

# Using Metrics & SCE Systems to Drive Performance Improvement

Sponsored by:

**SCE** SUPPLY CHAIN  
EXECUTION  
*Systems & Technologies Group*

Presented by:

John M. Hill  
The St. Onge Company

 **PROMAT** 2013  
AN MHA INTERNATIONAL EXPO  
McCORMICK PLACE CHICAGO JAN 21-24  
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**SCE** SUPPLY CHAIN  
EXECUTION  
*Systems & Technologies Group*

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# TAMING THE SUPPLY CHAIN JUNGLE

# WHERE DO WE START?



# ROADMAP TO EXCELLENCE



- Profile & Measure Current Performance
- Establish Target Performance Metrics
- Define Trading Partner Needs
- Map Processes, Material & Data Flows
- Identify Gaps & Opportunities
- Define Structural & Functional Needs
- Examine Alternatives to Close the Gaps
- Put a Value on Potential Incremental Gains
- Match Likely Costs & Benefits
- Prepare Roadmap & Action Plan
- Launch Initiative & Regularly Audit Results

# HORSES FOR COURSES

It is critical that you take the time to describe the track & define performance requirements before picking the horses to run your SC race.



# PROFILING

## FACILITY LAYOUT

- Size: Usable Sq. Feet, Height
- Material & Data Flow Diagrams

## MOVEMENT

- Lift Trucks, Pallet Jacks
- Conveyor, AGVs, Other

## STORAGE LOCATIONS

- Bulk, Pallet Rack & Flow Rack
- Bins/Shelving
- AS/RS, Mini-Load, Carousels

## SYSTEMS

- Types, Applications, Interfaces

## PRODUCT PROFILE

- Number of SKU's
- Classifications; e.g., Hazardous
- ABC Percentages

## CONSIDERATIONS

- Shelf Life, Lot & Date Codes
- Serial Numbers
- Seasonal Issues, Other

## DATA COLLECTION

- Radio Data Terminals
- Bar Code, RFID, Voice
- Other Terminals

# PROFILING

## ACTIVITIES

### RECEIPTS / HOUR / DAY

- Trucks/Railcar/Other
- Orders/Lines/Items
- Pallets/Cartons/Pieces

### PICKS / HOUR / DAY

- Orders/Lines/Items
- Cartons/Pallets/Other

### SHIPMENTS

- Trucks/Rail/Courier/Other

## RESOURCES

- Supervisory
- Receiving Operators
- Pickers / Packers / Checkers
- Replenishment Operators
- Shipping Personnel
- Inventory Control
- Expeditors
- Data Entry / Indirect
- Other

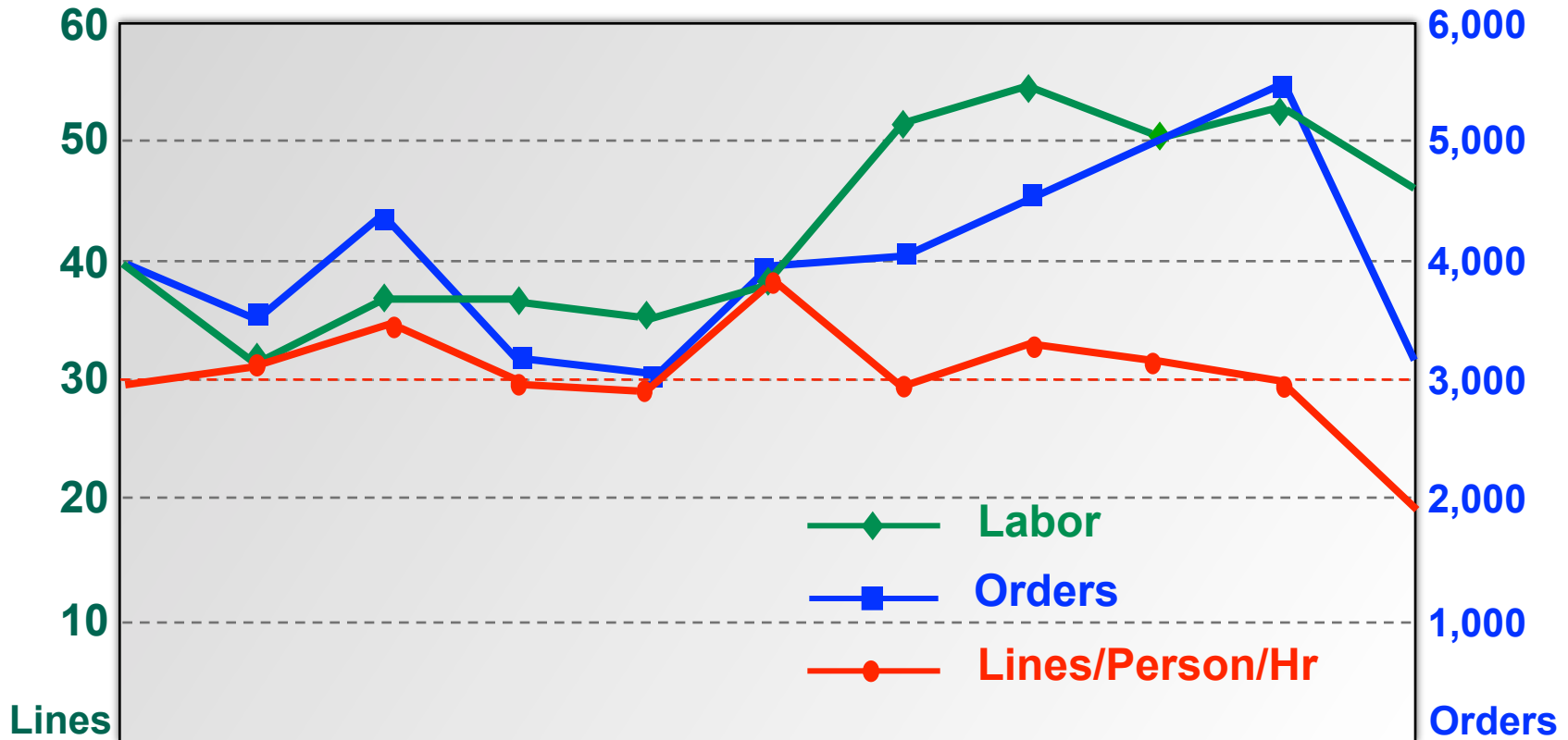


# PROFILING

- **Collect receipt, order & item history**
- **Profile transaction volume by task type**
  - Receipts by handling unit, material type
  - Orders by handling unit, ship method, client
  - SKU volume & daily activity by handling unit
- **Profile transaction volume by labor expended**
- **Audit and validate results with users**

# ACTIVITY PROFILE

## Order Picking Productivity



January Through November

# WHO PLAYS GOLF WITHOUT A SCORECARD?

Hole	Metric's Score	Name	White Stakes Yards	Par	Blue Stakes Yards	Par	Score	Strokes
1	5	Point Garry (out)	328	4	314	4	309	9
2	4	Sea	431	4	417	4	403	11
3	5	Trap	464	4	448	4	434	1
4	3	Carlekemp	175	3	166	3	162	15
5	5	Bunkershill	373	4	361	4	315	5
6	3	Quarry	162	3	140	3	128	17
7	6	Eil Burn	354	4	334	4	327	3
8	5	Linkhouse	495	5	462	4	418	13
9	6	Mizzentop	510	5	490	5	433	7
42		OUT	3292	36	3132	35	2927	36
10	2	Eastward Ho!	176	3	154	3	146	18
11	5	Bos'ns Locker	550	5	489	5	469	2
12	4	Bass	389	4	371	4	354	8
13	5	Pit	365	4	347	4	330	12
14	4	Perfection	376	4	358	4	341	
15	4	Redan	192	3	174	3	157	
16	4	Gate	381	4	363	4	346	
17	5	Point Garry (in)	425	4	407	4	390	
18	4	Home	274	4	256	4	239	
37		IN	3128	37	2968	36	2889	
42		OUT	3292	36	3132	35	2927	
79		TOTAL	6420	72	6100	71	5816	

# ESTABLISH KPI'S

## INTERNAL KPI's

- Perfect Orders
- On-Time Deliveries
- Inventory Accuracy
- Inventory Carrying Cost
- Inventory Turns
- Order Cycle Time
- Order Entry Accuracy
- Workforce Utilization
- Shipping Accuracy
- Order Fill Rate
- Customer Satisfaction

## SUPPLIER KPI's

- Inbound Cost/Order Value
- On-Time Deliveries
- Lead Time
- Fill Rate
- IT / Technology Resources
- Service Flexibility
- Attitude
- Returns Policy
- Value Added Services
- VMI Capabilities
- Ease of Doing Business
- Ethics / Compliance

## CUSTOMER KPI's

- Profitability
- Sales Volume
- Growth Potential
- Credit / Payment History
- Shared Strategic Vision
- Return Rate
- Customer Viability
- Order Frequency
- Loyalty
- Cost to Serve
- Competitive Pressure
- Hassle to Serve

# ESTABLISH KPI'S

- Order Fill Rates
- Order Cycle Times
- Lines & Orders/Person/Hour
- Errors
- Damage
- Inventory Accuracy
- Days on Hand
- Cost / Order
- Cost as % of Sales



# ORDER FULFILLMENT

MEASURE	CALCULATION	TODAY	FUTURE	VALUE
On-Time Delivery	$\frac{\text{Orders On-Time}}{\text{Total Orders Shipped}}$	%	%	\$
Order Fill Rate	$\frac{\text{Orders Filled Complete}}{\text{Total Orders Shipped}}$	%	%	\$
Order Accuracy	$\frac{\text{Error-Free Orders}}{\text{Total Orders Shipped}}$	%	%	\$
Line Accuracy	$\frac{\text{Error-Free Lines}}{\text{Total Lines Shipped}}$	%	%	\$
Order Cycle Time	Actual Ship Date Minus Customer Order Date	Hrs	Hrs	\$
Perfect Order Completion	$\frac{\text{Perfect Deliveries}}{\text{Total Orders Shipped}}$	%	%	\$

# INVENTORY MANAGEMENT

MEASURE	CALCULATION	TODAY	FUTURE	VALUE
Inventory Accuracy	$\frac{\text{Actual Qty per SKU}}{\text{System Reported Qty}}$	%	%	\$
Damaged Inventory	$\frac{\text{Total Damage $$$}}{\text{Inventory Value (Cost)}}$	%	%	\$
Days On Hand	$\frac{\text{Avg. Month Inventory \$}}{\text{Avg. Daily Sales/Month}}$	Days	Days	\$
Storage Utilization	$\frac{\text{Avg. Occupied Sq. Ft.}}{\text{Total Storage Capacity}}$	%	%	\$
Dock to Stock Time	$\frac{\text{Total Dock to Stock Hrs}}{\text{Total Receipts}}$	Hrs	Hrs	\$
Inventory Visibility	Receipt Entry Time - Physical Receipt Time	Hrs	Hrs	\$

# WAREHOUSE PERFORMANCE

MEASURE	CALCULATION	TODAY	FUTURE	VALUE
Orders per Hour	$\frac{\text{Orders Picked/Packed}}{\text{Total Whse Labor Hrs}}$	Ord/Hr	Ord/Hr	\$
Lines per Hour	$\frac{\text{Lines Picked/Packed}}{\text{Total Whse Labor Hrs}}$	Lines/Hr	Lines/Hr	\$
Items per Hour	$\frac{\text{Items Picked/Packed}}{\text{Total Whse Labor Hrs}}$	Items/Hr	Items/Hr	\$
Cost per Order	$\frac{\text{Total Warehouse Cost}}{\text{Total Orders Shipped}}$	\$/Order	\$/Order	\$
Cost as % of Sales	$\frac{\text{Total Warehouse Cost}}{\text{Total Orders Shipped}}$	%	%	\$



# ESTABLISH KPI TARGETS

MEASURE	CALCULATION	CURRENT	TARGET
On-Time Delivery	Total Orders On Time / Total Orders Shipped	87%	95%
Order Accuracy	Errorless Orders / Total Orders Shipped	92%	98%
Order Cycle Time	Actual Ship Date - Customer Order Date	12 Hrs	8 Hrs
Inventory Accuracy	Actual Qty. by SKU / Reported Qty. by SKU	96%	99%
Damaged Inventory	Total Damage \$\$\$ / Total Inventory Value	.75%	.50%
Days on Hand	Avg. Inventory Value (\$) / Average Daily Sales \$	50 Days	42 Days
Storage Utilization	Avg. Inventory Sq. Ft. / Storage Capacity Sq. Ft.	78%	85%
Orders per Hour	Orders Picked & Packed / Total Whse. Labor Hrs	15/Hr	20/Hr
Lines per Hour	Total Lines Picked / Total Whse. Labor Hrs	40/Hr	54/Hr
Cost per Order	Total Warehouse Costs / Total Orders	\$4.26	\$3.62
Cost % of Sales	Total Warehouse Costs / Total Revenue	3.1%	2.7%

# METRICS CAVEATS













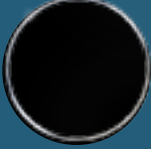












- **Level the playing field: canoes vs. cases**



- **Over-complexity undermines value**
- **As does over-simplification**
- **Workforce involvement is critical**

*A Hard Look at the Soft Side of Performance*, Vitasek & Maylett, CSCMP's *Supply Chain Quarterly*, Q4 2011

# METRICS CAVEATS

METRIC / IMPACT	Orders / Hour	On Time Delivery	Order Cycle Time	Order Accuracy	Damage
Orders / Hour					
On Time Delivery					
Order Cycle Time					
Order Accuracy					
Damage					

*IT'S TOUGH  
PLAYING  
GOLF WITH  
A BASEBALL  
BAT! AND, - -*



- - even the best technology  
installed in operations with ill-  
conceived material flows &  
processes will only enable  
users to do things  
**BADLY - - - FASTER!**



# STREAMLINE PROCESSES & REFINE INFRASTRUCTURE BEFORE IMPLEMENTING TECHNOLOGY OR SYSTEMS

**WHAT WOULD MOM SAY**



**ABOUT YOUR WAREHOUSE?**

# WHAT WOULD MOM SAY?

## ● CONGESTION

- ✓ Does the facility resemble an LA freeway at rush hour?
- ✓ Are pickers delayed while waiting for others in the same area?
- ✓ How about slotting & activity scheduling? Spread the fast movers across a wider pick front.

## ● CLEAN, WELL - LIGHTED SHIP

- ✓ Are work areas clean or cluttered? What about lighting?
- ✓ Are storage, staging & pick locations well & logically marked?
- ✓ What about the temperature? Too cold? Too hot?

## ● THE DIRTY FINGER TEST

While walking through the storage or picking areas closest to the shipping docks, drag a finger across the tops of the stored pallets, cases or items and check that finger every ten feet. The quicker it becomes dirty, the greater the problem with improper storage of slow moving materials.



# WHAT WOULD MOM SAY?

## ● GOLDEN ZONING

- ✓ Are pick locations positioned at or near picker waist height?
- ✓ SKU profiling can help with deployment of fast movers in the “golden zone”.

## ● DOCKS

- ✓ Do you use proper dock plates, levelers, trailer wheel chocks & restraints that engage the impact guard on trailers to prevent movement?
- ✓ When lift trucks fall from docks, injuries can be serious & sometimes fatal. Don't skimp on the busiest & most dangerous part of the warehouse!

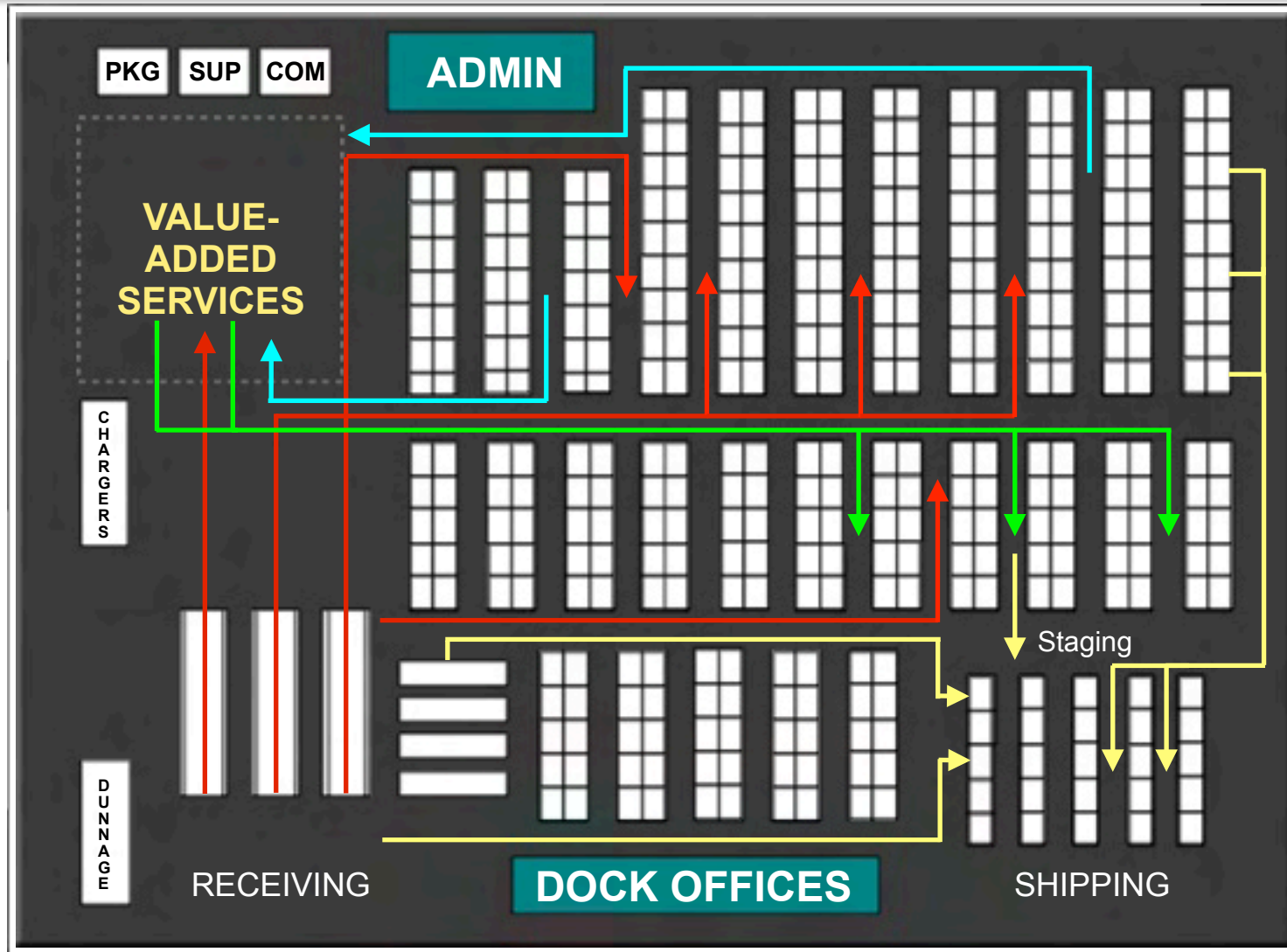
## ● PEOPLE

- ✓ What's the mood? Do managers know team members by name & greet them accordingly?
- ✓ Do workers receive regular feedback on targets & actual results?

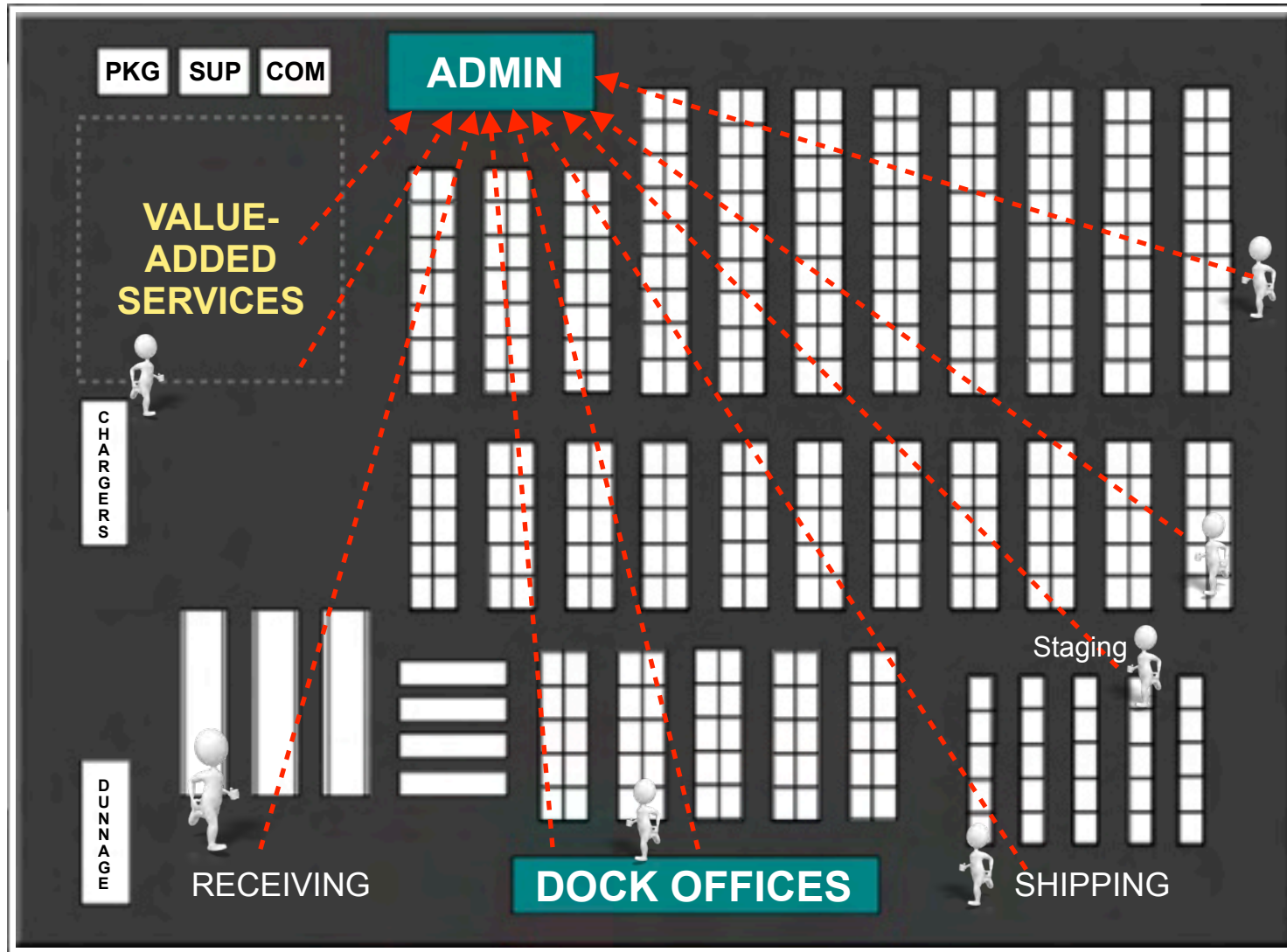
# FORGING YOUR SUPPLY CHAIN



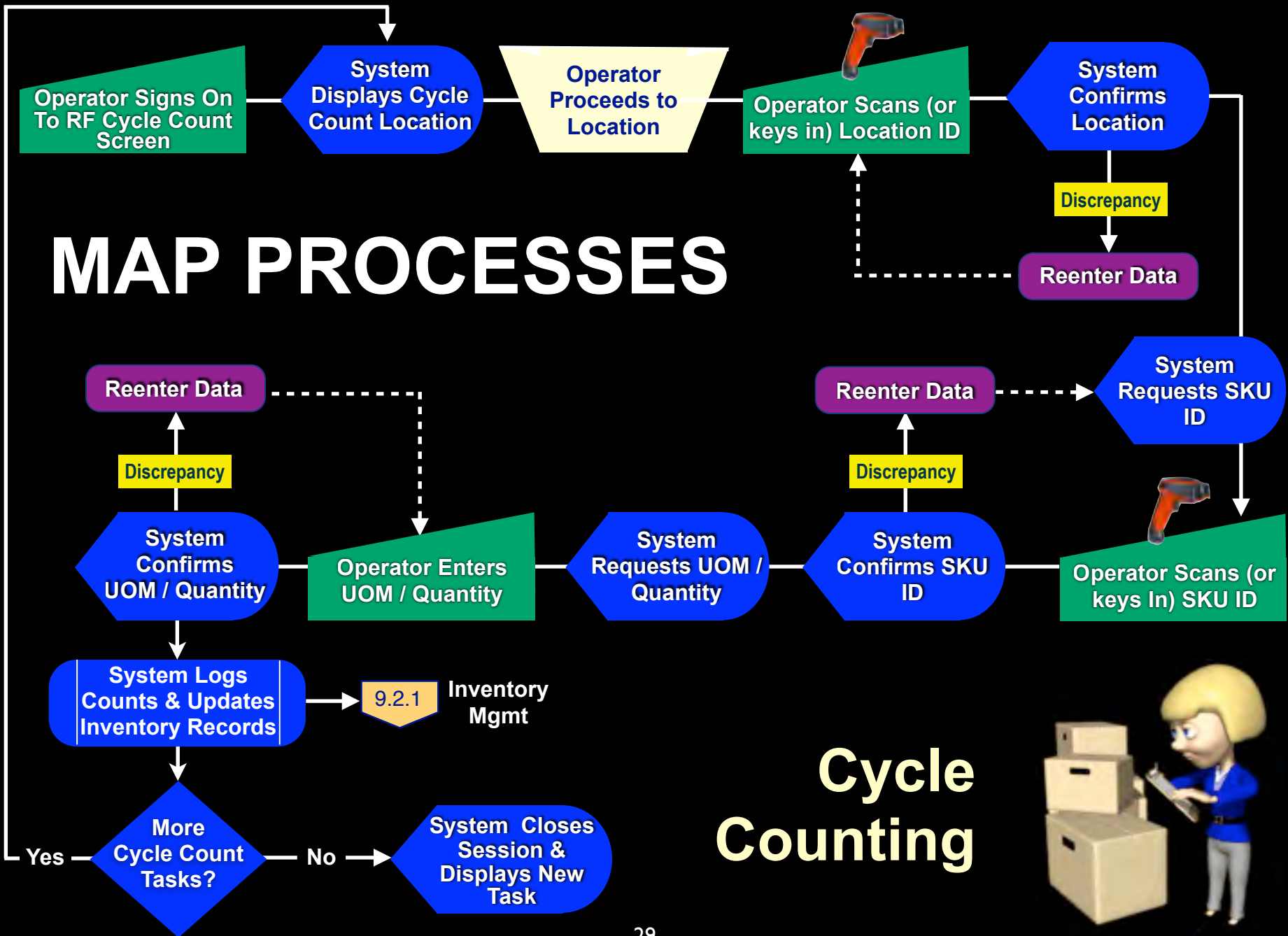
# MAP MATERIAL FLOWS



# MAP DATA FLOWS



# MAP PROCESSES



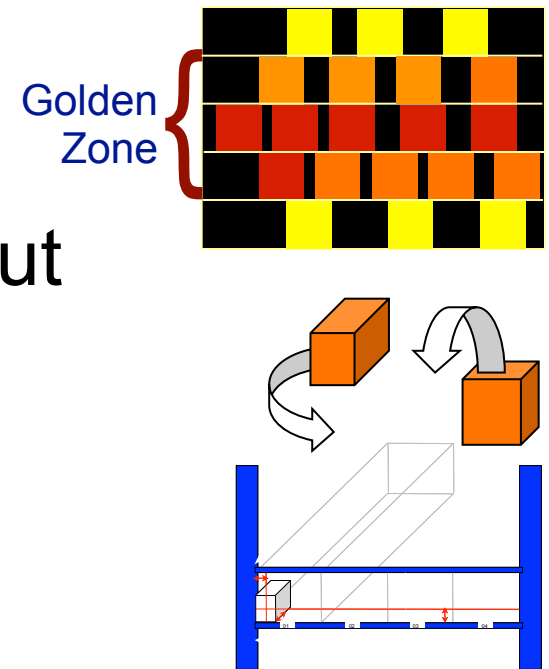
## Cycle Counting



# REFINE INFRASTRUCTURE

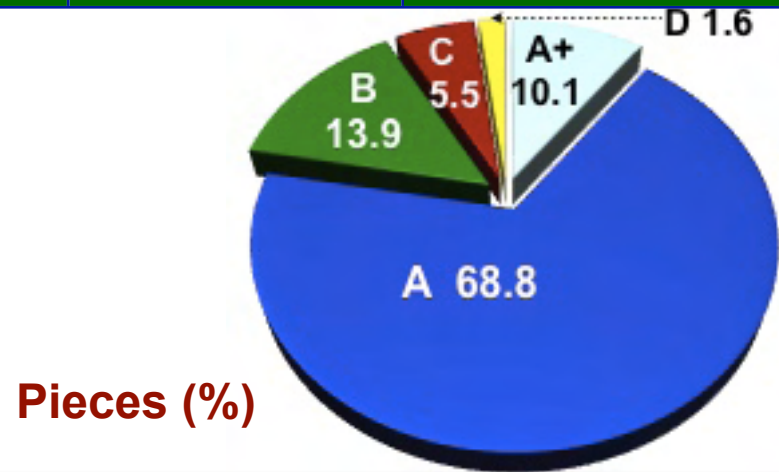
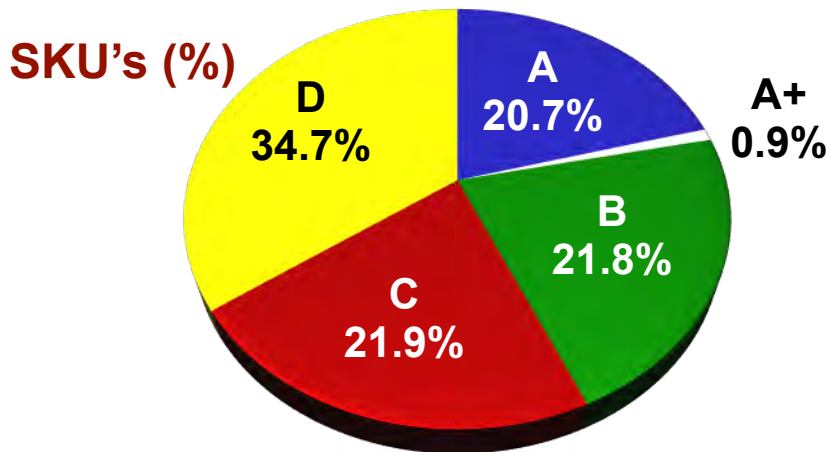
Use order & SKU activity profiles to deploy or 'slot' inventory based upon historical & anticipated volume to . . .

- Improve Space Utilization
- Reduce Travel Times
- Increase Pick Rates & Throughput
- Optimize Replenishment Activity
- Reduce Damage
- Improve Safety



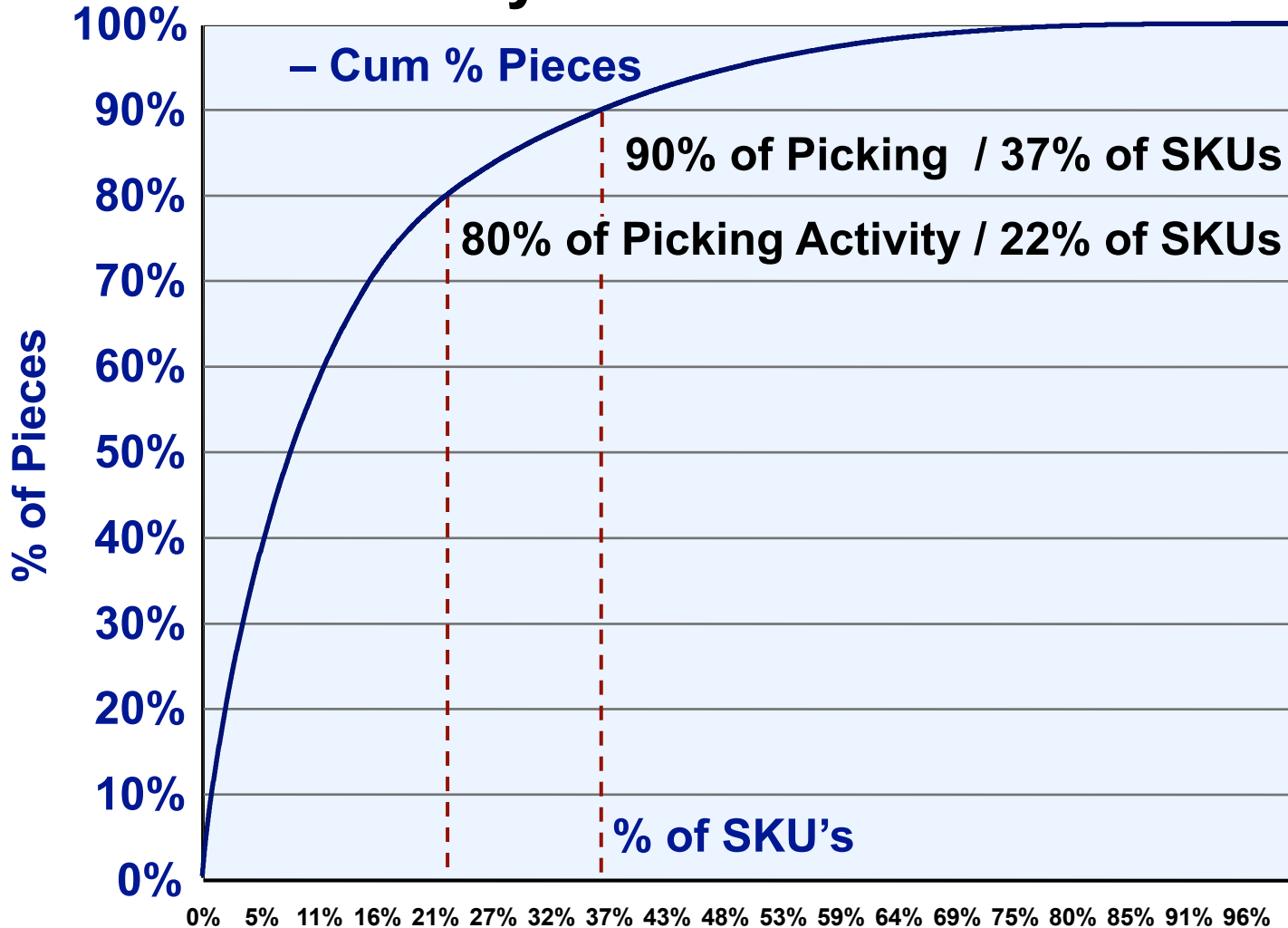
# ANALYZE INVENTORY

CATEGORY	# OF SKU'S	TOTAL PIECES	% OF SKU'S	% PIECES SHIPPED
A+	36	58,665	0.9%	10.1%
A	822	397,758	20.7%	68.8%
B	867	80,594	21.8%	13.9%
C	869	31,973	21.9%	5.5%
D	1381	9,021	34.7%	1.6%
<b>TOTALS</b>	<b>3,975</b>	<b>578,011</b>	<b>100%</b>	<b>100%</b>



# ANALYZE PICKING ACTIVITY

## Velocity Curve - Total Pieces





# REFINE INFRASTRUCTURE

## ISSUES

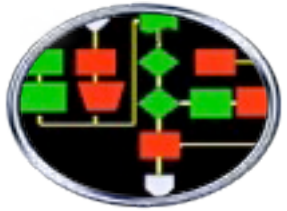
- Travel between locations
- Location searching
- Pick tour set-up
- Case & item picking
- Checking & verifying
- Counting
- Replenishment
- Congestion
- Operator idle time

## SOLUTIONS

- Bring location to operator
- Use WMS, lights, voice or RFID
- Sequence via WMS
- Assess alternate storage modes
- Bar code, voice or RFID
- Prepackage or weigh
- Dynamic via WMS
- Spread fast movers
- WMS task management



# WE'VE GOT THE TOOLS!



Network & Process Optimization  
*--- right environment*



Material Handling & Controls  
*--- right condition*



Automatic ID & Data Capture  
*--- right material*



Supply Chain Execution Systems  
*--- right time*

# REFINE INFRASTRUCTURE

## SCE TECHNOLOGY & SYSTEMS



## SYNCHRONIZE MATERIAL & DATA FLOW

# SCE Systems & Technologies Publications

**SCE SUPPLY CHAIN EXECUTION**  
Systems & Technologies Group Quarterly Report  
Summer 2012

**Leveraging Performance Metrics to Justify an SCE Investment**  
An Interview with John Hill

Considering an investment in supply chain execution (SCE) systems or technologies, but not sure of the potential payoff? Do the math first, advises John Hill, member of the Supply Chain Execution Systems & Technologies Industry Group (SCE) of the Material Handling Industry of America (MHIA).

"The potential value of an SCE system or technology investment can be estimated through analysis of current performance, followed by establishment of and comparison with metrics-based improvement targets," says Hill. "The key is alignment of the SCE solution with the metrics appropriate to the operational environment. Once in place, the metrics can be used to calculate the likely return, and, once deployed, the SCE solution(s) can be used to monitor and audit performance to ensure that the targets are achieved on an on-going basis."

Hill and members of MHIA's SCE Group have developed a systematic approach to establishing key metrics and improvement goals for warehousing and transportation operations to assist prospective users with SCE technology investment and investment justification.

SCE also produced a handy "cheat sheet" (see chart at right) that pinpoints which systems impact which metrics, while delivering the information necessary to regularly audit and benchmark performance post implementation.

Performance metrics (the left column), how to calculate those metrics (the middle column), and the corresponding SCE technologies and systems that enable performance improvement in each area and generate the data for monitoring and maintaining that performance.

METRICS		Existing Technology & Systems							
		RFID	AGV	WCS	WMS	WES	WES	WES	WES
ON-TIME DELIVERY	Days to Ship	•	•	•	•	•	•	•	•
CREDITAL RISK	Days to Ship	•	•	•	•	•	•	•	•
ORDER ACCURACY	Days to Ship	•	•	•	•	•	•	•	•
END-TO-END TIME	Days to Ship	•	•	•	•	•	•	•	•
SPACE	Days to Ship	•	•	•	•	•	•	•	•
SALES IN HAND	Days to Ship	•	•	•	•	•	•	•	•
STORAGE SPACE	Days to Ship	•	•	•	•	•	•	•	•
STOCK TO STOCK	Days to Ship	•	•	•	•	•	•	•	•
WARRANTY	Days to Ship	•	•	•	•	•	•	•	•
ORDER FULFILL	Days to Ship	•	•	•	•	•	•	•	•
LABOR & COSTS	Days to Ship	•	•	•	•	•	•	•	•
WARRANTY & SLA	Days to Ship	•	•	•	•	•	•	•	•
WARRANTY & SLA	Days to Ship	•	•	•	•	•	•	•	•

[www.mhi.org/sce](http://www.mhi.org/sce)  
SCE Impact on Supply Chain Performance

**SCE SYSTEMS & TECHNOLOGIES**

**IMPACT ON SUPPLY CHAIN PERFORMANCE**

MHIA

SCE SUPPLY CHAIN EXECUTION Systems & Technologies Group

[www.mhi.org/sce](http://www.mhi.org/sce)  
SCE Industry Group 2012 Quarterly Report

# SCE Systems & Technologies

Provide the data to profile current performance, establish and put a value on improvement targets, enable target achievement and audit results.

## METRIC

## VALUE PROPOSITION

- **ON-TIME DELIVERY:**

Complete, damage-free order delivered on date requested by the customer

Competitive differentiation & improved customer

- **ORDER FILL RATE:**

Order lines filled completely on schedule pass through the warehouse.

## METRIC

## VALUE PROPOSITION

- **DAMAGE:**

Damage reduction lowers inventory / working

- **ORDER ACCURACY:**

Items & quantities picked & shipped match the customer's order exactly

- **DAYS ON HAND:**

## METRIC

## VALUE PROPOSITION

- **DOCK-TO-STOCK TIME:**

The faster goods are received and processed, the more quickly they can be made available

- **ORDER CYCLE TIME:**

Time taken from order receipt to fulfillment and delivery.

- **STORAGE USAGE:**

Average storage location occupied as percentage of total facility

- **VISIBILITY:**

- **ORDERS PER HOUR:**

- **WAREHOUSE LABOR ÷ SALES:**

Total burdened labor costs divided by sales for a given period; typically

## METRIC

## VALUE PROPOSITION

- **TOTAL WAREHOUSE COSTS ÷ SALES:**

Burdened labor costs plus operating expenses including rent, supplies, utilities, depreciation, etc. divided by total sales for the fiscal year.

Lower overall warehousing costs per order shipped directly contribute to improved margins. Assessment of these costs by customer helps with fine-tuning service level targets and policies.

- **TRANSPORTATION COSTS ÷ SALES:**

Total shipping costs divided by total sales for the fiscal year.

Better order consolidation, load building & shipment routing coupled with improved yard management & carrier appointment scheduling reduce costs & order cycle times.

- **TOTAL WHSE / TRANSPORTATION COSTS ÷ SALES:**

Total warehousing & transportation costs divided by total sales for the fiscal year.

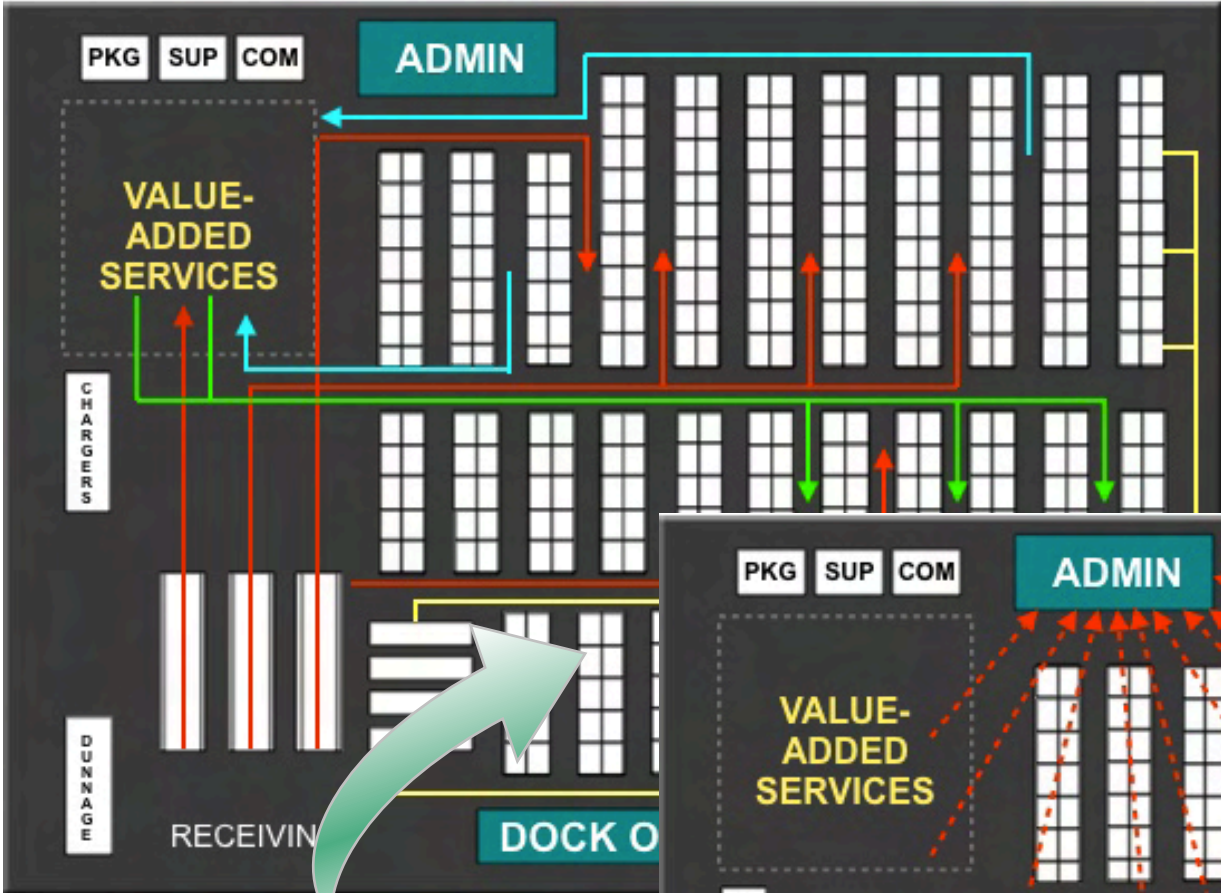
Many academic & professional organizations publish cross- and vertical industry numbers for this metric, which may vary from 3% to 12% or more.

# METRICS

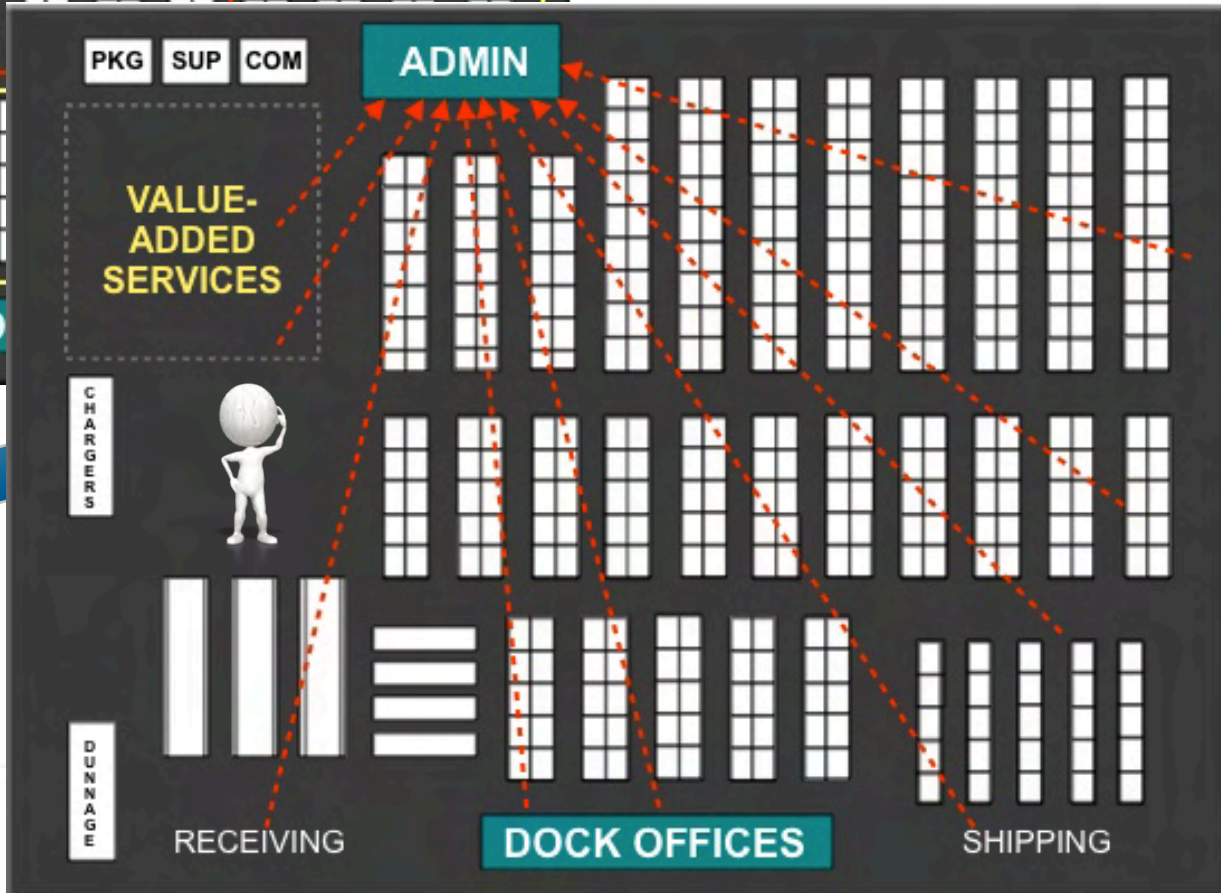
## Enabling Technology & Systems

		F/OMS	AIDC	WCS	WFM	WMS	TMS	SCV
ON-TIME DELIVERY	<u>Orders On-Time</u> Total Orders Shipped	●	●	●	●	●	●	●
ORDER FILL RATE	<u>Orders Filled Complete</u> Total Orders Shipped	○				○		○
ORDER ACCURACY	<u>Error-Free Orders</u> Total Orders Shipped		●	●	●	●	●	●
ORD. CYCLE TIME	Ship Date - (minus) Customer Order Date	○	○	○	○	○	○	○
DAMAGE	<u>Total Damage \$</u> Total Inventory \$		●			●	●	
DAYS ON HAND	<u>Avg. Inventory Value</u> Avg. Daily Sales	○	○			○		○
STORAGE USAGE	<u>Avg. Inventory Sq. Ft.</u> Storage Capacity Sq. Ft.	●		●		●		
DOCK-TO-STOCK	Average Dock-to-Stock Hrs per Receipt		○	○	○	○		
VISIBILITY	Receipt Data Entry - Time of Physical Receipt		●	●	●	●	●	●
ORDERS / HOUR	<u>Orders Picked &amp; Packed</u> Total Labor Hours		○	○	○	○		
WHSE LABOR \$ / SLS	<u>Warehouse Labor Costs</u> Total Shipped Revenue	●	●	●	●	●		
WHSE \$ / SALES	<u>Total Warehouse Costs</u> Total Shipped Revenue	○	○	○	○	○		
TRANSPORT \$ / SLS	<u>Total Transportation Costs</u> Total Shipped Revenue	●				●	●	●
WHSE/TRAN \$ / SLS	<u>Total Whse &amp; Trans Costs</u> Total Shipped Revenue	○	○	○	○	○	○	○

# MATERIAL



# DATA

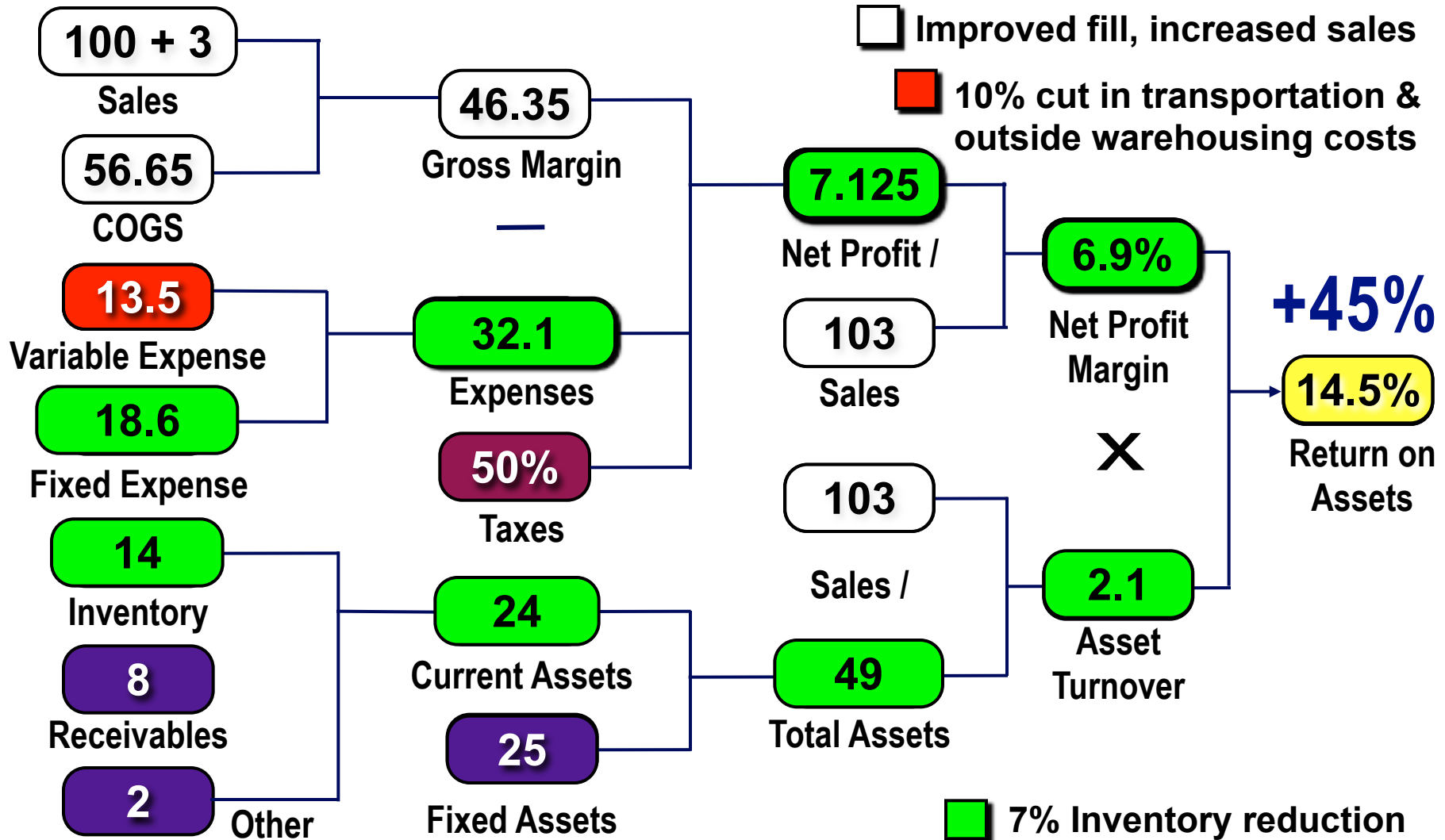


# Profile Performance, Set & Value Improvement Targets

Measure	Calculation	Current	Target	Value
On-Time Delivery	Total Orders On Time / Total Orders Shipped	87%	95%	\$250,000
Order Accuracy	Errorless Orders / Total Orders Shipped	92%	98%	See above
Order Cycle Time	Actual Ship Date - Customer Order Date	12 Hrs	8 Hrs	\$100,000
Inventory Accuracy	Actual Qty. by SKU / Reported Qty. by SKU	96%	99%	See above
Damaged Inventory	Total Damage \$\$\$ / Total Inventory Value	.75%	.50%	\$100,000
Days on Hand	Avg. Inventory Value (\$) / Average Daily Sales \$	50 Days	42 Days	\$1 Million
Storage Utilization	Avg. Inventory Sq. Ft. / Storage Capacity Sq. Ft.	78%	85%	\$100,000
Orders per Hour	Orders Picked & Packed / Total Whse. Labor Hrs	15/Hr	20/Hr	\$864,000
Lines per Hour	Total Lines Picked / Total Whse. Labor Hrs	40/Hr	54/Hr	See above
Cost per Order	Total Warehouse Costs / Total Orders	\$4.26	\$3.62	See above
Cost % of Sales	Total Warehouse Costs / Total Revenue	3.1%	2.7%	See above
<b>Annual Savings</b>				\$2.4 Million
<b>Probable Cost</b>				\$1.8 Million



# DEVELOP THE BUSINESS CASE



# RECAP

- Profile operations, current & projected activity
- Use metrics to measure performance & spot “gaps”
- Recalibrate performance targets (KPI’s)
- Review processes & identify options for improving layout, inventory slotting & material handling
- Assess SCES (AIDC, WMS, LMS, TMS) value for enabling achievement of performance goals
- Quantify potential gains & build the business case
- Launch program & use SCES to regularly audit performance against targets

# QUESTIONS?



A person wearing a red shirt and a helmet is riding a bicycle on a dark, curved ramp. The background shows a desert landscape with a blue sky and a valley. The text is overlaid on the image.

***Warehousing is like  
riding a bicycle –***

*Thanks for joining me today!*

## For More Information:

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[www.mhi.org/SCE](http://www.mhi.org/SCE)

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