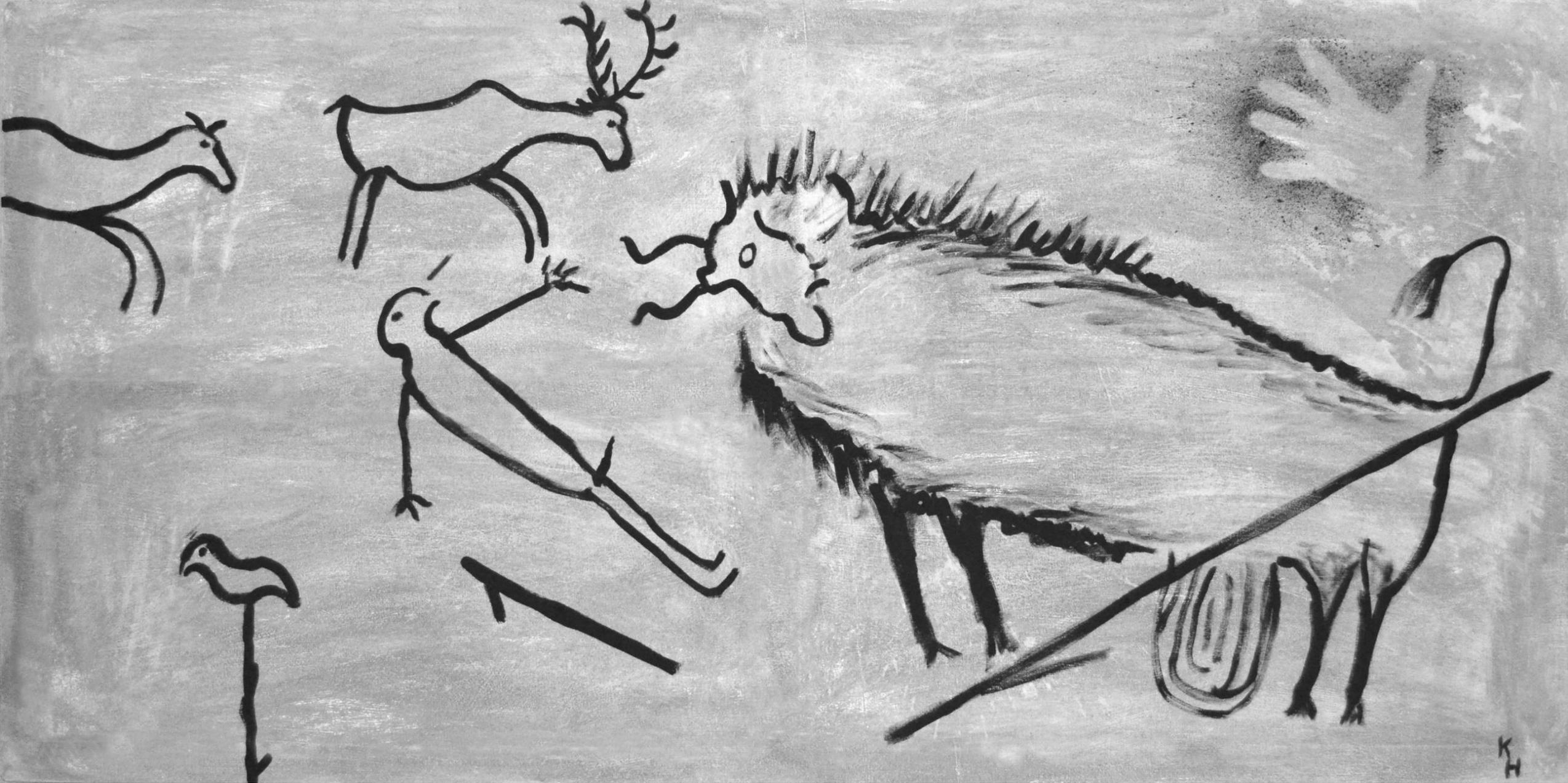


Benchmarking: The Role of Small Data in a Big Data World

The emergence of big data and other advanced technologies presents an exciting yet overwhelming sea of change in Facility Management. This discussion explore the range of these changes and value of “small” data approaches such as benchmarking in helping with the transition.



Early museum facilities were simpler..

...and the Facility Managers had limited technology / data.



Ever-increasing development of technology and data since - and that trend is accelerating!

Robots

Blockchain

facial+recognition
Machine+vision

simulations dimensional

spintronics

identification radio

printing Hadoop

Four

BIG+DATA

Analytics Technology blockchain

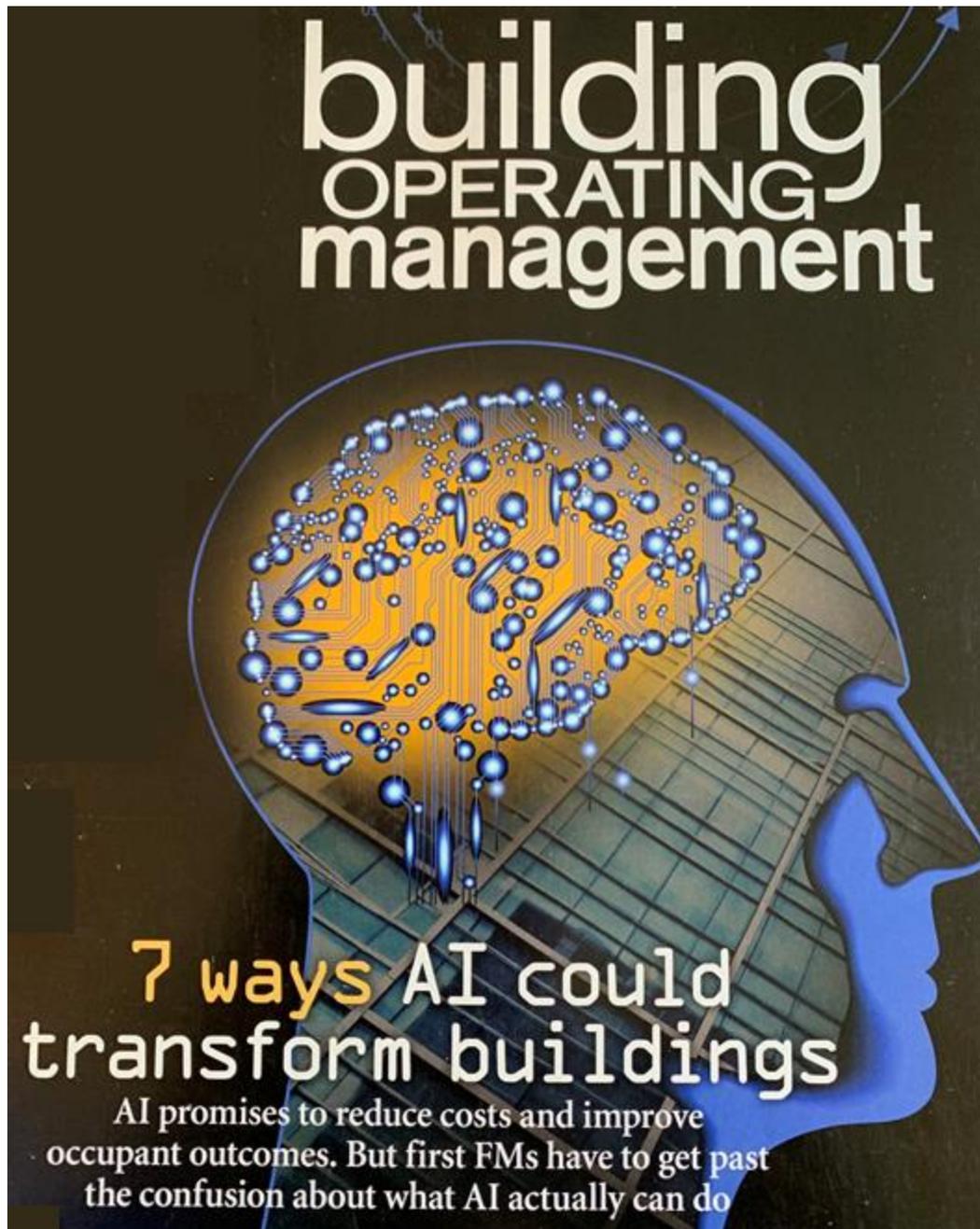
Machine+Learning

Drones

frequency

speech+recognition

Virtual+Reality



The promise is
very exciting...

Let's consider some
of the emerging
technologies

Building Operation Management, July 2019
Facilitiesnet.com/bom

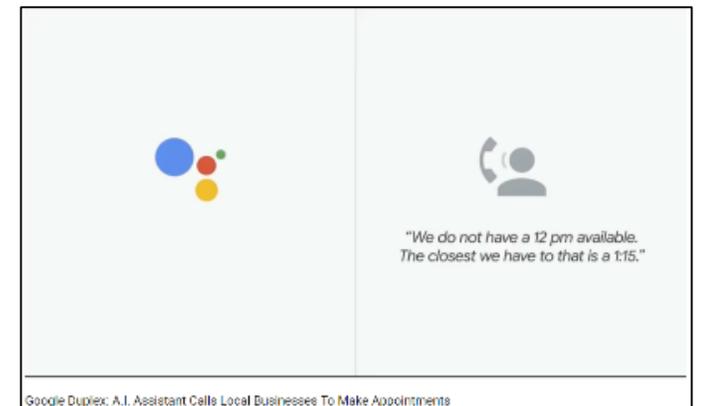
Emerging Technologies – Building Technology

- Advanced materials, 3D manufacturing
- Power generation & storage
- Sensors → IoT
- Connected buildings - 5G wireless
- Mobile apps ← operators & occupants



Emerging Technologies - Automation

- Drones – visual inspections & patrols
- Robotics – routine & hazardous work
- RPA (Robotic Process Automation)
- Self driving vehicles – deliveries, shuttles, commuters
- Augmented reality – maintenance
- Facial recognition
- Digital Assistants & Virtual Assistants



Hey Siri, Did Bill fix that leaky faucet on 3 west?

Yes, at 10:45 this morning...

The Facility Manager





Hey Siri, Did Bill fix that leaky faucet on 3 west?

Yes, at 10:45 this morning...

...but he stopped for 3 donuts on the way

27 work orders are scheduled today

The Facility Manager



Today's weather is partly cloudy

Your lunch order is on its way

This fixture will need replacement in 2 weeks

Fire Extinguisher 326b needs recharge

27 work orders are scheduled today

Hey Siri, Did Bill fix that leaky faucet on 3 west?

Yes, at 10:45 this morning...

Unusual activity detected in server room

Sorry, that website is blocked

...but he stopped for 3 donuts on the way

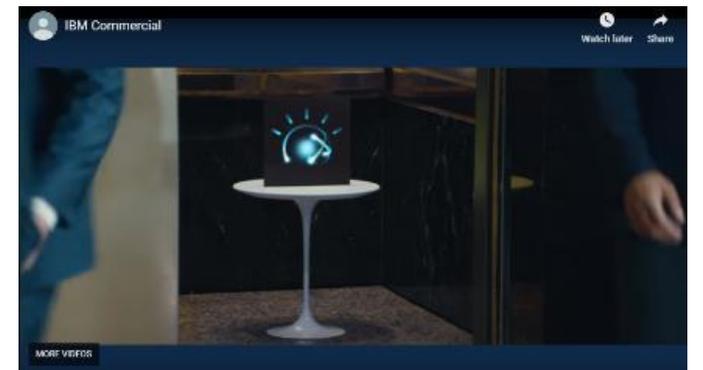
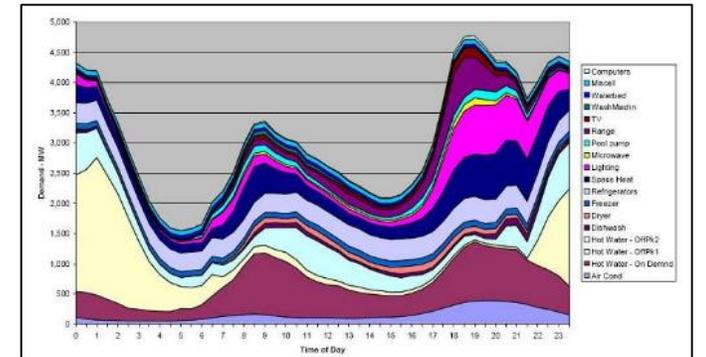
The Facility Manager

I could use a little water

Warning: fan 21 is overheating

Emerging Technologies – Analytics & Data

- BIM / 3D modeling / Virtual Reality
- Simulations & advanced modeling (i.e. Flow Network Modeling of HVAC systems)
- Energy Management Systems & Smart Buildings
- Predictive maintenance (software)
- Big Data
- Machine Learning & Artificial Intelligence
- Blockchain / Cybersecurity



The Driving Force is Social-Economic Evolution

"DIGITAL" /
KNOWLEDGE

- Personal Computer (1970's +-)

INDUSTRIAL

- Power & machines (18th - 19th century)

AGRICULTURE

- Neolithic Revolution (8-10,000 years ago)

HUNTER-
GATHERING

- All of human history (3+ million years)

Parallel Progression in Maintenance Approaches

RISK BASED MAINTENANCE

- Prioritize based on impact to value stream – risk and impact of failure
- Data analytics and machine learning

PREDICTIVE MAINTENANCE

- Early detection of maintenance issues using instrumentation or sensors
- Schedule repairs to manage downtime

PLANNED / PREVENTIVE MAINTENANCE

- Replace on time basis or historical data
- Checklist and schedule, visual inspections
- Reduce unforeseen failures

REACTIVE MAINTENANCE

- Run to failure
- Minimal planning
- Unplanned equipment failure can create outage

Similar Progression in Energy Management...

MACHINE LEARNING

- Optimization of load and supply
- Energy storage
- Predictive weather/load data

AUTOMATED CONSERVATION

- Rule-based Algorithms
- Energy management system/tracking
- Real time metering

MANUAL CONSERVATION

- Programmed Equipment Schedules
- Off-hour setbacks
- Demand management / manual analysis

REGULAR USE

- Run with minimal concern for energy consumption

Similar Progression Regulations/Guidelines...

SUSTAINABILITY

- Climate Change
- Green / Wellness rating systems

CONSERVATION

- Energy performance
- Architectural reviews

ZONING & LAND USE

- Use, Density, Height and Bulk
- Neighborhood compatibility, Open space

LIFE SAFETY

- Structural and Fire Protection

...and of course, Progression in Data Analytics

ARTIFICIAL INTELLIGENCE

- Machine Learning
- Predictive Algorithms
- Data Networks

CLOUD COMPUTING

- Sophisticated Software
- Sensors
- World Wide Web of Information

DESKTOP COMPUTING

- Readily Available Software
- Databases

MANUAL CALCULATIONS

- Expertise and Experience by Discipline
- Little or No Software

Big Data Has Arrived for Facilities...

Big data in facilities:

- Equipment sensors
- Energy meters
- Visitation patterns
- User comments
- Environmental sensors
- Industry data
- Work order comments

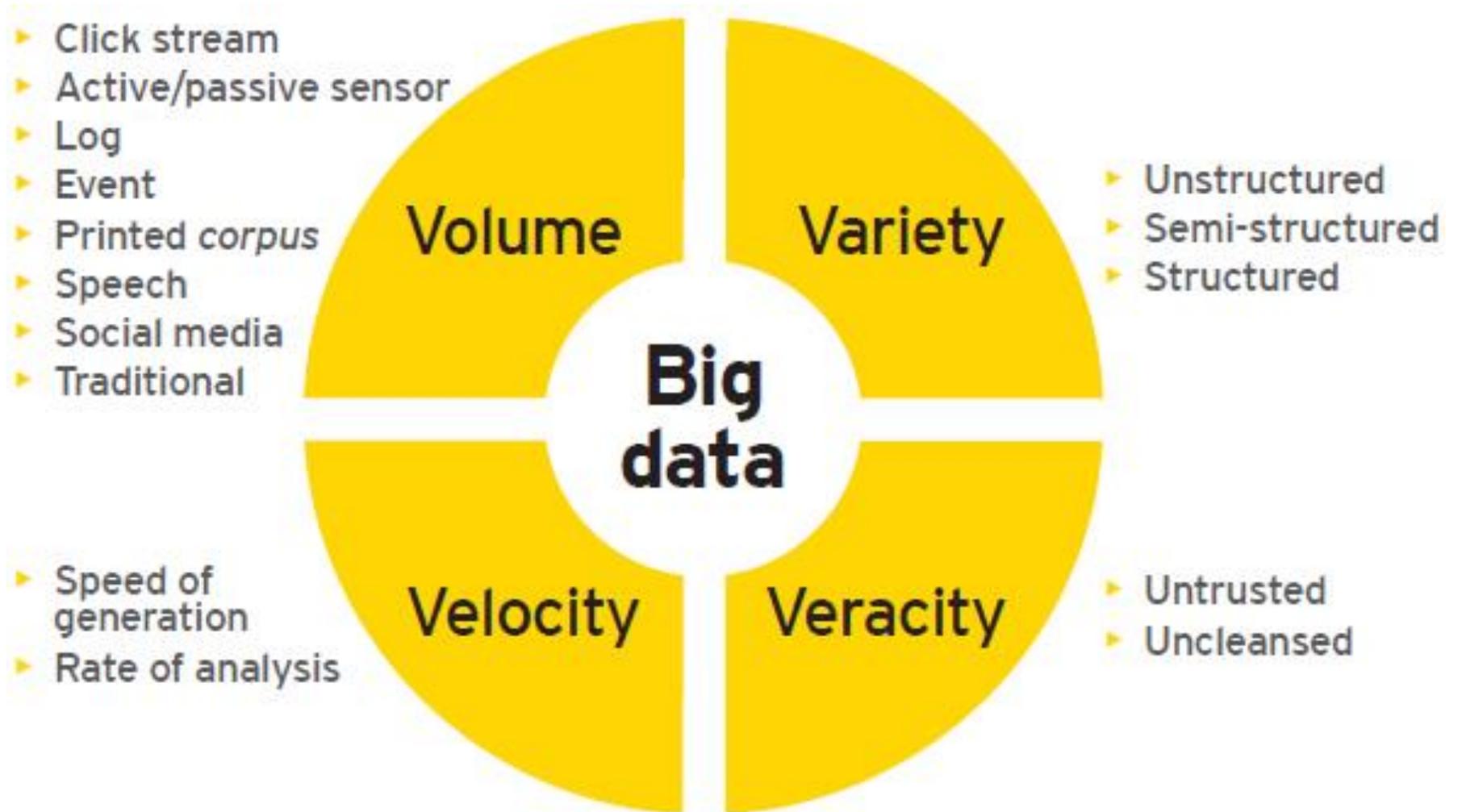


Image source: <http://www.ey.com/GL/en/Services/Advisory/EY-big-data-big-opportunities-big-challenges>

...but “Small Data” is Still Useful

...the data of operational processes rarely cross over the line from data to big data.

“First Step to Becoming a Data-Driven Operation” by Richard Lamb

(also the author of Maintenance Reinvented and Business Success)

<https://analytics4strategy.com/train-frststpdtdrvnops>

Progression in Benchmarking (& Other Small Data)

INTEGRATED ANALYTICS

- Integrated Into Multiple Systems
- Cross-Dimension Analysis
- Used in Predictive Algorithms

INCLUSIVE & TRENDING

- Comprehensive Data Dimensions
- Data Across Time
- Sophisticated Reporting

PERIODIC SNAPSHOT

- Ongoing, Periodic Program (annual)
- Standardized Databases

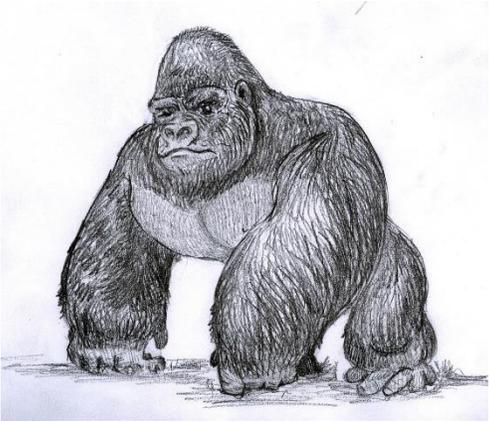
SIMPLE COMPARISON

- Single Dimension
- One-Time, Custom Analysis

How Benchmarking Helps Transition to Big Data World



APPLES TO APPLES



FIND THE GORILLA

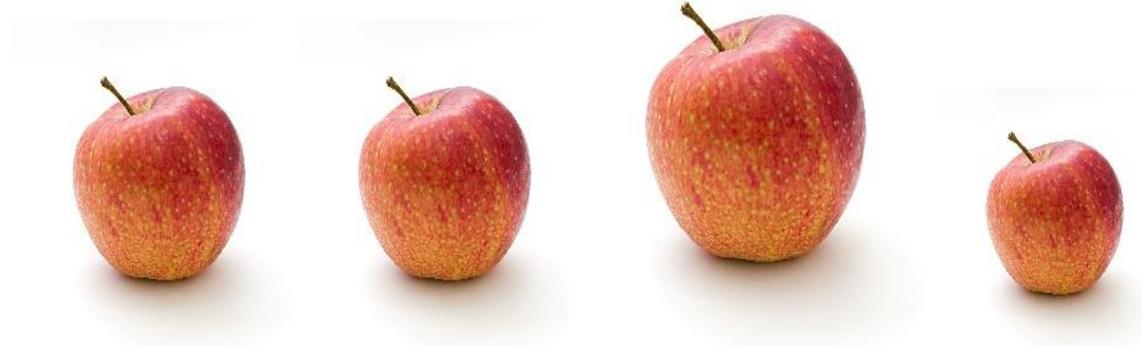


WATCH THE BLEEDING EDGE



DATA IN OUR POCKET

Apples to Apples



- Demonstrate Your Performance
 - Quantitative comparison of your facility operations
 - Comparison to a baseline (benchmark)
 - Comparison across systems/technologies
- Easy, affordable, understandable technique
- Data based on actual results (not models)
 - Shows what is achievable, reasonable, and likely

Big Data & Benchmarking are Complementary



Image source: <https://pixabay.com/users/StockSnap-894430>

Image source: <https://pixabay.com/users/BonnieHenderson-896542>

Benchmark Comparison and Trending are Useful

- Know where you stand now (quantitative)

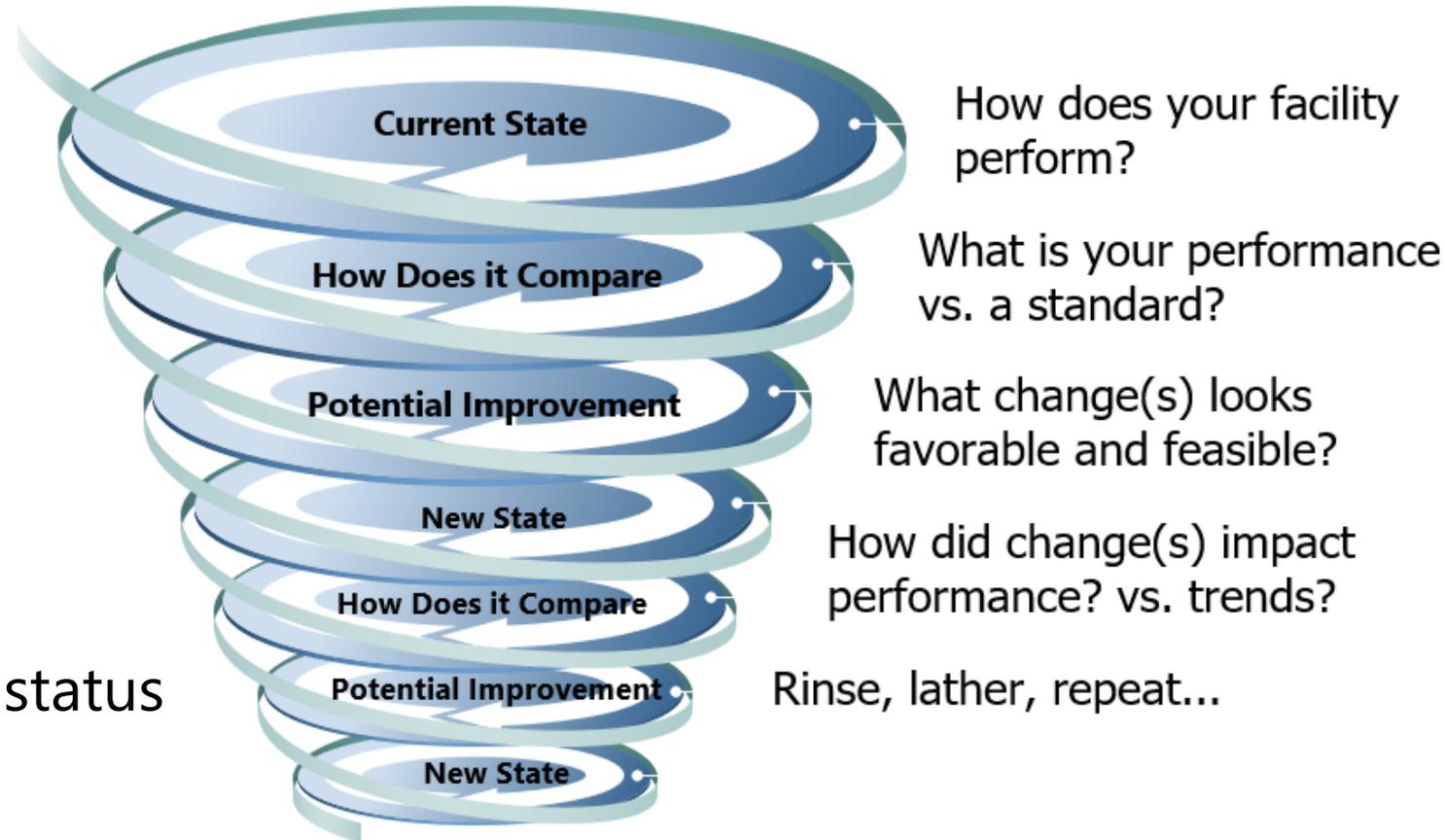
- Vs. peers
- Vs. your prior performance

- Need to communicate implications & initiatives:

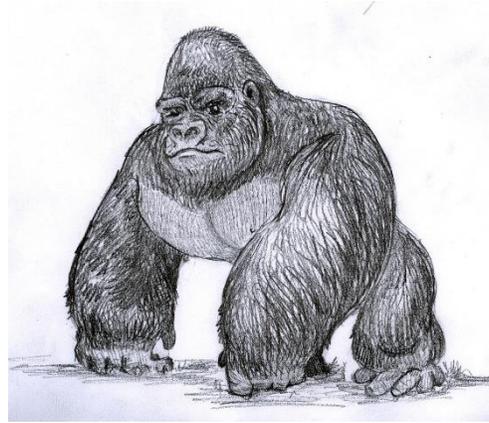
- To decision-makers
- To staff
- To the public

- Tracking progress

- Reference point of current status
- Tracking improvement



Find the Gorilla



- Identify what you don't know & potential opportunity areas
 - Identify potential "best practices" that may lead to performance improvements.
- Identify the Most Promising Opportunities
 - What is our opportunity Which ones to try → Find the Gorilla
 - Where to invest
 - How are others doing it?

Perception Limitations & Change Blindness

- We need to use metrics to see change in dynamic environments
 - Measured performance/outcomes
 - Unintended consequences on other factors
- Simple data is helpful to address potentially false perceptions by our stakeholders
 - ? *Trend toward sensationalism, entertainment, and opinion*
vs.
 - ! *verification, proportion, relevance, and quality of interpretation*

The Monkey Business Illusion



The Door Study

Approximately 50% of the people approached in this study didn't notice when the person they were talking to was replaced by someone else.

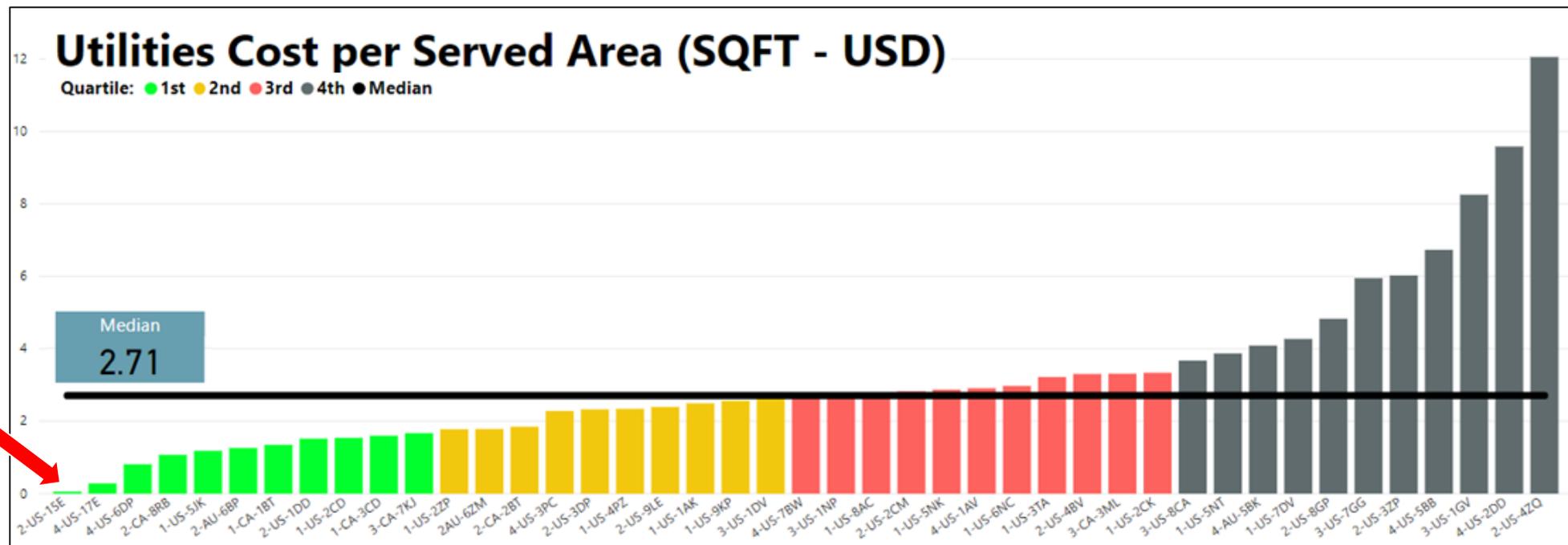
The Invisible Gorilla

<http://www.theinvisiblegorilla.com/videos.html>

Identify Opportunities & Fine-Tune Initiatives

- Which technologies to implement? In what sequence?
 - How much value can be provided for your situation?
- Supporting your implementation plan!
 - Justifying and obtaining funding
 - Pitfalls to avoid, Ramping up the skills to implement and operate

Actual results show that this level of performance is possible with a new approach.



Watch the Bleeding Edge



- Continuous improvement approach
 - Measure both incremental and quantum progress
- Track Progress and Learn from Others
 - Share your lessons learned
 - Gain lessons learned by others

Adopting New Technologies

- Progressions from level to level are not made in a single “jump”
- Lot of trial and error in the transitions
- Lot of fine tuning within each level
- Earlier levels continue with advances made possible by next level

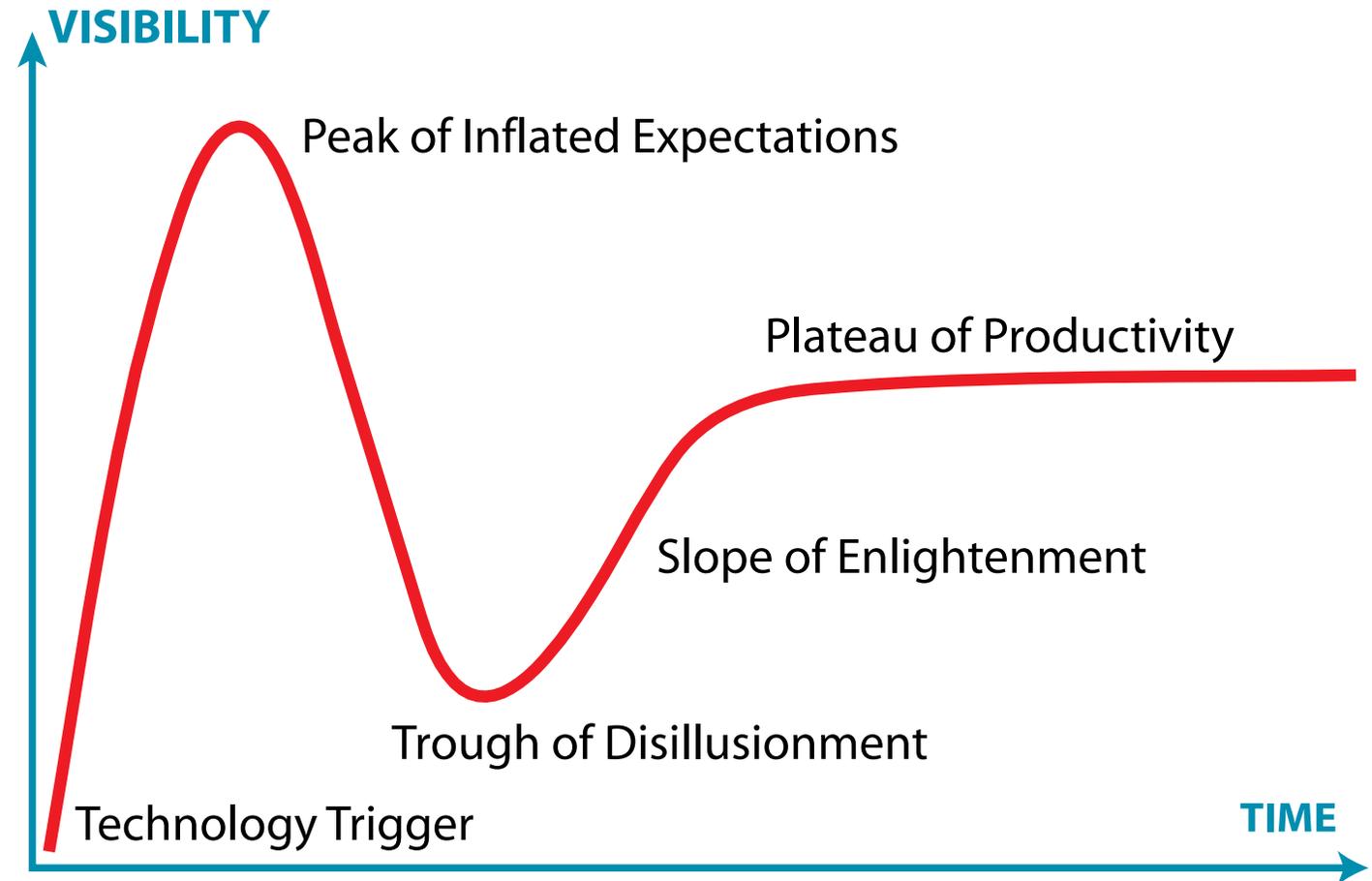
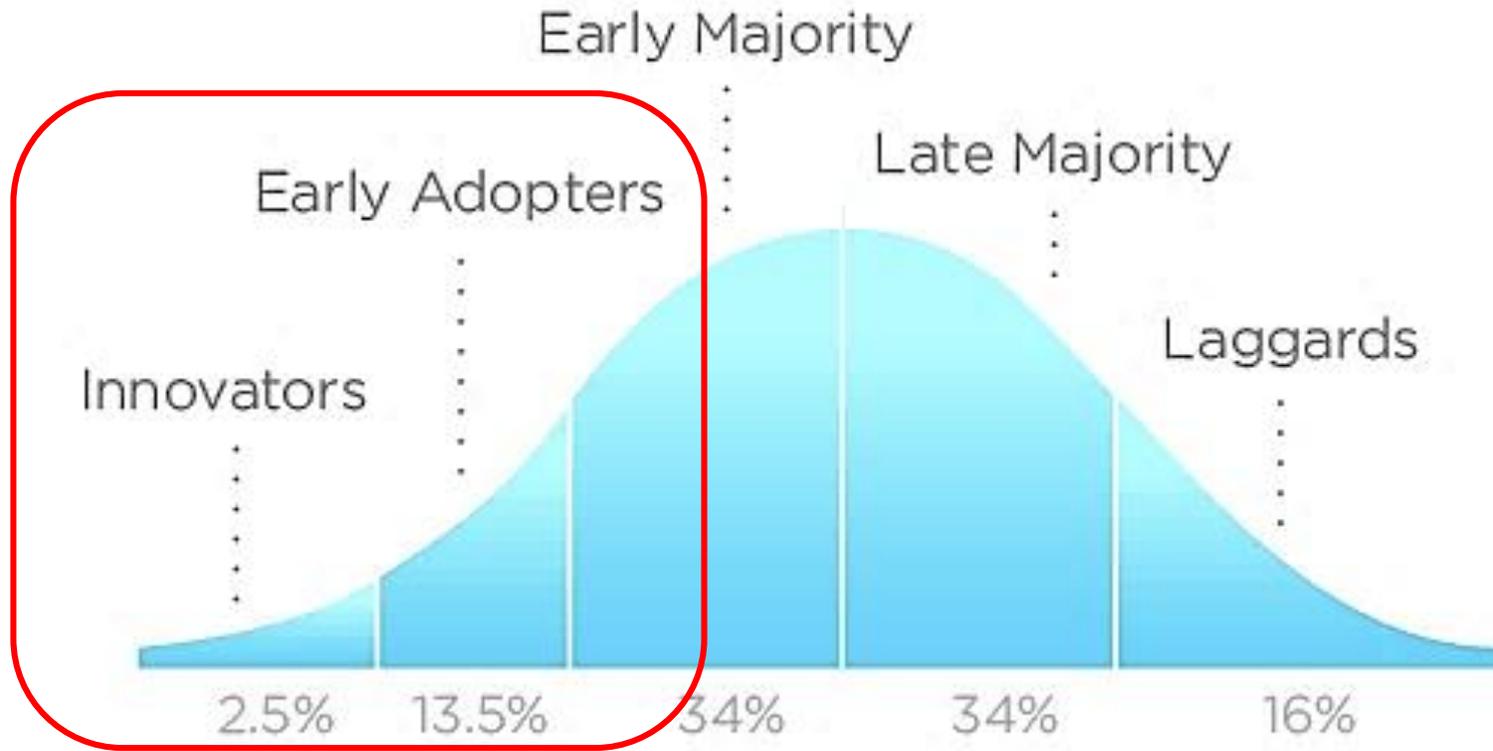


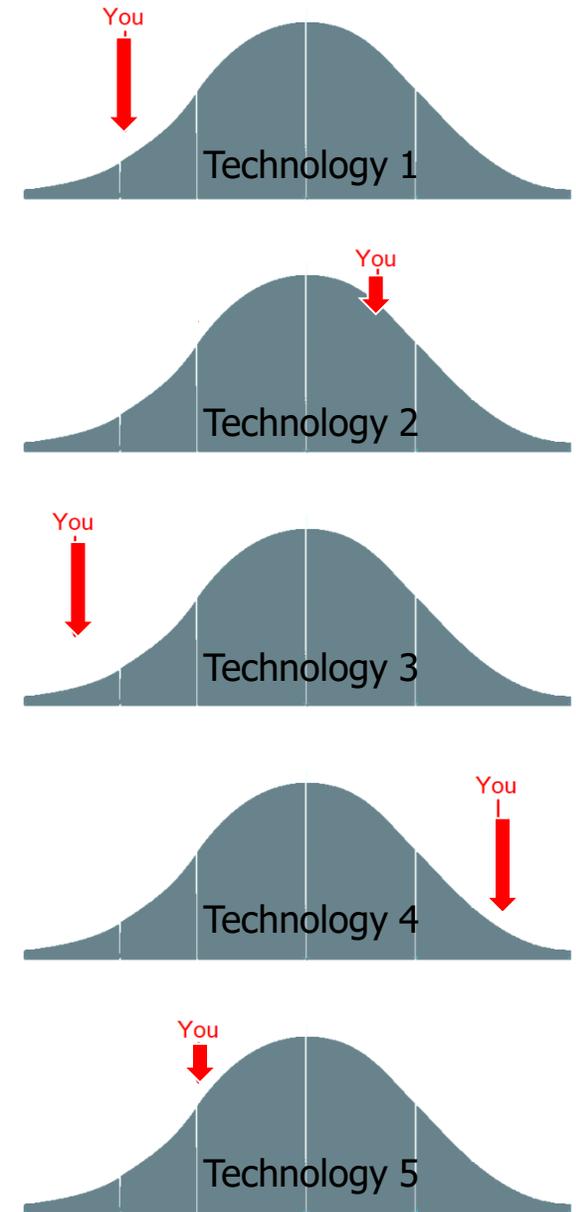
Image source: By Jeremykemp at English Wikipedia, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=10547051>

Innovators and Early Adopters can share success stories and lessons learned.

Usually we all have something to share and learn.



INNOVATION ADOPTION LIFECYCLE



Source: <https://en.wikipedia.org/wiki/File:DiffusionOfInnovation.png>

"Data in Our Pocket"



- Integrating from/to data systems
 - Makes data more accessible
 - Provides benchmark reference for multiple purposes
- Integrated Scorecards
 - Take the work out of KPI's
- Continuous improvement approach
 - Can measure both incremental and quantum progress

Benchmarking as Part of Integrated Scorecard

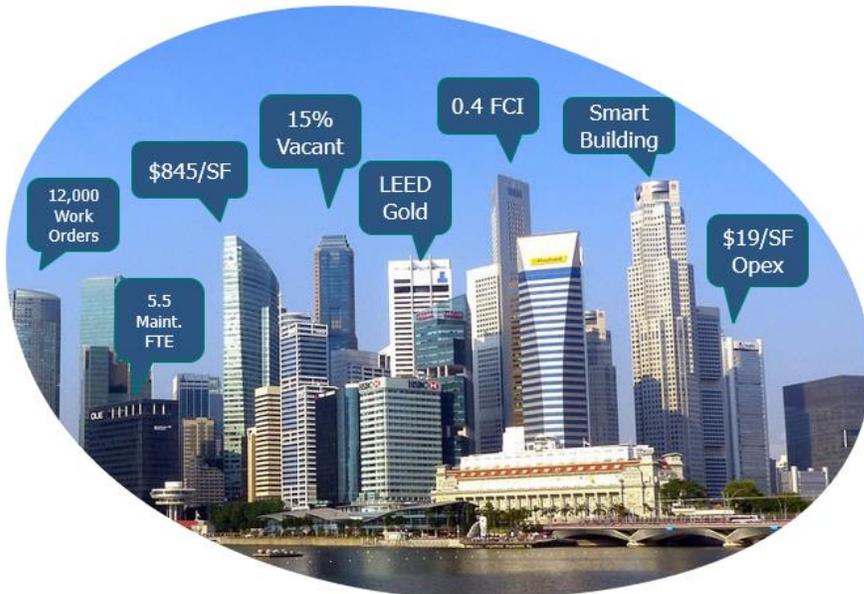
■ Avoid “data desert”

- Use the available wealth of facility-related data
- Clean and integrate fragmented, mismatched and conflicting data



■ Avoid “data drowning”

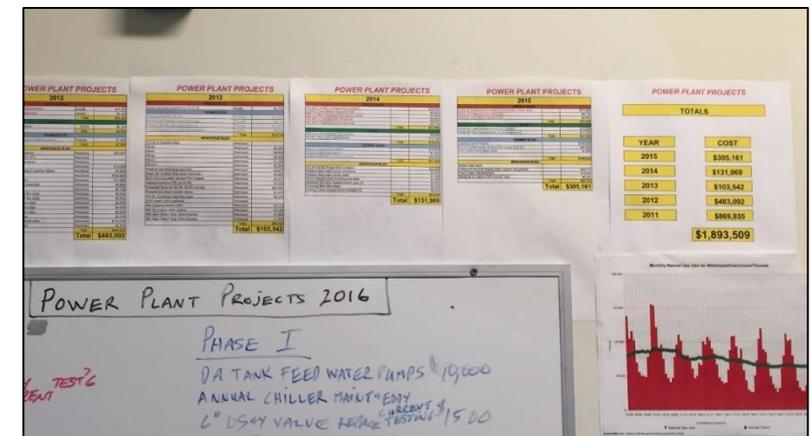
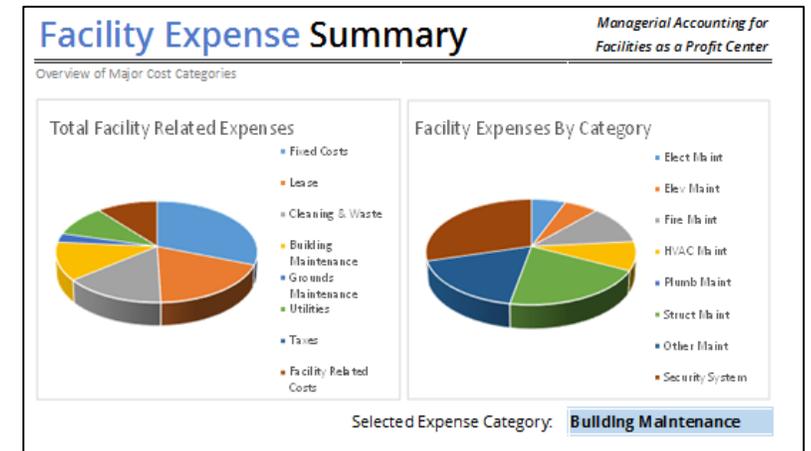
- Distill down to manageable set
- Adopt exploration mindset - you do not know what your data will tell you



Data For All: Small Data Supplements Big Data

Put appropriate scorecard excerpts where they are helpful to educate and influence user behavior:

- Lobby / Hallways
- Newsletters
- Break areas
- Boiler rooms



Email us (Rlambe@FacilityIssues.com) for more information:

- Benchmarking & Facility Metrics
- Custom Dashboards & Scorecards
- Strategic Facility Planning

FACILITY ISSUES
your link to continuous improvement

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Museums & Cultural Institutions Utilities Council Facility Managers Round Table Research Facilities Critical Facilities

Are your facility management costs sky high?

We can help you find out. Facility Issues offers benchmarking services for people who manage buildings.

Learn about our ongoing groups and start saving now.

WHY BENCHMARK?

[More Benefits »](#)

The **cost savings** associated with benchmarking can be **significant**. For example, our Research Facilities group saved more than **\$158 million** over a 5-year period — an average of about \$1.25 per square foot annually.

- Identify your strengths and weaknesses
- Compare costs and find savings
- Evaluate your effectiveness
- Practice continuous improvement
- Identify the best practices for your facility
- Establish goals for further improvements
- Provide information for strategic planning
- Network and learn from your peers