Performance Monitoring and Problem Identification with Performance Dashboard/Scorecard in a Business Intelligence Platform
Collaboration with the Center for ERP

- Center for Enterprise Resource Planning (ERP)
- Sample Research Prototypes
  - Performance Dashboard
  - Scorecard
- Collaboration Opportunities
ERP Center Profile

Corporations worldwide have focused on improving business processes for the past two decades. In their efforts to use information technology more effectively in enabling business processes, we have seen the emergence and growth of Enterprise Systems, and more recently, Extended Enterprise Systems such as Supply Chain Management (SCM), Customer Relationship Management (CRM), Strategic Enterprise Management (SEM), Performance Dashboards and Scorecards, and Business Intelligence.

Most Fortune 500 companies have already adopted Enterprise Resource Planning (ERP) systems and many midsize companies are also planning ERP implementations.

With a commitment to keep pace with these changes in business processes and technology, the Missouri S&T joined SAP University alliance, Oracle Academy, and Microsoft's University Alliance programs in order to continue and expand classroom
Faculty

• Dr. Bih-Ru Lea, Director, Center for ERP
• Dr. Vincent Yu
• Craig Claybaugh
• Dr. Ray Kluczny (Emeritus)
• Dr. Barry Flachsbart (Default graduate Advisor)
• Ms. Yu-Hsien Chiu (undergraduate Advisor)
• Mr. Ryan Sims, SAP Administrator
Software Resources

• SAP Products
  – SAP ECC Core
  – Customer Relationship
  – Business Intelligence
  – Supply Chain Management
  – Performance Dashboard
  – Business Objects
  – Business One (ERP software for small to Mid-size companies)
  – Portal
  – xRPM
  – etc.

• SAS
  – Statistics
  – Business Intelligence
  • Enterprise Miner
  • Text Miner

• Microsoft Dynamic (Microsoft’s ERP software)

• Microsoft Developer Tools

• Oracle
  – Database
  – Developer Suite
  – Application Server
  – E-Business Suite (in planning)
Enterprise Resource Planning (ERP) System

- ERP software systems facilitate decision making by capturing all corporate data and making it available to managers as usable information.
  - Vendors: SAP, Oracle/PeopleSoft and Microsoft.

Make Software Prototypes
# The Evolution of Performance Management

<table>
<thead>
<tr>
<th>21st Century</th>
<th>Scorecards</th>
<th>Business Intelligence</th>
<th>Dashboards</th>
<th>Six Sigma</th>
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</thead>
<tbody>
<tr>
<td>Late Twentieth Century</td>
<td>Shareholder Value</td>
<td>Competencies/ Capabilities</td>
<td>Business Process Reengineering</td>
<td>Customer Satisfaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Operational Improvement</td>
</tr>
<tr>
<td>Nineteenth Century</td>
<td>Management Accounting</td>
<td>Competitive Advantage</td>
<td>Comparative Benchmarking</td>
<td></td>
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<tr>
<td>Fifteenth Century</td>
<td>Double-Entry Bookkeeping</td>
<td></td>
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</tbody>
</table>

## Financial

## Strategic

## Operational
Performance Dashboard Applications

• Performance Dashboard
  A performance dashboard is a multilayered application build on a business intelligence and data integration infrastructure that enables organizations to measure, monitor, and manage business performance more effectively.

• A Performance Management System
  Translates the organization’s strategy into objectives, metrics, initiatives, and tasks customized to each group and individual in the organization.
Common Research Objectives

The objective of our research is to assess the effectiveness of using dashboard based and Balanced Scorecard based Performance Management System

– Impact of Data Visualization
– Effectiveness of the proposed system
– The degree of employee involvement
– The usability of the proposed system
– ...


http://erp.mst.edu  erp@mst.edu
Enterprise Resource Planning

Research > Live Demonstrations

ERP Center Profile
- Certificates
- Curriculum
- News
- Events
- Research
- Faculty and Staff
- Student Resources
- Recruiter Resources

ERP Demonstration
Assess Commercialization Feasibility of Bio-Energy with Dashboard Technology

Researcher: Madhur Chopra (mcgd8@mst.edu)
Research Advisor: Dr. Bih-Ru Lea (leabi@mst.edu)
Dr. Vincent Yu (yuwen@mst.edu)
Dr. Nathan Chen (a project for the Bureau of Energy at Ministry of Economic Affairs, Taiwan)
Role of Dashboard

• To provide a BIG picture
  • Performance comparison based on plant location
  • Evaluating and Monitoring the environmental benefits
  • Evaluate various production methods to find a cost effective solution
• and more...
Financial Perspective

Cost Overview and breakdown of Bio-Fuel production costs

The Bio-Fuel production process can be divided broadly into 4 sub processes namely Cultivation of rawmaterial, harvesting of rawmaterial, Floculation and finally the production of the Bio-Fuel.

A further breakdown of the cost of each sub process can be seen by selecting a production process from the "Cost Overview" chart.

A further breakdown of the cost can be seen by selecting a production process from the "Cost Overview" chart.
<table>
<thead>
<tr>
<th>Year</th>
<th>Hours of Sun Light</th>
<th>Temperature</th>
<th>Total Energy Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2,980.0 HR</td>
<td>7.362 C</td>
<td>3,686,133 KJ</td>
</tr>
<tr>
<td>2001</td>
<td>2,985.0 HR</td>
<td>7.386 C</td>
<td>3,688,827 KJ</td>
</tr>
<tr>
<td>2002</td>
<td>2,987.0 HR</td>
<td>7.229 C</td>
<td>3,011,443 KJ</td>
</tr>
<tr>
<td>2003</td>
<td>2,986.0 HR</td>
<td>7.175 C</td>
<td>3,576,870 KJ</td>
</tr>
<tr>
<td>2004</td>
<td>2,961.0 HR</td>
<td>7.753 C</td>
<td>3,523,203 KJ</td>
</tr>
<tr>
<td>2005</td>
<td>2,964.0 HR</td>
<td>7.360 C</td>
<td>3,644,043 KJ</td>
</tr>
<tr>
<td>Overall Result</td>
<td>17,846.8 HR</td>
<td>43,365 C</td>
<td>21,887,520 KJ</td>
</tr>
</tbody>
</table>
Enhancing Strategic Alignment with Dashboard and Scorecard: A Case Study

Researchers:

Yuh-Puu Han (yhan@mst.edu)
Juned Kazi, (S&T-Student)
Rutuja Honnattti

Research Advisors:

Dr. Bih-Ru Lea (leabi@mst.edu)
Strategic Planning

WHERE

How do we get there?

Business Plan

NOW

Where will we be in the future?

HOW

Strategic Planning
Develop a dashboard to facilitate COC’s strategic planning process.
Application of Dashboard Technology in Transportation Infrastructure Performance Management

Presenter: **Yuh-Puu Han** ([yhan@mst.edu](mailto:yhan@mst.edu))

Research Advisors:
- Dr. Bih-Ru Lea ([leabi@mst.edu](mailto:leabi@mst.edu))
- Dr. Vincent Yu ([yuwen@mst.edu](mailto:yuwen@mst.edu))
- Dr. Hojong Baik ([baikh@mst.edu](mailto:baikh@mst.edu))
Motivation for Research
Research Objectives

- Transforming collected traffic data (over 8,294,4000 daily records) into a multi-dimensional business information warehouse
- Developing dashboards for visualize traffic data for extracting hidden pattern and developing rules for decision making processes
- Incorporating dashboard and balanced scorecard technologies into the daily and long term performance management process
Traffic Control Dashboard Demonstration

This dashboard is developed for Interstate I-XXX traffic data. It is intended for:

- Accident Impact Assessment
- Highway Segment Improvement
- Determine Traffic Pattern

ACCIDENT IMPACT ASSESSMENT
- Traffic
- Speed
- Impact

HIGHWAY SEGMENT IMPROVEMENT
- Segment
- Improvement

DETERMINE TRAFFIC PATTERN
- Traffic
- Pattern

STATION
- M1270E000.90
- M1270E001.80
- M1270E022.40
- M1270E003.60

HOUR
- 17
- 18
- 19
- 20

Trafic direction

Traffic control analysis for different speed ranges:
- < 30 mph
- 30~60 mph
- > 60 mph

Overview (PDF)
Dashboard Overview (video)
Scorecard Overview (video)
Business Objects
- Bio-Fuel
- Traffic Data
- COC
- Sales Simulation
- Budget
- Corporate Dashboard Example
- Traffic Data Dashboard Example
- Sales Overview
- Stock Market
SAP
- Traffic Management Cockpit
- Scorecard
Management Cockpit: Civil Project Cockpit 3

Overall Speed and Volume Data
Detail Loop Speed, Volume and Occupancy Data
Tactical Dashboard

S2F2

% Difference

- Space Average
- Time Average
- Speed Difference (%)

S2F3

Number of Vehicles

S2F4

Number of Vehicles

S2F5

Speed (mph)

S2F6

Occupancy

Time (5 minutes)

Time (5 minutes)

Time (2 minutes)
Comparison of Dashboard based and Balanced scorecard based performance management system

Student: Lin Zhu
Thesis Advisor: Dr. Bih-Ru Lea

Graduate committee members:
Dr. Wen-Bin (Vincent) Yu
Dr. Xiaoqing (Frank) Liu
Current practices of CPM - Scorecard

Provides a high level overview
Provides accountability and traceability
Visualization of data results
Current practices of CPM - Scorecard

![Scorecard 'ThesisResearch_LinZhu': Analysis](image)

- Shows causal effect relationship among strategies, perspectives, objectives and measures.
Show the strategic linkages between objectives.
Impact of ERP Software...

70% + of the world economy's transactions in some shape or form touch an SAP system

65% of world-wide chocolate annual production (2.2 million tons)

Retail outlets transactions totaling $330 billion per day

50 million people worldwide with a Bank America credit card

Production of 32,000 car engines per day

5 million tons of Chemicals produced per day

Defense contracts totaling $1 trillion

Production of 40 million barrels of oil per day

107 countries

4 million tons of Chemicals per day

Utility bills annually

ERP is Cross Industries
Impact of ERP Software...

70% + of the world economy's transactions in some shape or form touch an SAP system.

65% of world-wide chocolate annual production (2.2 million tons)

Production of 32,000 car engines per day

Defense forces in 107 countries

Production of 40 million barrels of oil per day

Outlets transactions totaling 3 million per day

Production of 4 million tons of Chemicals per day

Now, add companies that run other ERP software (e.g., Oracle, Microsoft)

32,000

107

40 million

2.5 billion

3.8 million

1.5 billion

7.5% of world-wide annual beer production (1.5 billion hectoliter)

Processing of 2.5 billion utility bills annually

2.2 million

1 million

400 million

3.8 million
Impact of ERP Software...

In 2009...

- SAP has more than 95,000 customers across 120 countries.
- 85% of the Fortune 500 run SAP software.
- 80% of Fortune 1,000 companies run SAP software.
- 60% of Fortune 2,000 companies run SAP software.
- Approximately 64,000 SAP customers are small businesses or midsize companies.

ERP are implemented by both Profit-seeking and non-profit seeking.
Impact of ERP Software...

In 2009...

- SAP has more than 95,000 customers across 120 countries.
- 85% of the Fortune 500 run SAP software.
- 80% of Fortune 1,000 companies run SAP software.
- 60% of Fortune 2,000 companies run SAP software.
- Approximately 64,000 SAP customers are small businesses or midsize companies.

Now, add companies that run other ERP software (e.g., Oracle, Microsoft).
Collaboration with Center for ERP

Opportunities
Industry Research Collaboration

• Faculty Supervised Student Projects
  – Class projects
    • Shorter term (typically one semester)
    • Can be arranged to be related projects for different classes
  – Thesis and Research projects
    • Longer term (typically two to three semesters)
    • Can be single project for one student or related projects for a group of students

• Faculty Research Projects
Collaboration, HOW?

Bio-Energy Dashboard

Email erp@mst.edu for details