



PROMAT

2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

Big Data Meets Forklifts!

Sponsored by:



Presented by:

AK Schultz

Bill Leber

powered by



www.ProMatShow.com

FIND WHAT'S
NEXT.



PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

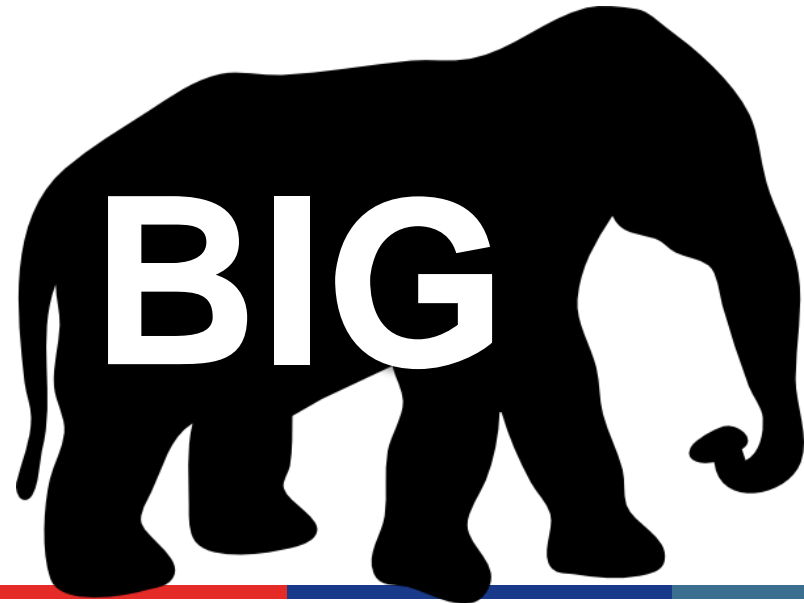
powered by  MHI

WHAT IS BIG DATA?

It is **<data/>**

101101010010010011001100101010010
010010010011000100101101100100100
10011010010100110100101001101
010100100100100100100101010101
0010010010010010010010010010010
101010010010011010010101110010010
100110010010010101001100110010010

And it is



FIND WHAT'S
NEXT.



PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by  MHI

BUT WHY IS IT CALLED BIG DATA?

Data sets so **large and complex...**

That it becomes **difficult to process...**

Using **traditional data processing apps**

**FIND WHAT'S
NEXT.**



PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by  MHI

90%

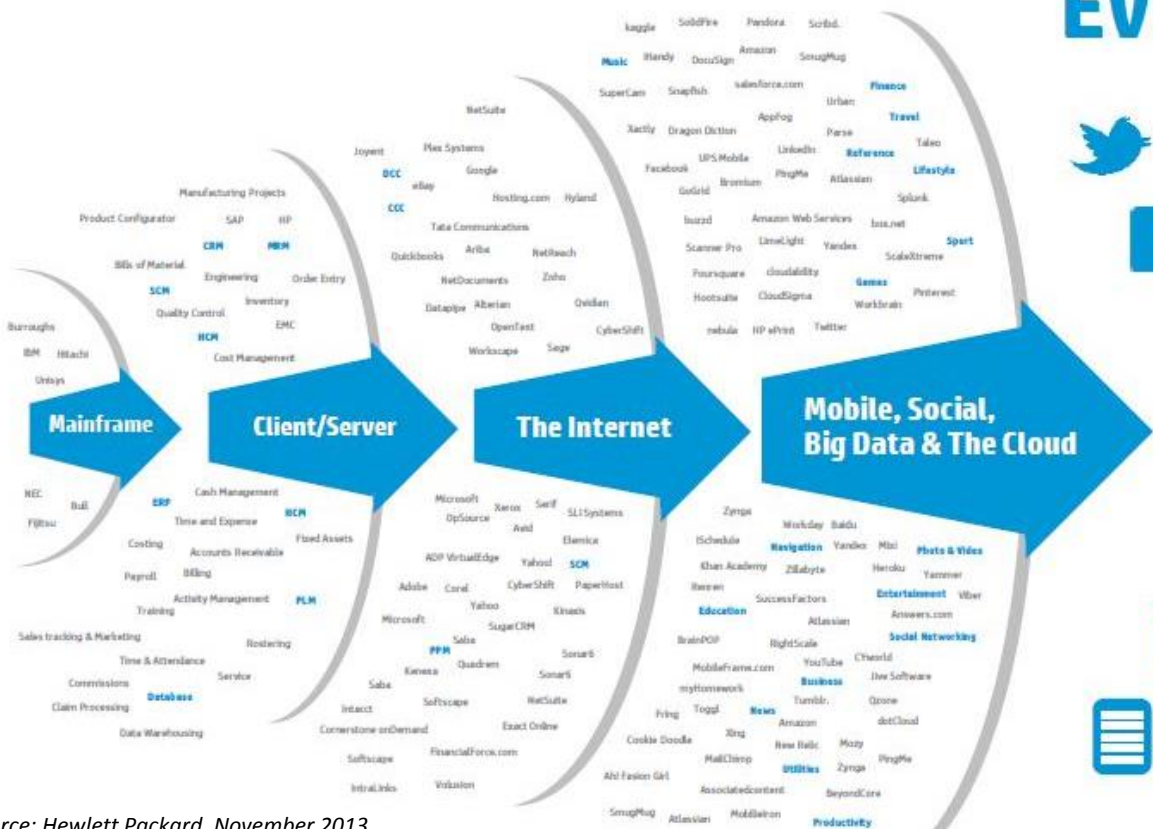
OF ALL THE DATA IN
THE WORLD

HAS BEEN GENERATED
OVER THE LAST








TWO
YEARS!

**Source: Science Daily, May 2013*

FIND WHAT'S NEXT.



Every 60 seconds

-  **98,000+** tweets
-  **695,000** status updates
-  **11 million** instant messages
-  **698,445** Google searches
-  **168 million+** emails sent
-  **1,820TB** of data created
-  **217** new mobile web users

*Source: Hewlett Packard, November 2013

1k TB was created while you have been viewing this slide!

FIND WHAT'S NEXT.

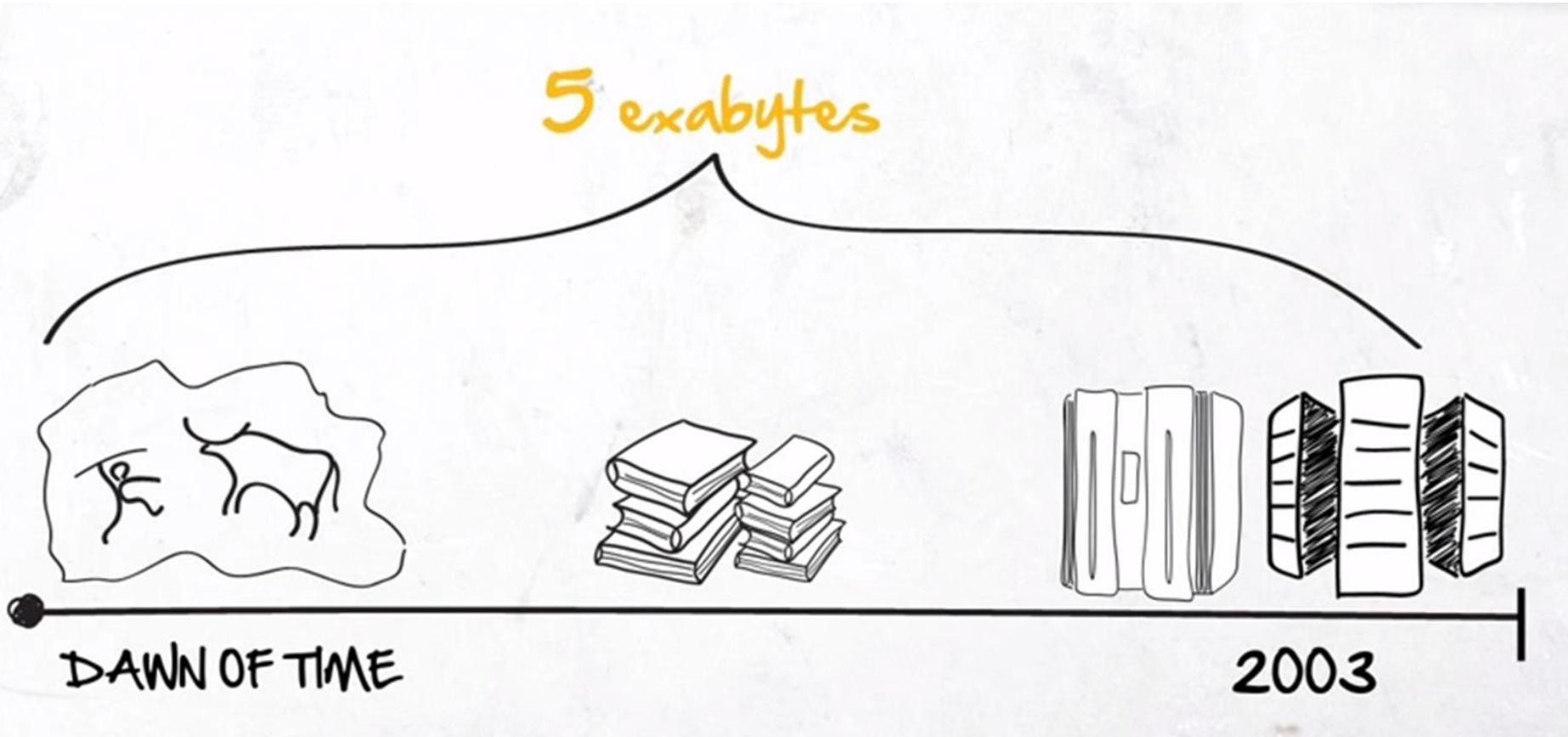


PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by MHI

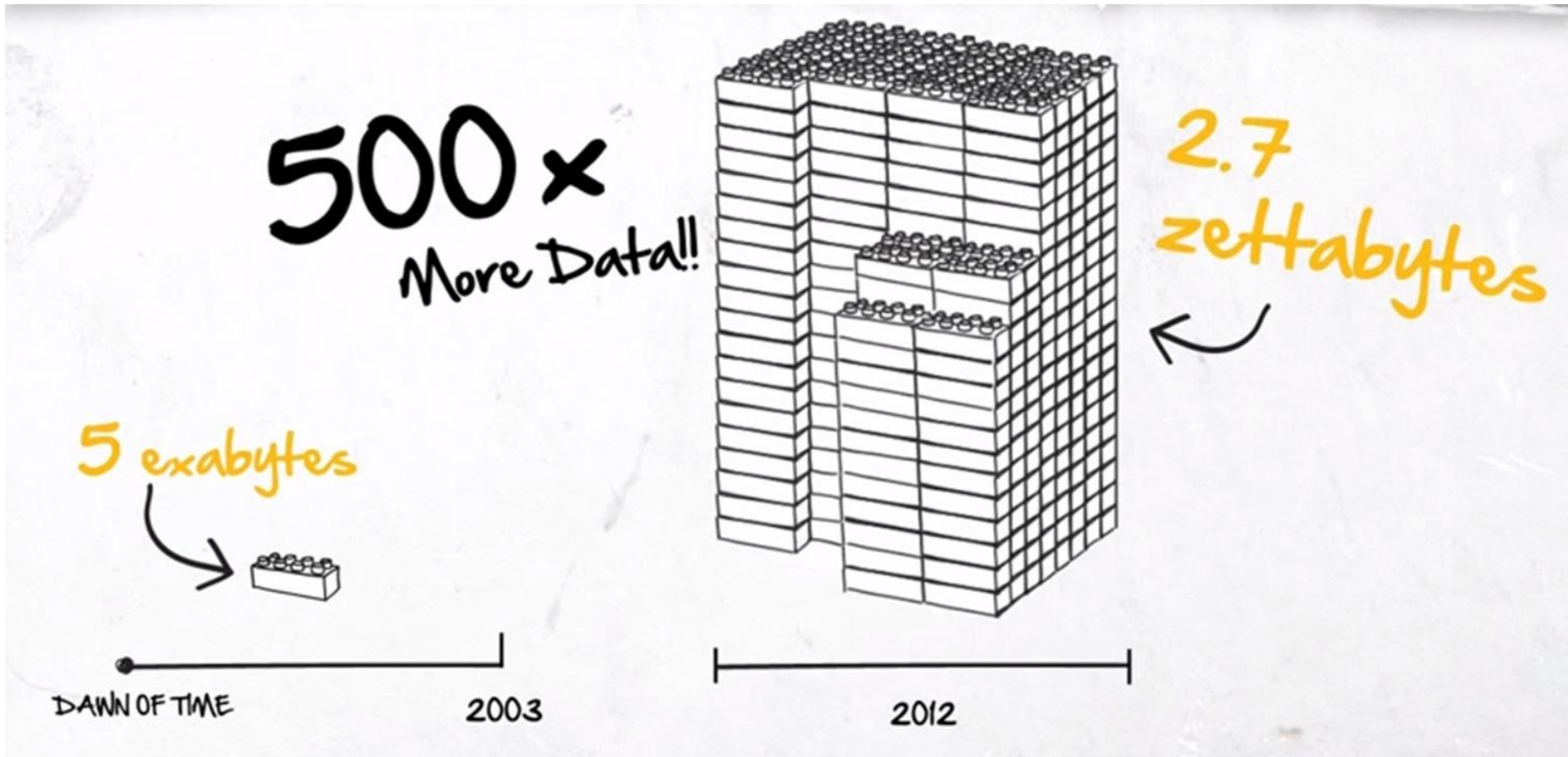
LET'S GIVE YOU A SENSE OF SCALE



*Source: Intel

FIND WHAT'S NEXT.

LET'S GIVE YOU A SENSE OF SCALE



*Source: Intel

FIND WHAT'S
NEXT.

LET'S GIVE YOU A SENSE OF SCALE



*Source: MHI

FIND WHAT'S NEXT.

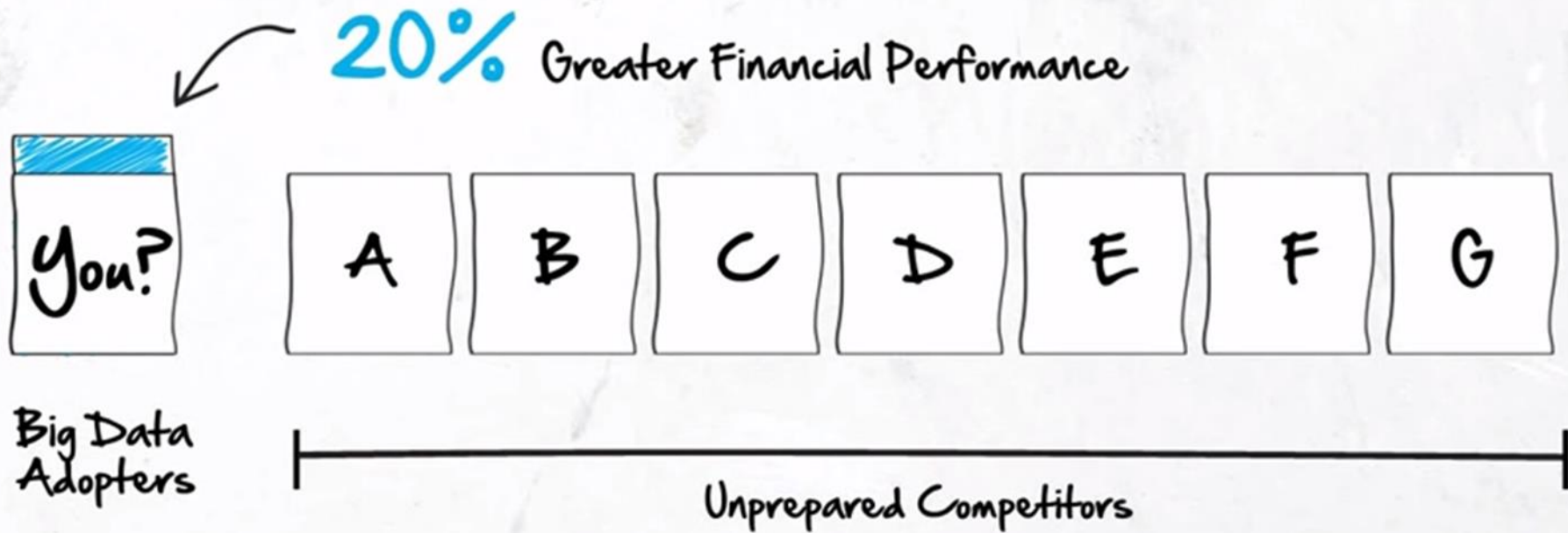


PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by MHI

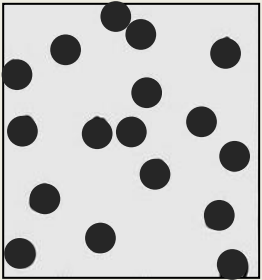
WHY SHOULD YOU CARE?



*Source: Intel

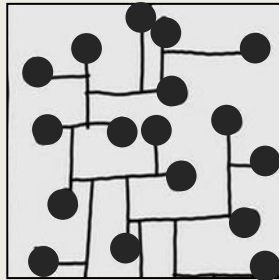
DATA-WISDOM CONTINUUM

DATA



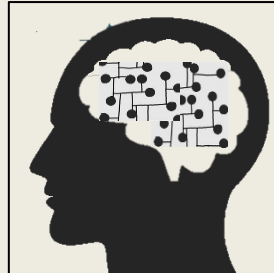
- Facts
- Gathering
- Research

INFORMATION



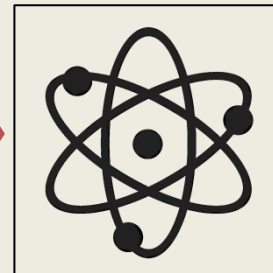
- Presentation
- Organization
- Gives Meaning

KNOWLEDGE



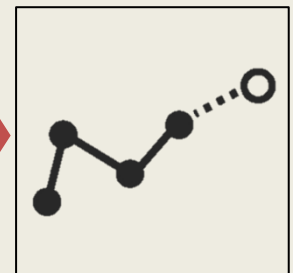
- Application
- Synthesized
- Learning

WISDOM



- Understanding
- Interpretation
- Actionable

DECISIONS



- Change
- Movement
- Optimization

THE PAST

WHY?

Reveals Patterns

WHAT?

Reveals Relationships

THE FUTURE

WHAT IS BEST?

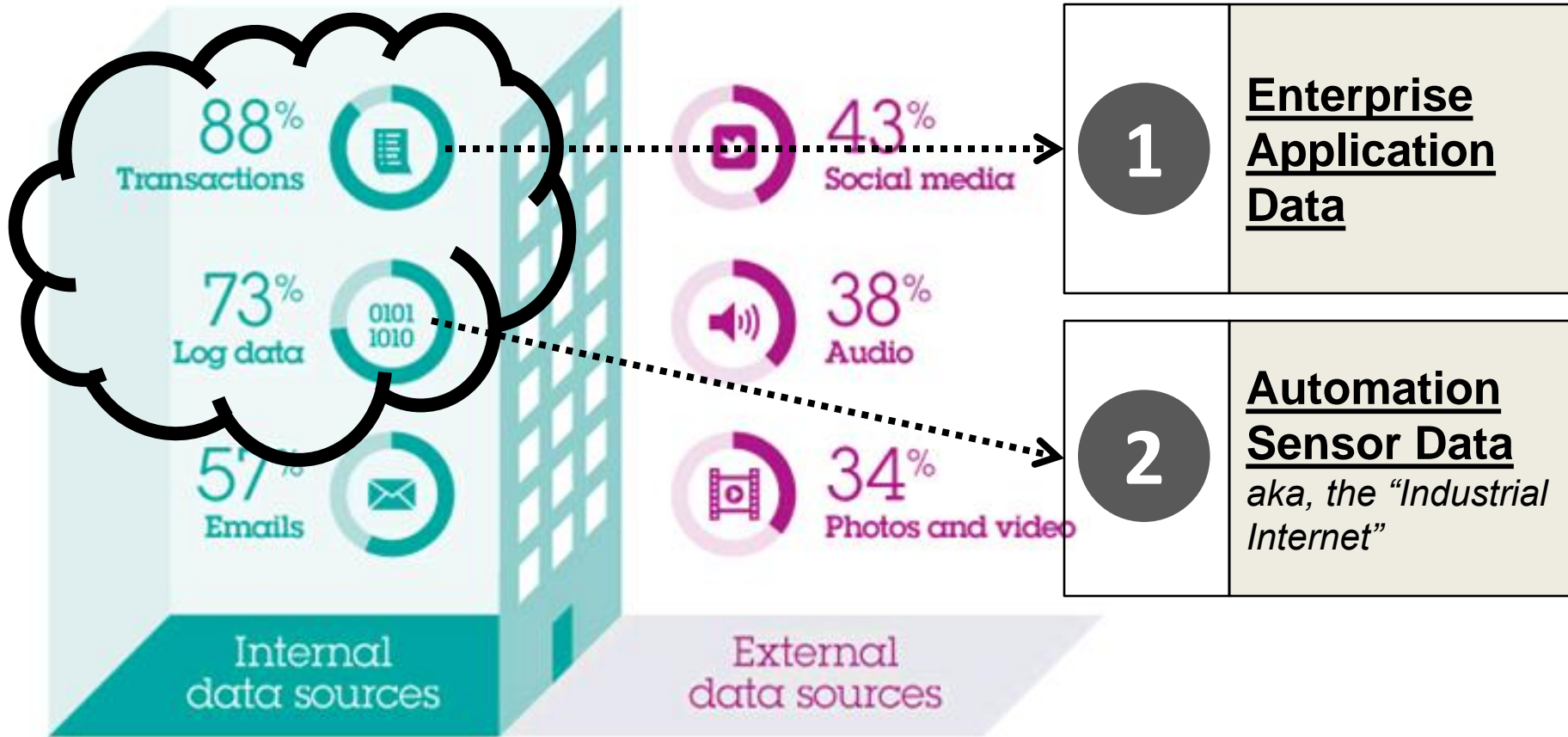
Reveals principles

WHAT ACTION?

Reveals direction

FIND WHAT'S NEXT.

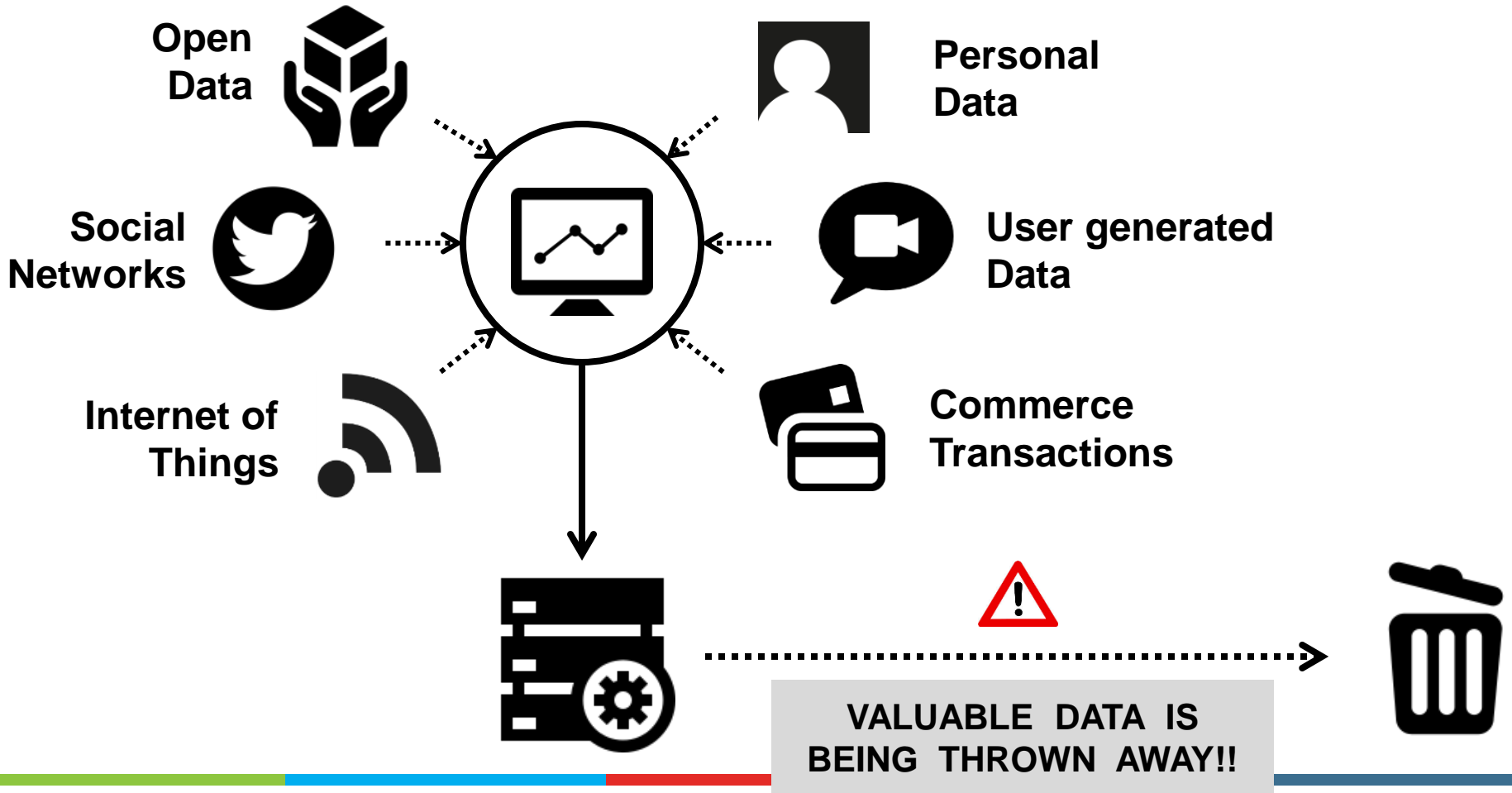
IN SUPPLY CHAIN, WHAT DO WE CARE ABOUT?



*Source: IBM

**FIND WHAT'S
NEXT.**

VALUABLE DATA IS THROWN AWAY!



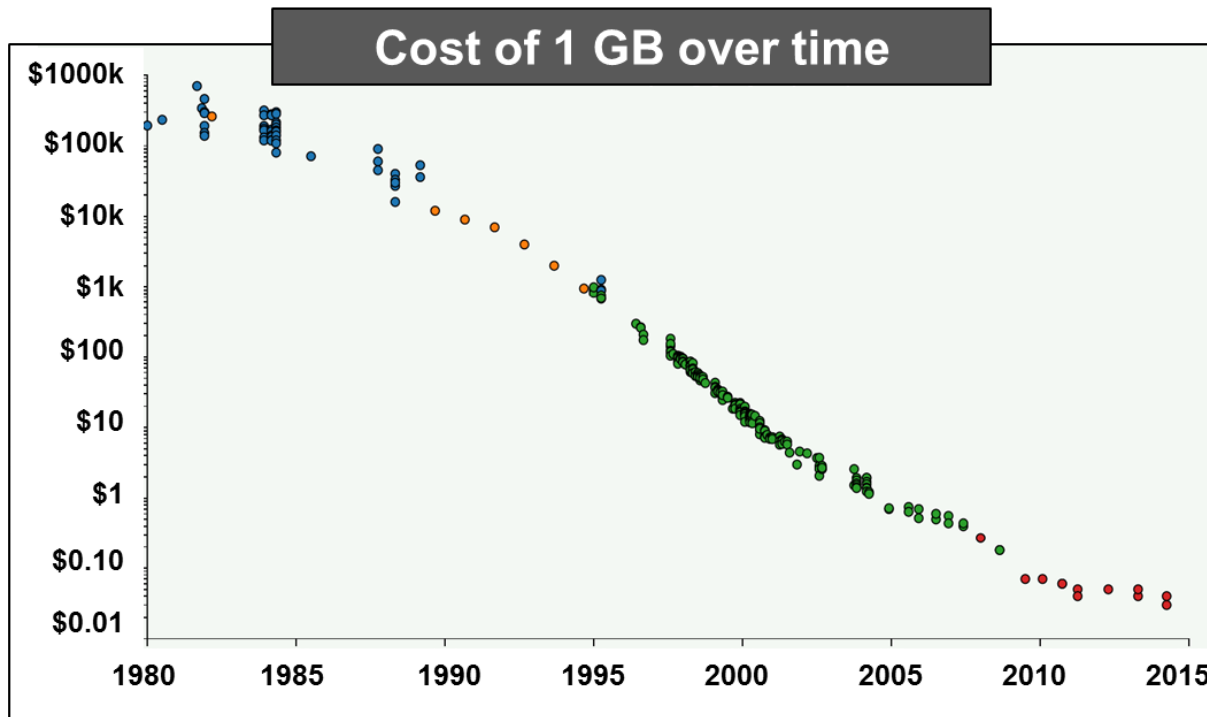


EXAMPLES FROM WAREHOUSING

- A typical warehouse storing pallets will generate 1 to 2 GB per mos in its WMS.
- A typical retail distribution ASRS dealing primarily in case handling will generate 25 to 50 GB per mos in its WMS.
 - *Approx. 25 times the data for the same case volume*
 - *5 to 10 GB per mos of industrial internet data.*
 - *3 to 5 GB of data in a data warehouse.*
- **This means we are likely not leveraging 300 GB to 1 TB annually per site!**



COST OF STORING BIG DATA



*Source: mkomo.com

Log first. Ask questions later.

FIND WHAT'S NEXT.



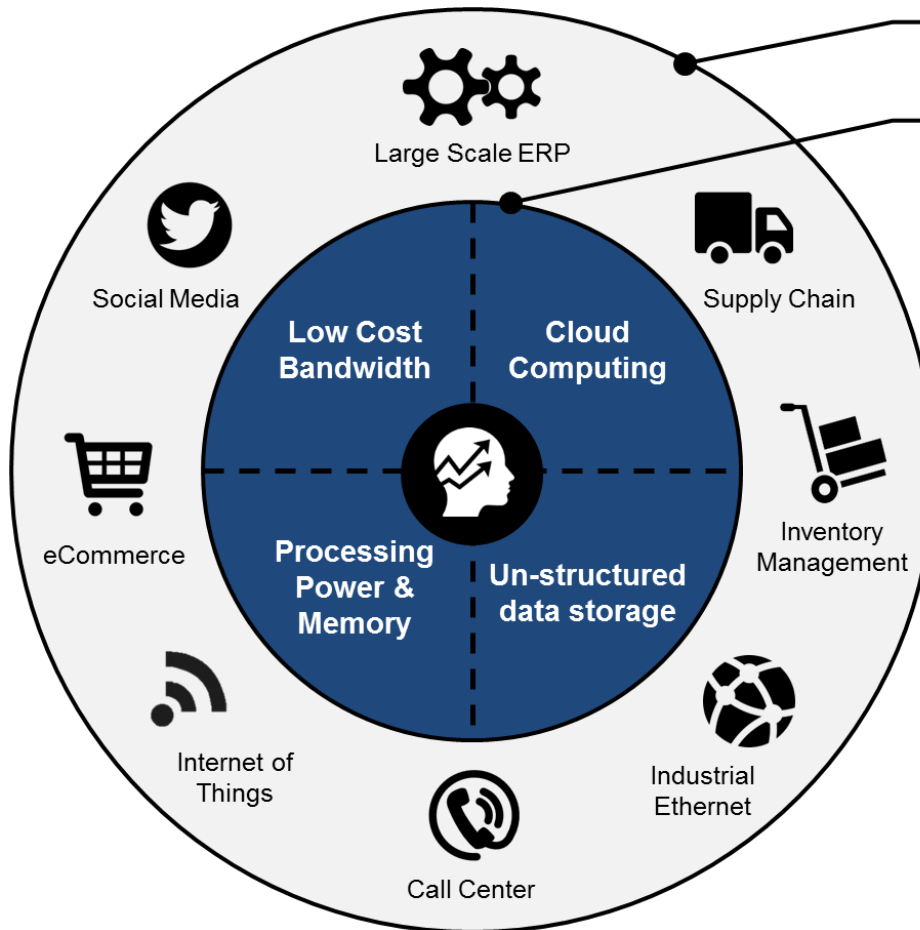
PROMAT

2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

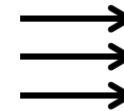
powered by MHI

WHY TODAY IS A NEW DAY



DATA SOURCES

NEW TECHNOLOGY



**High leverage,
data driven,
actionable
insights**

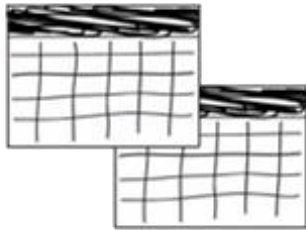


THE INDUSTRY THAT MAKES SUPPLY CHAINS WORK™

FIND WHAT'S NEXT.

ENTER THE DATA LAKE

Traditional
Structured
Data



Raw Unstructured Data



SQL

NoSQL!!!

**FIND WHAT'S
NEXT.**



PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by MHI

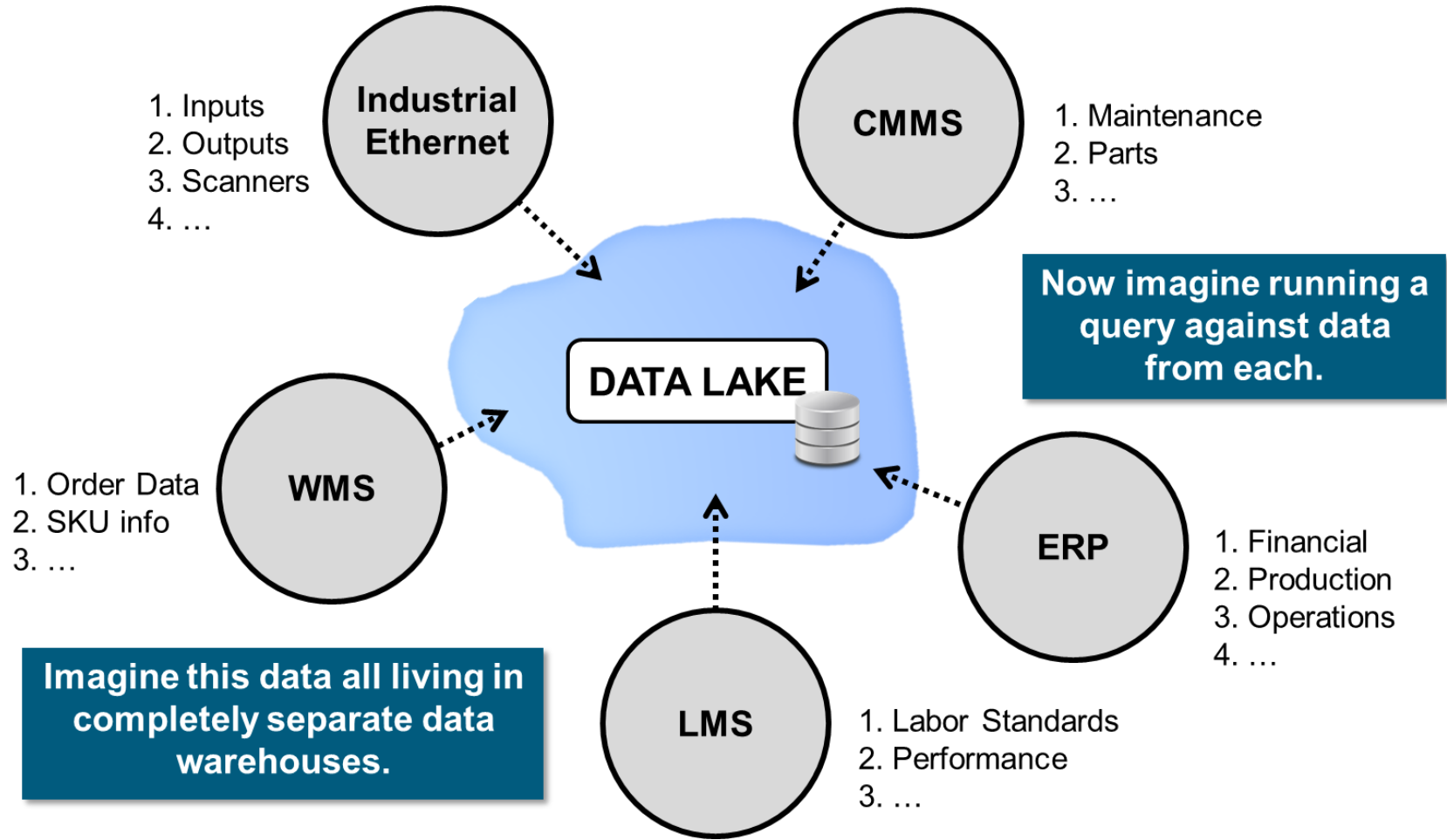
BIG DATA = BIG IMPACT

Most of it doesn't
matter

DATA LAKE

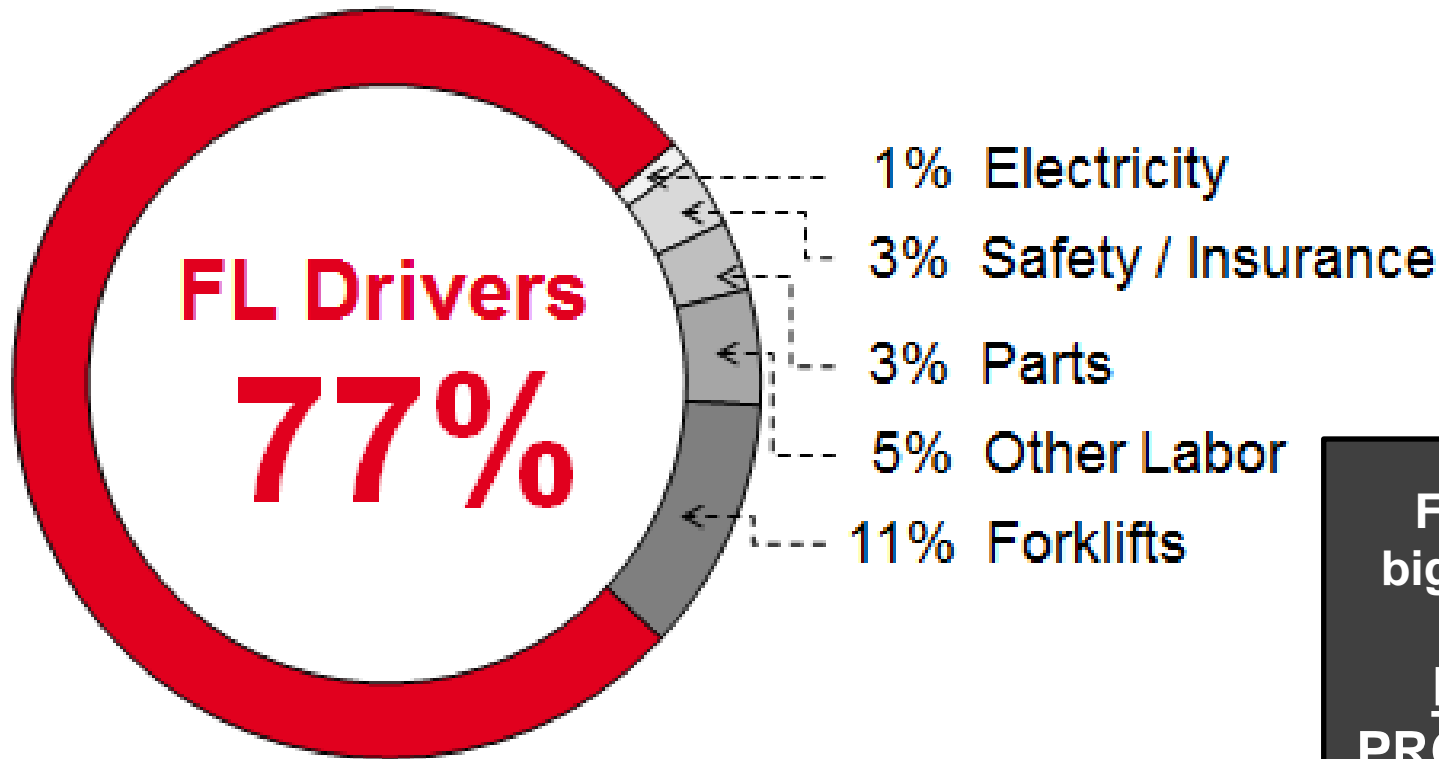
Some of it is crazy
important!

DATA SOURCES IN DCs





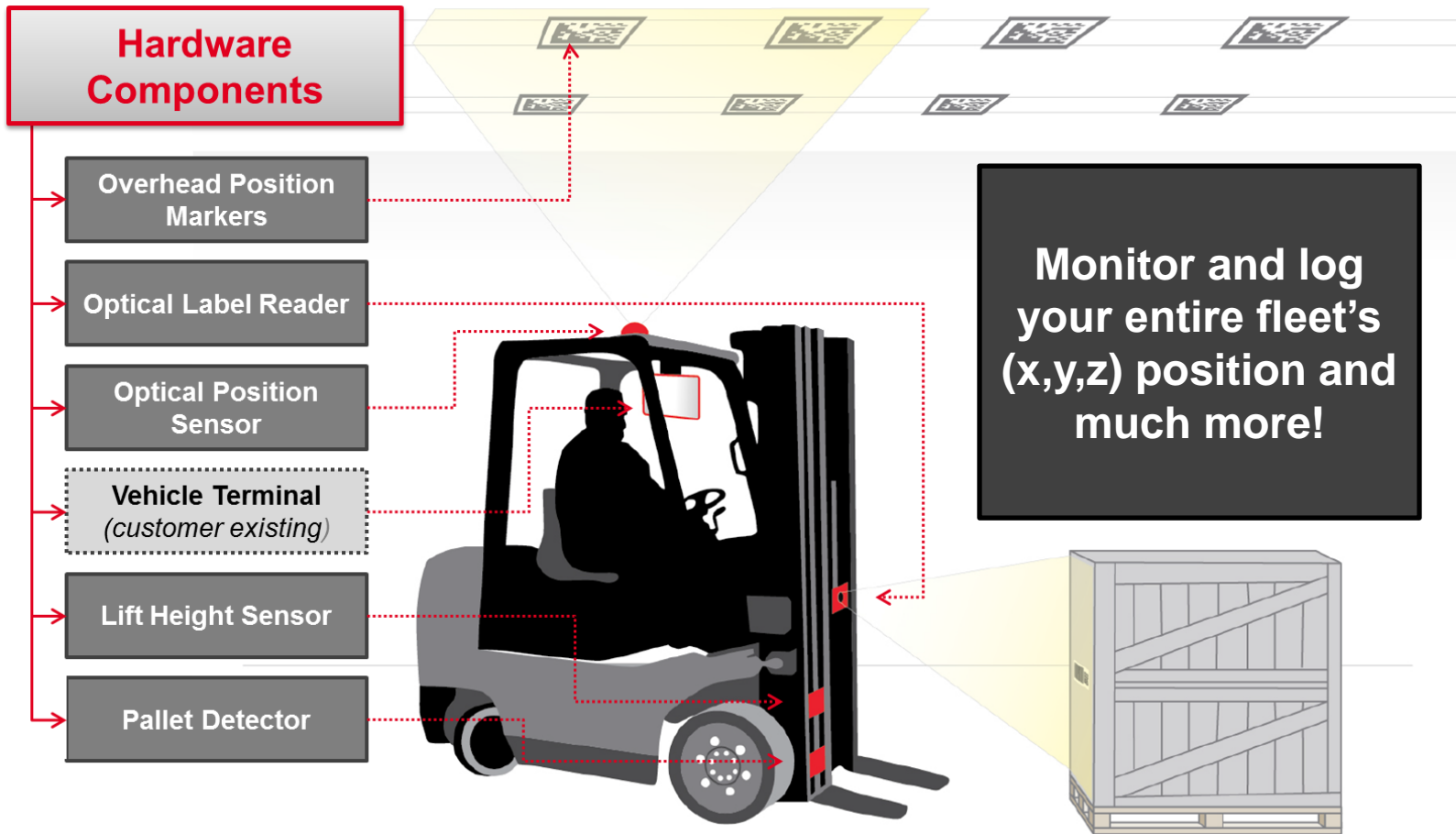
DATA SOURCES IN DCs



Focus on the biggest piece of the pie:
FORKLIFT
PRODUCTIVITY!

* TCO statistics courtesy Crown Equipment Corp

BIG DATA FROM FORKLIFTS!



FIND WHAT'S NEXT.



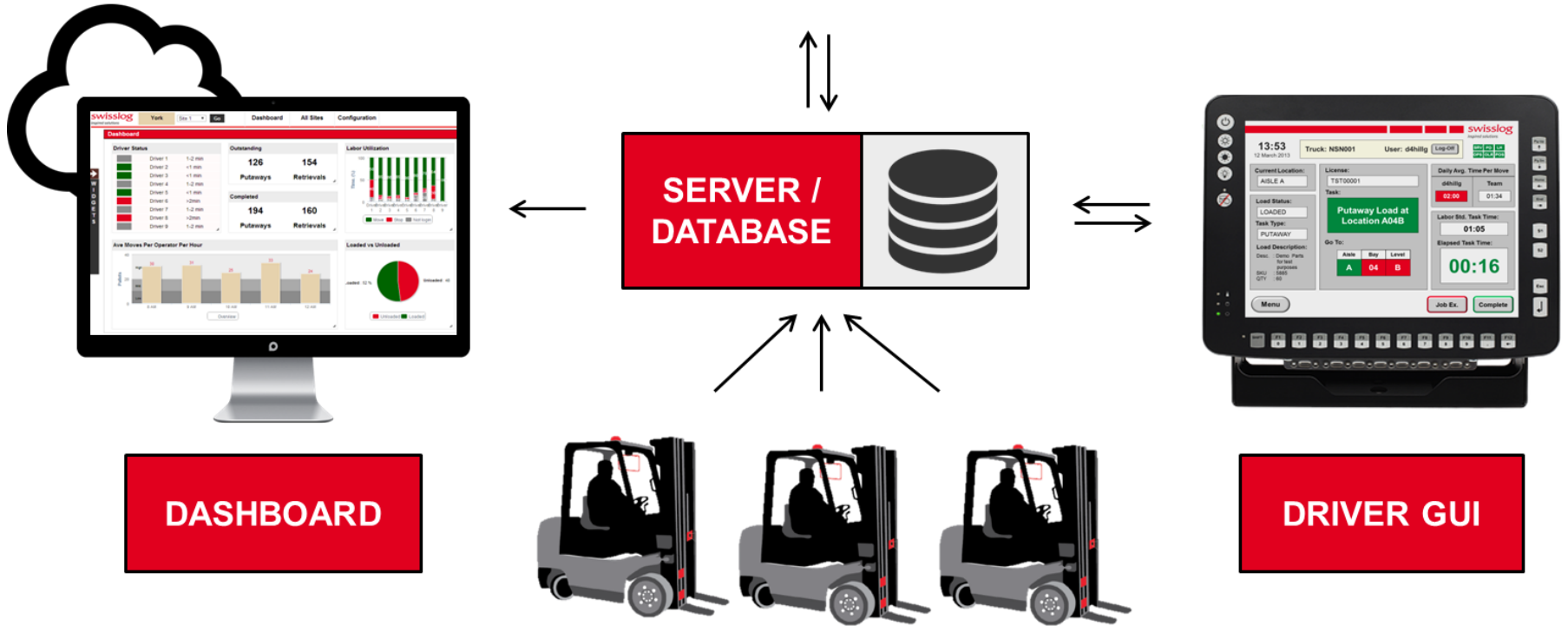
PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by MHI

BIG DATA FROM FORKLIFTS!

Customer
WMS / ERP / LMS



DASHBOARD

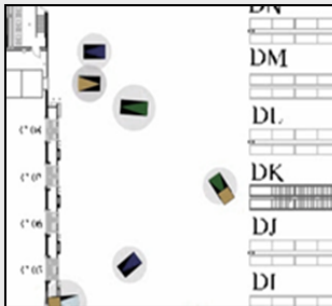
DRIVER GUI



BENEFITS

1

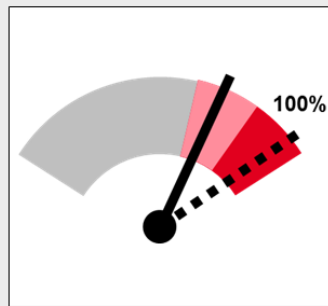
INCH-ACCURATE VEHICLE TRACKING



- Bread crumb visualization of vehicle fleet movement
- Optimize inventory locations based on traffic

2

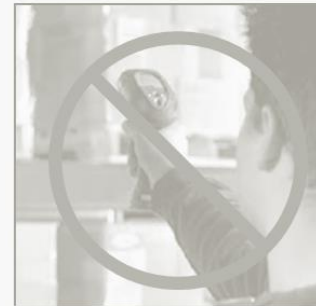
REAL-TIME INVENTORY ACCURACY



- Know the real-time location of your inventory
- No more time spent "hunting" for pallets

3

NO MORE SCANNING



- Hands-free / Voice-free scanning
- Average savings of 8 to 14 seconds per move

4

BIG DATA INTELLIGENCE



- Web-hosted BI Tools that displays real-time forklift data
- Automated email / text alerts

FIND WHAT'S
NEXT.



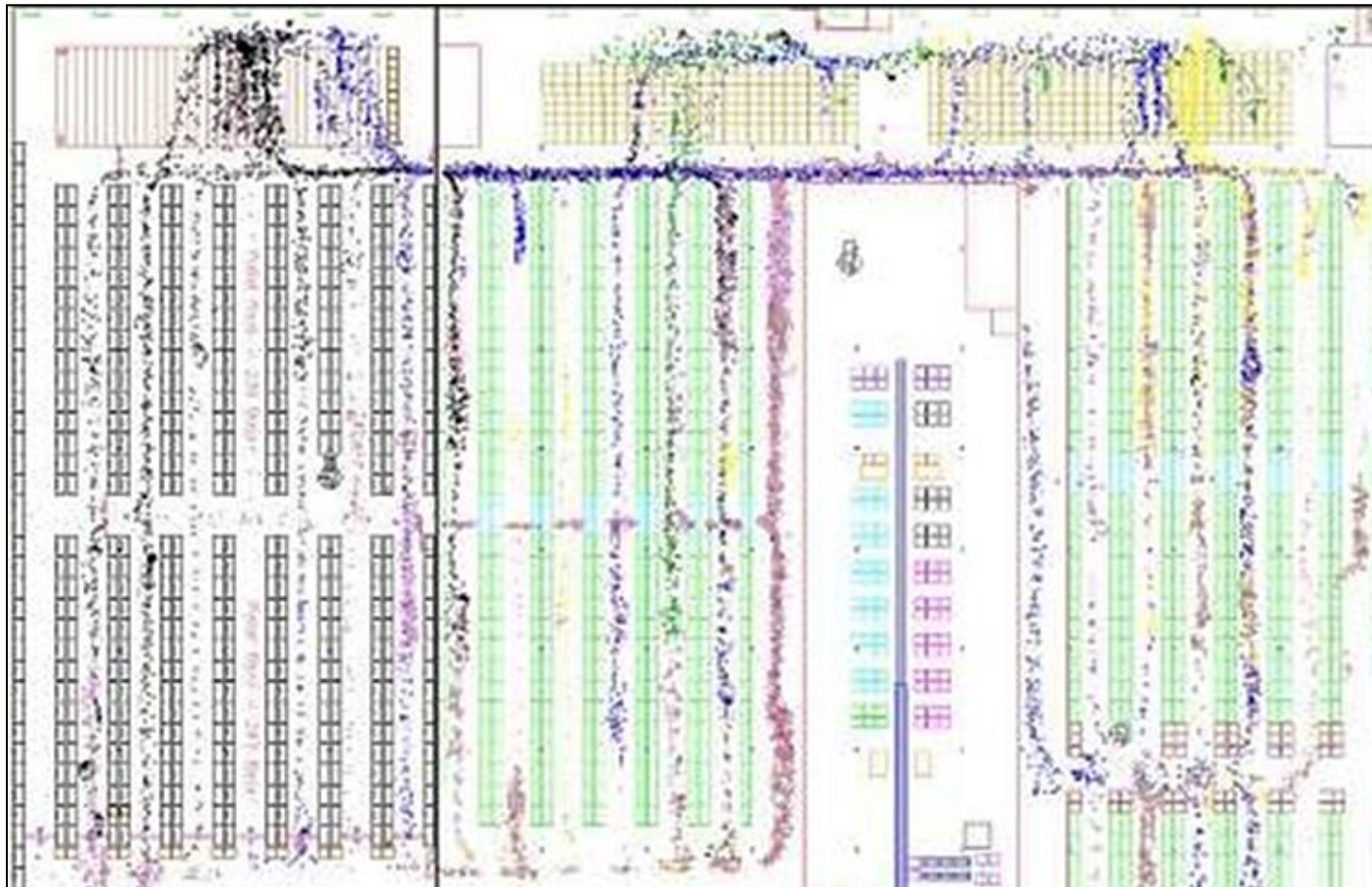
PROMAT

2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by MHI

BREAD-CRUMB VIEW

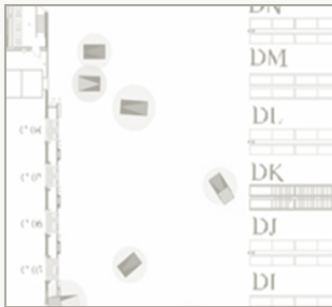




BENEFITS

1

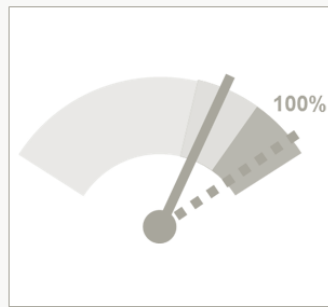
INCH-ACCURATE VEHICLE TRACKING



- Bread crumb visualization of vehicle fleet movement
- Optimize inventory locations based on traffic

2

REAL-TIME INVENTORY ACCURACY



- Know the real-time location of your inventory
- No more time spent "hunting" for pallets

3

NO MORE SCANNING



- Hands-free / Voice-free scanning
- Average savings of 8 to 14 seconds per move

4

BIG DATA INTELLIGENCE



- Web-hosted BI Tools that displays real-time forklift data
- Automated email / text alerts

FIND WHAT'S NEXT.




PROMAT

2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by MHI

DRIVER INTERFACE



inspired solutions

13:53
12 March 2013

Truck: NSN001 User: d4hillg Log-Off

SRV	PD	LH
OPS	OLR	POS

Current Location:
AISLE A

License:
TST00001

Task:
Putaway Load at Location A04B

Go To:

Aisle	Bay	Level
A	04	B

Daily Avg. Time Per Move

d4hillg	Team
02:00	01:34

Labor Std. Task Time:
01:05

Elapsed Task Time:
00:16

Load Status:
LOADED

Task Type:
PUTAWAY

Load Description:
Desc. : Demo Parts for test purposes
SKU : 5885
QTY : 60

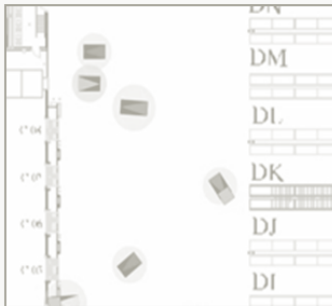
Menu **Job Ex.** **Complete**



BENEFITS

1

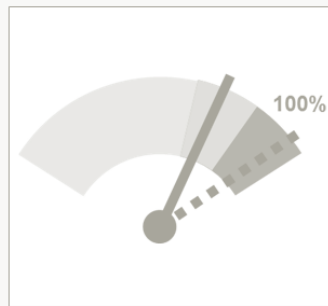
INCH-ACCURATE VEHICLE TRACKING



- Bread crumb visualization of vehicle fleet movement
- Optimize inventory locations based on traffic

2

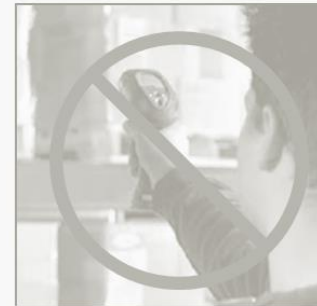
REAL-TIME INVENTORY ACCURACY



- Know the real-time location of your inventory
- No more time spent "hunting" for pallets

3

NO MORE SCANNING



- Hands-free / Voice-free scanning
- Average savings of 8 to 14 seconds per move

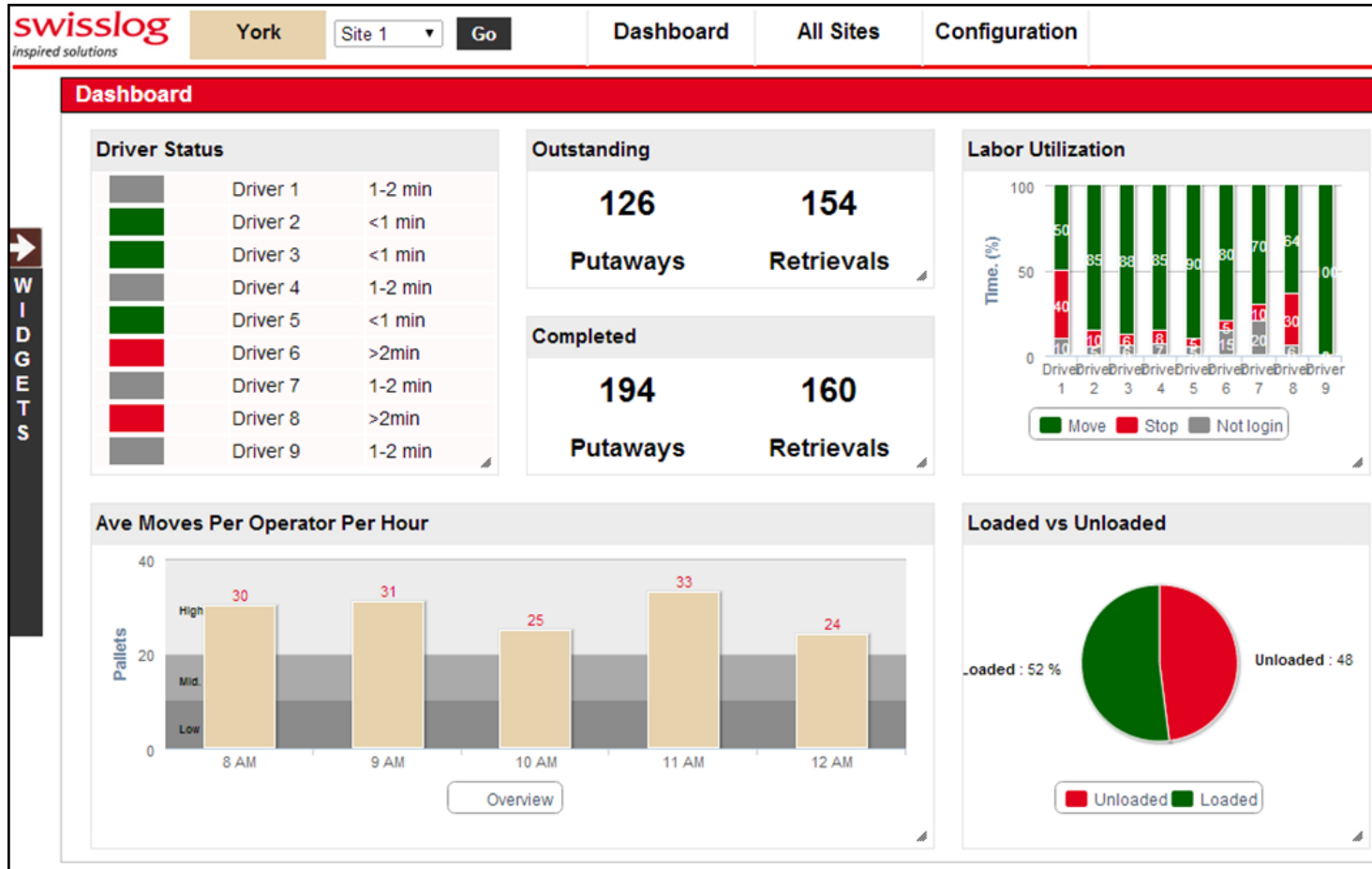
4

BIG DATA INTELLIGENCE



- Web-hosted BI Tools that displays real-time forklift data
- Automated email / text alerts

DASHBOARD FOR MANAGEMENT



CUSTOMER REFERENCE

THE CUSTOMER:

BACKGROUND

4 Sites, First Implementation (Go Live April '14)

PURPOSE

Improved Productivity and Inventory Accuracy

- **Improvements seen in first 12 weeks at Bobcat**
 - Over 30% increase in Avg. number of pallets moved per hour
 - 25% decrease in number of drivers per shift
 - 10% increase in inventory accuracy
 - Over 100% reduction in new driver training. New drivers are trained within 1 day vs. 3-4 days on the older system
 - Reduction in inventory counts (4th week only)
- **DC Velocity article published October 2014.**



Bobcat excavates productivity, inventory improvements

The construction equipment company makes heavy-duty gains in lift truck driver productivity and inventory accuracy with the help of some new technologies.

BOBCAT'S COMPACT BUT POWERFUL LOADERS, excavators, and other types of landscaping, construction, and industrial equipment are pretty much ubiquitous during construction seasons. Nearly all of those products flow out of Bobcat Co.'s main production facility in Gwinnett, N.D. The 800,000-square-foot manufacturing campus includes three warehouse buildings that range in size from 25,000 to 50,000 square feet. Production materials, which include large steel coils and subassemblies from other Bobcat facilities in North Dakota and Minnesota, pass through those warehouses on their way to manufacturing.

Donnie Herbet, Bobcat's strategic materials manager, says the warehouses handle about 40 truckloads of inbound materials each day—about a thousand skids in total. And keeping track of all that inventory in a fast-moving operation had become a vexing problem

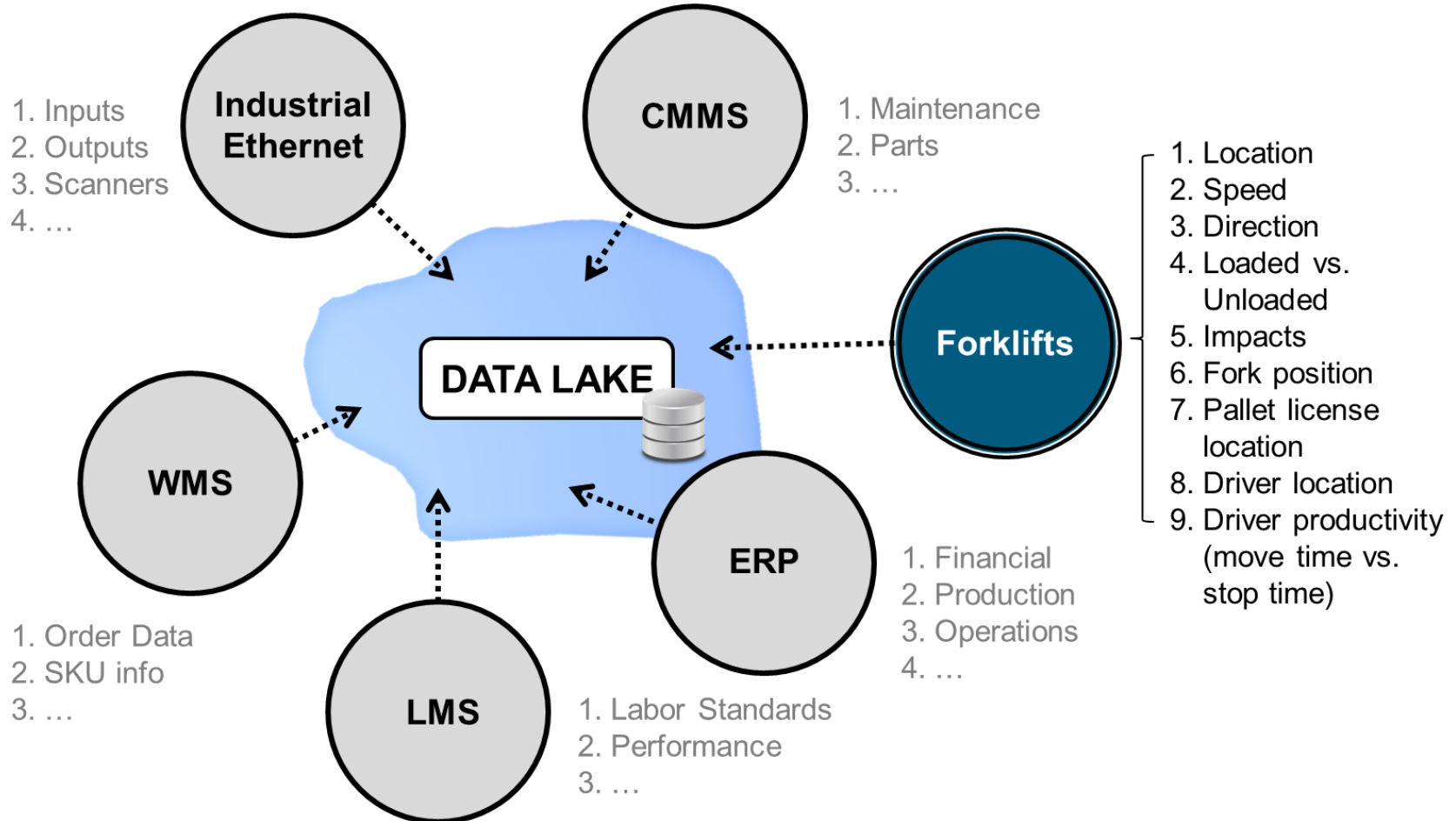
for the company. Its inventory management practices could no longer keep up with the rapid flow of materials.

"We had a significant amount of error in trying to locate product," Herbet says. "We had used a gatekeeper or check-out philosophy, but humans make mistakes." Essentially, the company relied on forklift drivers to report where they had picked up or dropped specific pallets. But pallets were often not where they were expected to be, and quantities were sometimes incorrect. "We were looking for a solution that would take out the human error," he says. "With some 4,000 skidding locations in the warehouses, the manufacturer needed a robust system for keeping accurate real-time data on every pallet."

Bobcat ruled out the use of radio-frequency identification (RFID) tagging. Previous experience with



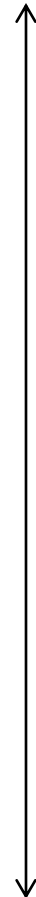
GAME CHANGER





GENERAL GUIDELINES

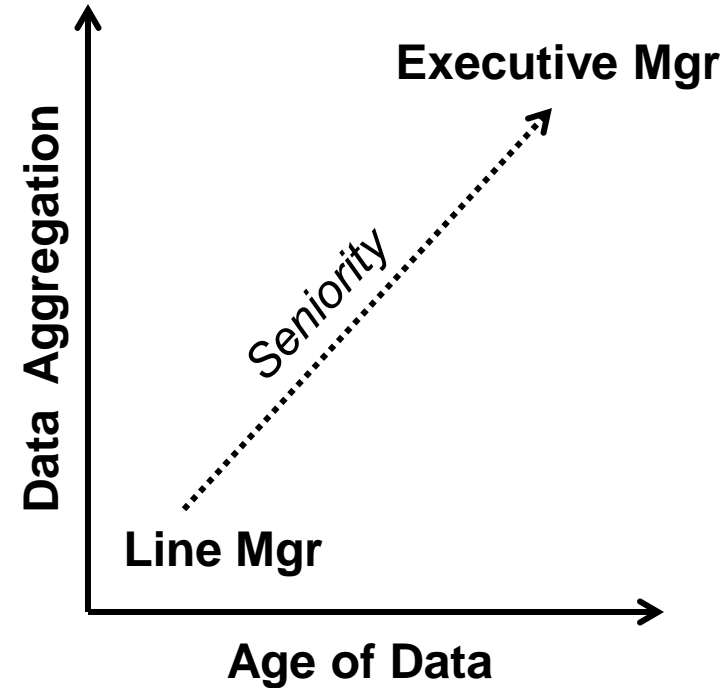
1	<u>Actionable information</u> Right info, right person, right time.
2	<u>Predict Failure</u> Resolve before Impact
3	<u>Forecast</u> throughput volume



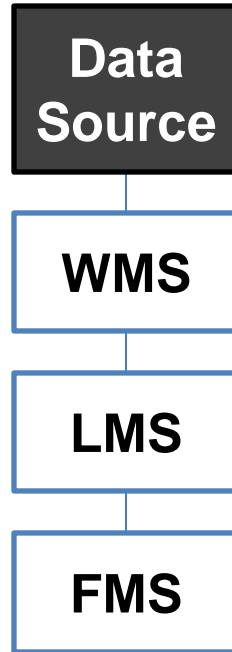
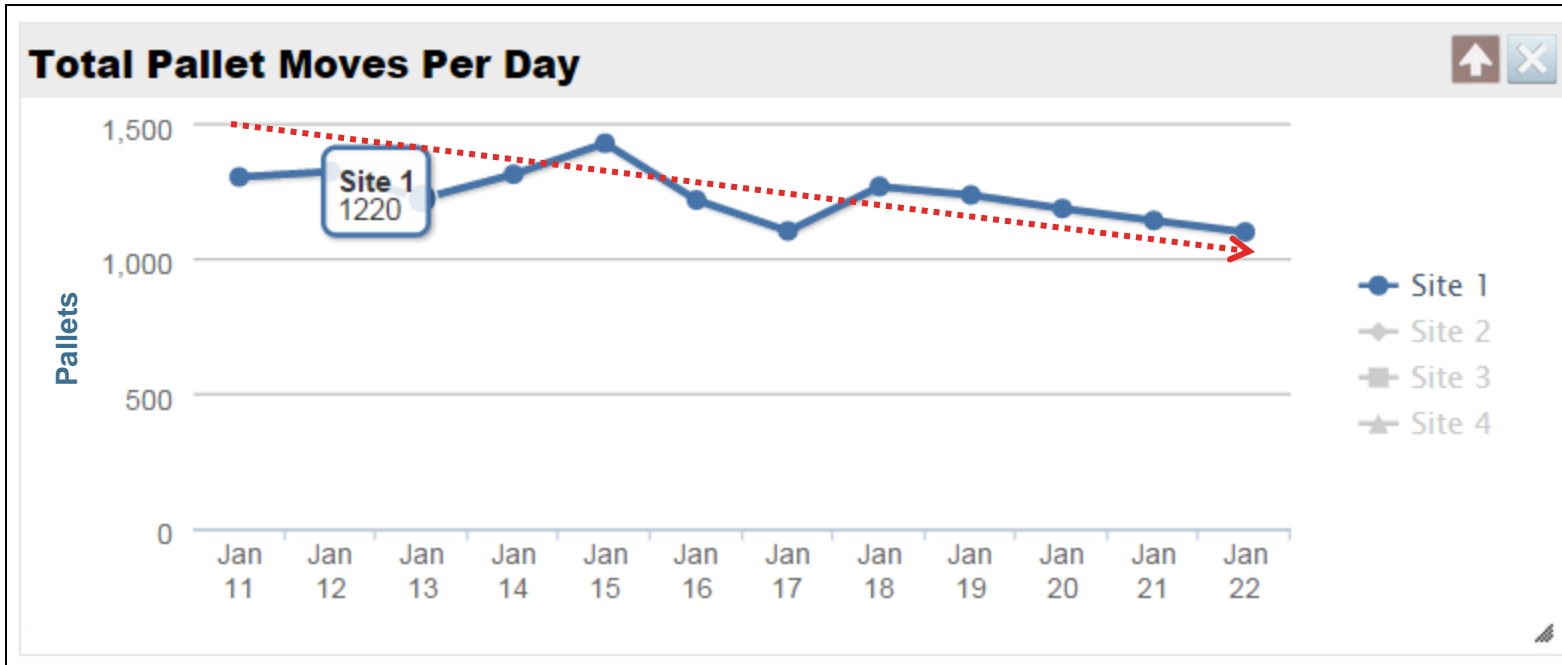
Historical

Real-time

Predictive

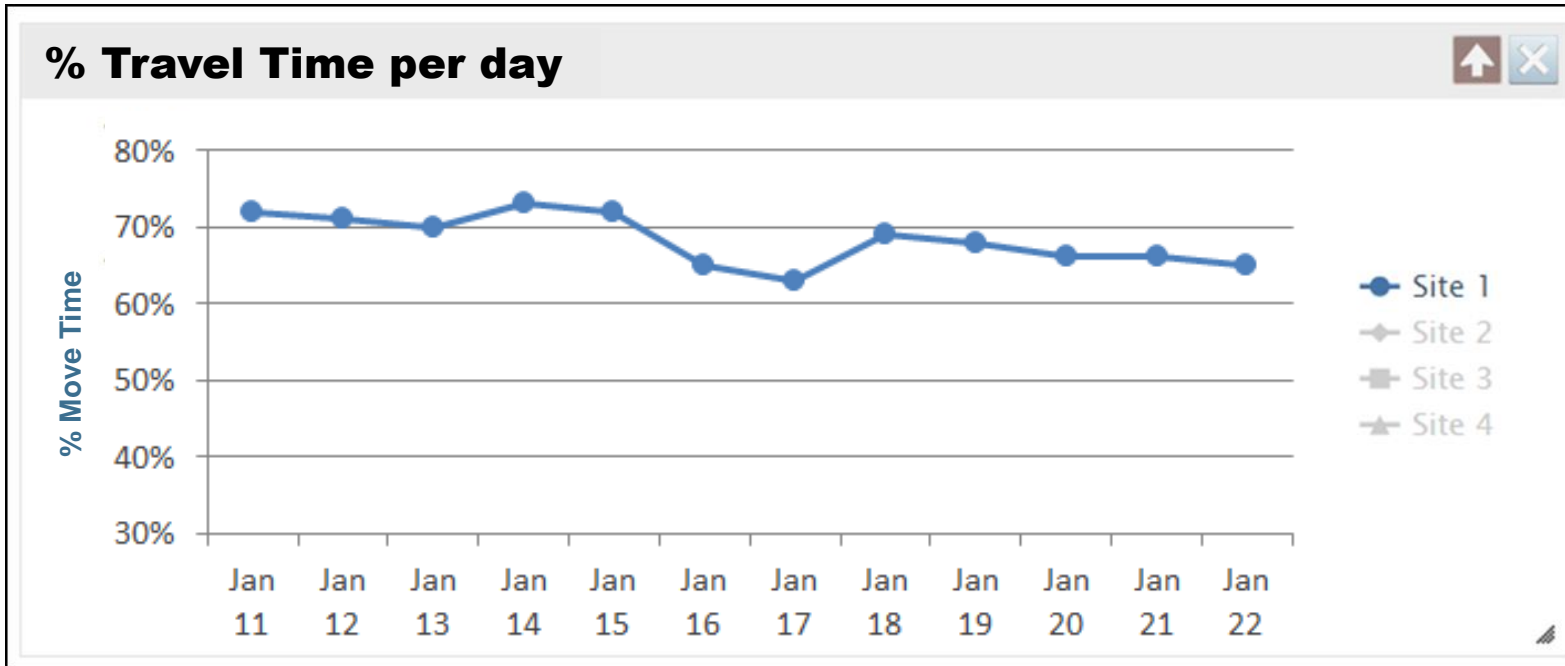


USE CASE #1: Drop in Driver Productivity



BUT WHY?

USE CASE #1: Drop in Driver Productivity



Data Source

WMS

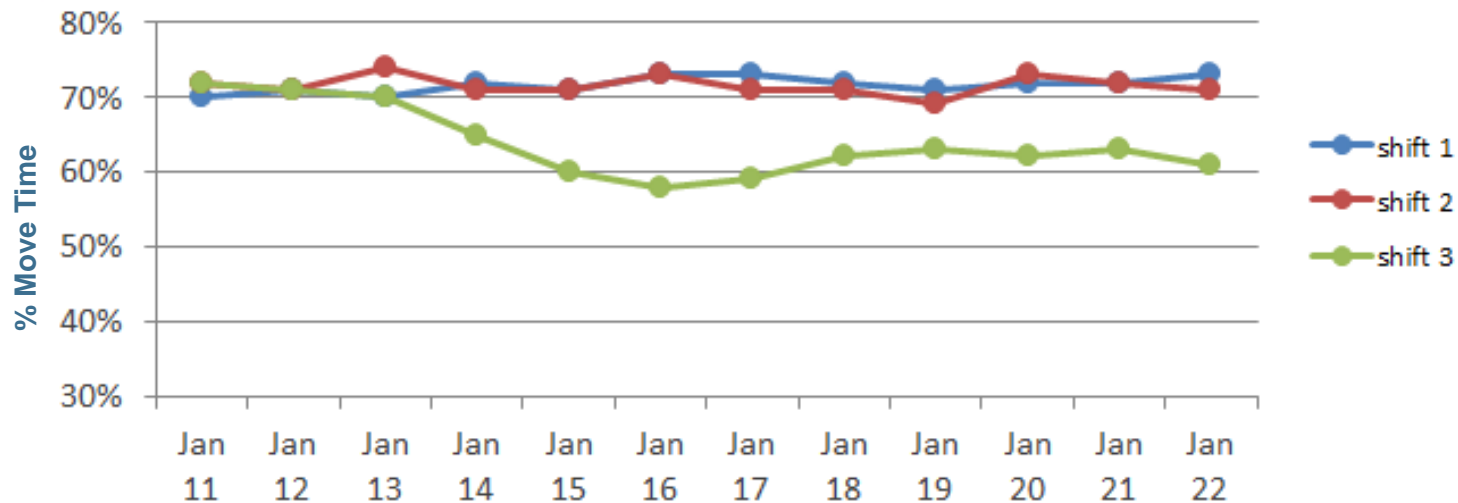
LMS

FMS

%Travel Time = %Time forklift is moving

USE CASE #1: Drop in Driver Productivity

% Travel Time per day



Data Source

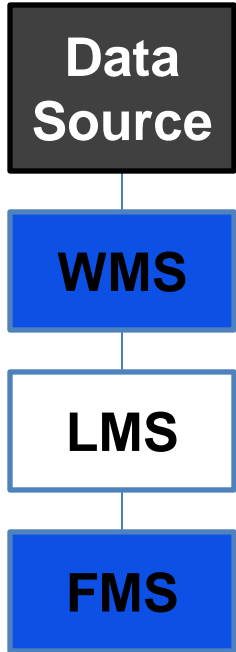
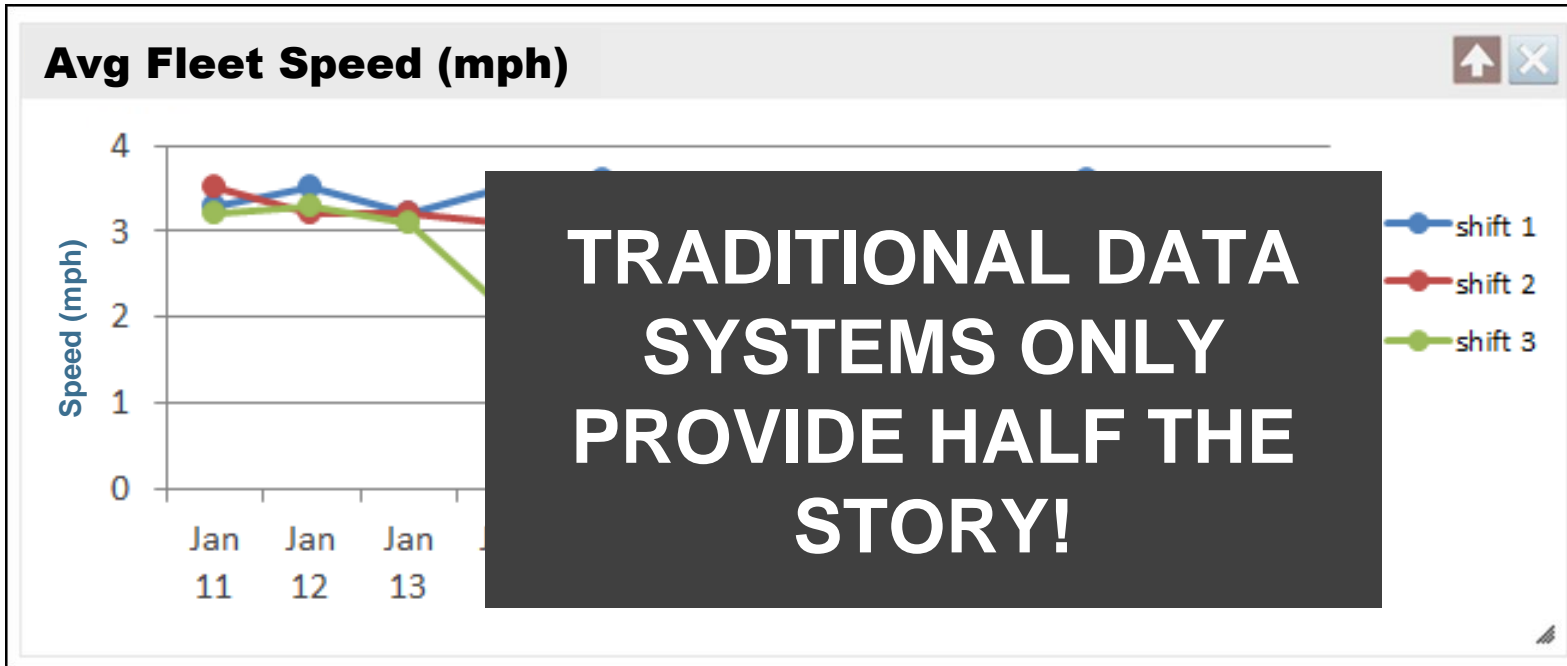
WMS

LMS

FMS

Shift 3 likely the cause

USE CASE #1: Drop in Driver Productivity



Shift 3 slowest moving shift – WHY?

FIND WHAT'S NEXT.



PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by MHI

Breadcrumb View

Warehouse Layout



Data Source

~~WMS~~

~~LMS~~

~~FMS~~

XYZ

FIND WHAT'S NEXT.

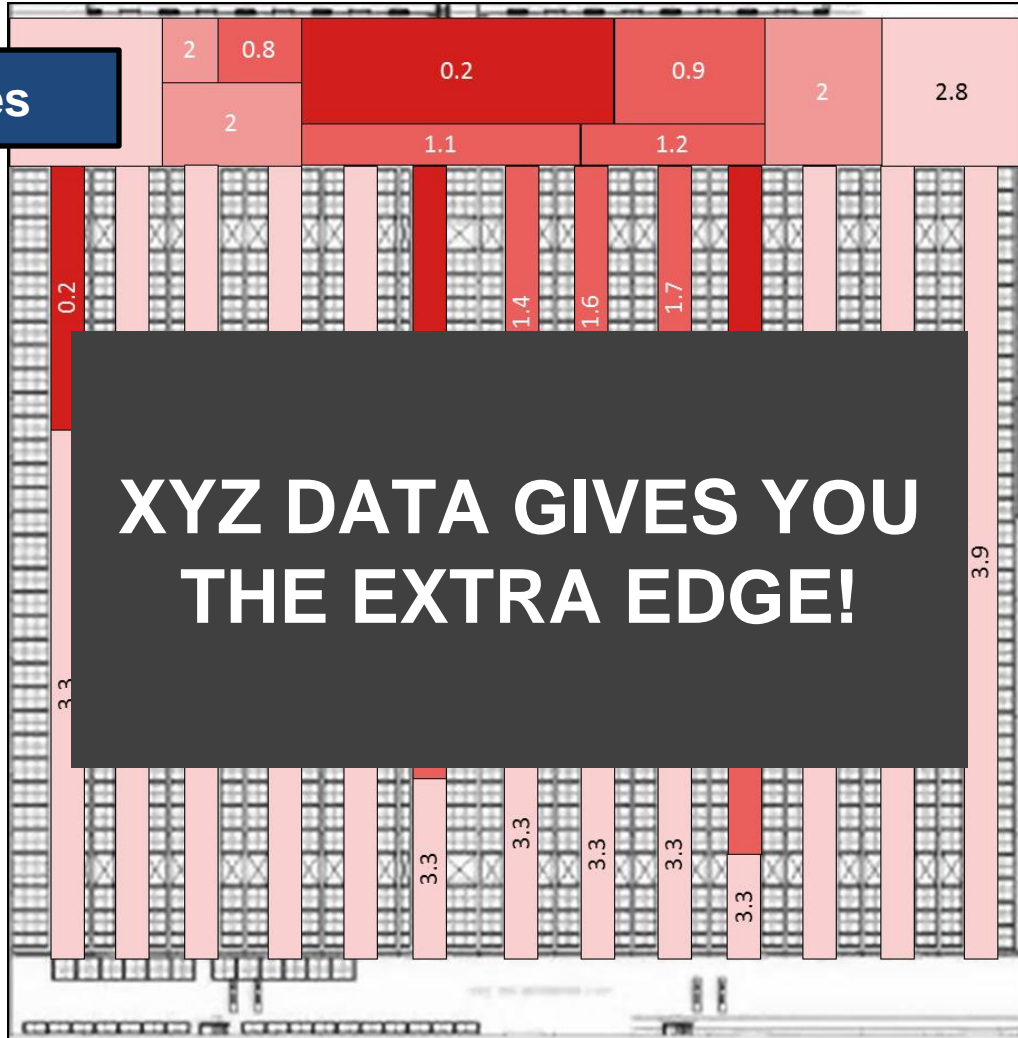


PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by MHI

Velocity Zones



Data Source

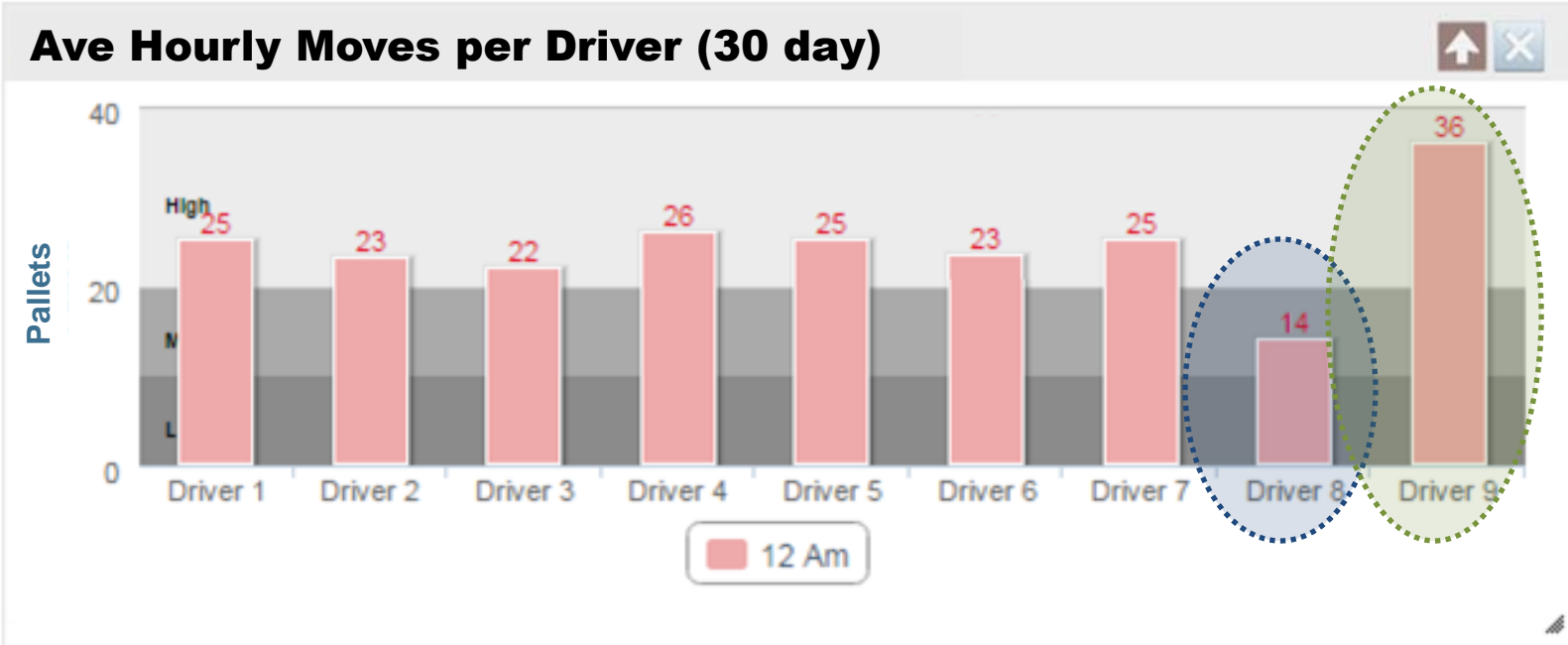
~~WMS~~

~~LMS~~

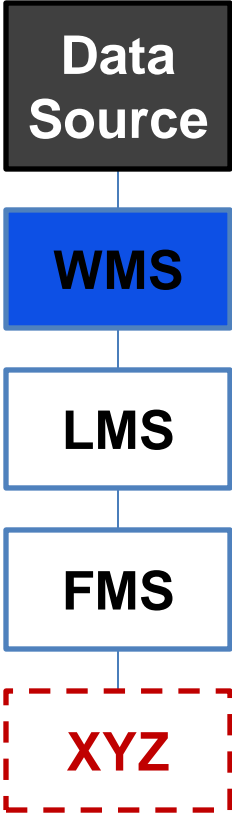
~~FMS~~

XYZ

USE CASE #2: Individual Driver Performance

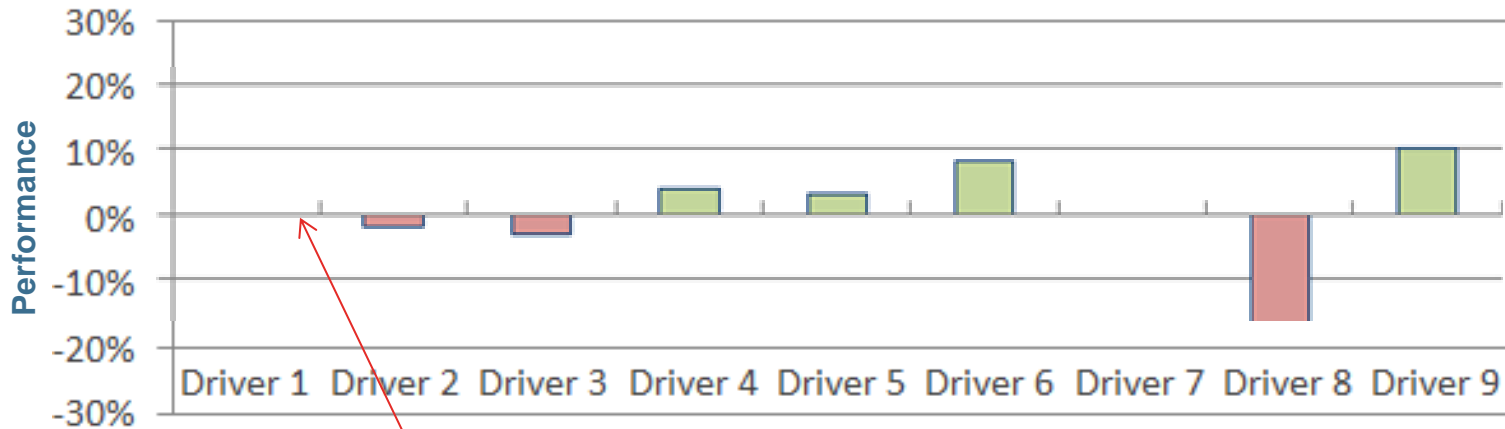


BUT WHY?



USE CASE #2: Individual Driver Performance

Performance against labor standard (30 day)



Labor Standard

LMS provides a good snapshot of driver performance – but is it accurate??

Data Source

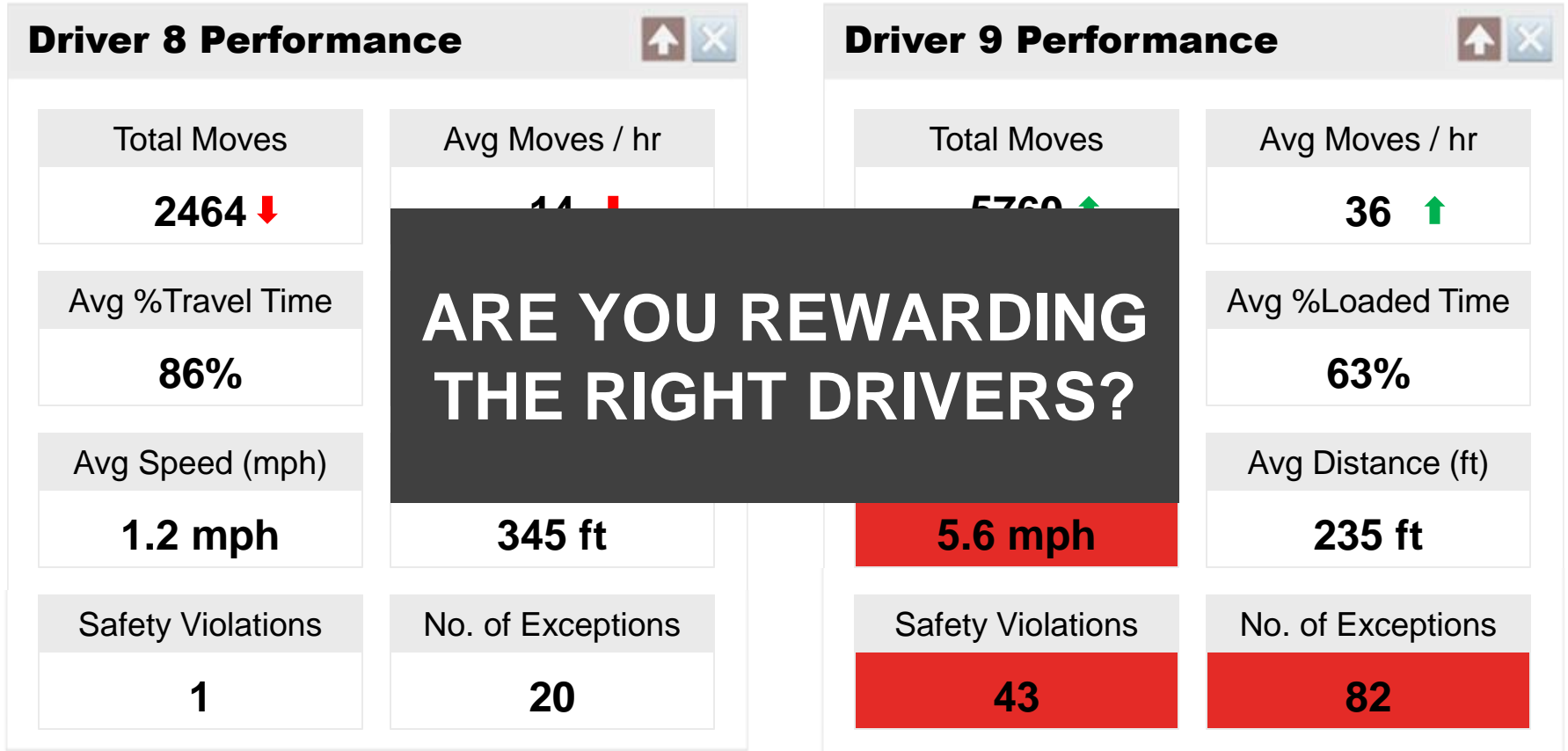
WMS

LMS

FMS

XYZ

USE CASE #2: Individual Driver Performance



**FIND WHAT'S
NEXT.**



PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by  MHI

Other cases we are studying...

- Effect of speed limit on collisions (impact sensor)
- Effect of congestion on productivity
- Effect of SKU type on productivity

FIND WHAT'S NEXT.



PROMAT[®] 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by MHI

DATA-WISDOM CONTINUUM

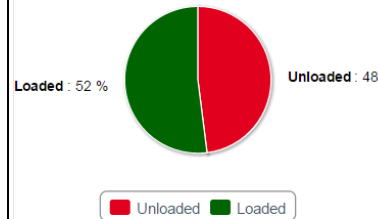
DATA



INFORMATION

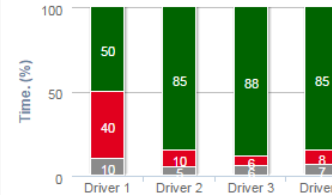


Loaded vs Unloaded

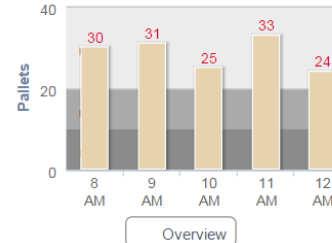


KNOWLEDGE

Labor Utilization



Ave Moves Per Operator Per Hour

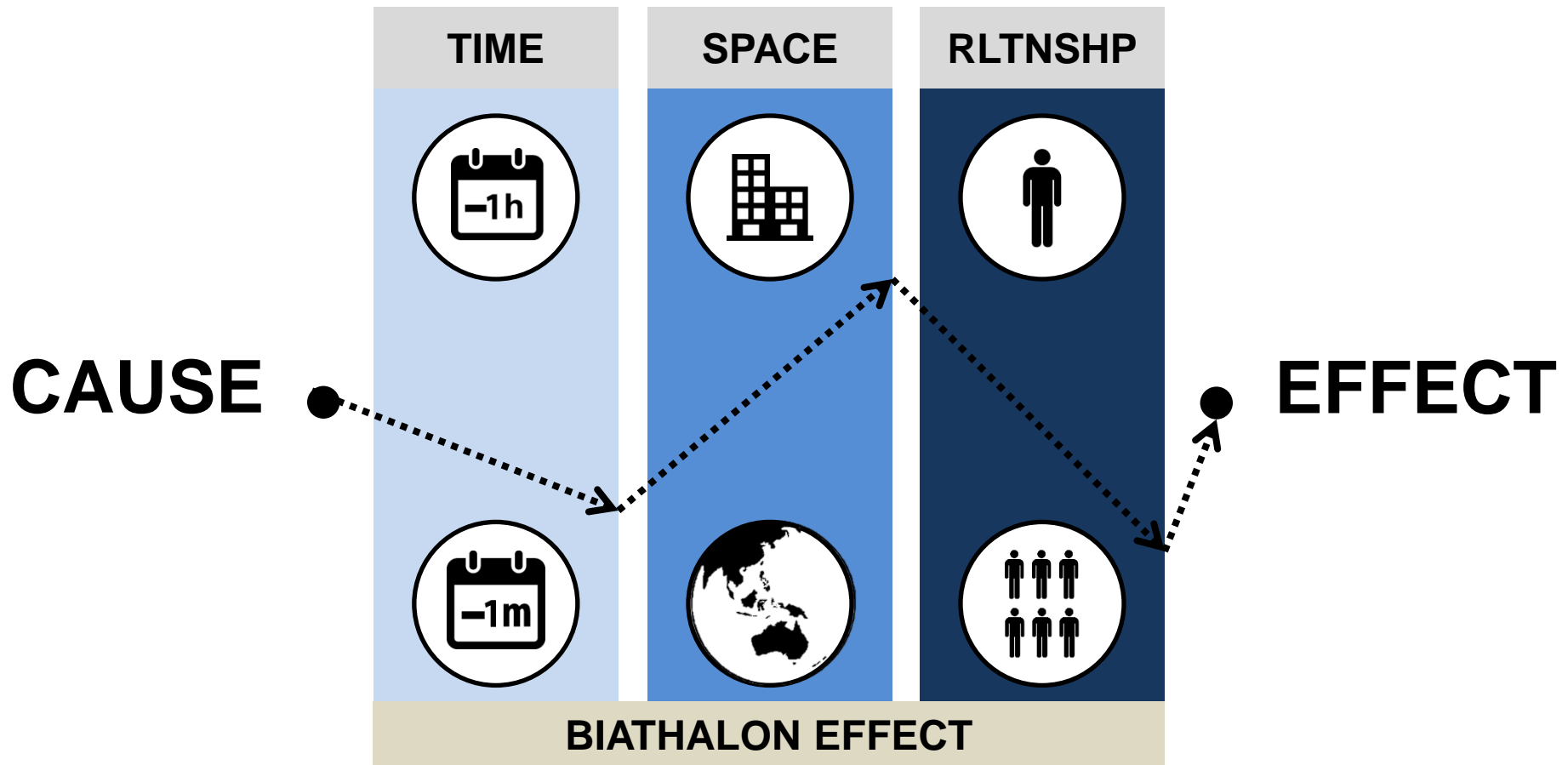


WISDOM



FIND WHAT'S NEXT.

WE ARE SEARCHING FOR CAUSALITY



**FIND WHAT'S
NEXT.**



PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by MHI

DO SOMETHING WITH THE DATA

1

**DOMAIN
KNOWLEDGE**



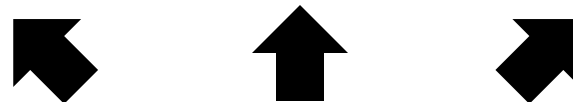
2

**DATA
SCIENCE**



3

TECHNOLOGY



THE INDUSTRY THAT MAKES SUPPLY CHAINS WORK™

**FIND WHAT'S
NEXT.**



PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by MHI

DO SOMETHING WITH THE DATA

1

**DOMAIN
KNOWLEDGE**

2

**DATA
SCIENCE**

3

TECHNOLOGY



THE INDUSTRY THAT MAKES SUPPLY CHAINS WORK™

FIND WHAT'S
NEXT.



PROMAT

2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by  MHI

HOW TO MOVE FORWARD



*Source: Intel



HOW TO MOVE FORWARD

- Everything starts from the **data source!** Garbage-in is garbage-out.
- Start **collecting accurate data** from your **biggest cost areas.**
- Start **storing more** of your **data** – it's not that expensive!
Log first, ask questions later!
- You need **x,y,z telemetry** – not just impact, fleet or labor management to **truly** understand your operations.



HOW TO MOVE FORWARD

- Combine multiple data sources into a **Data Lake** i.e. WMS, ERP, LMS and get access to insightful metrics!
- **Build a Big Data Team** (Domain, Data Science, Technology). Likely you will need to outsource some of it.
- **Master Information** and **Knowledge** before trying to get into Wisdom.
- **Start small** and grow.

**FIND WHAT'S
NEXT.**



PROMAT 2015

McCormick Place South | Chicago
March 23-26, 2015
promatshow.com

powered by  MHI

For More Information:

Speaker email: ak.schultz@swisslog.com

Website: www.swisslog.com

Speaker #2 email: bill.leber@swisslog.com

website: www.swisslog.com

Or visit ProMat 2015 Booth #2912