Performance Dashboards: Measuring, Monitoring, and Managing Your Business
Wayne W. Eckerson

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- Eckerson has 17 years of industry experience and has covered data warehousing and business intelligence since 1995.
- Eckerson is the author of many in-depths reports, a columnist for several business and technology magazines, and a noted speaker and consultant.
- He can be reached at weckerson@tdwi.org
Course Agenda

1. Evolution of Performance Dashboards
2. Why Performance Dashboards?
3. What are Performance Dashboards?
4. Architecting Performance Dashboards
5. Case Studies
7. Costs of Deployment
8. How to Build Effective Metrics
9. How to Design Effective Dashboard Screens
10. Criteria for Evaluating Dashboard Products
Appendices

• A - Performance Dashboard Trends
• B - Readiness Assessment
• C - How to Ensure Adoption
• D - Performance Dashboard Market Segmentation
• E – Sample Metrics Report
Evolution of Performance Dashboards
The Business Challenge

Decision makers suffer from…

• too much data…
• too little information…
• delivered too late…

to make effective decisions.
Evolution of a Solution

The search for the perfect “business insight system”:

• 1980s
  – Executive information systems (EIS)
  – Decision support systems (DSS)

• 1990s
  – Data warehousing (DW)
  – Business intelligence (BI)

• 2000s
  – Dashboards and scorecards
  – Performance management

• 2010+??
Two Metaphors

Dashboard + Performance Chart = Performance Dashboard
Two Disciplines

**Business Intelligence**

1. Strategize
2. Plan
3. Monitor/Analyze
4. Act/Adjust

**Corporate Performance Management**

1. Strategize
   - Mission, Values, Goals
   - Objectives, Incentives
   - Strategy Maps
2. Plan
   - Budgets, Plans
   - Forecasts, Metrics
   - Initiatives, Targets
3. Monitor/Analyze
   - Actions, Decisions
4. Analyze
   - BI/DW Performance Dashboards

**Performance Dashboards**
Corporate Performance Management

1. Strategize
   - Mission, Values, Goals
   - Objectives, Incentives
   - Measures

2. Plan
   - Budgets, Plans
   - Forecasts, Targets
   - Initiatives

3. Monitor/Analyze
   - Actions, Decisions
   - Revisions, Alerts
   - Workflow, Discussions

4. Act/Adjust
   - Query, Reporting
   - Analysis (BI) tools
   - Data Warehouse

Integrated Data

STRATEGY

EXECUTION
Waves of Software Automation

- 1985-2000
- 1990
- 1995
- 2000

- Efficiency
- Effectiveness

- Back Office
  (Manufacturing, Finance, Human Resources, Procurement, Logistics)

- Cross-Functional Value Chains
  (Customers, Supplies, Products)

- Front-Office
  (Sales, Service, Marketing)

- Mgmt
  (Strategy Execution)

- CRM, SCM
- CPM
- Sales Force Automation, Call Center, Campaign, Mgmt
- ERP Packages
- Software/IT Enablers

Business Activities
Operations
Why Performance Dashboards?
Status of Performance Dashboards

- No plans, 17%
- Under development, 33%
- Deployed, 51%

What's On Your Dashboard?

Steve Ballmer
MICROSOFT
Ballmer requires his top officers to bring their dashboards with them into one-on-one meetings. Ballmer zeroes in on such metrics as sales, customer satisfaction, and status of key products under development.

Ivan Seidenberg
VERIZON
Seidenberg and others can choose from more than 300 metrics to put on their dashboards, from broadband sales to wireless defects. Managers pick the metrics they want to track, and the dashboard flips the pages 24 hours a day.

Jeff Immelt
GENERAL ELECTRIC
Many GE executives use dashboards to run their day-to-day operations, monitoring profits per product line and fill rates for orders. Immelt occasionally looks at a dashboard, but he relies on his managers to run the businesses so he can focus on the big picture.

Larry Ellison
ORACLE
A fan of dashboards, Ellison uses them to track sales activity at the end of a quarter, the ratio of sales divided by customer service requests, and the number of hours that technicians spend on the phone solving customer problems.
Tactical Drivers

Resonates with users

- Monitors status of several areas on one screen
- Graphical view of key metrics
- Alerts users to exception conditions
- Click to analyze and drill to detail
- Customized views based on role
- Personalized views based on interest
- No training required!
Tactical Drivers (cont.)

Rich data

- *Blends data from multiple sources*
- *Both detailed and aggregated*
- *Both historical and real-time*

Empowers workers

- *Focuses users on what’s really important*
- *Shows them how their contributions count*
- *Motivates with goals, competition, & incentives*
- *Drives proactive intervention*
Strategic Drivers

Aligns the business

- Everyone uses the same data
- Everyone uses the same metrics
- Everyone works toward the same strategy

Improves communication

- Tool for communicating strategy
- Managers & staff - collaboration
- Among departments - coordination

Improves visibility and compliance

- Fewer surprises
Strategic Drivers - The “Five Cs”

- Communicate
- Compare
- Collaborate
- Coordinate
- Congratulate
Agent of Organizational Change

### Compliance Management Dashboard
**Sarbanes-Oxley Compliance**

#### Processes
- (CO) COSO / Entity
- (EX) Expenditure
- (FA) Fixed Assets
- (FR) Financial Close & Reporting
- (IM) Inventory Management

#### Business Activities
- (CO-CA) Control Activities
- (CO-CE) Control Environment
- (CO-IC) Information & Communication
- (CO-MO) Monitoring
- (CO-RA) Risk Assessment
- (EX-10) Purchasing
- (EX-20) Processing Accounts Payable
- (EX-30) Processing Disbursements
- (EX-40) Maintaining Supplier Master File
- (FA-05) Acquiring Fixed Assets

#### Tasks
- (CO-CA-10) Policies & Procedures
- (CO-CA-20) Safeguarding Assets
- (CO-CA-30) Segregation of Duties
- (CO-CA-40) Planning & Budgeting
- (CO-CE-10) Integrity and Ethical Values
- (CO-CE-20) Commitment to Competence
- (CO-CE-30) Board of Directors or Audit Committee
- (CO-CE-40) Management's Philosophy and Operations
- (CO-CE-50) Organizational Structure

### Confidence
- Show Status
- Show Plot
- Controls
- Financials
- Disclosures

#### By Entity
- North America
- South & Central America
- Europe
- Asia
- Africa/Middle East

#### By Account
- Cash and Overdrafts
- Accounts Receivable - Trade
- Accounts Receivable - Interco
- Accounts Receivable - Related
- Income Taxes Receivable
- Prepaid and Other Current
- Total Current Assets
- Buildings - Depreciation
- Furniture/Fixtures - Cost
- Furniture/Fixtures - Deprec
- Machinery and Equipment
- Machinery/Equipment - Dis
- Computers and Software
- Computers and Software - Hardware
- Reserve for Depreciation
- Gross PPE
- Net PPE

### Compliance
- Statement Confidence
  - Balance Sheet: 98% (High), 1.3% (Medium), 0.1% (Low)
  - Income Statement: 80% (High), 20% (Medium), - (Low)

#### Sign-Offs
- VP Planning
- VP Treasury
- VP Accounting
- VP Operations

#### Filings
- On-time Tax Filings
- On-time SEC Filings
- On-time Regulatory Filings
Charting a Course

- Direction without a Performance Dashboard
- Direction with a Performance Dashboard

Goal
What are Performance Dashboards?
The “Three Threes”

• Three Applications
• Three Layers
• Three Types
<table>
<thead>
<tr>
<th>Purpose</th>
<th>Monitoring</th>
<th>Analysis</th>
<th>Collaboration</th>
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<tr>
<td></td>
<td>Convey performance status &amp; trends at a glance</td>
<td>Analyze exceptions and find root cause</td>
<td>Collaborate, plan, and ACT</td>
</tr>
<tr>
<td>Elements</td>
<td>- Multi-paneled screens</td>
<td>- Drill down/up hierarchies</td>
<td>- Telephone</td>
</tr>
<tr>
<td></td>
<td>- Graphical metrics (i.e. dials, gauges, symbols)</td>
<td>- Pivot and swap out dimensions</td>
<td>- Meetings</td>
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<tr>
<td></td>
<td>- Charts and tables</td>
<td>- Drill through to operational data</td>
<td>- Email (notification)</td>
</tr>
<tr>
<td></td>
<td>- Status, trend, and threshold indicators</td>
<td>- Time series, segmentation, predictive, and other analyses</td>
<td>- Annotations</td>
</tr>
<tr>
<td></td>
<td>- Color-coded, conditional formatting</td>
<td>- Reporting</td>
<td>- Threaded discussions</td>
</tr>
<tr>
<td></td>
<td>- Alerts: Web-based, email, other</td>
<td></td>
<td>- Recommended analysis, actions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Publish to server</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Workflow</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Triggers, Updates</td>
</tr>
</tbody>
</table>

**Three Applications**

**Purpose**
- Convey performance status & trends at a glance
- Analyze exceptions and find root cause
- Collaborate, plan, and ACT

**Elements**
- Multi-paneled screens
- Graphical metrics (i.e. dials, gauges, symbols)
- Charts and tables
- Status, trend, and threshold indicators
- Color-coded, conditional formatting
- Alerts: Web-based, email, other
- Drill down/up hierarchies
- Pivot and swap out dimensions
- Drill through to operational data
- Time series, segmentation, predictive, and other analyses
- Reporting
- Telephone
- Meetings
- Email (notification)
- Annotations
- Threaded discussions
- Recommended analysis, actions
- Publish to server
- Workflow
- Triggers, Updates
Three Layers of Information

Monitoring

Graphical Abstracted Data
Graphs, Symbols, Charts

Analysis

Summarized Dimensional Data
Dimensions, hierarchies, “slice/dice”

Planning

Reporting

Detailed, Operational Data
DW queries, Operational reports

Performance Dashboard

Plans, models, forecasts, updates
Dashboard Usage

“Our executives will drill one or two levels down before they call someone who can fix the problem, while our managers will often drill three or four layers down before they make a call.”

– Thomas Tomlinson, director of BI for Bull Moose Tube, a steel manufacturer in Chesterfield, MO.
Dashboards vs Scorecards

• Distinct?
• Synonymous?
• Both?

Rule of thumb:
Use whatever term business users prefer!
### Dashboards vs Scorecards

<table>
<thead>
<tr>
<th></th>
<th><strong>Dashboard</strong></th>
<th><strong>Scorecard</strong></th>
</tr>
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<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>Measures current activity</td>
<td>Charts progress</td>
</tr>
<tr>
<td><strong>Users</strong></td>
<td>Executives, managers, staff</td>
<td>Executives, managers, staff</td>
</tr>
<tr>
<td><strong>Updates</strong></td>
<td>“Right time” feeds</td>
<td>Periodic snapshots</td>
</tr>
<tr>
<td><strong>Data</strong></td>
<td>Events</td>
<td>Summaries</td>
</tr>
<tr>
<td><strong>Queries</strong></td>
<td>Run against remote systems</td>
<td>Run against local data mart</td>
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<tr>
<td><strong>Display</strong></td>
<td>Charts</td>
<td>Symbols</td>
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</table>

Dashboards and scorecards are visual interfaces for *monitoring* business performance.
# Three Types

<table>
<thead>
<tr>
<th></th>
<th>Operational</th>
<th>Tactical</th>
<th>Strategic</th>
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<tbody>
<tr>
<td>Focus</td>
<td>Monitor operations</td>
<td>Optimize process</td>
<td>Execute strategy</td>
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<tr>
<td>Emphasis</td>
<td>Monitoring</td>
<td>Analysis</td>
<td>Collaboration</td>
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<tr>
<td>Users</td>
<td>Supervisors+</td>
<td>Managers+</td>
<td>Executives+</td>
</tr>
<tr>
<td>Scope</td>
<td>Operational</td>
<td>Departmental</td>
<td>Enterprise</td>
</tr>
<tr>
<td>Information</td>
<td>Detailed</td>
<td>Detailed/Summary</td>
<td>Summary</td>
</tr>
<tr>
<td>Updates</td>
<td>Intra-day</td>
<td>Daily/Weekly</td>
<td>Monthly/Quarterly</td>
</tr>
<tr>
<td>“Looks like a…”</td>
<td>“Dashboard”</td>
<td>“BI Portal”</td>
<td>“Scorecard”</td>
</tr>
</tbody>
</table>
Pretenders to the throne

– **Too Flat**
  “A prettified spreadsheet”

– **Too Isolated**
  “Another spreadmart”

– **Too Manual**
  “Not scalable or sustainable”

– **Too Cheap**
  “You get what you pay for!”
How Do You Architect a Performance Dashboard?
Three Architectures

Business Architecture
BI Architecture
Data Architecture
BI Architecture

Integrated BI Capabilities

Business Architecture

BI Platform (Analytic Server)
- Common services, object model, API, file formats, etc.

Data Delivery Architecture

Monitoring Layer
Dashboards, scorecards, KPIs, Alerts

Analysis Layer
Dimensions, hierarchies, “slice/dice”

Reporting Layer
Management and operational reports

Planning Layer
Plans, models, forecasts

EDUCATION AND RESEARCH
© Copyright TDWI, 2006
Data Architecture – Quicken Loans

- Mainframe
- AS/400
- Packaged Applications
- Phone System
- Web

Messaging Backbone
(Enterprise Application Integration software)

- Data Warehouse (7 years of data)
- Operational Data Store (2 months of data)
- Real-time Store (2 days of data)

ETL

- 250 Cubes (7 years of data)
- 100 Cubes (2 weeks of data)
- Reporting & Analysis Tools
- Operational and Tactical Dashboards
Direct Query Architecture

Screen elements linked directly to individual queries

Pros:
- Deploy quickly
- Low cost

Cons
- No depth, limited drill down
- No dimensions
- Hard-wired queries
Query and Cache Architecture

Pros:
- Deploy quickly
- Fast response
- Rapid navigation

Cons:
- Static data sets

Queries populate a queryable cache

- Data Warehouse
- Data Marts
- Mainframe
- Packaged Applications
- Phone System
- Reports
- Spreadsheets
BI tools provide query objects that represent a database in business terms for users.

**Pros:**
- Abstract query objects
- Dimensionalized views

**Cons:**
- Generic ODBC connections
- Primarily historical data in DW
Federated Query Architecture

An EII tool dynamically queries data from multiple sources to populate screen elements.

Pros:
- Multiple sources
- Semantic layer abstraction
- Quick to deploy
- Prototype before you persist

Cons
- No history
- Data quality issues
- Complexity
Dashboard queries its own persistent data mart loaded in batch.

**Pros:**
- Multiple sources
- Dimensional model
- Historical context
- Fast complex queries

**Cons**
- No right time data
- Non-integrated?
Event-driven Architecture

Operational Dashboard
- Data Capture, Data Aggregation, Metrics Management,
- Event Detection, Rule Processing, Agents/Triggers

**Inputs**
- Operational System
- Operational System
- Operational System
- Data Warehouse

**Outputs**
- Workflow Engine
- Operational Systems
- Triggers
- SQL/Stored Procedures
- Alerts

Enterprise Service Bus
- Historical Context
“Manual” Architecture

Use when….
• Data doesn’t exist
• Strategy is short-term
• Want to prototype the KPIs
• Executives can’t wait

But don’t be fooled…
• Permanent prototypes
• No scale, depth, value
• Reputations on the line!
Performance Dashboard
Case Studies
Operational Dashboard Case - Quicken Loans

• The largest U.S.-based online lender
  – $12 billion in loans in 2004, 2,500 employees
  – Sells mortgages via call center and Web

• Web Call Center in Livonia, Michigan
  – 500+ “mortgage lenders” on one giant floor
  – Disruptions costs millions of dollars an hour
Situation

• Company philosophy/culture
  – *What gets measured, gets approved*
  – *Leverage “velocity as a competitive problem”*

• Information systems – pre-2002
  – *Reports run off operational systems*
    • Run slowly, Deliver obsolete data
  – *Disjointed data for historical analysis*
    • Took three weeks to do 18-24 month analysis
  – *Executives and users very frustrated!*

• Negative view of data warehousing/OLAP
Solution

• Right-time data warehousing architecture
  – 1 year at $1 million
  – Trickle fed OLAP cubes
  – Existing ESB

• Different dashboards for different users
  – Dashboard ticker – mortgage specialists
  – Kanban reports – Sales managers, TV monitors
  – Managerial dashboards – Call center managers
  – Analytical dashboards/BI tools – Analysts

• Metrics
  – Phone statistics, Number and quality of leads, Sales pipeline, Web traffic, Commissions, products mix
Quicken Loans Architecture

- **Mainframe**
- **AS/400**
- **Packaged Applications**
- **Phone System**
- **Web**

**Messaging Backbone**
(Enterprise Application Integration software)

**Data Warehouse**
(7 years of data)
- 250 Cubes
- ETL

**Operational Data Store**
(2 months of data)
- 100 Cubes
- ETL

**Real-time Store**
(2 days of data)

**OLAP Cubes**
- (7 years of data)
- (2 weeks of data)

**Reporting & Analysis Tools**

**Operational and Tactical Dashboards**
Dashboard Ticker

Personal and group metrics updated daily

Personal and group metrics updated instantly

Personal forecasts updated every 15 minutes

User ID: MyUserName
Team: MyTeamName
Name: MyName
Date: 3/30/2005

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<td><strong>MTD (7 Day Lag)</strong></td>
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<td>Measure 2</td>
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<td>14.02 %</td>
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<td>Measure 4</td>
<td>12.55 %</td>
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<td>Measure 5</td>
<td>6.64 %</td>
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# Kanban Report

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<th>Date: 17-Dec-04</th>
<th>Metric 1</th>
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<th>Metric 3</th>
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</table>
Managerial Dashboard
Tactical Dashboard Case
International Truck and Engine

• $9.7 billion manufacturer of trucks, buses, diesel engines, and parts based in Illinois

• Key business issues:
  – *Market reality: Global competition, new regulations, emerging markets*
  – *Goals: 1) $15b in revenues 2) reduced costs, 3) improved quality, 4) reduced risk*
Situation

• Finance department goals in 2001:
  – *Provide access to financial information any time*
  – *Focus on analysis rather than data collection*
  – *Deliver proactive rather than reactive analysis*
  – *Use financial data as a predictive tool for decisions*

• Programs
  – *Accelerate closing of books*
  – *Standardize company’s information infrastructure*
  – *Replace legacy systems with packaged applications*
  – *Implement a Web-based “reporting portal.”*
KBI Portal

• Purpose
  – *Deliver actionable information to financial analysts*

• Scope
  – *Spans 32 source systems across five divisions*
  – *130 key business indicators, updated daily*
  – *Supports 500 financial executives, managers, and analysts*

• Upshot
  – *Bridges gulf between finance and operations*
  – *Replaces hodge-podge of paper reports*
  – *Saves analysts time creating custom reports*
  – *Shuts down dozens of reporting systems*
Architecture

**Purpose**

- Run the business
- Gather all data in one place. Keep a copy for future reuse.
- Integrate data for easy loading into OLAP cubes.
- Store data dimensionally to support fast queries and easy navigation.
- Display key metrics so they can be viewed at a glance.

**Data**

- **Source Systems**
  - Transactional
  - ETLTools
- **Staging Area Database**
  - Transactional
- **Star Schema Database**
  - Transactional & lightly summarized
  - ETLTools
- **OLAP Cubes**
  - Moderately summarized
  - Web Server
- **Reporting Portal**
  - Highly summarized
Analysis Layer
**Detail Transaction Layer**

```
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<th>Order Number</th>
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</table>

*Click* any VIN to expand full page order/build report
```
Personalization
Metadata

Cost of Poor Quality

Resource Information
Strategic Dashboard Case
Hewlett-Packard TSG

• HP Technology Services Group
  – Provides consulting, support services, and software globally for HP
  – $12 billion division of Hewlett Packard

• Situation
  – Dozens of overlapping reporting systems with inconsistent metrics
  – No consistent means of measuring regional and business unit performance against company objectives and holding individuals accountable
Solution

• HP Performance Measurement and Management System (PMMS)
  – *Executive scorecard (LIBRA) deployed to EMEA region in 2001, then globally thereafter*
  – *Cascaded down multiple levels in each region*
  – *Implemented unified reporting system underneath (MUSE)*

• Upshot: $26 million cost-savings in 3 years on $1m expenditure
  – *$8.6 million – Shut down dozens of report systems*
  – *$10.6 million – Reduced time spent looking for reports*
  – *$1.3 million – Training users on BI tools, etc.*
  – *Raised customer satisfaction scores, lowered missed service-level commitments, correlate to revenue*
PMMS Architecture

Value

Knowledge

"LIBRA" (OLAP)

"Balanced" Scorecards

"Unbalanced" scorecards

Information

"MUSE" (OLAP)

Scorecard Reports

Data

SOURCE DATA

(Databases, Spreadsheets, Files)

Operational Systems

Data Warehouses

Budgets, Surveys

Data Marts

Content

Value

Data

12 OLAP cubes updated monthly with 100MB of data

2,500 OLAP cubes updated daily to monthly with 200 GB of data, spread across four data centers

40 data sources, only exception conditions captured

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Monitoring Layer
Analysis Layer
Analysis Layer (cont.)
Reporting Layer
Rohm & Haas

• Company
  – $8 billion global chemicals manufacturer

• Impetus
  – CFO restructures finance to improve efficiency
  – Eliminate spreadsheets – offer consistent metrics

• Time and cost
  – First iteration: 12 months, $500k
  – Subsequent dashboards (12): $100k

• Tools – Custom built
  – SAP Portal, SAP Web Application Developer
  – Runs against SAP BW with Hyperion data imported
### Summary View

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<td>Volume (KGS)</td>
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<td>249,935 KGS</td>
<td>243,335 KGS</td>
<td>229,967 KGS</td>
<td>248,040 KGS</td>
<td>3,110 KGS</td>
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<td>Net Sales</td>
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<td>$ 635,232</td>
<td>$ 659,428</td>
<td>$ 617,109</td>
<td>$ 49,082</td>
<td>$ 24,885</td>
<td>$ 67,205</td>
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<td>3.6 %</td>
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<td>Gross Profit %</td>
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<tr>
<td>S &amp; A Expenses</td>
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<td>$ 54,098</td>
<td>$ 64,260</td>
<td>$ 67,313</td>
<td>$ 63,335</td>
<td>$ 182</td>
<td>$ 3,214</td>
<td>($ 763)</td>
<td>0.2 %</td>
<td>3.7 %</td>
<td>(0.9 %)</td>
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<td>$ 24,235</td>
<td>$ 23,255</td>
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<td>$ 21,658</td>
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<td>($ 285)</td>
<td>($ 2,579)</td>
<td>(2.4 %)</td>
<td>(1.2 %)</td>
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<td>Working Capital</td>
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<td>$ 2,257,754</td>
<td>$ 2,222,258</td>
<td>$ 2,283,842</td>
<td>$ 2,222,780</td>
<td>$ 54,805</td>
<td>$ 15,883</td>
<td>($ 44,924)</td>
<td>2.4 %</td>
<td>0.7 %</td>
<td>2.0 %</td>
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<td>Cycle Time (Days)</td>
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<td>126.7</td>
<td>129.8</td>
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<td>1.1</td>
<td>(1.3)</td>
<td>2.5</td>
<td>0.3 %</td>
<td>(1.0 %)</td>
<td>1.9 %</td>
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### Trend/Periodic Comparison

#### Periodic - Net Sales

- Periodic - Net Sales: CY, BP, Fost, PY

#### CY v PY Comparison - Net Sales

- CY v PY Comparison: CY Act v PY Act, CY BP v PY Act

- December 2004 to November 2005
- Rolling 12 Months
- Variance Contributors
- Summary/Margin Trend
- Chart Type
- Rolling Year

---

**People Data is now available for March 2006 (Apr-10)**

**Preliminary financials have been loaded for March 2005 (Apr-05)**
Railroad Company

• Impetus
  – Automate daily performance report (paper)
    • 120 page report, 45 measures, 4 levels, all locations
    • Reduce time spent analyzing data

• Time and Cost
  – First iteration: 7 months and $500k
  – Current view: 1.5 years and $1M

• Tools
  – Existing: Teradata, Essbase, Alphablox, ESRI
  – New: Treemap software (~$2k)
IBM

• Impetus - 1998
  – *Dueling spreadsheets in weekly sales meetings*

• Time and cost
  – *First iteration: 6 months, $200k*
  – *Became basis of BI and EDW initiative*
    • 25,000 users, thousands of reports, 40 dashboards

• Tools
  – *Lotus Notes (email, disconnected, unstructured)*
  – *Web portal for mid-level managers*
End to End Business Process

Dashboard designed to allow management by exception. Requires agreement across the enterprise on thresholds.
**Order Load Information:**

- **Storage:**
  - All areas significantly below historical range

- **Services:**
  - Closed 7 yr deal worth $xM with XYZ.

**Technology**

- Revenue coverage and Shipments below historical range

**Report Information**

- Who to contact? Jagdish D Sinha/Somers/IBM
- Report data notes
- Related reports (click on title to open)

Simple text based inputs. Updated as required.
Contact Information

Wayne Eckerson

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The Data Warehousing Institute
70 Martins Lane, Hingham, MA USA
781 740-9504
weckerson@tdwi.org