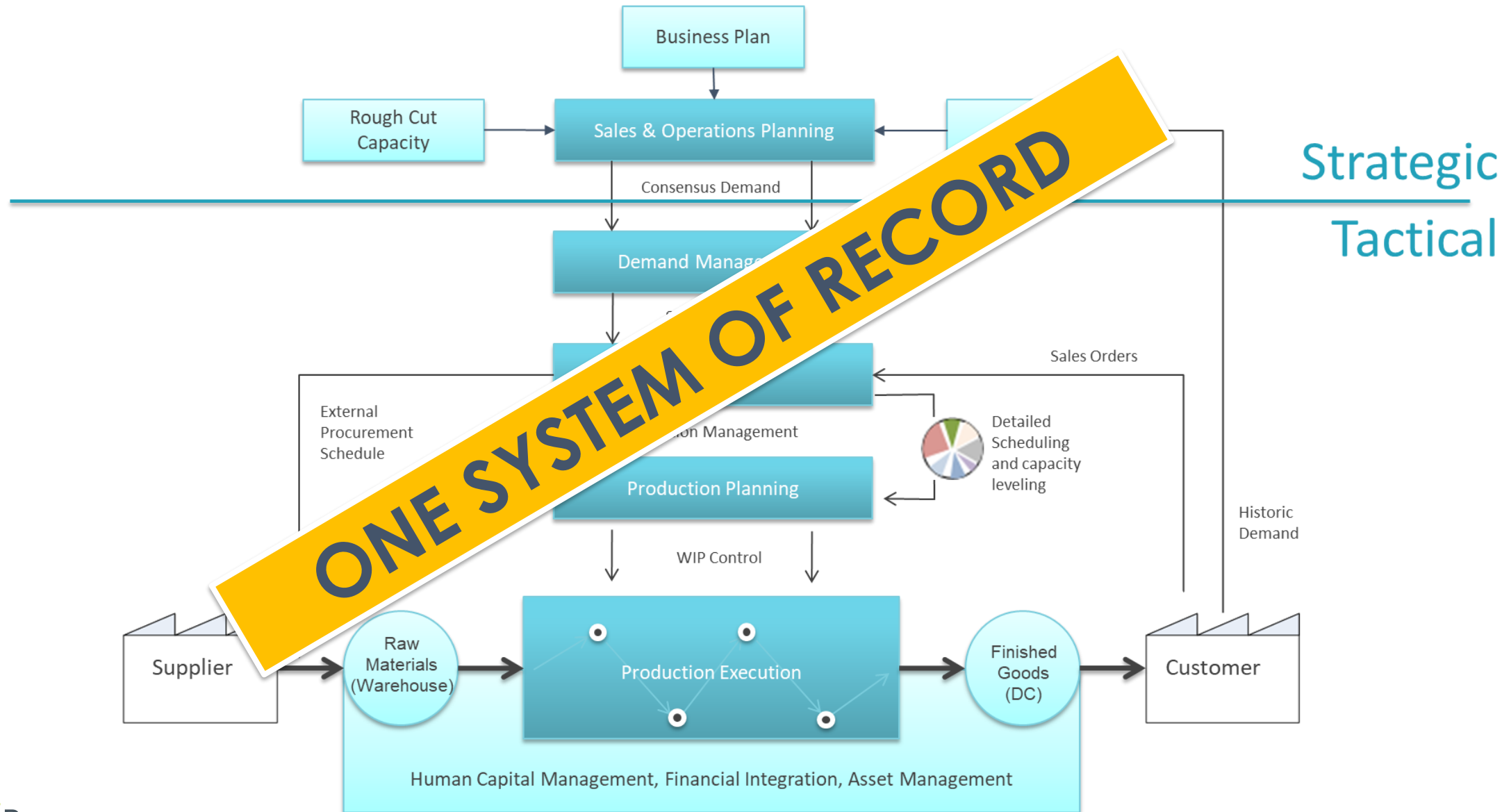
- Planning inside SAP
- Capacity Planning
- Process Integration
- Exception Management
- End to End visibility
- Dash Boarding
- Audit Trail

People

- Education
- Certification
- Ownership/Accountability
- Individual KPI's
- Team Structure
- Job Descriptions
- PAT

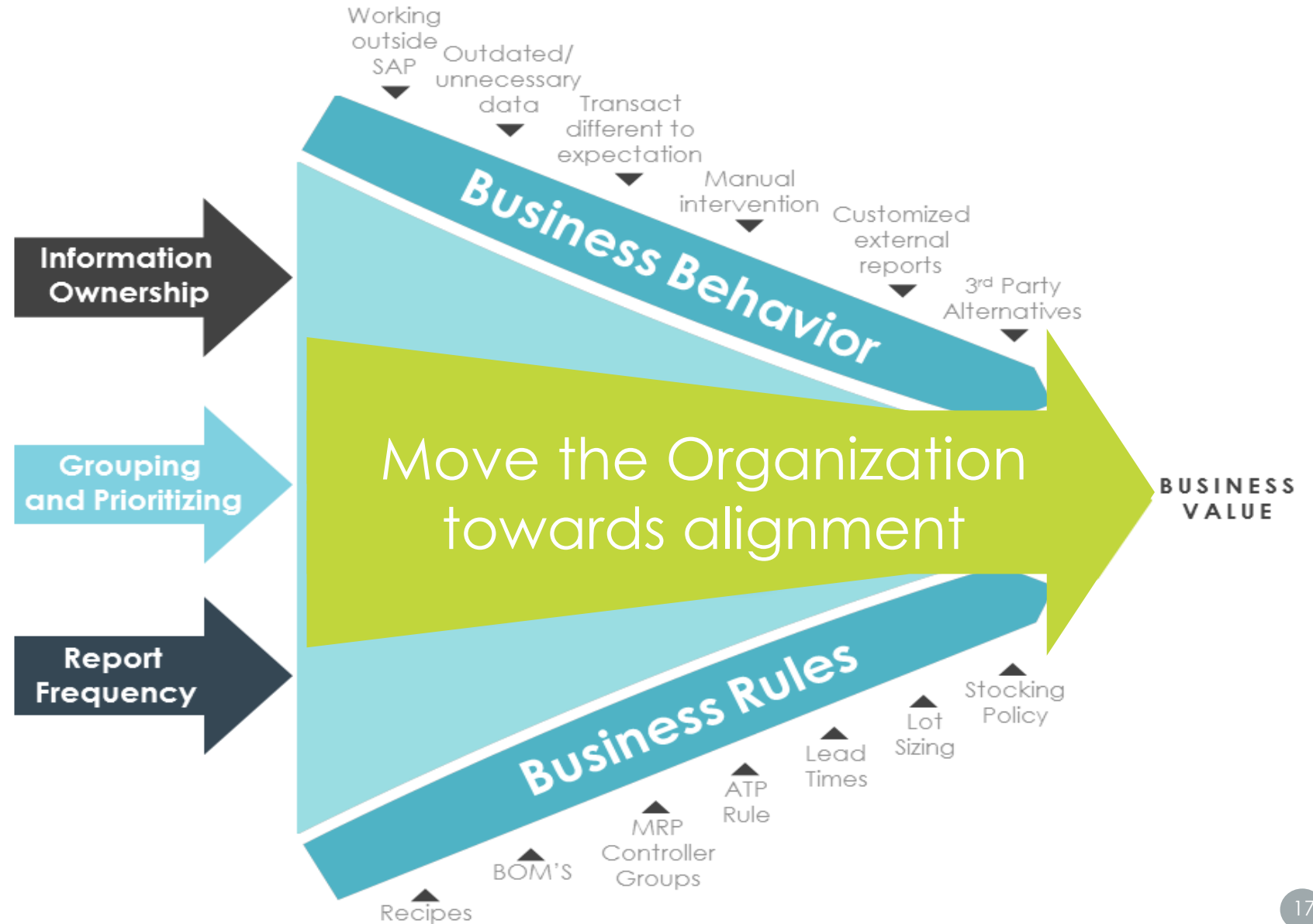
- Job Descriptions
- Certification
- KPIs

First Principle: One system of record



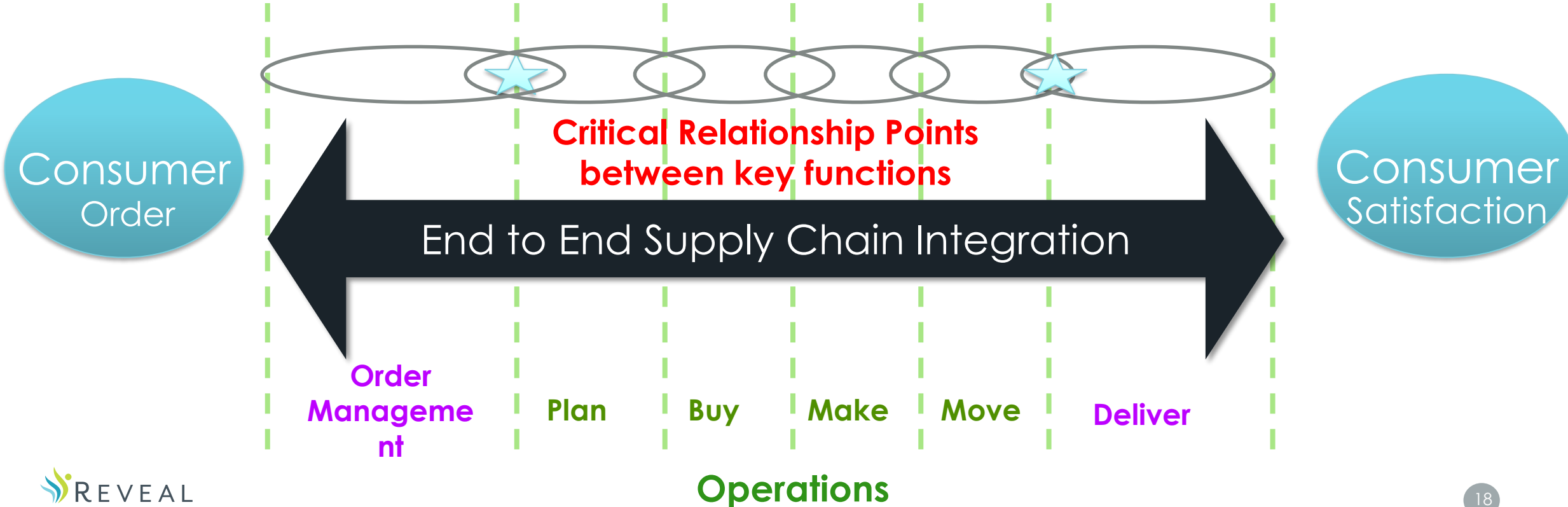
Second Principle: Rules vs Behavior

Relentless alignment of Business Practice and SAP Rules

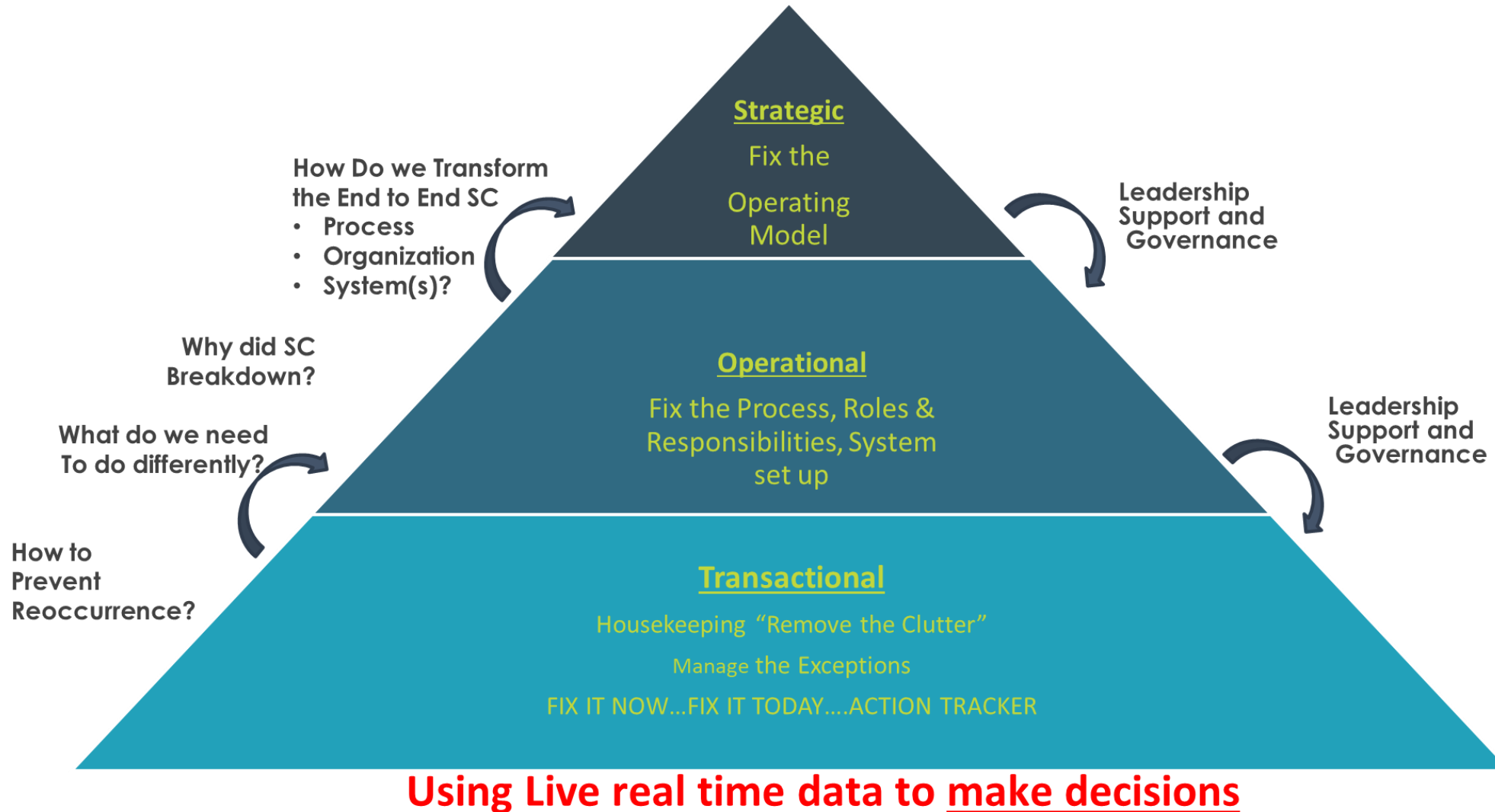


Third Principle: Horizontal Integration

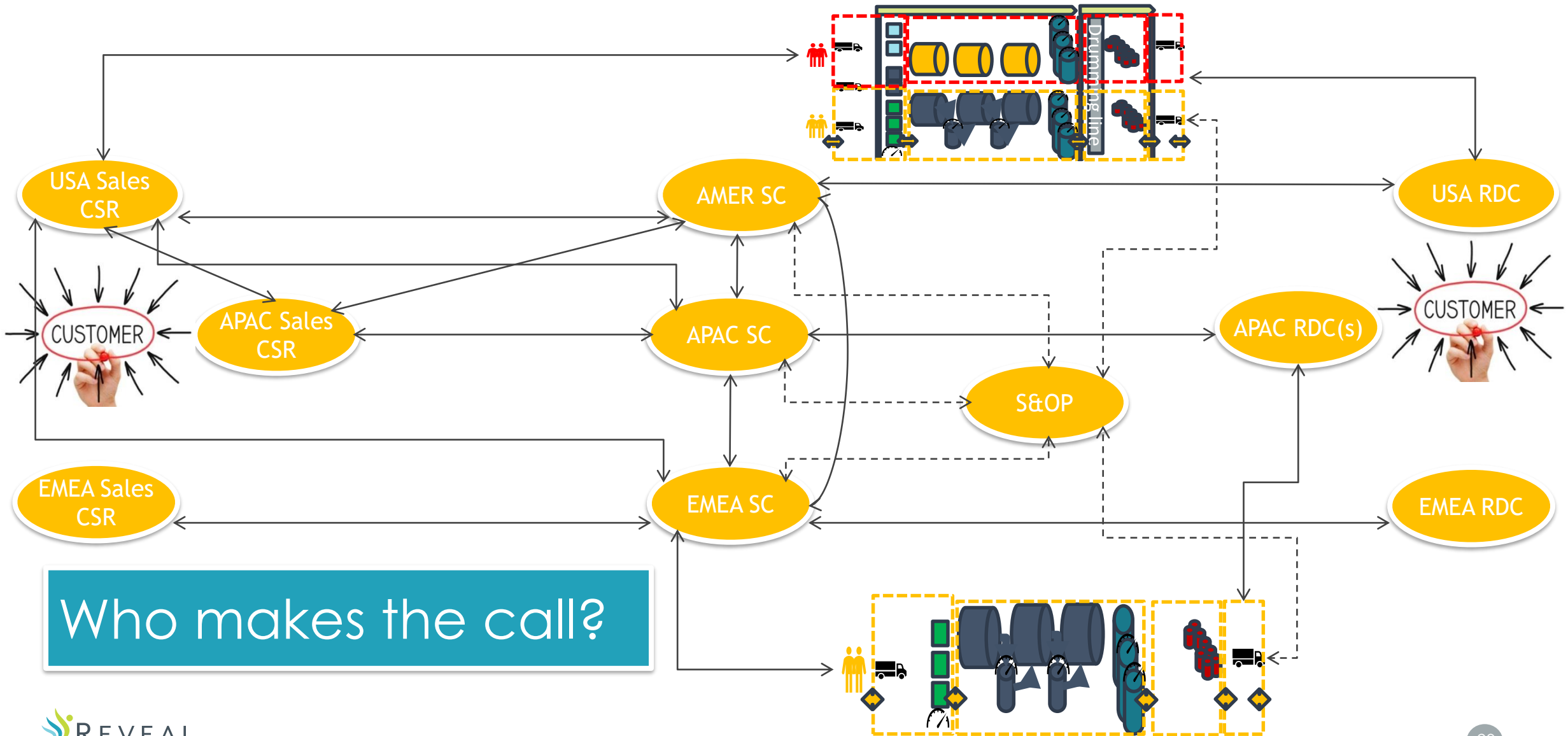
Regardless of how we badge it....
Supply Chain is a horizontal process that flows end to end through our vertical functions



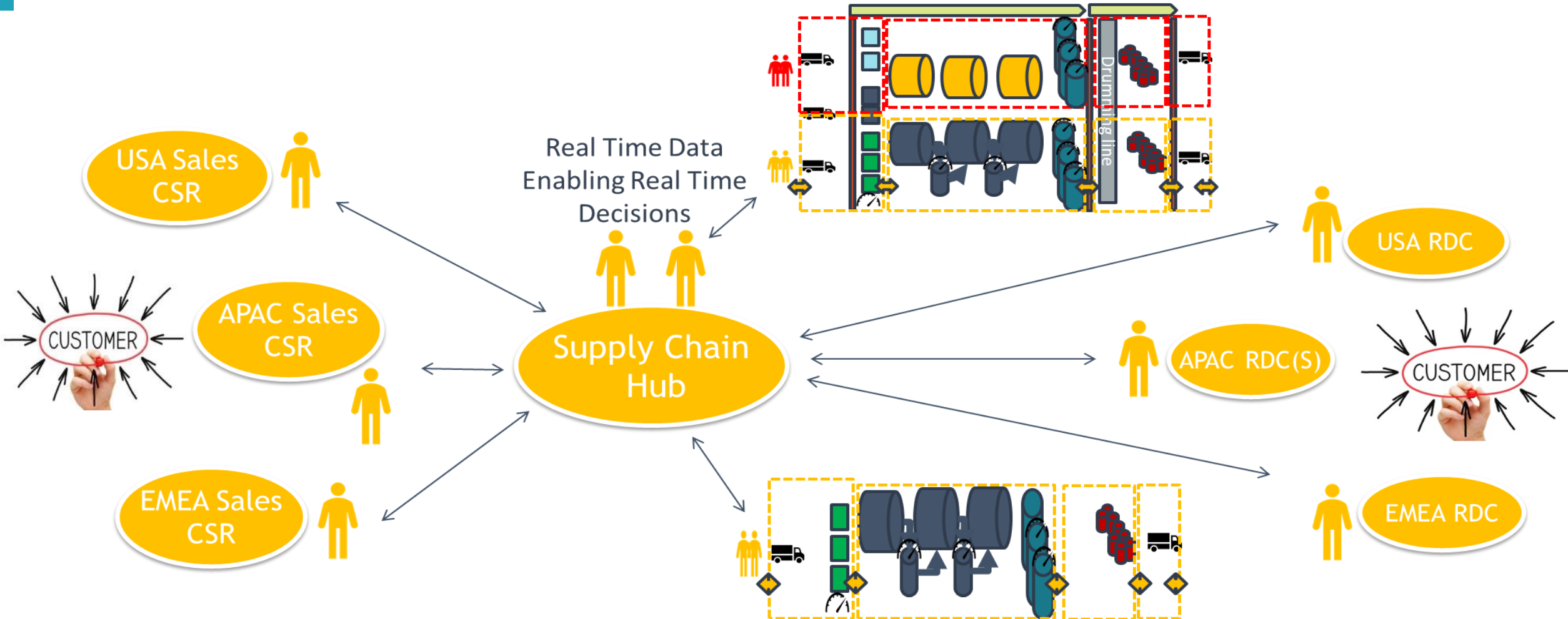
Fourth Principle: Vertical Integration



Principle 5: Single Point of Promise



Principle 5: Single Point of Promise

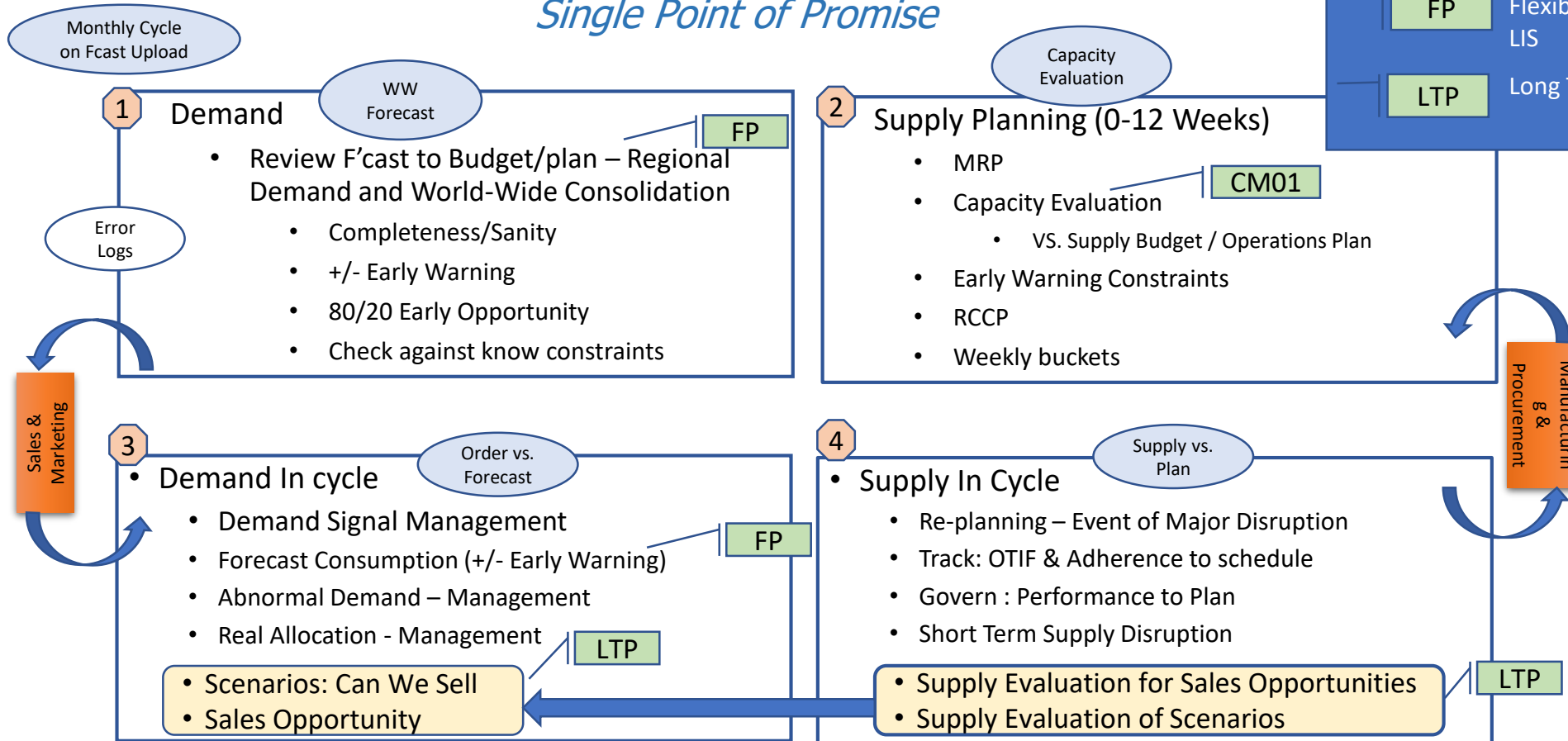


Central Hub Overview

Global Perspective, Support and Governance Single Point of Promise

SAP Technology Deployment

- FP Flexible Planning LIS
- LTP Long Term Planning



Step 1 Manage Demand (Forecast)

Standard analysis for info structure S811: Basic List

Version A00 No. of Business Zone - Region: 3

Business Zone - Region	Missing Forecast	Sales Order Quantity	Allocated Qty Wt	Confirm Quant. Weigh
Total	83,975,411 KG	2,016,914,483		
01 EAME	9,479,753 KG	252,889,938		
02 APAC	5,274,006 KG	261,959,791		
03 US	69,221,652 KG	1,502,064,754		

Key figures comparison

Business Zone - Region	Sales Order Quantity	Missing Forecast	Difference	%
Total	2,016,914,483	83,975,411	1,932,939,072-	95.84-
01 EAME	252,889,938	9,479,753	243,410,185-	96.25-
02 APAC	261,959,791	5,274,006	256,685,785-	97.99-
03 US	1,502,064,754	69,221,652	1,432,843,102-	95.39-

Version A00 No. of Business Zone - Region: 3

Business Zone - Region	Missing Forecast	Sales Order Quantity	Allocated Qty Wt	Confirm Quant. W
Total	83,975,411 KG	2,016,914,483		
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03 US	69,221,652 KG	1,502,064,754		

Key figures comparison

Business Zone - Region	Sales Order Quantity	Allocated Qty Wt	Difference
Total	2,016,914,483		2,016,914,483-
01 EAME	252,889,938		252,889,938-
02 APAC	261,959,791		261,959,791-
03 US	1,502,064,754		1,502,064,754-

Step 2 Capacity Plan to Forecast

Capacity Planning: Standard Overview

Cap. details/period

Work center P_SAU P_SAU Production Plant N020
Capacity cat.: 001 Machine Capacity

Week	Requirements	AvailCap.	CapLoad	RemAvailCap	Unit
<input checked="" type="checkbox"/> 05/2019	331.00	96.00	345 %	235.00-	H
<input type="checkbox"/> 09/2019	234.63	168.00	140 %	66.63-	H
<input type="checkbox"/> 10/2019	253.30	168.00	151 %	85.30-	H
<input type="checkbox"/> 11/2019	179.68	168.00	107 %	11.68-	H

Work center P_AMU P_AMU Production Plant N020
Capacity cat.: 001 Machine Capacity

Week	Requirements	AvailCap.	CapLoad	RemAvailCap	Unit
<input type="checkbox"/> 05/2019	431.00	96.00	449 %	335.00-	H
<input type="checkbox"/> 06/2019	264.00	168.00	157 %	96.00-	H
<input type="checkbox"/> 12/2019	194.53	168.00	116 %	26.53-	H

Work center P_AAU P_AAU Production Plant N020
Capacity cat.: 001 Machine Capacity

Week	Requirements	AvailCap.	CapLoad	RemAvailCap	Unit
<input type="checkbox"/> 05/2019	349.16	96.00	364 %	253.16-	H

Work center P_FB74 P_FB74 Production Plant N020
Capacity cat.: 001 Machine Capacity

Week	Requirements	AvailCap.	CapLoad	RemAvailCap	Unit
<input type="checkbox"/> 05/2019	325.68	96.00	339 %	229.68-	H
<input type="checkbox"/> 12/2019	193.48	168.00	115 %	25.48-	H

Work center P_CARB1 P_CARB1 Production Plant N020
Capacity cat.: 001 Machine Capacity

Week	Requirements	AvailCap.	CapLoad	RemAvailCap	Unit
<input type="checkbox"/> 05/2019	349.16	96.00	364 %	253.16-	H
<input type="checkbox"/> 06/2019	168.00	168.00	100 %	0.00	H
<input type="checkbox"/> 07/2019	168.00	168.00	100 %	0.00	H
<input type="checkbox"/> 08/2019	68.14	168.00	41 %	99.86	H
<input type="checkbox"/> 09/2019	36.98	168.00	22 %	131.02	H
<input type="checkbox"/> 10/2019	144.00	168.00	86 %	24.00	H

Capacity Planning: Standard Overview

Cap. details/period

Work center P_SAU P_SAU Production Plant N020
Capacity cat.: 001 Machine Capacity

Week	Requirements	AvailCap.	CapLoad	RemAvailCap	Unit
<input type="checkbox"/> 05/2019	331.00	96.00	345 %	235.00-	H
<input type="checkbox"/> 06/2019	96.59	168.00	58 %	71.41	H
<input type="checkbox"/> 07/2019	167.96	168.00	100 %	0.04	H
<input type="checkbox"/> 08/2019	43.05	168.00	26 %	124.95	H
<input type="checkbox"/> 09/2019	234.63	168.00	140 %	66.63-	H
<input type="checkbox"/> 10/2019	253.30	168.00	151 %	85.30-	H
<input type="checkbox"/> 11/2019	179.68	168.00	107 %	11.68-	H
<input type="checkbox"/> 12/2019	147.56	168.00	88 %	20.44	H
<input type="checkbox"/> 13/2019	0.00	168.00	0 %	168.00	H
Total >>>	1,453.77	1,440.00	101 %	13.77-	H

Work center P_AMU P_AMU Production Plant N020
Capacity cat.: 001 Machine Capacity

Week	Requirements	AvailCap.	CapLoad	RemAvailCap	Unit
<input type="checkbox"/> 05/2019	431.00	96.00	449 %	335.00-	H
<input type="checkbox"/> 06/2019	264.00	168.00	157 %	96.00-	H
<input type="checkbox"/> 07/2019	141.82	168.00	84 %	26.18	H
<input type="checkbox"/> 08/2019	133.79	168.00	80 %	34.21	H
<input type="checkbox"/> 09/2019	135.26	168.00	81 %	32.74	H
<input type="checkbox"/> 10/2019	168.00	168.00	100 %	0.00	H
<input type="checkbox"/> 11/2019	146.53	168.00	87 %	21.47	H
<input type="checkbox"/> 12/2019	194.53	168.00	116 %	26.53-	H
<input type="checkbox"/> 13/2019	132.61	168.00	79 %	35.39	H
Total >>>	1,747.53	1,440.00	121 %	307.53-	H

Work center P_AAU P_AAU Production Plant N020
Capacity cat.: 001 Machine Capacity

Week	Requirements	AvailCap.	CapLoad	RemAvailCap	Unit
<input type="checkbox"/> 05/2019	349.16	96.00	364 %	253.16-	H
<input type="checkbox"/> 06/2019	168.00	168.00	100 %	0.00	H
<input type="checkbox"/> 07/2019	168.00	168.00	100 %	0.00	H
<input type="checkbox"/> 08/2019	68.14	168.00	41 %	99.86	H
<input type="checkbox"/> 09/2019	36.98	168.00	22 %	131.02	H
<input type="checkbox"/> 10/2019	144.00	168.00	86 %	24.00	H

Step 3 Orders to Forecast

Standard analysis for info structure S811: Basic List

No. of Business Zone - Region: 3

Business Zone - Region	Missing Forecast	Sales Order Quantity	Allocated Qty Wt	Confirm Quant. Weight	Blocked Qty (weight)	Delivered Quantity Wt	Shipped Quantity Wt
Total	0 ***	97,604,341 KG	734,707 KG	95,417,843 KG	6,070,989 KG	76,965,536 KG	37,174,335 KG
01 EAME	0 ***	5,947,101 KG	0 KG	5,586,221 KG	522,569 KG	4,632,743 KG	2,354,971 KG
02 APAC	0 ***	9,842,451 KG	734,707 KG	9,315,914 KG	1,321,624 KG	7,381,621 KG	3,912,128 KG
03 US	0 ***	81,814,789 KG	0 KG	80,515,707 KG	4,226,796 KG	64,951,172 KG	30,907,236 KG

Plan/Actual Comparison

Key figure Sales Order Quantity
Version A00 Active version

Business Zone - Region	Planned	Actual	Difference	%
Total	87,583,833	97,604,341 KG	10,020,509 KG	11.44
01 EAME	11,135,536	5,947,101 KG	5,188,435- KG	46.59-
02 APAC	10,076,621	9,842,451 KG	234,170- KG	2.32-
03 US	66,371,675	81,814,789 KG	15,443,114 KG	23.27

Step 4 Schedule to Plan, Make to Plan

Standard analysis for info structure S812: Basic List

Version A00 No. of Component Bulk: 575 Qty (Weight)

Component Bulk	Sales Ord Qty Wt	Key figure	Qty (Weight)
Total	3,677,559,554 KG	Version 15	Version 15
000000000000036063		79,131,851	79,295,144 KG
000000000000036433		27,319,846	27,492,211
000000000000034551	21,535,593 KG	19,174,645	19,174,645
000000000000034548	10,905,078 KG	7,995,309	7,995,309 KG
000000000000034550	15,007,583 KG	5,163,691	5,644,499
000000000000032585		2,458,038	2,458,038 KG
000000000000034565		2,256,721	2,256,721 KG
000000000000034186		1,344,668	1,344,668
000000000000034469	38,257,566 KG	1,167,600	1,167,600 KG
000000000000250948		800,000	800,000
000000000000033340		672,050	672,050
000000000000033231		668,300	668,300
0000000000000213839		570,640	570,640
0000000000000213834	508,645 KG	270,000	270,000 KG
000000000000034044	80,075,566 KG	265,000	265,000 KG
0000000000000263257		260,000	260,000
0000000000000263228		260,000	260,000
0000000000000246683		251,744	251,744
000000000000033322		241,500	241,500
000000000000035799	911 KG	235,360	235,360 KG
000000000000032330	120,107,495 KG	200,000	200,000 KG
0000000000000251055		198,000	198,000
0000000000000302887		176,000	176,000
000000000000036446	47,898,863 KG	172,365	172,365
000000000000034052		154,000	154,000
0000000000000251083		150,000	150,000
000000000000032336		143,250	143,250 KG
0000000000000252028		139,812	139,812 KG
000000000000032336	3,098,401 KG	130,000	130,000
0000000000000251051	212,505 KG	127,066	127,066 KG
0000000000000251051	135,396 KG	113,249	113,249 KG
000000000000034025	204,844,861 KG	110,000	110,000
000000000000034119	11,231,793 KG	104,832	104,832
0000000000000304083		100,000	100,000
0000000000000251018		110,000	110,000
0000000000000304083		71,849	71,849
0000000000000251018		110,000	110,000
0000000000000305009		110,000	110,000

Plan/Actual Comparison

Component Bulk	Planned	Version A00	Difference	%
Total	79,131,851	79,295,144 KG	163,293 KG	0.21
000000000000036063	27,319,846	27,492,211	172,365	0.63
000000000000036433	19,174,645	19,174,645	0	0.00
000000000000034551	7,995,309	7,995,309 KG	0	0.00
000000000000034548	5,163,691	5,644,499	480,808	9.31
000000000000034550	2,458,038	2,458,038 KG	0	0.00
000000000000032585	2,256,721	2,256,721 KG	0	0.00
000000000000034565	1,344,668	1,344,668	0	0.00
000000000000034186	1,167,600	1,167,600 KG	0	0.00
000000000000034469	800,000	800,000	0	0.00
000000000000250948	672,050	672,050	0	0.00
000000000000033340	668,300	668,300	0	0.00
000000000000033231	570,640	570,640	0	0.00
0000000000000213839	270,000	270,000 KG	0	0.00
0000000000000213834	265,000	265,000 KG	0	0.00
000000000000034044	260,000	260,000	0	0.00
0000000000000263257	260,000	260,000	0	0.00
0000000000000263228	251,744	251,744	0	0.00
000000000000033322	241,500	241,500	0	0.00
000000000000035799	235,360	235,360 KG	0	0.00
000000000000032330	200,000	200,000 KG	0	0.00
0000000000000251055	198,000	198,000	0	0.00
0000000000000302887	176,000	176,000	0	0.00
000000000000036446	172,365	172,365	0	0.00
000000000000034052	154,000	154,000	0	0.00
0000000000000251083	150,000	150,000	0	0.00
000000000000032336	143,250	143,250 KG	0	0.00
0000000000000252028	139,812	139,812 KG	0	0.00
000000000000032336	130,000	130,000	0	0.00
0000000000000251051	127,066	127,066 KG	22,660-	15.15-
0000000000000304083	113,249	113,249 KG	41,400 KG	57.62
0000000000000251018	110,000	110,000	0	0.00

bd Qty	Qty (Weight)	Qty (Weight)
556,684 KG	10,547,924 KG	79,295,144 KG
995,309 KG	0 KG	27,492,211
0 KG	2,458,038 KG	19,174,645
256,721 KG	0 KG	7,995,309 KG
167,600 KG	1,360,776	5,644,499
872,050	0 KG	2,458,038 KG
668,300	800,000	2,256,721 KG
0 KG	570,640	1,360,776
265,000 KG	270,000 KG	1,167,600 KG
0 KG	260,000	800,000
241,500	0 KG	672,050
235,360 KG	0 KG	668,300
200,000 KG	0 KG	570,640
0 KG	198,000	270,000 KG
0 KG	176,000	265,000 KG
143,250 KG	0 KG	260,000
0 KG	154,000	260,000
0 KG	150,000	260,000
0 KG	139,812 KG	260,000
0 KG	130,000 KG	260,000
0 KG	127,066 KG	260,000
41,400 KG	0 KG	260,000
	110,000	260,000
	110,000	260,000
	104,832	260,000
	100,000	260,000

Utilizing the SAP System

Planning Table: SAPFCG001 Finite scheduling forw./all functs.activ

GrafObj. Capacity Order Operation Strategy Plan.log.

		Work Centers													
Work ctr	Work center desc.	Ca	08	CW 09				CW 10				CW 11			
			22/2018	02/24/2018	02/26/2018	02/28/2018	03/02/2018	03/04/2018	03/06/2018	03/08/2018	03/10/2018	03/12/2018	03/14/2018	03/16/2018	03/18/2018
P_CARB1	CARB1 Productio	00	3456	135403457				135403458				135403459			
P_CARB2	CARB2 Productio	00	5238	134789405				135495239				135495240			
P_JAU1	JAU1 Production	00	134848355	130185368											
P_JAU2	JAU2 Production	00		130185362											
P_JAU3	JAU3 Production	00		134848356											

		Orders (pool)													
Material	Order	08	CW 09				CW 10				CW 11				
		22/2018	02/24/2018	02/26/2018	02/28/2018	03/02/2018	03/04/2018	03/06/2018	03/08/2018	03/10/2018	03/12/2018	03/14/2018	03/16/2018	03/18/2018	

Data Extract 01/20/2018

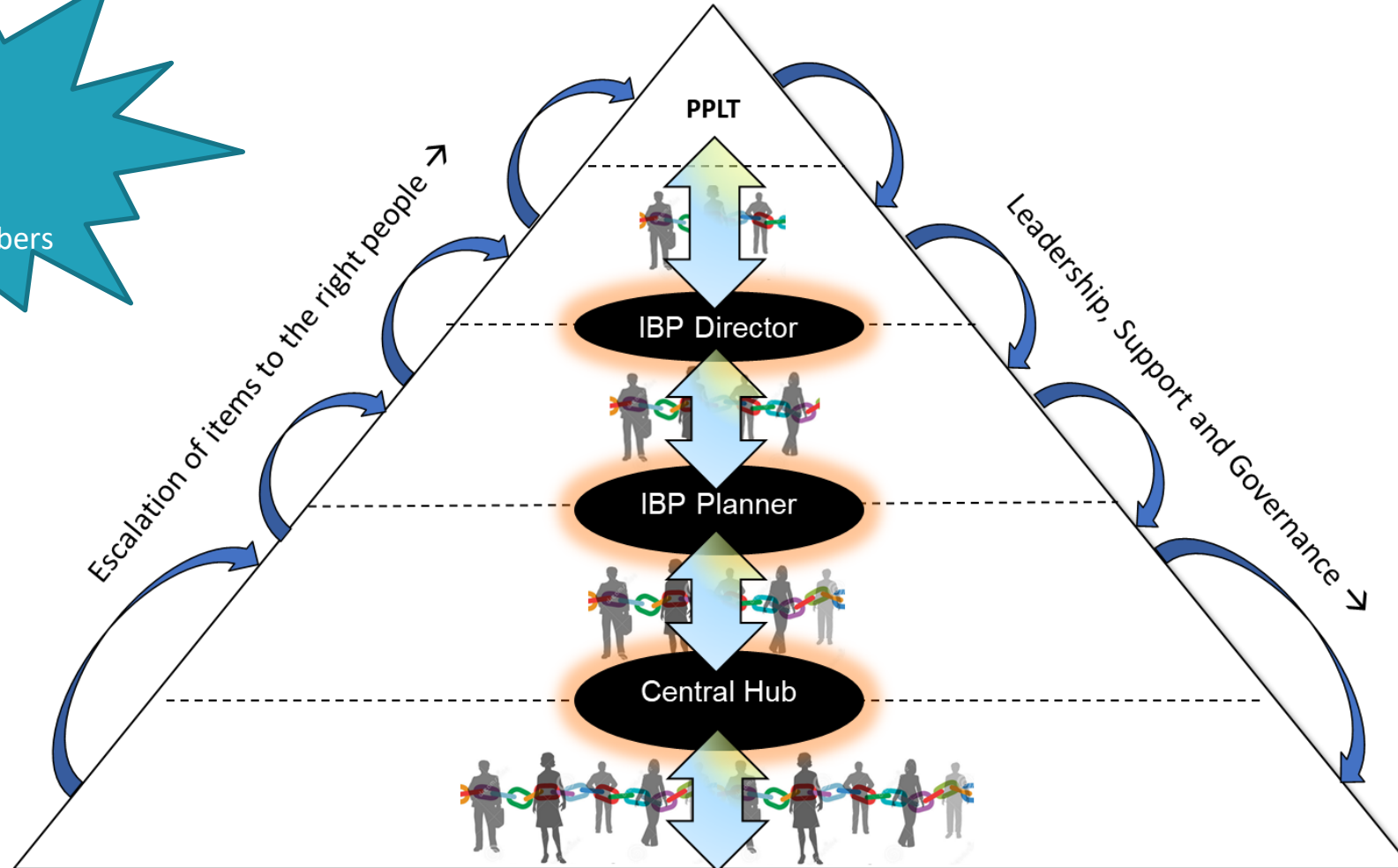


No. of Plant: 5

Plant	Materials	Red Lights	Exceptions	OvrdueSply	OvrdueDmnd	AvgValStckValue	Dead Stock Value
Total	2,427	112	1,967	125	227		
E165	262	7	271	8	5		
E320	188	36	231	14	102		
N020	1,583	48	1,070	80	60		
N580	294	9	136	8	16		
P221	100	12	259	15	44		

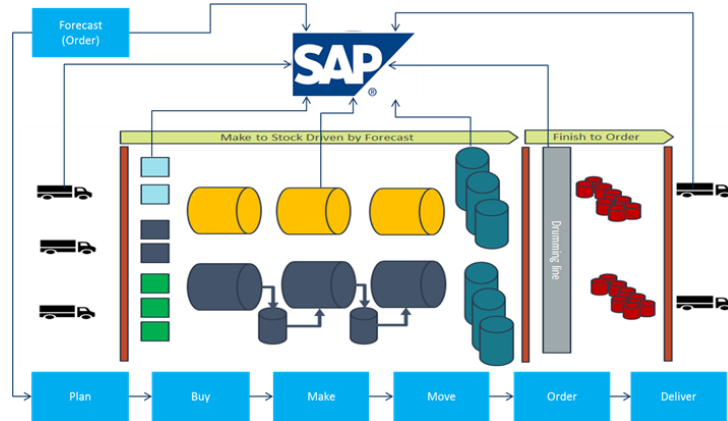
GOVERNANCE: Building a Planning Backbone

Goal:
One Team
One System
One Set of Numbers

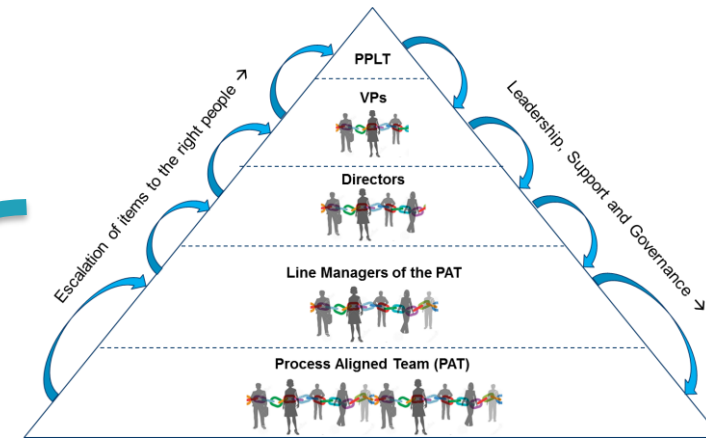


RESULTS: The initiative has built...

Integrated data for end to end supply chain execution (SAP)

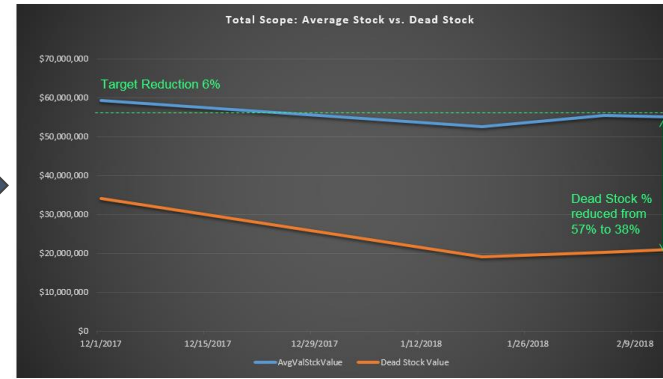
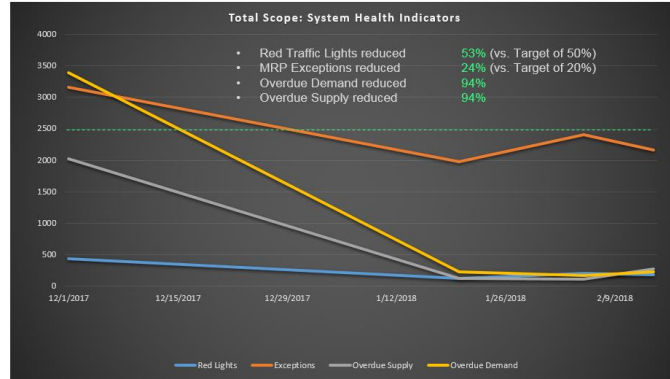


The framework for integration and alignment (oVo Methodology)



Full benefit realization comes from true cross functional behavior

RESULTS: Flow Through Impact on the Business Customer Service



- MRP Balances Supply and Demand daily in SAP
- MRP **Exceptions** show what Supply Chain issues need to be fixed every day to ensure we can meet the customer requirement
- Daily Exception Monitoring is clearing true exceptions every day

Dead Stock reduction represents a significant improvement in the quality of the Inventory “The right stuff at the right time to meet the customer requirement”

With the Supply Chain in balance (daily) and the Quality of the inventory improved we will see a flow through benefit to...

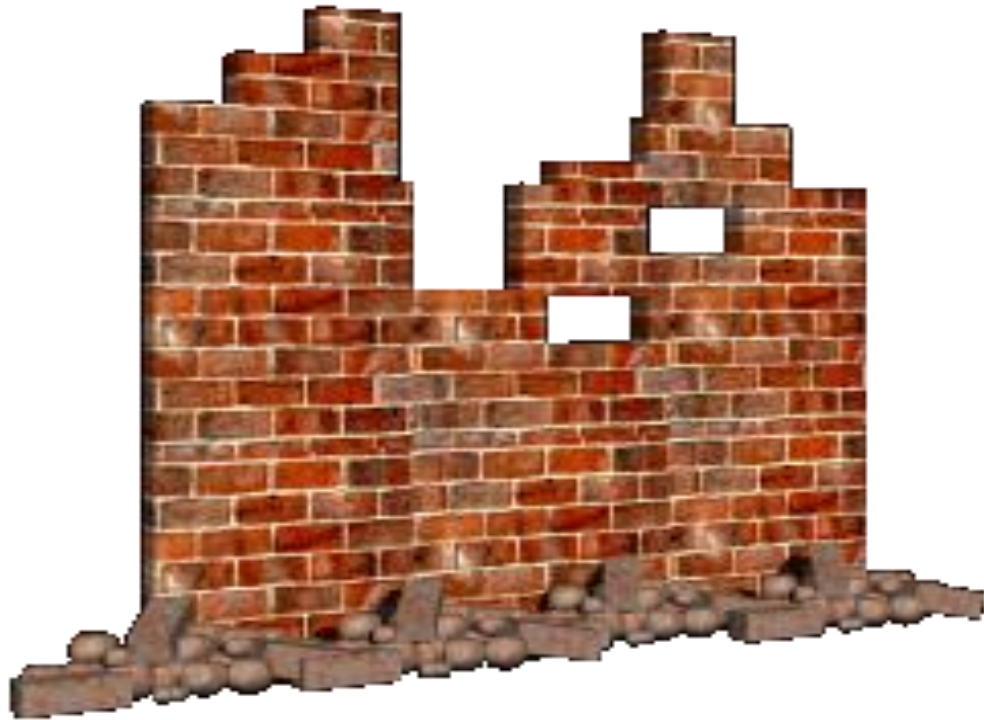
- OTIF
- Manufacturing Stability & Utilization
- Adherence to Schedule

Key Benefits

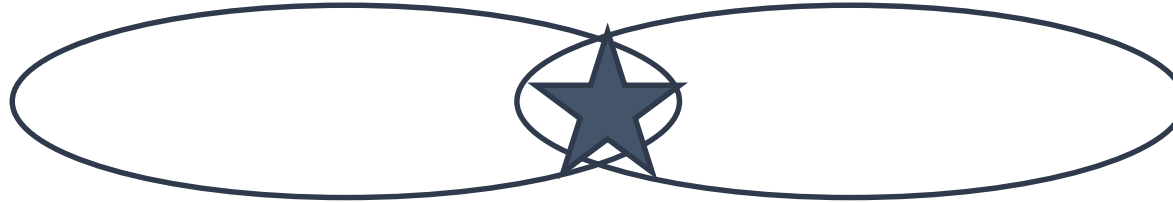
Since starting the oVo[®] project, Huntsman has seen a significant transformation. The impact includes:

- Integrated business using one system of record
- Supply Chain Hubs “a single point of promise”
- Educated process aligned employees
- Clarified role definitions
- Increased SAP utilization
- Demand driven planning via MRP
- Real Time, Reliable, Decision Making
- Faster and more accurate Response to Changing Market Demands
- Reduction in Average Inventories
- 46% reduction in exceptions
- 60% reduction in red traffic lights

Key Learnings



Key Learnings



Trust
Transparency
Tolerance

Built Around...
#1 Set of Numbers
#1 Version of Truth
#1 System of Record



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Access the slides from 2019 ASUG Annual Conference here:

<http://info.asug.com/2019-ac-slides>

Q&A

For questions after this session, contact us at carol_ottaway@huntsman.com.

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