DATA INTEGRATION

APPA Institute for Facilities Management
September 9, 2019
Nashville, TN

PURPOSE OF TODAY'S PRESENTATION

- To provide a broad understanding of:
  - Data as a utility
    - How various units of Facilities Management can share data that they may not be aware others need
  - Application Database (OLAP) versus Transaction Database (OLTP)
  - Integrating various databases
  - Converting data into information

AGENDA

- What is data?
- Database versus Data Warehouse
- Data Integration
- Group Discussion
- If time permits, Converting data into information
  - Metrics, kpi
  - Example applications

WORDS OF WISDOM

Knowing that a tomato is a fruit? That's Data.

Knowing not to put one in a fruit salad? That's Knowledge.

With apologies to Brian O'Driscoll

DEFINITION

What is data?

Raw facts that are persistently collected and stored for conversion into information used to inform business processes.

It must be accurate, documented, and managed on an on-going basis to ensure its value to the organization.

It must be delivered to the institution on a continuous, as-needed basis.

WHERE WOULD YOU GET THE INFORMATION TO PRODUCE THIS REPORT?

- Create a report of energy consumption and cost for each building owned by your institution:
  - If served by a District Energy System or local system(s):
    - Chilled Water
    - Steam or Hot Water
    - Electricity
    - Water
    - Fuel-Gas/Oil/Coal
  - If served by the local utility
    - Electricity
    - Fuel-Gas/Oil/Coal
    - Water
  - This year versus last year information:
    - Consumption and cost
    - Hours used and weekly schedule
    - Number of occupants, i.e. staff, students, faculty
    - Square footage of building including classification(s), i.e. instructional space, administrative, research, etc.
    - Departmental ownership
    - Weather, e.g. average temperatures, % sun, etc.
    - HVAC system type

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DATA WAREHOUSING

- Technique for assembling and managing data from various sources for the purpose of answering interrelated questions, allowing for decisions that were not previously easily reached.
- A decision support (analytics) database maintained separately from the organization's operational databases

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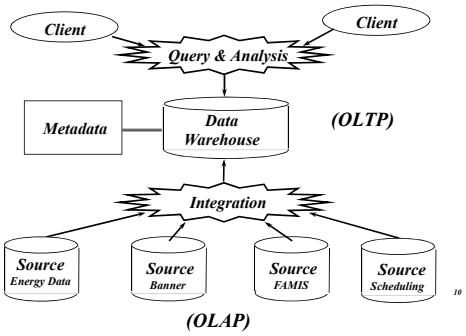
CHARACTERISTICS OF DATA WAREHOUSE

- **Subject oriented.** Data are organized based on how the users refer to them.
- **Integrated**. All inconsistencies regarding naming convention and value representations are removed.
- **Nonvolatile**. Data are stored in read-only format and do not change over time.
- **Time variant**. Data are not current but normally time series.

CHARACTERISTICS OF DATA WAREHOUSE

- **Summarized** Operational data are stored in a decision-usable format
- **Large volume**. Time series data sets are normally quite large.
- **Metadata**. Data about data are stored.
- **Data sources**. Data come from internal and external unintegrated operational systems.

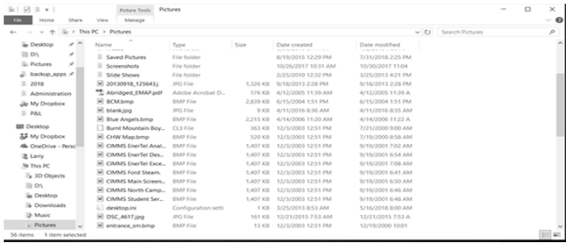
WAREHOUSE ARCHITECTURE



THE METADATA

- The name suggests some high-level technological concept, but it really is fairly simple. Metadata is "data about data".
- With the emergence of the data warehouse as a decision support structure, the metadata are considered as much a resource as the business data they describe.
- Metadata are abstractions -- they are high level data that provide concise descriptions of lower-level data.

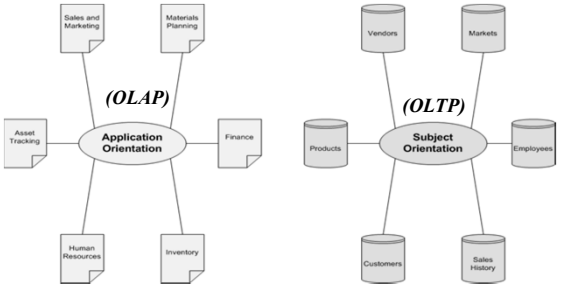
THE METADATA



All the fields you see by each file in File Explorer is actually metadata. The actual data is inside those files. Metadata includes:

- file name,
- type,
- size,
- creation date and time,
- last modification date and time.

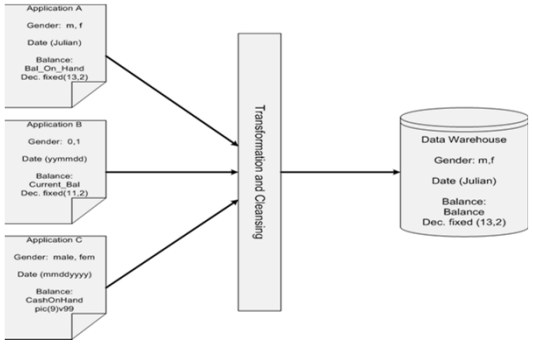
A DATA WAREHOUSE IS SUBJECT ORIENTED



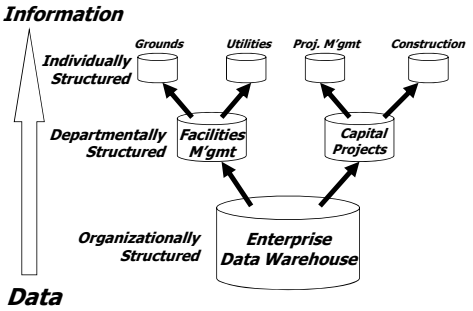
DATA INTEGRATED

- **Integration** –consistency in naming conventions and measurement attributes, accuracy, and common terms.
- Establishment of a common unit of measure for all synonymous data elements from dissimilar databases.
- The data must be stored in the DW in an integrated, globally acceptable manner

DATA INTEGRATED



FROM THE DATA WAREHOUSE TO DATA MARTS



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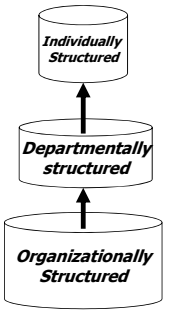
USERS HAVE DIFFERENT VIEWS OF DATA



Seekers: Browse and use information created by authors

Authors: Harvest data from various known sources to create useful information

Data Scientists: Seek out the unknown and previously unsuspected rewards hiding in the detailed data

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INTERACT-QUERY

- What do you do?
- What data do you gather (or should gather), and who uses it?
- What data does your function need?
- What data is most important to your particular function?
  - Is some or all of it gathered by some other function?
  - How easy is it to get/use?

INTERACT-SUMMARIZE

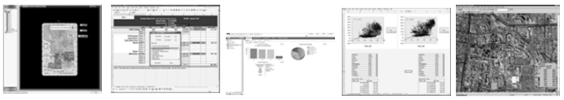
- What data is most used?
- What data is most required for our various functions?
- What are the most common reasons why the data is needed?
- Who gathers most of the data?

INTERACT-SYNTHESIZE

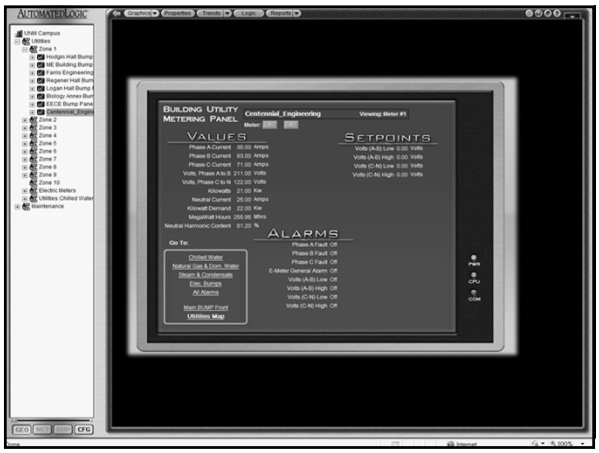
- What data is collected by other functions in your organization that you can/want to use?
- What data is collected institutionally that can be used to meet your needs?
- What formats does the data require, i.e. spreadsheet, dashboard, formal reports, etc.?
- How can we convert the data into information in the required format(s)?

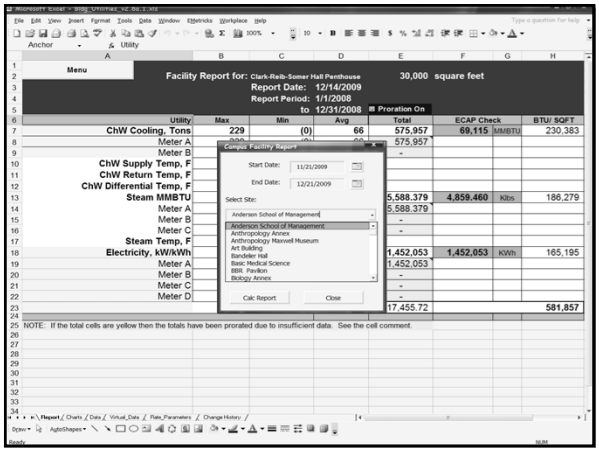
EXAMPLES OF OPERATIONAL SYSTEMS

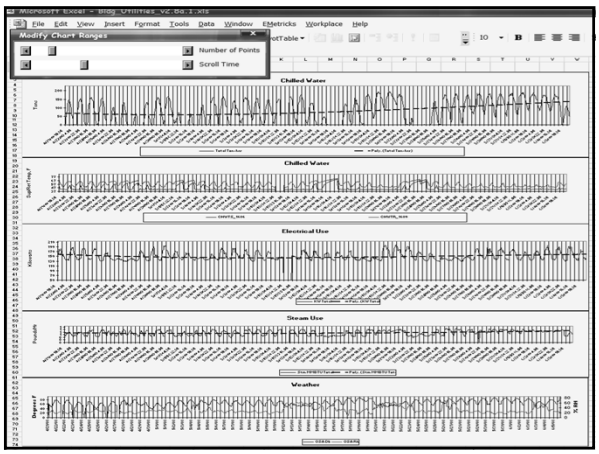
Utilities Examples:

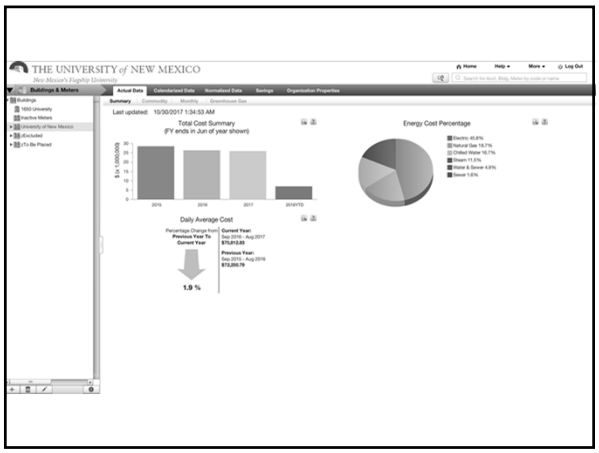


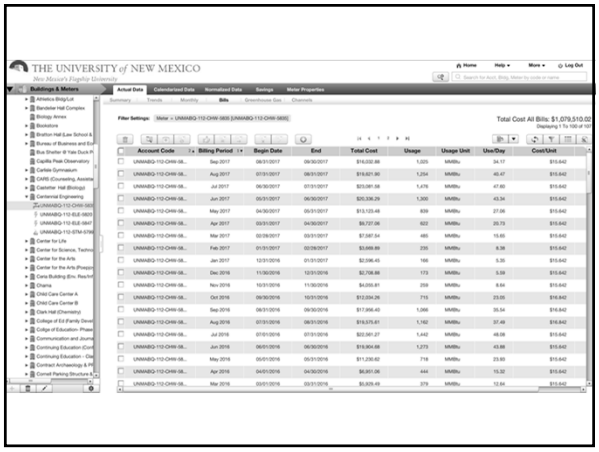
Real-Time Web Viewer | *Data Analysis Report Writer* | *Web-based Reporting and Billing* | *Statistical Analysis* | *Data Provisioning to 3rd Party Applications*

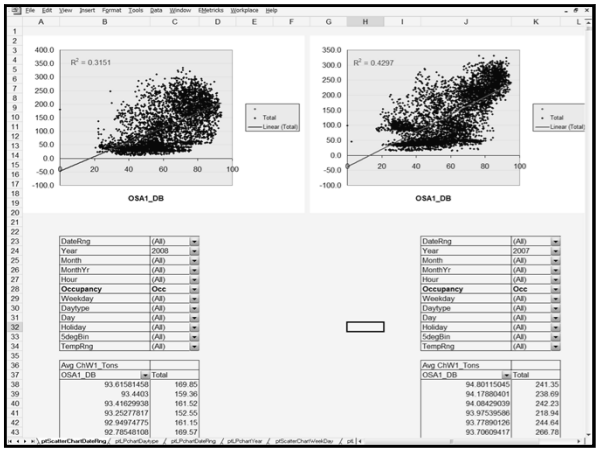

AUTOMATED LOGIC
BUILDING UTILITY METERING PANEL
Centennial_Engineering
VALUES
SETPOINTS
ALARMS
Chilled Water
Natural Gas & Dom. Water
Steam & Condensate
Elec. Bumps
All Alarms
Main BUMP Front
Utilities Map

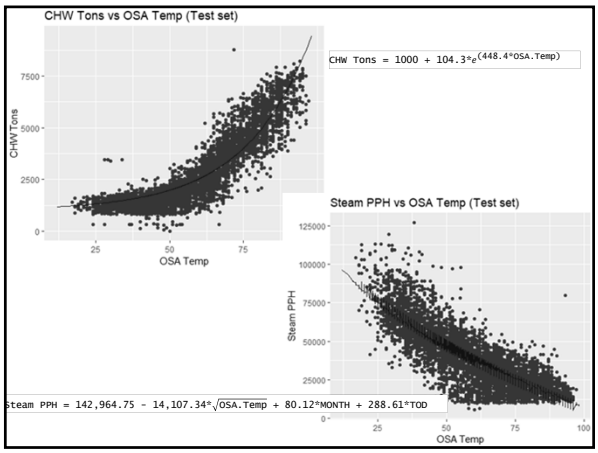

Menu
Facility Report for: Clark-Reib-Somer Hall Penthouse 30,000 square feet
Report Date: 12/14/2009
Report Period: 1/1/2008
to 12/31/2008
Proration On
Utility
Max
Min
Avg
Total
ECAP Check
BTU/ SQFT
ChW Cooling, Tons
Meter A
Meter B
ChW Supply Temp, F
ChW Return Temp, F
ChW Differential Temp, F
Steam MMBTU
Meter A
Meter B
Meter C
Steam Temp, F
Electricity, kW/kWh
Meter A
Meter B
Meter C
Meter D
NOTE: If the total cells are yellow then the totals have been prorated due to insufficient data. See the cell comment.
Campus Facility Report
Start Date:
End Date:
Select Site:
Anderson School of Management
Calc Report
Close

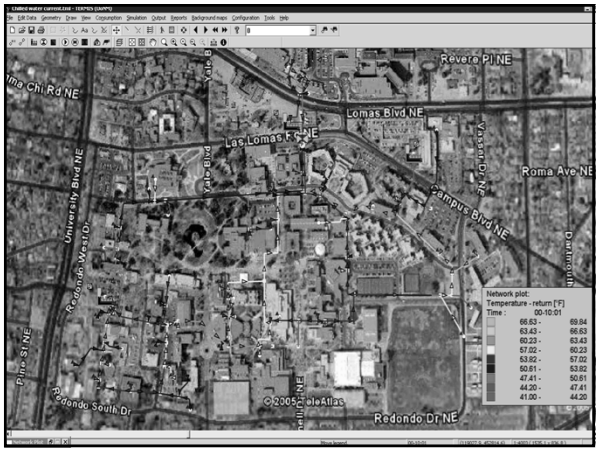

Modify Chart Ranges
Number of Points
Scroll Time
Chilled Water
Chilled Water
Electrical Use
Steam Use
Weather


THE UNIVERSITY of NEW MEXICO
Last updated: 10/30/2017 1:34:53 AM
Total Cost Summary
(FY ends in Jun of year shown)
Energy Cost Percentage
Daily Average Cost
1.9 %


THE UNIVERSITY of NEW MEXICO


R² = 0.3151
R² = 0.4297
OSA1_DB
OSA1_DB
Total
Linear (Total)





SUMMARY

Data-> Integration-> Information -> Knowledge:

Convert DATA into INFORMATION
Convert INFORMATION into KNOWLEDGE

- Gather dispersed and disparate application data from multiple sites, multiple suppliers and different multiple databases.
- Validate the data and manage missing or erroneous data.
- Convert the raw data into usable management information, particularly meaningful Key Performance Indicators (KPIs).
- Generate meaningful, added-value reports that include the analysis of trends and exceptions.
- Distribute the analyses and reports across multiple sites, internally and externally, in a timely fashion.

QUESTIONS & ANSWERS

Thank You!