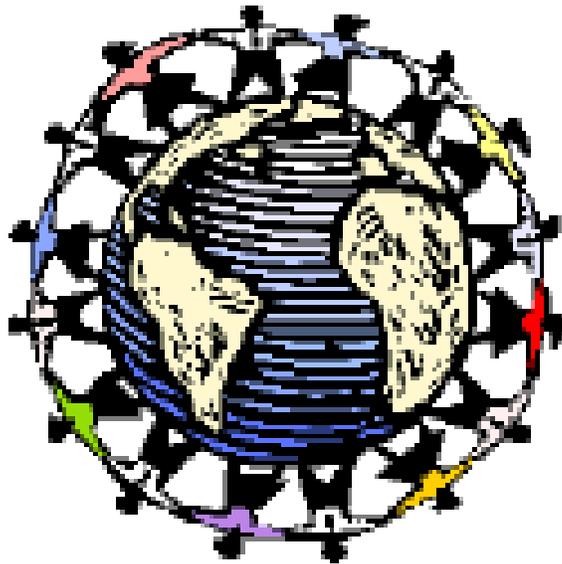




*GeoSpatial Enablement Strategy Appendix 3-  
Management Methodologies and  
Performance Measures*



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## **Appendix 3 – Management Methodologies and Performance Measures**

This appendix will describe the management methodologies and performance measure techniques KDOT has evaluated for various technology governance principles.

### ***1.1 Management Methodologies***

The following industry management methodologies were analyzed to determine if there was intrinsic value to the geospatial enablement effort.

1. Balanced Scorecard
2. COBIT
3. Intellectual Capital

#### **1.1.1 Balanced Scorecard**

The Balanced Scorecard defines a methodology to measure goals and initiatives, and a philosophy that assists in translating strategy into action. It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and results. When fully deployed, the balanced scorecard transforms strategic planning from an academic exercise into the nerve center of an enterprise.

The basic tenets of The Balanced Scorecard include assigning all business strategy and vision with respect to four perspectives. Those perspectives are:

1. Learning and Growth
2. Business Process
3. Customer
4. Financial

A brief overview of each of these will be discussed in the following paragraphs.

The Learning and Growth perspective includes employee training and corporate cultural attitudes related to both individual and corporate self-improvement. Due to rapid technological change, it is necessary for workers to constantly increase their knowledge foundation because ultimately the employees are the source of what drives how the technology is administered. Government agencies deal with hiring restrictions that limit their ability to recruit new technical workers. This factor, in combination with a decline in training of existing employees, has eroded technical skill sets. Metrics can be implemented to allow managers to devise strategies to properly allocate training funds where they will be of the greatest benefit. Learning and growth are essential building blocks for creating a knowledgeable work force.

The Business Process Perspective refers to internal business processes. Performance measures relating to this perspective allows companies to determine how well a business is functioning, and whether its goods and services are meeting customer expectations. These measures must be designed by those who have the most in-depth knowledge of their company's business processes and customer expectations. In addition to the strategic management process, mission-oriented processes, and support processes must be defined and analyzed.

The Customer Perspective deals with customer focus and satisfaction. This is very simplistic to measure, if ones customers are not satisfied they will find other suppliers more in line with helping them meet their objectives. In developing performance measures for satisfaction, customers should profile and their business processes studied.

The Financial Perspective centers around developing funding data as a priority. Steps must be taken to secure it. A centralize database should provide easier access to funding information. To much emphasis on financials leads to the unbalanced scorecard with respect to other perspectives.

KDOT has strategically analyzed this management methodology. In the KDOT Value Chain these perspectives are factored in the KDOT Strategic Information Technology Plan. In addition, the State of Kansas Strategic Information Technology Plan has embraced the philosophy of balancing these key business management components. This helps to align KDOT's IT and the State's IT management philosophies and policies.

### **1.1.2 COBIT**

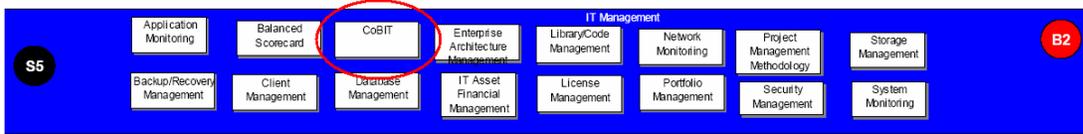
COBIT stands for Control Objectives for Information and related Technology. It is an open standard for control over information technology developed and promoted by the IT Governance Institute.

COBIT identifies 34 IT processes, a high-level approach to control over these processes, as well as 318 detailed control objectives and audit guidelines to assess the identified IT processes. COBIT defines general standards for reasonable IT security and control practices. These practices will support management needs in determining and monitoring the appropriate level of IT security for their organizations.

COBIT helps focus on performance management. It integrates principles of the Balanced Scorecard. This assists IT management in defining Key Goal Indicators to identify and measure outcomes of processes. In addition, Key Performance Indicators are formulated to assess how well processes are performing by measuring the enablers of the process. In many companies today, IT has become the major enabler of the e-business environment. This identifies a salient relationship between business

goals with their measures, and IT with its goals and measures. Figure 1 illustrates KDOT’s incorporation of this paradigm into its IT governance decision making.

**Figure 1 COBIT as a KDOT IT Management Principle**



KDOT has effectively evaluated this IT management methodology and grafted in its best practices. This is also reflected in how BCS has aligned its goals with that of KDOT’s in general. Table 1 provides a summary.

**Table 1 KDOT - BCS Goal Parallel**

	<b><u>KDOT</u></b>	<b><u>BCS</u></b>
<b><u>Goal</u></b>		
<b>CTP</b>	To provide a statewide transportation system to meet the needs of Kansas.	Work to align IT with KDOT’s core business processes.
<b>Private Sector Partners</b>	KDOT will build relationships with all of its non-government customers and partners.	Assume business partners and the public use our systems.
<b>Intergovernmental Partners</b>	KDOT will enhance its relationship with all of its intergovernmental customers and partners.	To provide systems that are easy for business partner use of our systems.
<b>Technology Usage</b>	KDOT will optimize technology to improve overall department operations.	Work to help KDOT innovate through the effective use of technology and process improvement.
<b>Workforce Optimization</b>	KDOT will maximize the effectiveness of its workforce.	Ensure information is available to all who should have it.

### 1.1.3 Intellectual Capital

Intellectual capital can be comprised of intangible assets such as employee knowledge, patents, and research. These types of assets are entering usage as tools to strengthen an agencies position with their constituents. Various research initiatives estimate that spending on intangible assets like research and development and employee education can result in a return eight times greater than an equal investment in equipment and facilities.

Knowledge is useful information about things that are essential to any Company. These can consist of variables such as its customers, competitors, and product

business strategies. Knowledge management entails capturing and leveraging valuable information and disseminating it for use by other people throughout the company. Knowledge management also addresses aggregating information into "components" which when combined and modified. These components can then be used in other departments within a company in a totally different context.

In addition, how does KDOT define and measure success with regards to intellectual capital? What can be defined as viable measures of KDOT's intellectual capital? Let's revisit some of the aforementioned components. David Skyrme has devised an increasingly popular classification divides intellectual assets into three categories:

1. **Human Capital** - that in the minds of individuals: knowledge, competences, experience, and know-how.
2. **Structural Capital** - "that which is left after employees go home for the night": processes, information systems, and databases.
3. **Relationship (or Customer) Capital** - customer relationships, brands, trademarks.

These classifications schemes may vary from organization to organization but provide a framework for KDOT and other companies to categorize intellectual capital investment. Also, there is a paradigm of thought that separates out assets protected by law. Many companies, Intergraph included, have formed Intellectual Property divisions. These areas would deal with the protection trademarks, patents, copyrights, and licenses. KDOT may seek to ensure proper protection of published works within the transportation industry. This would be an example of "intellectual property."

Performance measure for intellectual capital should not be static. These measures should help managers identify the underlying cause and effect. Scorecards should be devised to help an organization to understand its intellectual capital.

Skyrme has identified several success stories in devising strategies and scorecards to measure and manage intellectual capital. Among these that have successfully applied enhanced measures are:

1. Skandia AFS - use its Navigator (90 measures in 5 groups) and other tools to set management goals and drive the business forward. It published *Intellectual Capital Supplements* alongside its twice-yearly financial reports from 1994-1999.
2. Dow Chemical - has focused specifically on understanding the value in their patent portfolio. Using the Technical Factor method of Arthur D. Little, alongside their own management model, they have generated over \$125m new revenues from their patents.

3. Austrian Research Centers, Seibersdorf - developed an IC report to provide better information to its stakeholders that also revealed greater insights into its internal knowledge processes.
4. Systematic Software Engineering, Denmark – stated its IC report helped raise the organization's profile, attracting more customers and highly skilled employees.

These organizations have found it gives them a better understanding of the drivers of value and it also improves management and growth of these vital assets. KDOT should consider any technique to strengthen the dissemination of knowledge process throughout the enterprise. In addition, techniques or strategies to enhance the ability to recruit the level of skill necessary for KDOT to meet enterprise goals should be considered.

## ***1.2 Performance Measures and Success Indicators***

This section will address the following:

1. FHWA Performance Measures
2. KDOT Critical Success Indicators

### **1.2.1 FHWA Performance Measures**

FHWA has defined performance measurement as the process of assessing progress toward achieving predetermined goals, including information on the efficiency with which resources are transformed into goods and services (outputs), the quality of those outputs (how well they are delivered to clients and the extent to which clients are satisfied) and outcomes (the results of a program activity compared to its intended purpose), and the effectiveness of government operations in terms of their specific contributions to program objectives.

Performance measures being universally embraced for highway systems to monitor the effectiveness of operational strategies and to evaluate the success of achieving agency targets. Performance measures of operational effectiveness are used in the planning and systems engineering to prioritize projects, convey feedback on how effective long-term strategies have been, tune goals and objectives, and improve processes for the delivery of transportation services. Performance measures in planning are used in reporting trends, conditions, and outcomes resulting from improvements to the transportation system.

Pickrell and Neumann stated at the TRB 2000 meeting some of the reasons for adopting performance measures are:

1. Accountability - They provide means of determining whether resources are being allocated to the priority needs that have been identified.

2. Efficiency - They focus actions and resources on organizational outputs and the process of delivery.
3. Effectiveness - In regards to goals achievement, they provide a linkage between ultimate outcomes of policy decisions and actions of a transportation agency.
4. Communications – They allow better information to customers and stakeholders on progress toward goals and objectives or system performance problems.
5. Clarity - They lend clarity to the purpose of an agency’s actions and expenditures.
6. Improvement – They aid in periodically refining programs and service delivery based on system monitoring.

The Office of Management and Budget has constructed some criteria for defining performance measures. Among those are:

1. They must be tied to a specific goal or objective.
2. Data requirements such as the population and the metric will include the frequency of measurement and data sources.
3. The calculation methodology will include required equations and definition of key terms.
4. A clear data collection plan that helps streamline the data collection processes.

Table 2 presents some common performance measures for measuring effectiveness of a highway system:

**Table 2 Common Performance Measure for a Highway System**

<b>#</b>	<b><u>Performance Measure</u></b>	<b><u>Definition</u></b>
1	Commercial vehicle safety violations	Number of violations issued by law enforcement based on vehicle weight, size, or safety.
2	Congestion cost per capita	Annual “tax” per capita
3	Congestion cost per eligible driver	Annual “tax” per driver
4	Delay caused by incidents	Increase in travel time caused by incidents.
5	Delay per capita	Annual time per person
6	Delay per eligible driver	Annual time per driver
7	Density	Passenger cars per hour per lane
8	Duration of congestion	Period of congestion
9	Evacuation clearance time	Reaction and travel time for evacuees to leave an area at risk
10	Incidents	Traffic interruption caused by a crash or unscheduled event

#	Performance Measure	Definition
11	Level of service (LOS)	Qualitative assessment of highway point, segment, or system using “A” (best) to “F” (worst) based on effectiveness.
12	Percent of system congested	Percent of miles congested (usually based on LOS E or F).
13	Percent of travel congested	Percent of vehicle-miles or person-miles traveled.
14	Rail crossing incidents	Traffic crashes that occur at highway–rail grade crossings.
15	Recurring delay	Travel time increases from congestion, but does not consider incidents.
16	Response time to weather-related incidents	Period required for an incident to be identified/verified and for action to alleviate the delay to traffic to at the scene.
17	Roadway congestion index	Cars per road space
18	Security for highway and transit	Number of violations issued by law enforcement for acts of violence against traveler.
19	Speed	Distance divided by travel time.
20	Toll revenue	Dollars generated from tolls.
21	Traffic volume	Annual ADT, peak-hour traffic, or peak-period traffic.
22	Travel costs	Value of driver’s time for a trip and expenses incurred during the trip (ownership, operating expenses, tolls, or tariffs).
23	Travel rate index	Amount of extra travel time
24	Travel time	Distance divided by speed
25	Travel time reliability	Definitions include: 1) variability of travel times, 2) % of travelers arriving at destination in acceptable time, 3) range of travel times.
26	Vehicle-miles traveled	Volume times length
27	Vehicle occupancy	Persons per vehicle
28	Wasted fuel per capita	Extra fuel due to congestion
29	Wasted fuel per eligible driver	Extra fuel due to congestion
30	Weather-related traffic incidents	Traffic interruptions caused by inclement weather

The FHWA recently endorsed a series of steps to define performance measure. These steps originated from research by the U.S. General Accounting Office. The steps consist of:

1. Define mission and goals (include outcome-related goals):
  - Involve key stakeholders in defining missions and goals.
  - Identify key factors that could significantly affect the achievement of the goals.

- Align activities, core processes, and resources to help achieve the goals.
- 2. Measure performance:
  - Measures at organizational levels that demonstrate results based on a vital indicators for each goal at that level,
  - The measures should respond to multiple priorities, link to responsible programs, and not be costly.
  - Collect complete and consistent data to document performance. It must support decision-making at various organizational levels.
  - Report performance information in a useful way.
- 3. Use performance information:
  - Use performance information for managing the agency or program to achieve goals.
  - Communicate performance information to key stakeholders and the public.
  - Demonstrate program performance.
  - Support resource allocation and other policy decision-making.
- 4. Reinforce performance-based management:
  - Devolve decision making with accountability for results.
  - Create incentives for improved performance.
  - Build expertise in strategic planning, performance measurement, and use of performance information in decision-making.
  - Integrate performance-based management into the agency culture and activities.

### 1.2.2 KDOT Critical Success Indicators

KDOT tasked an internal team during 2003 to define enterprise wide critical success indicators (CSI) for the state transportation system. These indicators functions as conditions or measures that must be satisfied to ensure KDOT programs are delivering a sufficient transportation system to the citizens of the state of Kansas.

The overarching CSI's that were defined for KDOT are as follows:

1. **Provide a statewide transportation system to meet the needs of Kansas.** This is judged a success when:
  - The overall condition of the State Highway System (SHS) improves or remains at a favorable condition.
  - Added traffic demands on the SHS are managed without a decrease in the service level.
  - Crash and/or fatality rates decrease or remain constant on the SHS.
  - The physical condition of public use airports shows improvement.
  - The physical condition of short-line rail infrastructure supports safe and efficient movement of goods throughout Kansas.
2. **Organizationally KDOT is successful when:**

- Schedules and budgets are met for construction programs.
  - Department operation costs remain at or below current level (factored inflation).
  - When legal actions against KDOT decrease.
  - Employees are productive and have a sense of fulfillment.
3. **KDOT successfully satisfies our customers when:**
- The public is satisfied with the level of service of the system.
  - Business partners and KDOT have a mutually beneficial relationship.
  - The public believes KDOT is providing proper services for their tax dollars.

KDOT has established specific success indicators to support the enterprise wide performance measures mentioned above. These indicators address the following operational aspects of KDOT's business processes:

1. **Highway Maintenance.** This consists of success factors for:
  - Pavement Management – Performance levels for the SHS
  - Maintenance Quality Assurance - Measures the overall impact of cumulative maintenance activities on the LOS being provided to the traveling public.
  - Bridge Health Index - A 0-100 ranking system that functions as a performance measure to communicate the condition of a bridge. In 2002 KDOT used the this index as a performance measure for GASB34 reporting.
2. **Highway Capacity.** KDOT has established the following criteria for LOS to measure success:
  - Density, in terms of passenger cars per mile per lane;
  - Speed, in terms of mean passenger car speed;
  - Volume to capacity ratio.
3. **Highway Safety.** Measures have been established for the following areas:
  - Work Zone/Work Zone Accident Statistics – Methods used to enhance work zone safety include public education and awareness programs.
  - Highway Rail Crossings/Crossing Accident Rates – KDOT is involved with several public education programs that have seen a dramatic decrease since 1999 in the crash rate for at-grade crossings. Among these are:
    1. Operation Lifesaver
    2. Positive Enforcement
    3. Partnership with Northern Santa Fe and Union Pacific Railroads.
  - State Highway/Injury and Fatal Crash Rates – KDOT tracks crashes that involve injuries and fatalities that occur on the SHS. The Injury Crash rate conveys the overall number of injury crashes per million miles traveled by people on the SHS. The Fatal Crash rate is the number of crashes with fatalities per hundred million miles traveled by people on the SHS.

4. **Public Transportation.** Success indicators were established for the following modes:
  - o Transit Ridership - Under the CTP, funding for the Coordinated Public Transportation Assistance Fund program was increased from \$1 million per year to \$6 million per year. The funding targeted underserved areas of the State in order to provide vehicles for medical transportation, expand and enhance future public transit needs.
  - o Airports - The Runway Pavement Condition Index is an overall average condition index of public-use runways in Kansas. The index starts with 0 - failed rating, to 100 - excellent rating. A good rating (from 56 to 70) is acceptable.
  - o Rail - The State Rail Service Improvement Fund (SRSIF) provide short-line railroads operating in Kansas with low-interest, 10-year revolving loans. This program resulted in the following:
    4. 2000 – 2002: Thirteen rehabilitation projects and one acquisition project.
    5. 2003: Ten infrastructure rehabilitation projects and one acquisition.
5. **Highway Construction Program.** Success indicators were established to evaluate the following:
  - o State Highway Program - Is evaluated by four specific indicators:
    1. Total Program Beginning Estimate,
    2. Total Program Current Estimate,
    3. Cumulative-to-date Beginning Estimate,
    4. Cumulative-to-date Actual.
  - o Projects Scheduled vs Actual Lets. Classification criteria as follows:
    1. Program type:
      - Substantial Maintenance,
      - Major Modification,
      - Priority Bridge,
      - System Enhancement,
      - Total Program.
    2. Projects are classified each quarter as:
      - Let early,
      - Let on time,
      - Number of months late (1-3 months, 4-6 months, or greater than 7).
  - o Change Orders - This is a very significant factor for determining how successful KDOT has been throughout a highway project's life cycle (design through construction).
    1. Percentages measured for:
      - The total program,
      - Substantial Maintenance,
      - Major Modification,

- Priority Bridge.
- 2. KDOT has established a measure of 2% of all projects potentially will have an unexpected change.
- o Federal Fund Usage. KDOT's goal is to get actual federal funding obligations as close to planned obligations as possible. Performance goals for several categories of highway are evaluated accordingly:
  1. Actual Obligation as a Percent of Original Planned Obligation (close to 100.0 % as is possible).
  2. Planned Obligation versus the Actual Obligation of Federal Funds.
  3. Construction Engineering costs as a % of total construction costs (7.5%).
  4. Cumulative Construction Engineering Percentage.
  5. Preliminary Engineering (PE) costs.
  6. Cumulative Preliminary Engineering Percent.
- 6. **Capital Improvement Building Program.** Success indicators were established to evaluate the following:
  - o Building Improvement Program - Is designed to depict the results of KDOT's Building Improvement Program (BIP).
  - o Dollars Appropriated.
- 7. **Legal Actions.** Categories that indicators were devised for are:
  - o Legal Activities and Costs - Indicators for these two categories are:
    1. The number of tort claims filed against KDOT and those still pending,
    2. The dollar loss resulting from settlement of those claims,
    3. The costs of private legal counsel,
    4. The costs of the Office of Chief Counsel.
  - o Trends of Legal Actions.
- 8. **Worker Safety.** Success indicators established as follows:
  - o Work-Related Accidents includes the following measures:
    1. The total number of accidents reported and the dollars accumulated-to-date.
    2. The lost time due to accidents in districts.
- 9. **Workforce Levels.** Success factors that are measured and analyzed are as follows:
  - o Leave Usage by Area - Indicators for measured are:
    1. Number of full-time employees in each office/bureau/district.
    2. Average vacation leave taken per person in the office/bureau/district .
    3. Average sick leave taken per person in the office/bureau/district.
  - o Turnover Rate – The % of employees terminated, retired, or transferred from an organization to the number of employed workers.
- 10. **Contractors.** Disputes occasionally arise with its highway construction contractors.