Developing Enterprise-Wide Measures for Tracking Performance of Acquisition Organizations

Wolfhart Goethert

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213-3890

Sponsored by the U.S. Department of Defense
© 2002 by Carnegie Mellon University
Purpose of Overall Effort

Develop a methodology to define enterprise-wide measures that reflect the “health” of a government organization that supports acquisition.

Apply methodology to ensure alignment between the enterprise-level goals of an organization and the measures used to characterize that organization's performance.

Use these measures as a guide to their overall performance and performance improvement effort.
Overview Outline

Methodology

Major components
• BSC
• GQ(I)M

Example use
• Initial measurement areas
• Indicators

Summary
Develop Strategic Goals

- Clarify mission & Vision statement
- Derive Sub-Goals
- Map Sub-Goals to each quadrant of the Balanced Score Card

For each BSC Quadrant

Apply GQ(I)M to:
- identify measurement areas
- develop measurement goals
- pose relevant questions
- postulate indicators
- identify data elements

Methodology Overview

Balanced Scorecard
- Financial
- Customer
- Internal Business
- Learning & Growth

Indicators

Data Elements
Major Components

GQ(I)M
• Align measures with goals; ensure measures selected will be used

Balanced Scorecard
• Ensure set of measures provides coverage of all elements of performance; avoid hidden trade-offs

Process Model of Performance
• Select measures that are most meaningful with respect to selected areas of performance; prefer outcome then output measures over process and input measures
A Balanced Scorecard Perspective on Performance

Source: A Management Guide for the deployment of strategic metrics, Ratheon
Success Vs Progress Indicators

Goal

Strategy to accomplish the goal

Success Criteria

Success Indicators

Analysis Indicators

Tasks to Accomplish goal

<table>
<thead>
<tr>
<th>Task 1</th>
<th>Task 2</th>
<th>Task 3</th>
<th>Task n</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Progress Indicators

© 2002 by Carnegie Mellon University
Identifying Potential Measures: A Process Model of Performance

Inputs → Process → Outputs

Potential Measures:
- Resources consumed
- Throughput, tasks
- Products and services
- Impact on customer or user
Identifying Potential Measures: A Process Model of Performance

Goal: Increase Customer Satisfaction

**Inputs** - dollars spent on customer service training, dollars spent on quality assurance

**Process** - number of work product inspections performed, number of tests performed

**Outputs** – number of new features released, resolution time for customer service calls

**Outcomes**: trends in customer satisfaction survey data, number of defects reported after release
Balanced Scorecard Perspective:
A Multi-dimensional view

Financial Perspective
Vision and Strategy
Internal Business Perspective
Innovation and Learning Perspective
Customer Perspective

Defining Indicators & Measures Based Upon Goals

GOAL(s)

Question 1          Question 2                    Question n

Reporting Periods
Total SLOC Planned
Weeks
Trouble Rpts Module
SLOC   Staff-hours  Trouble Reports  Milestone dates
Overview Outline

Methodology

Major components
• BSC
• GQ(I)M

Example use
• Initial measurement areas
• Indicators

Summary
Organization

Example based on aggregate of several organizations with similar characteristics

- Government agency consisting of 300 management, administrative, and technical personnel
- Development, maintenance and enhancement of system components of fielded systems, and acquisition
Use of Methodology - Example

**Mission**
Develop, acquirer, and maintain integrated software-intensive systems

**Strategic Goals**
- Clarify Mission and Vision
- Develop Strategic Goals
- Derive Sub-Goals
- Map sub-goals to each quadrant of the BSC

**Purpose**
- Clarify Mission and Vision
- Develop Strategic Goals
- Derive Sub-Goals
- Map sub-goals to each quadrant of the BSC

**Measurement Workshop**

**Sub-Goals**

**Internal Business**
- Quality deficiencies
- Available resources
- Etc.

**Financial**
- Funding stability
- Delivered costs
- Etc.

**Customer**
- Timeliness
- Responsiveness
- Communication
- Relationship
- Quality of products
- Etc.

**Learning and Growth**
- Enhance staff capability
- Improvement quality
- Etc.
Success Criteria

Balanced Scorecard

Financial • Sub-Goals
Customer • Sub-Goals
Learning & Growth • Sub-Goals
Internal Business • Sub-Goals

BSC Quadrant

<table>
<thead>
<tr>
<th></th>
<th>Strategic Sub-Goals</th>
<th>Success Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Business Process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning and Growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Success Criteria
Typical Questions Related to Sub-Goals

Customers’ Viewpoint
• What is important to our customer? What are the customers’ “hot buttons”? 
• How do our customers evaluate timeliness? 
• What does the customer consider a quality product? Are there any standards or goals currently set by the customer? 
• How and what do our customers currently evaluate our organization? 
• Etc.
Initial Measurement Areas

**Customer**
- Customer satisfaction with delivered product
- Compliance with customer requirements
- On time delivery

**Financial**
- Funding stability
- Trend in Expenses

**Internal Business**
- Availability and capability of resources (staff)
- Status of open deficiencies in delivered projects
- Timeliness of projects completion

**Innovation & Learning**
- CMM level
- Trend in employee satisfaction
- Meeting functional requirements
Measurement Areas to Indicators

GQ(I)M Methodology

Indicators
## Internal Business

**Status of Open Deficiencies in Delivered Projects**

<table>
<thead>
<tr>
<th>Severity Levels</th>
<th>Number of Deficiencies That Have Been Open x Days</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x &lt; 30</td>
<td>30 &lt; x ≥ 60</td>
</tr>
<tr>
<td>Severity 1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Severity 2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Severity 3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Severity 4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Severity 5</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Totals</td>
<td>20</td>
<td>13</td>
</tr>
</tbody>
</table>
## Internal Business
### Availability and Capability of Resources (Staff)

<table>
<thead>
<tr>
<th>E&amp;S</th>
<th>GOAL 40%</th>
<th>FY 99</th>
<th>FY 00</th>
<th>FY 01</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Entry Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Journeyman</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>High Grade</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tech</th>
<th>GOAL 45%</th>
<th>FY 99</th>
<th>FY 00</th>
<th>FY 01</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Entry Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Journeyman</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>High Grade</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other</th>
<th>GOAL 15%</th>
<th>FY 99</th>
<th>FY 00</th>
<th>FY 01</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Entry Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Journeyman</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>High Grade</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Internal Business
Timeliness of Project Completion

Completed Projects in Reporting Period

<table>
<thead>
<tr>
<th>Period</th>
<th>On Time</th>
<th>Late</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period 1</td>
<td>12 (44%)</td>
<td>3 (15%)</td>
</tr>
<tr>
<td>Period 2</td>
<td>15 (56%)</td>
<td>6 (44%)</td>
</tr>
<tr>
<td>Period 3</td>
<td>10 (40%)</td>
<td>10 (60%)</td>
</tr>
</tbody>
</table>

Legend:
- Green: on time or early
- Yellow: exceeded original schedule by less than 10%
- Red: exceeded original schedule by more than 10%
Summary of Initial Results

- Funding stability
- Trend in Expenses
- Avail. & capability of staff
- Status of open deficiencies
- Timeliness of project completion

- Satisfied with delivered Product
- Compliant with requirements
- On-time delivery

- Trend in employee satisfaction
- Meeting functional requirements
- CMM Level

Compliance with customer requirements

<table>
<thead>
<tr>
<th>Total Systems</th>
<th>Full Compliance</th>
<th>Partial Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
</tbody>
</table>

Funding stability
- Trend in Expenses
- Avail. & capability of staff
- Status of open deficiencies
- Timeliness of project completion

<table>
<thead>
<tr>
<th>Number of Deficiencies That Have Been Open x Days</th>
<th>Severity Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>x &lt; 30</td>
<td>30 &lt; x ≤ 60</td>
</tr>
<tr>
<td>Severity 1</td>
<td>2</td>
</tr>
<tr>
<td>Severity 2</td>
<td>4</td>
</tr>
<tr>
<td>Severity 3</td>
<td>3</td>
</tr>
<tr>
<td>Severity 4</td>
<td>4</td>
</tr>
<tr>
<td>Severity 5</td>
<td>8</td>
</tr>
<tr>
<td>Totals</td>
<td>20</td>
</tr>
</tbody>
</table>
Indicator Documentation

Documents the why, what, who, when, where, and how
Overview Outline

Methodology

Major components
  • BSC
  • GQ(I)M

Example use
  • Initial measurement areas
  • Indicators

Summary
Summary

The approach, using the BSC and GQ(I)M, provides a systematic way to obtain indicators and measures that reflect the health and performance of the organization.

The approach uses an organization’s vision and mission statements to identify and clarify strategic goals and sub-goals.

The sub-goals are mapped to the balanced scorecard.

The GQ(I)M methodology is then used to identify measures and indicators

Bottom Line
We tried it; It worked; Now maturing methodology
Develop Strategic Goals

- Clarify mission & Vision statement
- Draft Vision

Strategic Goals

Derive Sub-Goals

- Map Sub-Goals to each quadrant of the Balanced Score Card

For each BSC Quadrant

Apply GQ(I)M to:
- identify measurement areas
- develop measurement goals
- pose relevant questions
- postulate indicators
- identify data elements

Balanced Scorecard

- Financial: Sub-Goals
- Customer: Sub-Goals
- Internal Business: Sub-Goals
- Learning & Growth: Sub-Goals

Methodology

Mission → Draft Vision → Strategic Goals → Derive Sub-Goals → Map Sub-Goals to each quadrant of the Balanced Score Card

Indicators

Data Elements
Back-up Material
Some Definitions

Performance Management
“The use of performance measurement information to help set agreed-upon performance goals, allocate and prioritize resources, inform managers to either confirm or change current policy or program directions to meet those goals, and report on the success in meeting those goals.”

Performance Measurement
“A process of assessing progress towards achieving predetermined goals, including information on [efficiency, quality, and] outcomes….