Metrics, Informatics & Performance

Chris Smeds
Technology Officer
U.Va. Facilities Management
smeds@virginia.edu

AIA Continuing Education Provider

1

Credit(s) earned on completion of this course will be reported to American Institute of Architects (AIA) Continuing Education Session (CES) for AIA members.

Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

AIA Continuing Education Provider

2

Course Description

558: Metrics, Informatics & Performance

Modern facilities organizations are awash in a sea of data – from financial to work management, geospatial to building controls, organizations are collecting vast amounts of data. Too often, however, organizations simply use that data as a record of past outcomes rather than as a tool that supports forward-looking organizational decision making. This session will discuss how organizations can address this issue and begin to effectively use their data. Topics will include data, metrics, KPIs, benchmarking (including APPA's Facilities Performance Indicators) and APPA's newly launched initiative on Facilities Informatics.

Faculty Member: Chris Smeds

AIA Continuing Education Provider

3

Learning Objectives

1. Learn how to address the sea of data being collected.
2. Discuss data, metrics, KPIs, and benchmarking.
3. Discuss using the metrics collected in APPA's Facilities Performance Indicators and facilities informatics.
4. Discuss how to effectively use the data collected.

AIA Continuing Education Provider

4

Today we will cover

Becoming data-based decision makers

1. Transforming data into wisdom
2. Metrics & KPIs
3. Benchmarking
4. Reports, dashboards & visualizations
5. Data analytics, modeling & predictive analytics
6. Facilities informatics

5

Have a question or comment?

Feel free to ask or share during the presentation

Open discussion format

6

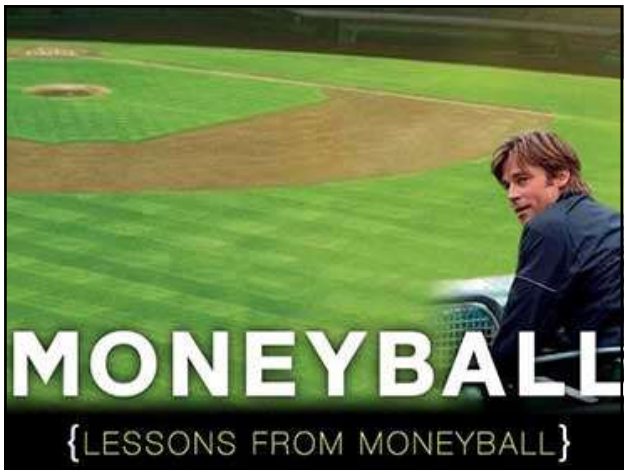
1

Transforming data into wisdom

7

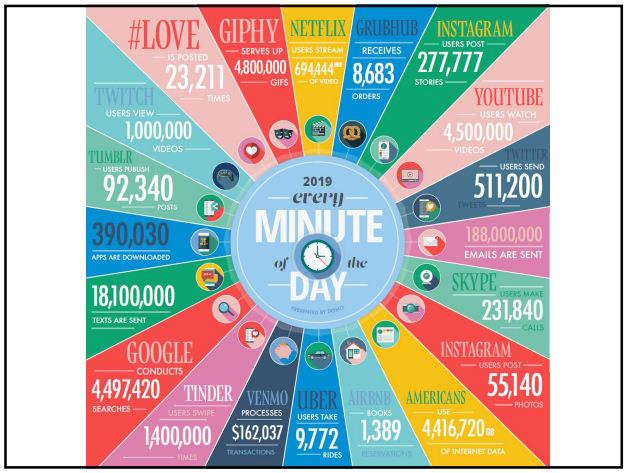
3 common data mistakes organizations make

8

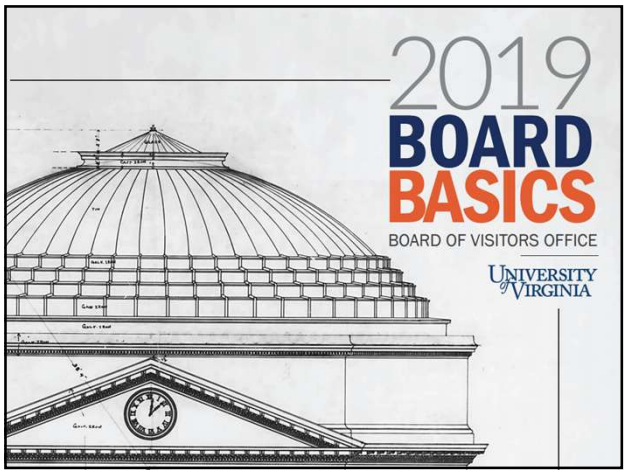


9

10


2019
every
MINUTE
of the
DAY
#LOVE
IS POSTED
23,211
TIMES
GIPHY
SERVES UP
4,800,000
GIFS
NETFLIX
USERS STREAM
694444
OF VIDEO
GRUBHUB
RECEIVES
8,683
ORDERS
INSTAGRAM
USERS POST
277,777
STORIES
TWITCH
USERS VIEW
1,000,000
VIDEOS
YOUTUBE
USERS WATCH
4,500,000
VIDEOS
TUMBLR
USERS PUBLISH
92,340
POSTS
TWITTER
USERS SEND
511,200
TWEETS
390,030
APPS ARE DOWNLOADED
188,000,000
EMAILS ARE SENT
18,100,000
TEXTS ARE SENT
SKYPE
USERS MAKE
231,840
CALLS
GOOGLE
CONDUCTS
4,497,420
SEARCHES
INSTAGRAM
USERS POST
55,140
PHOTOS
TINDER
USERS SWIPE
1,400,000
TIMES
VENMO
PROCESSES
$162,037
TRANSACTIONS
UBER
USERS TAKE
9,772
RIDES
AIRBNB
BOOKS
1,389
RESERVATIONS
AMERICANS
USE
4,416,720
OF INTERNET DATA

11


2019
BOARD
BASICS
BOARD OF VISITORS OFFICE
UNIVERSITY of VIRGINIA

12

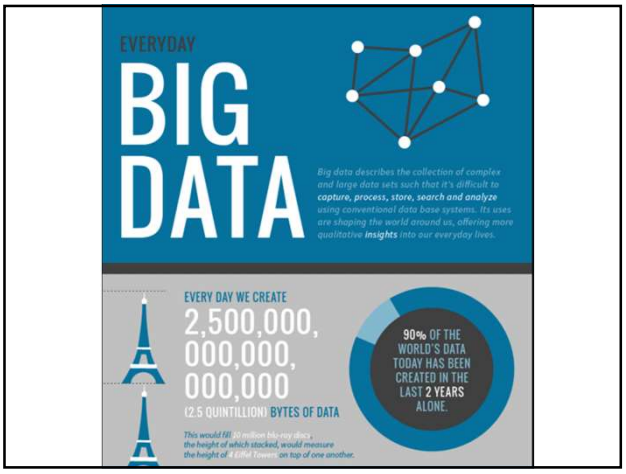
1,000,000,000 unique emails processed in 2018.

2,422,000 email messages received daily (2018 average).

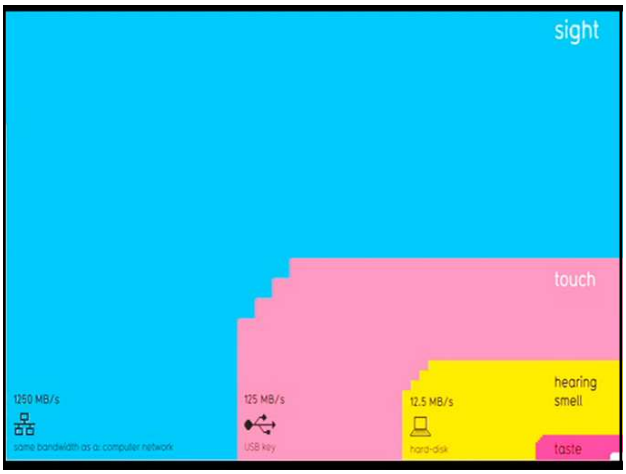
1,545,000 incoming emails detected daily as spam (2018 average). **(63%!!!)**

12,950,900 daily attacks blocked by our intrusion protection system/ firewalls in 2018.

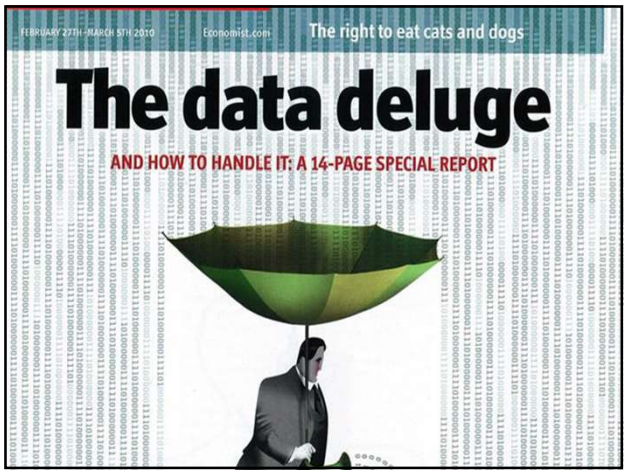
13



14



15


FEBRUARY 27TH–MARCH 5TH 2010
Economist.com
The right to eat cats and dogs
The data deluge
AND HOW TO HANDLE IT: A 14-PAGE SPECIAL REPORT

16

17

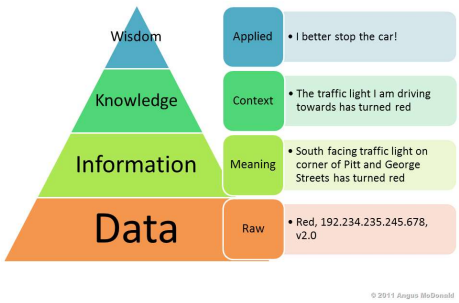
18

3 common data issues organizations face

- Using the wrong data/having the wrong goal (Moneyball)
- Overwhelmed by amount of data (trying to find a needle in a haystack)
- Not using the data (the ostrich)

19

Our goal should be to become **data-based** decision makers

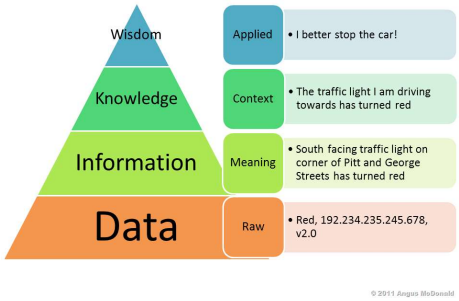


20

42

21

Our goal should be to become **data-informed** decision makers



22

Your data foundation has to be solid

1. Sources of data
2. Completeness of data
3. Accuracy
4. Cleanliness of data (garbage in, garbage out)
5. Structure of data (e.g. work classification)
6. Granularity of data
7. Timeliness of data
8. Efficiently collecting data
9. Governance

23

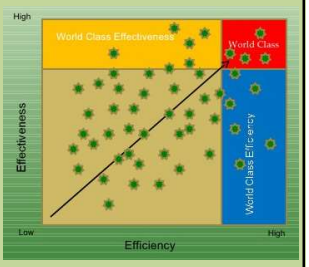
Information & Knowledge: Focus on what matters to your organization

24

25

Organizational values set the context for how we use our data

- Know the business
- Know the goals of the organization
- Know the constraints on the organization



26

Understanding the context of our organizations

- Regulatory
- Industry best practices
  - APPA (www.appa.org)
  - SMRP (www.smrp.org)
  - DOE Building Performance Database (http://energy.gov/eere/buildings/analysis-tools)
  - Many others…
- Books, magazines, web content
  - APPA publications
  - Whittaker & Shouse: Achieving Excellence in Facilities Management
- Consultants
- Tribal knowledge
- Customers!

27

APPA's Levels of Service

Level	Maintenance	Custodial	Grounds
1	Showpiece Facility	Orderly Spotlessness	State-of-the-Art
2	Comprehensive Stewardship	Orderly Tidiness	High Level
3	Managed Care	Casual Inattention	Moderate Level
4	Reactive Management	Moderate Dinginess	Moderately Low- Level
5	Crisis Response	Unkempt Neglect	Minimum Level

28

APPA's Maintenance Level of Service

Level	1	2	3	4	5
Description	Showpiece Facility	Comprehensive Stewardship	Managed Care	Reactive Management	Crisis Response
Customer Service & Response Time	Able to respond to virtually any type of service, immediate response.	Response to most service needs, including non-maintenance activities, is typically in a week or less.	Services available only by reducing maintenance, with response times of one month or less.	Services available only by reducing maintenance, with response times of one year or less.	Services not available unless directed from top administration, none provided except emergencies
Customer Satisfaction	Proud of facilities, have a high level of trust for the facilities organization.	Satisfied with facilities related services, usually complimentary of facilities staff.	Accustomized to basic level of facilities care. Generally able to perform mission duties. Lack of pride in physical environment.	Generally critical of cost, responsiveness, and quality of facilities services.	Consistent customer ridicule, mistrust of facilities services.
vs. Corrective Maintenance	100%	75-100%	50-75%	25-50%	<25%
Maintenance Mix	All recommend preventive maintenance (PM) is scheduled and performed on time. Emergencies (e.g. storms or power outages) are very infrequent and are handled efficiently.	A well-developed PM program: most required PM is done at a frequency slightly less than per defined schedule. Occasional emergencies caused by pump failures, cooling system failures etc.	Reactive maintenance predominates due to systems failing to perform, especially during harsh seasonal peaks. The high number of emergencies causes reports to upper administration.	Worn-out systems require staff to be scheduled to react to systems that are performing poorly or not at all. PM work possible consists of simple tasks and is done inconsistently.	No PM performed due to more pressing problems . Reactive maintenance is a necessity due to worn-out systems. Good emergency response because of skills gained in reacting to frequent system failures.
Aesthetics, Interior	Like-new finishes.	Clean/crisp finishes.	Average finishes.	Dingy finishes.	Neglected finishes.
Aesthetics, Exterior	Windows, doors, trim, exterior walls are like new.	Watertight, good appearance of exterior cleaners.	Minor leaks and blemishes, average exterior appearance.	Somewhat drafty and leaky, rough-looking exterior, extra painting necessary.	Inoperable windows, leaky windows, unpainted, cracked panes, significant air and water penetration, poor appearance overall.
Aesthetics, Lighting	Bright and clean, attractive lighting.	Bright and clean, attractive lighting.	Small percentage of lights out, generally well lit and clean.	Numerous lights out, some missing diffusers, secondary areas dark.	Dark, lots of shadows, bulbs and diffusers missing, cave-like, damaged, hardware missing.
Service Efficiency	Maintenance activities appear highly organized and focused. Service and maintenance calls are responded to immediately.	Maintenance activities appear organized with direction. Service and maintenance calls are responded to in a timely manner.	Maintenance activities appear to be somewhat organized, but remain people-dependent. Service and maintenance calls are variable and sporadic, without apparent cause.	Maintenance activities appear somewhat chaotic and are people-dependant. Service and maintenance call are typically not responded to in a timely manner.	Maintenance activities appear chaotic and without direction. Equipment and building components are routinely broken and inoperable. Service and maintenance calls are never responded to in a timely manner.
Building Systems' Reliability	Breakdown maintenance is rare and limited to vandalism and abuse repairs.	Breakdown maintenance is limited to system components short of mean time between failures (MTBF).	Building and systems components periodically or often fail.	Many systems are unreliable. Constant need for repair. Backlog of repair needs exceeds resources.	Many systems are non-functional. Repair instituted only for life safety issues.
Facility Maintenance Operating Budget as % of CRV	>4.0	3.5-4.0	3.0-3.5	2.5-3.0	<2.5
Campus Average FCI	<0.05	0.05-0.15	0.15-0.29	0.30-0.49	>0.50

29

APPA's Grounds Level of Attention

Level	1	2	3	4	5
Description	State-of-the-Art Maintenance	High-Level Maintenance	Moderate Level Maintenance	Moderately Low-Level Maintenance	Minimum-Level Maintenance
Turf Care	Grass height maintained. Mowed at least once every five days and as often as once every three days.	Grass cut once every five days.	Grass cut once every ten working days.	Low-frequency mowing scheduled based on species.	Low-frequency mowing scheduled based on species.
Fertilizer	Adequate fertilization applied to plant species according to their optimum requirements.	Adequate fertilizer level to ensure that all plant materials are healthy and growing vigorously.	Applied only when turf vigor seems to be low.	Not fertilized	Not fertilized
Irrigation	automatic commonly used. Frequency of use follows rainfall.	automatic commonly used. Frequency of use follows rainfall.	Dependent on climate.	No irrigation.	No irrigation.
Litter Control	Minimum of once per day, seven days per week.	Minimum of once per day, five days per week.	Minimum service of two to three times per week.	Once per week or less.	On demand or complaint basis.
Pruning	Frequency dictated primarily by species and variety of trees and shrubs.	Usually done at least once per season unless species planted dictate more frequent attention.	When required for health or reasonable appearance.	No regular trimming.	No pruning unless safety is involved.
Disease and Insect Control	Controlling objective to is avoid public awareness of any problems.	Usually done when disease or insects are inflicting noticeable damage, are reducing vigor or plant material, or could be considered a both to the public.	Done only to address epidemics or serious complaints.	None except where the problem is epidemic and the epidemic condition threatens resources or the public.	No control except in epidemic or safety situations.
Snow Removal	Snow removal starts the same day that accumulations of .5 inch are present.	Snow removed by noon the day following snowfall.	Done based on local law requirements but generally accomplished by the day following snowfall.	Done based on local law requirements but generally accomplished by the day following snowfall.	Done based on local law requirements but generally accomplished by the day following snowfall.
Surfaces	Sweeping, cleaning, and washing of surfaces should be done so that at no time does an accumulation of sand, dirt, or leaves distract from the looks or safety of the area.	Should be cleaned, repaired, repainted, or replaced when their appearances have noticeably deteriorated.	Cleaned on complaint basis. Repaired or replaced as budget allows.	Replaced or repaired when safety is a concern and when budget is available.	Serviced only when safety is a consideration.
Repairs	Repairs to all elements of the design should be done immediately.	Should be done whenever safety, functions, or appearance is in question.	Should be done whenever safety or function is in question.	Should be done whenever safety or function is in question.	Should be done whenever safety or function is in question.
Inspections	A staff member should conduct inspection daily.	A staff member should conduct inspection daily.	Inspections are conducted once per week.	Inspections are conducted once per month.	Inspections are conducted once per month.
Floral Plantings	Maximum care, including watering, fertilizing, disease control, disbudding, and weeding, is necessary. Weeding is done a minimum once per week.	Care cycle is usually at least once per week, but watering may be more frequent. Bed essentially kept weed free.	Only perennials or flowing trees or shrubs.	None.	None.

30

APPA's Custodial Levels of Appearance

Level	1	2	3	4	5
Description	Orderly Spotlessness	Ordinary Tidiness	Casual Inattention	Moderate Dinginess	Unkempt Neglect
Floors & Base Moldings	Shine and/or are bright and clean; colors are fresh	Shine and/or are bright and clean; no build-up in corners or along walls; up to two days worth of dust, dirt, stains, or streaks	Floors are swept or vacuumed clean, but upon close observation there can be stains. A build-up of dirt and/or floor finish in corners and along walls can be seen. There are dull/spots and/or matted carpet in walking lanes. There are streaks or splashes on base moldings.	Floors are swept or vacuumed clean, but are dull, dingy, and stained. There is a noticeable build-up of dirt and/or floor finish in corners and along walls. There is a dull path and/or floor obviously matted carpet in the walking lanes. Base molding is dull and dingy with streaks or splashes.	Floors and carpets are dull, dingy, scuffed, and/or matted. There is a conspicuous buildup of old dirt and/or floor finish in the corners and along walls. Base molding is dirty, stained, and streaked. Gum, stains, dirt, dust balls, and trash are broadcast.
Vertical & Horizontal Surfaces	Freshly cleaned or polished appearance and have no accumulation of dust, dirt, marks, streaks, smudges, or fingerprints. Lights all work and fixtures are clean.	Surfaces are clean, but marks, dust, smudges, and fingerprints are noticeable upon close observation. Lights work and fixtures are clean.	All vertical and horizontal surfaces have obvious dust, dirt, marks, smudges, and fingerprints. Lamps all work and fixtures are clean	All vertical and horizontal surfaces have conspicuous dust, dirt, marks, smudges, and fingerprints. Lamp fixtures are dirty and some lamps (up to 5%) are burned out.\	Major accumulation of dust, dirt, smudges, and fingerprints, all of which will be difficult to remove. Lack of attention obvious.
Washroom & Shower Fixtures	Fixtures and tile gleam and are odor-free. Supplies are adequate.	Fixtures and tile gleam and are odor-free. Supplies are adequate.	Fixtures and tile have some dull spots and upon further observation have buildup of dirt. Slight odor is apparent. Supplies are adequate.	Fixtures and tile are dull, dingy and stained. Odor is obvious. Some supplies are inadequate (less than 5% missing).	Fixtures and tile are dull, dingy and stained. Odor is overwhelming. Supplies are inadequate (more than 5% missing).
Trash Containers & Pencil Sharpeners	Hold only daily waste, and are clean and odor-free.	Hold only daily waste, and are clean and odor-free.	Hold only daily waste, and are clean and odor-free.	Have old trash and shavings. They are stained and marked. Trash containers smell sour.	Light fixtures are dirty with dust balls and flies. Many lamps (more than 5%) are burned out.

APPA

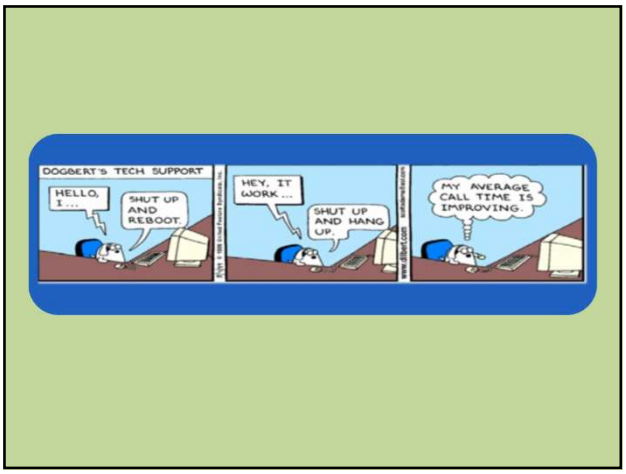
31

32

2

Metrics & KPIs

33



34

How do you know you are successful?

35

What is a metric?

Metric Description	Std.	Metric Description	Std.
Facility Condition Index (FCI)	<0.05	Stockroom Turns / Year	2 - 3
Deferred Maintenance Backlog	Trend	Annual Training Hours	>40 hrs.
On-the-job Wrench Time	>60%	Maint. Cost / Replacement Cost	3 - 4%
PM / CM Ratio	70 / 30	Percent Return Work	<5%
Unscheduled Maintenance Downtime	<2%	Mean Time Between Failures	Trend
PM Schedule Compliance	>95%	% Failures Assessed: Root Cause	>75%
CM Schedule Compliance	>90%	Maintenance OT Percentage	5-15%
Unscheduled Man-Hours	<10%	% WO Covered by Estimates	>90%
WO Turn-Around Time	Trend	On-Site Supervisor Time	>65%
Emergency Response Time	<15 min.[2]	Stockroom On-Time Delivery	>97%
Stockroom Service Level	>97%	Material / Part Performance	>98%

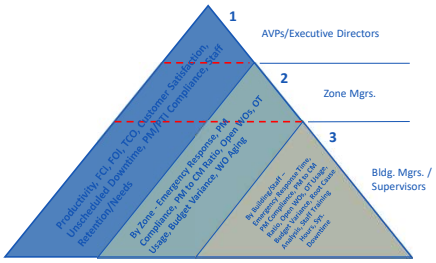
36

FEA's Metrics Database of O&M Performance Measures

Balanced Scorecard Perspective	Measurement		Target		CMMS	Priority	Type Metric	KPI Level
Customer Perspective		G	Y	R				
1. Customer Awareness, Response, and Feedback	On-Site Supervisor Time	>60%	40-60%	<40%	✔	1	Outcome	3
	Annual Customer Expectations Calibration	APPA L1	APPA L2	APPA L3		3	Process	2
	Proactive Manager Contacts w/ Customers	>1/qtr	1/qtr	None		2	Process	2,3
	Custodial QA Inspection Hits	<5 / Insp.	5-10 / Insp.	> 10 / Insp.	✔	3	Outcome	2
	Emergency Response Time Compliance	>95%	85-95%	<85%	✔	4	Outcome	3
	Emergency Response Times	<15 min.	15-30 min.	>30 min.	✔	1	Process	2,3
	Percent of Rework (call backs)	<3%	3-5%	>5%	✔	2	Outcome	2
	Customer Satisfaction	>95%	90-95%	<90%	?	1	Outcome	1,2
	Percent WO with Customer Feedback	>15%	10-15%	<10%	✔	3	Process	2,3
	Top Ten WO Trouble Codes	# & Type	# & Type	# & type	✔	2	Process	2,3
Process Perspective								
1. PM, PdM/PTBI, and RCM (Planned Maintenance)	Workforce Productivity	>60%	45-60%	<45%	✔	1	Outcome	1,2,3
	WOs Initiated by Staff as Result of Inspections/RCM	>75%	50-75%	<50%	✔	2	Process	2
	Equipment Uptime	>99%	98-98%	<98%	✔	3	Process	3
	Unscheduled Downtime	<2%	2-5%	>5%	✔	1	Process	1,2,3
	Number of Preventable Breakdowns	<2%	2-5%	>5%	✔	1	Process	2,3
	Equipment Downtime Caused by Breakdowns	Trend	Trend	Trend	✔	2	Process	2,4
	Breakdowns Caused by Poor PM	Trend	Trend	Trend	✔	3	Process	2,5
	Mean Time Between Failures (MTBF)	Trend	Trend	Trend	✔	4	Process	2,6
	Mean Time To Repair (MTTR)	Trend	Trend	Trend	✔	5	Process	2,7
	Emergency Man Hours (%)	<2%	2-5%	>5%	✔	6	Process	2,8
	Hours Spent on Unscheduled WOs	<10%	10-20%	>20%	✔	3	Process	2,3
	PM to CM Ratio	>80%	65-80%	<65%	✔	1	Process	2
	PM Schedule Completion Rate	>95%	85-95%	<85%	✔	2	Process	1,2,3
	PM Compliance for Critical Systems	100%	90-98%	<90%	✔	2	Process	2
	PM Efficiency	<2%	2-5%	>5%	✔	2	Process	2
	Overdue PM Tasks	<5%	5-10%	>10%	✔	2	Process	2
	PT&I Completion Rates to Schedule	>95%	85-95%	<85%	✔	5	Process	1,2,3
	PT&I WOs as Percent of Total PM	>10%	10-15%	>15%	✔	2	Process	2
	Savings Attributed to PT&I	Trend	Trend	Trend	✔	2	Process	2
	Number of Failures Averted Due to PT&I	Trend	Trend	Trend	✔	2	Process	2
	Root Cause Analyses (% Failures Assessed)	>75%	50-75%	<50%	✔	2	Process	2,3
	Percentage of Repetitive Equipment Failures	Trend	Trend	Trend	✔	2	Process	2
	Savings Attributed to RCM Program	Trend	Trend	Trend	✔	2	Process	2
	OEE vs. Percentage of Critical Equipment (Availability)	>99%	98-98%	<98%	✔	2	Process	2
2. Stores/Stockroom/Warehouse Management	Inactive Stock (No Movement in Past 12 mo.)	<2%	2-5%	>5%	✔	2	Process	2
	Materials/Stockroom Turns per Year	2 - 3	1 or 4-5	0 or >5	✔	3	Process	2
	Materials On-Time Delivery	>97%	90-97%	<90%	✔	4	Process	3

37

KPI Reporting Levels (Roll ups)



38

Balanced scorecard

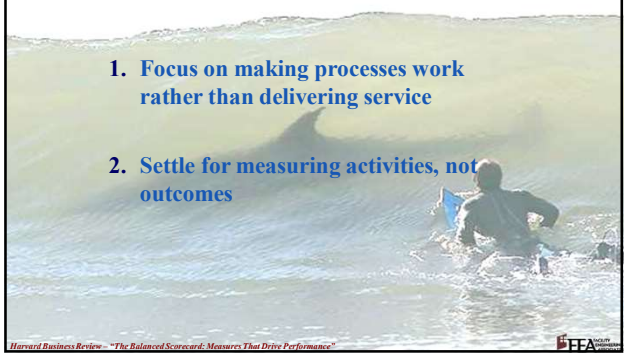
Source: The Balanced Scorecard, Measures that Drive Performance, Harvard Business Review, 1992

39

Top 10 Maintenance KPIs

40

Key elements organizations overlook



41

Unintentionally incentivizing the wrong behaviors

- **Response time to service calls**: Institutions track this metric to help improve customer service. However, publicly posting this metric sends the signal to staff that responding to service calls is more critical than scheduled work. As a result, staff prioritize service calls over preventive maintenance tasks.
- **Preventive maintenance completion rates**: This metric is intended to encourage staff to complete all of their assigned preventive work orders. However, asking staff to focus on this metric can lead to artificially high completion rates. Some institutions report staff close out tasks that are not fully resolved.
- **Time to close work orders**: This metric aims to minimize the number of open work orders and maximize the volume of work completed across all staff. However, staff often close work orders before they are finished and open new ones, duplicating the work to reduce their time to close.
- **Cost per work order**: The purpose of tracking cost per work order is to minimize costs. But asking staff to manage this metric often leads to staff completing only the cheapest fixes and re-logging more expensive work for later.

42

Recommended Operational Metrics

Metric	Definition	Directionality
Number of Service Calls	Number of customer-initiated work orders	↓
Compliance Completion Rate	Percentage of required preventive maintenance tasks completed	↑
Maintenance Mix (PM/RM)	Ratio of preventive maintenance to reactive maintenance tasks completed	↑
Rework	Number of work orders submitted as a result of an error in recently performed maintenance	↓
Follow Up Work Orders per 100 PM Checks	Number of follow up work orders for repairs submitted during 100 preventive maintenance checks	↓
Work Order Queue (Backlog) per Employee	Number of open preventive maintenance work orders in an employee's queue	↓

43

Recommended Strategic Metrics

Metric	Definition	Directionality
Number of Preventable Service Calls	Number of customer-initiated work orders that could have been prevented through performing scheduled preventive maintenance	↓
System Runtime/Downtime	Number of days running without failure or time and extent of system shutdown	↑ / ↓
Proactive Maintenance	Number of work orders submitted by staff for issues observed in the field	↑
Failure Code	Indicator of why an asset failed to facilitate better maintenance interventions	N/A
Normalized Investment	Money spent on new equipment due to inadequate preventive maintenance	↓
Customer Satisfaction	Customer responses on work order satisfaction questionnaires	↑

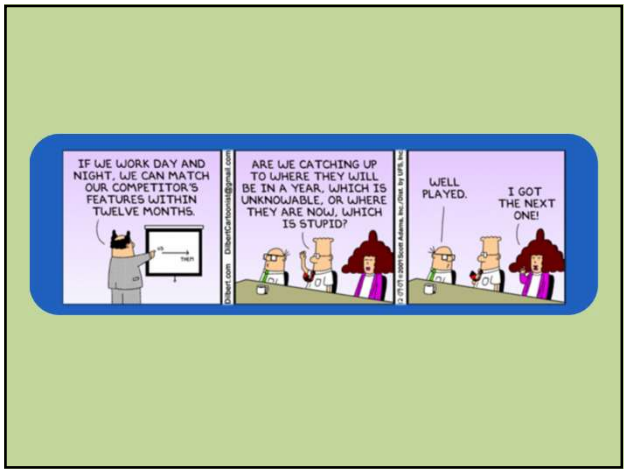
44

45

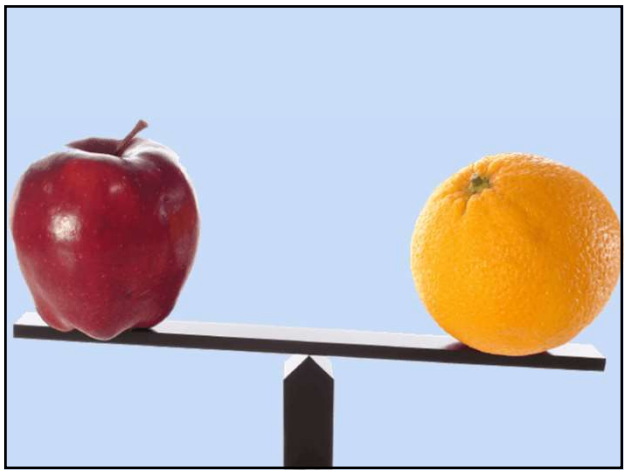
3

Benchmarking

46

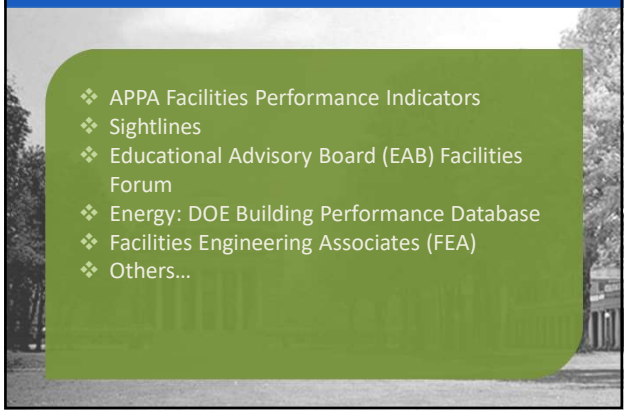


47



48

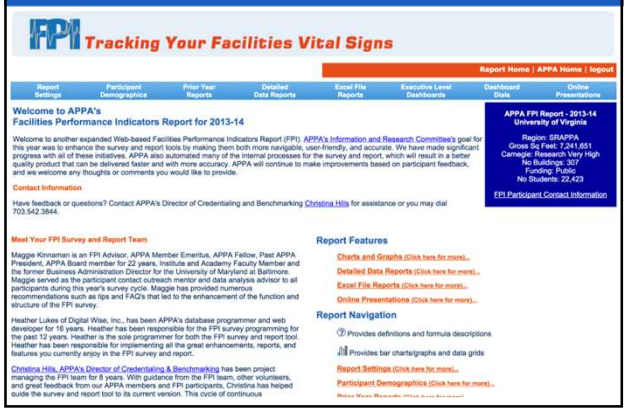
Sources for benchmarking Facilities organizations



- APPA Facilities Performance Indicators
- Sightlines
- Educational Advisory Board (EAB) Facilities Forum
- Energy: DOE Building Performance Database
- Facilities Engineering Associates (FEA)
- Others…

49

Hands on: APPA Facilities Performance Indicators (FPI)



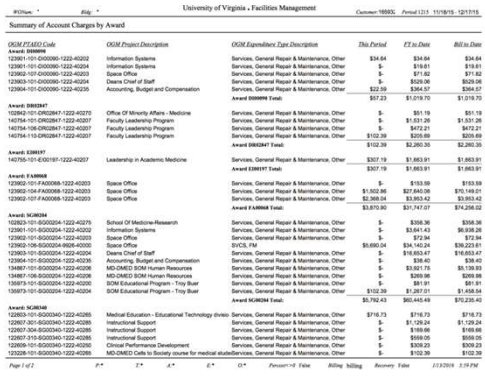
50

4

Reports, Dashboards & Visualizations

51

Reports



University of Virginia , Facilities Management

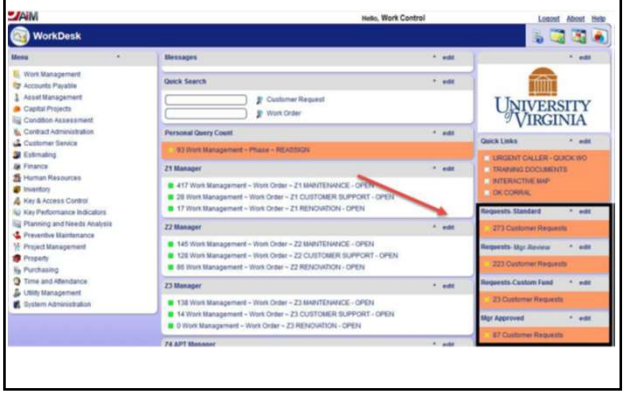
Summary of Account Charges by Award

OGM PTAEO Code	OGM Project Description	OGM Expenditure Type Description	This Period	FY to Date	Bill to Date
Award: D000090					
123901-101-DI000090-1222-40202	Information Systems	Services, General Repair & Maintenance, Other	$34.64	$34.64	$34.64
123901-101-DI000090-1222-40204	Information Systems	Services, General Repair & Maintenance, Other	$-	$19.61	$19.61
123902-107-DI000090-1222-40203	Space Office	Services, General Repair & Maintenance, Other	$-	$71.82	$71.82
123903-101-DI000090-1222-40204	Deans Chief of Staff	Services, General Repair & Maintenance, Other	$-	$529.06	$529.06
123904-101-DI000090-1222-40235	Accounting, Budget and Compensation	Services, General Repair & Maintenance, Other	$22.59	$364.57	$364.57
		Award DI000090 Total:	$57.23	$1,019.70	$1,019.70
Award: DI002847					
102842-101-DR02847-1222-40270	Office Of Minority Affairs - Medicine	Services, General Repair & Maintenance, Other	$-	$51.19	$51.19
140754-101-DR02847-1222-40207	Faculty Leadership Program	Services, General Repair & Maintenance, Other	$-	$1,531.26	$1,531.26
140754-106-DR02847-1222-40207	Faculty Leadership Program	Services, General Repair & Maintenance, Other	$-	$472.21	$472.21
140754-110-DR02847-1222-40207	Faculty Leadership Program	Services, General Repair & Maintenance, Other	$102.39	$205.69	$205.69
		Award DI002847 Total:	$102.39	$2,260.35	$2,260.35
Award: E395197					
140755-101-E000197-1222-40207	Leadership in Academic Medicine	Services, General Repair & Maintenance, Other	$307.19	$1,863.91	$1,863.91
		Award E395197 Total:	$307.19	$1,863.91	$1,863.91
Award: FA98068					
123902-101-FA00068-1222-40203	Space Office	Services, General Repair & Maintenance, Other	$-	$153.59	$153.59
123902-104-FA00068-1222-40203	Space Office	Services, General Repair & Maintenance, Other	$1,502.86	$27,640.06	$70,149.01
123902-107-FA00068-1222-40203	Space Office	Services, General Repair & Maintenance, Other	$2,368.04	$3,953.42	$3,953.42
		Award FA98068 Total:	$3,870.90	$31,747.07	$74,256.02
Award: SG98284					
102823-101-SG00204-1222-40275	School Of Medicine-Research	Services, General Repair & Maintenance, Other	$-	$358.36	$358.36
123901-101-SG00204-1222-40202	Information Systems	Services, General Repair & Maintenance, Other	$-	$3,641.43	$6,938.26
123902-101-SG00204-1222-40203	Space Office	Services, General Repair & Maintenance, Other	$-	$72.94	$72.94
123902-106-SG00204-9928-40300	Space Office	SVCS, FM	$5,680.04	$34,140.24	$36,223.81
123903-101-SG00204-1222-40204	Deans Chief of Staff	Services, General Repair & Maintenance, Other	$-	$16,653.47	$16,653.47
123904-101-SG00204-1222-40236	Accounting, Budget and Compensation	Services, General Repair & Maintenance, Other	$-	$38.40	$38.40
134867-101-SG00204-1222-40206	MD-DMED SOM Human Resources	Services, General Repair & Maintenance, Other	$-	$3,921.75	$5,139.93
134867-106-SG00204-1222-40206	MD-DMED SOM Human Resources	Services, General Repair & Maintenance, Other	$-	$269.98	$269.98
136973-101-SG00204-1222-40200	SOM Educational Program - Troy Buer	Services, General Repair & Maintenance, Other	$-	$81.91	$81.91
136973-101-SG00204-1222-40204	SOM Educational Program - Troy Buer	Services, General Repair & Maintenance, Other	$102.39	$1,287.01	$1,458.54
		Award SG98284 Total:	$5,782.43	$60,445.49	$70,235.40
Award: SG98340					
122603-101-SG00340-1222-40285	Medical Education - Educational Technology divisio	Services, General Repair & Maintenance, Other	$716.73	$716.73	$716.73
122607-301-SG00340-1222-40285	Instructional Support	Services, General Repair & Maintenance, Other	$-	$1,129.24	$1,129.24
122607-304-SG00340-1222-40285	Instructional Support	Services, General Repair & Maintenance, Other	$-	$169.66	$169.66
122607-310-SG00340-1222-40285	Instructional Support	Services, General Repair & Maintenance, Other	$-	$559.05	$559.05
122609-101-SG00340-1222-40290	Clinical Performance Development	Services, General Repair & Maintenance, Other	$-	$309.23	$309.23
123228-101-SG00340-1222-40285	MD-DMED Cells to Society course for medical studies	Services, General Repair & Maintenance, Other	$-	$102.39	$102.39

Page 1 of 2

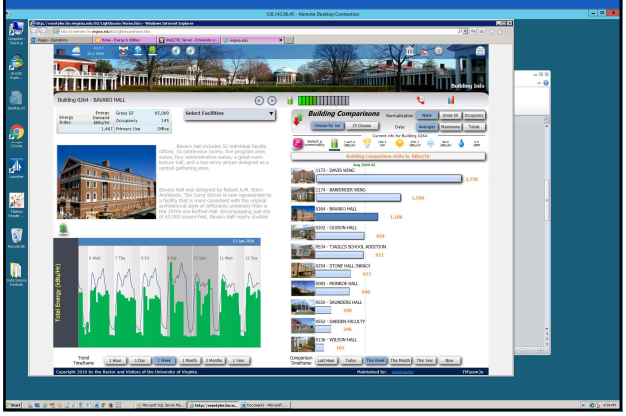
52

Dashboards

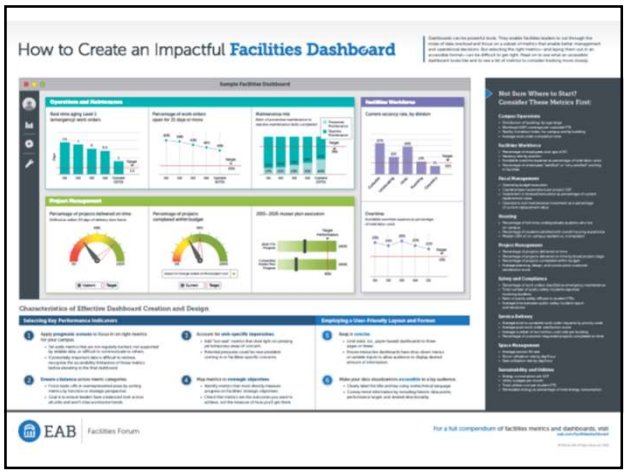


53

Dashboards



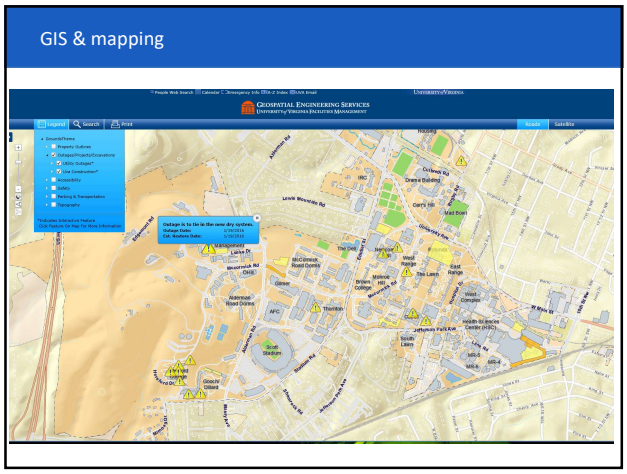
54


How to Create an Impactful Facilities Dashboard
EAB
Facilities Forum

55

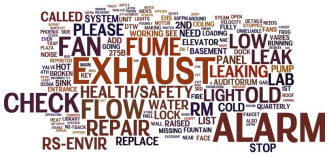

Visualizations

56


GIS & mapping
Geospatial Engineering Services

57

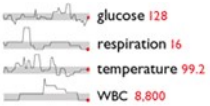
Other visualizations: Word clouds



Wordle.net

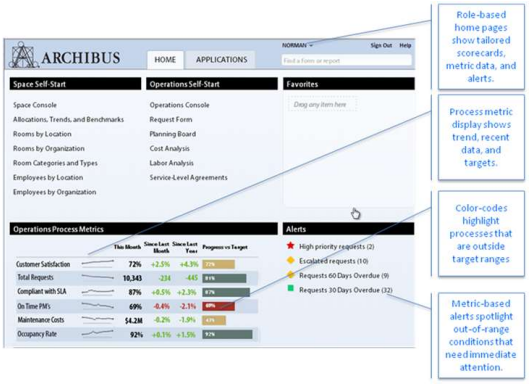
58

Other visualizations: Sparklines



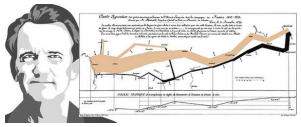
59

Other visualizations: Sparklines in action



60

Visualizations: Edward Tufte



www.edwardtufte.com

61

5

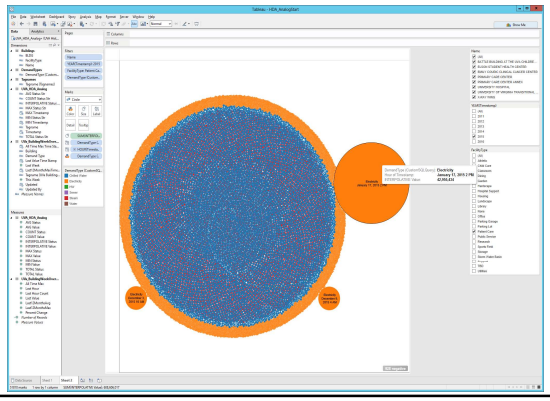
Data Analytics, Modeling & Predictive Analytics

62

Hands on: Analytics with Tableau

63

Analytics: Can you find the anomaly?



64

6

Facilities Informatics

65

Health informatics

Health Informatics (HI) is the intersection of clinical, IM/IT and management practices to achieve better health.

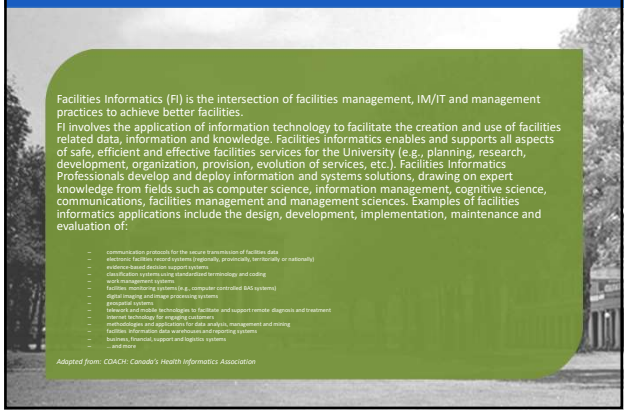
HI involves the application of information technology to facilitate the creation and use of health related data, information and knowledge. Health informatics enables and supports all aspects of safe, efficient and effective health services for all Canadians (e.g., planning, research, development, organization, provision, evolution of services, etc.). Health Informatics Professionals develop and deploy information and systems solutions, drawing on expert knowledge from fields such as computer science, information management, cognitive science, communications, epidemiology, management sciences and health sciences. Examples of health informatics applications include the design, development, implementation, maintenance and evaluation of:

- communication protocols for the secure transmission of healthcare data
- electronic patient record systems (regionally, provincially, territorially or nationally)
- evidence-based clinical decision support systems
- classification systems using standardized terminology and coding
- case management systems (e.g., for community, home and long-term care)
- access and referrals systems for healthcare services
- patient monitoring systems (e.g., computer controlled bedside monitors and patient home monitoring devices)
- digital imaging and image processing systems
- telehealth technologies to facilitate and support remote diagnosis and treatment
- internet technology for engaging patients in their own care
- public health surveillance and protection systems
- methodologies and applications for data analysis, management and mining
- clinical information data warehouses and reporting systems
- business, financial, supportand logistics systems

source: COACH: Canada's Health Informatics Association

66

Facilities informatics (as modeled after health informatics)



Facilities Informatics (FI) is the intersection of facilities management, IM/IT and management practices to achieve better facilities.

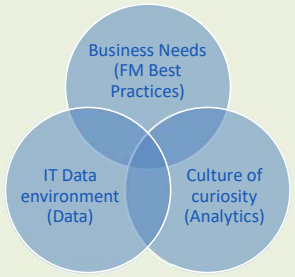
FI involves the application of information technology to facilitate the creation and use of facilities related data, information and knowledge. Facilities informatics enables and supports all aspects of safe, efficient and effective facilities services for the University (e.g., planning, research, development, organization, provision, evolution of services, etc.). Facilities Informatics Professionals develop and deploy information and systems solutions, drawing on expert knowledge from fields such as computer science, information management, cognitive science, communications, facilities management and management sciences. Examples of facilities informatics applications include the design, development, implementation, maintenance and evaluation of:

- communication protocols for the secure transmission of facilities data
- electronic facilities record systems (regionally, provincially, territorially or nationally)
- evidence-based decision support systems
- classification systems using standardized terminology and coding
- work management systems
- facilities monitoring systems (e.g., computer controlled BAS systems)
- digital imaging and image processing systems
- preceptial systems
- telework and mobile technologies to facilitate and support remote diagnosis and treatment
- internet technology for engaging customers
- methodologies and applications for data analysis, management and mining
- facilities information data warehouses and reporting systems
- business, financial, support and logistics systems
- ... and more

Adapted from: COACH: Canada's Health Informatics Association

67

Facilities Informatics



68

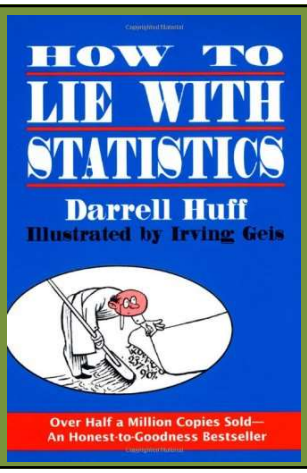
APPA Facilities Informatics workgroup

- Whitepaper: Informatics Maturity Model for Facilities
- Data
- Whitepaper: The Case for Facilities Informatics
- Whitepaper: Living labs
- FPI 2.0

69

Final thoughts…

70



71

Integrity

- Don't lie!
- Don't cherry pick
- Understand that representations create different impressions
- Document, document, document! (Site sources, references, explain w/ footnotes)
- Have & understand a clear takeaway

72

Questions and/or comments?

73

Thank you

74

UNIVERSITY of VIRGINIA

Chris Smeds
Technology Officer
U.Va. Facilities Management

smeds@virginia.edu
(434) 982-4796 office

http://www.fm.virginia.edu/

75

This concludes The American Institute of Architects Continuing Education Systems Course

AIA Continuing Education Provider

76