A Study For
THE OFFICE OF LEGISLATIVE OVERSIGHT
Montgomery County, Maryland

AUGUST 1995

Developing Performance Measures For Montgomery County Maryland Information Technology Projects

National Academy of Public Administration

1120 G Street, N. W., Suite 850
Washington, DC 20005
202-347-3190
FAX 202-393-0993
Internet: napa@tmn.com

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Project completed under
Montgomery County, Maryland
Purchase Order PO 50300001

STAFF

Miriam F. Browning	*Project Director* *Director, NAPA Center for Information Management*
Patrice Keough Gibson	*Senior Research Associate*
Jennifer A. Hughes	*Senior Consultant*

NATIONAL ACADEMY OF PUBLIC ADMINISTRATION REVIEW COMMITTEE

R. Scott Fosler	*President, National Academy of Public Administration*
Barbara R. Dyer	*Director, Alliance for Redesigning Government*
Christopher G. Wye	*Director, Program for Improving Government Performance*

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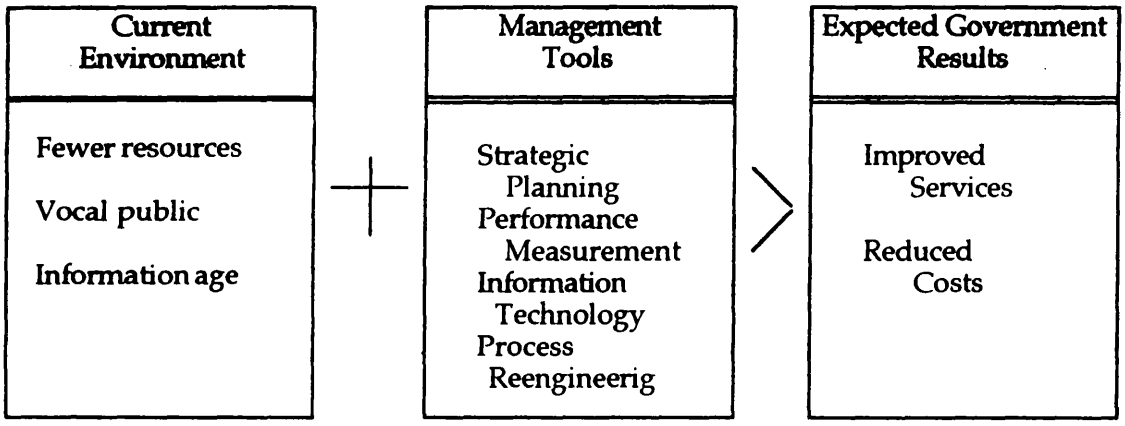
1. INTRODUCTION

An environment of decreasing resources, a more vocal and sophisticated public, and the demands of the information age have forced government, at all levels, to improve its services and reduce costs. Government decision makers are seeking to understand and use new management tools in the planning, development, implementation, and communication of major government projects. Key management tools include strategic planning, performance measurement, information technology, and business process reengineering. (See Exhibit 1.)

EXHIBIT 1
A MODEL FOR IMPROVING GOVERNMENT PERFORMANCE



Strategic planning is a process by which decision makers in cooperation with other stakeholders can:

- Analyze the situation;
- Articulate vision, mission, goals, and objectives;
- Develop strategies to achieve the vision and goals;
- Develop specific performance measures;
- Implement, monitor, and assess programs and performance measures; and
- Communicate results to the public and other stakeholders.

Introduction

Performance measures are metrics agreed upon and used by decision makers and other stakeholders to improve program performance, reduce costs, and/or communicate program value.

Information technology is the computers and telecommunications that can help managers improve government services and reduce costs. However, information technology's enabling nature must be leveraged by the programs which use it. For example, the speed of a computer is less important than its ability to be part of an information system that delivers a government check in three days instead of three weeks. More importantly, the performance of that system is directly related to its accomplishing program goals (performance measurement) and how well the results meet user needs (business process reengineering).

The County Council's Office of Legislative Oversight, Montgomery County, Maryland has asked the National Academy of Public Administration for assistance in developing specific processes and metrics related to performance measurement and information technology (IT). Specifically, the Office of Legislative Oversight asked NAPA to:

- Describe a generic process for developing program outcome measures and modifications to that process appropriate for major information technology projects;
- Identify program outcome measures that could be used for the Montgomery County Public Schools' Global Access Project, the Public Safety 800 Megahertz Trunked Radio Project, and the Health and Human Services Community Services Workstation Project;
- Describe the process that could be followed to use technology to consolidate a function common to multiple agencies, taking into account budgets, savings, and benefits; and
- Describe the steps that could be followed to use technology to link participants to a common process, again taking into account budgets, savings, and benefits.

NAPA used its existing data bases and sources and data from interviews with project personnel in Montgomery County and their counterparts in similar projects throughout the nation to develop general guidelines for the tasks. NAPA also interviewed five Montgomery County Council members concerning their views and expectations of the projects. In addition, as requested by the contract, NAPA integrated into this report examples from government and business to illustrate the successful use of performance measures in achieving program results. It is important to note that Montgomery County is, in many ways, a leader in seeking to develop *outcome-based* performance measurement systems for information technolog programs.

Business process reengineering (BPR) is a methodology that critically examines, rethinks, and redesigns mission products and services within the political, economic, and social environment of an organization. BPR's process orientation crosses boundaries between organizational subunits or functions and often crosses organizational boundaries as well, involving other organizations or individuals in mission delivery. A business process is a collection of related structured activities that produces a specified service or product for a customer.

PERFORMANCE MEASURES: DEFINITIONS

The introduction of new technology or business practices involves developing a common language describing its important aspects. For practical application of performance measurement systems to projects, it is important that individuals involved in developing those systems share a common language. Definitions from a variety of sources of common terms related to performance measurement are contained in Exhibit 2.

EXHIBIT 2
PERFORMANCE MEASUREMENT DEFINITIONS

Performance measure: Data on inputs, processes, outputs, or outcomes of a program used to help stakeholders understand the program's accomplishments, shortcomings, and value

Performance management: Use of data (including performance measures and program evaluations) as part of a management cycle including planning, implementing, reviewing and revising programs to improve productivity

Stakeholders: Individuals with an interest in program performance including elected officials, managers, workers, customers, and the public

Input measure: Resources, time, and/or staff used for a program

Output measure: Products or services produced as a result of a process

Outcome measure: Measures which indicate the extent to which program or customer objectives have been achieved. An example is customer satisfaction.

Benchmark: Metric to which measures are compared. Benchmarking often connotes comparison against programs recognized as "best practices" in the field.

Productivity: A concept that relates the level of outputs to the level of inputs used in their production

Efficiency: Measure of the relationship of outputs to inputs usually expressed as a ratio. Sometimes characterized as *doing things right.* Can include unit costing, work measurement (standard time for a task), labor productivity (ratio of outputs to inputs), and cycle time.

Effectiveness: Measure of output conformance to specified characteristics. Sometimes characterized as *doing the right thing.*

Source: *Managing Technology for Results*, NAPA, 1994 and
A Guide to Designing Performance Indicators, NAPA, 1993.

INFORMATION TECHNOLOGY: DEFINITIONS

As the discussion of performance measurement requires knowledge of the pertinent terms, discussion of information technology also requires knowledge of a common vocabulary. Terms relevant to information technology are included in Exhibit 3.

EXHIBIT 3
INFORMATION TECHNOLOGY DEFINITIONS

Information resources: The people, equipment, dollars and information technology used in the collection, processing, maintenance, use, sharing, dissemination, or disposition of information

Information management: The process of managing information resources to accomplish an organization's missions and to improve organizational performance

Information system: A discrete set of information resources, whether automated or manual, that are organized for the collection, processing, maintenance, use, sharing, dissemination, or disposition of information in accordance with defined procedures and relationships. An information system can include both computer and telecommunications systems.

Information technology: Any equipment or interconnected system or subsystem of equipment, software, services, satellites, sensors, computer system, or telecommunications system that is used in the acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the organization

Source: Information Technology Management Reform Act of 1995 (Senate Bill S.946).

Performance measures can be used appropriately at all stages in the life cycle of an information technology project. Before the introduction of new IT projects, performance data are obtained for the existing program. For each stage in the life cycle, the project manager in cooperation with other stakeholders defines relevant outcome measures and compares them to the current system or environment. Performance measures for cost, schedule, and contractor performance are identified and analyzed at each stage as well as for the overall project. As the program is fully implemented, metrics are used to plan for improvements or changes and to communicate program value to stakeholders.

DEVELOPMENT OF PERFORMANCE MEASURES

Strategic planning and performance measurement are part of a management cycle which includes policy making, program implementation, assessment and revision. Success in implementing them requires a major shift in thinking. To develop performance measures, policy makers and other stakeholders form a team committed to the formulation of goals that stretch organizational performance and may require major process changes.

In addition to representing various viewpoints of a project, the team should have members with the following specific skills and knowledge:

- Understanding of the program's history, politics and context;
- Knowledge of program operations and costs;
- Skills in program analysis;
- Skills in information collection and analysis;
- Skills in reporting and communication;
- Understanding of performance measures;
- Understanding of how to work on a team; and
- Flexibility and creativity.

Teams composed of representatives from the program's external and internal constituencies are included in strategic planning, business process reengineering, performance measurement, and the design of information technology projects. It is also important that top management commits resources, effort, and its personal support to the program and process changes.

Throughout the management cycle, different individuals may lead the team because of their specific expertise. Developing and using performance measures requires a learning process for all involved, but the long-term rewards are great. Data from performance measures can be used to improve services, reduce costs, strengthen accountability for results, and communicate program value to stakeholders.

STAKEHOLDERS

Stakeholders are individuals or groups of individuals who have an interest in the project or program. Stakeholders can include but are not limited to elected officials, managers, other employees, business and interest groups, non-profit organizations, customers, and the public. The appropriate stakeholder individuals or groups who participate in any process or project (strategic planning, BPR, information technology project) are typically determined by the individual in charge of that process or project. The basic criteria for selection is an interest in the outcome of the process or project. Any particular phase of the process or project may include more or less stakeholders.

2. STRATEGIC PLANNING AND PERFORMANCE MEASUREMENT

Strategic planing is the process that steers organizational change by framing choices related to mission, identifying future opportunities and shortfalls, and involving uncontrollable environmental factors. The strategic planning cycle begins by gaining the commitment of top management, staff and other stakeholders to the process and necessary follow-on activities. Sufficient time and resources must be allowed for these people to develop strategic plans.

Once personnel and resources are in place, it is important to establish an overall plan outline, a realistic plan period, and a mission statement. Strategic plans can encompass the work of the entire agency or may involve individual programs that can best be managed as separate entities. Time frames for the strategic plan depend on budgeting cycles or calendar cycles, the expected life of equipment, or the availability of resources.

The mission statement is the foundation of the strategic plan. It tells what activities the organization will carry out, why, for whom, how, and when. These elements of the strategic plan are reflected in the performance measurement system. In recent years, the customer focus has become one of the priority elements in developing mission statements. Consensus must be reached on the organization's mission statement before team members develop strategic plans or performance measures associated with the strategic planning model.

Once the basics are in place, team members implement a six-phase strategic planning cycle. (See Exhibit 4).

- **Analyze the situation.** The team uses available data to look at where the program is or potential clients are in terms of the mission. To do this analysis, or environmental scan, the team gathers facts and analyze trends to help them understand the program context and where the program stands relative to stakeholder requirements. These requirements are related to factors such as customers' demand for services, the organization's core competencies, ability to adapt to change, and resources.

- **Articulate vision, mission, goals, and objectives.** The vision statement answers the question "What do you want to see in place if our program is successful?" and defines potential outcome measures. Mission, goals, and objectives are then formulated to achieve the vision. They are typically linked to customer satisfaction, service quality, cost reduction, and specific program improvements.

- **Develop strategies.** In this step, the team asks "How can we reach our goals?" It includes discussion of the opportunities for and barriers to progress. Strategies focus on the long term program outcomes with the identification of specific steps

to take to achieve strategic goals. At this time, the team determines if change is needed and the extent of that change.

- **Develop performance management plans.** The team determines specific goals, possibly expressed in quantifiable terms. Performance measures include outputs, outcomes, service levels, bases for comparisons, and validation techniques.

- **Implement, monitor and assess performance measures.** Program/project managers begin the initial implementation of action plans and test performance measurement systems. Gathering and analyzing pilot data and developing presentation formats are the key steps in the initial monitoring effort.

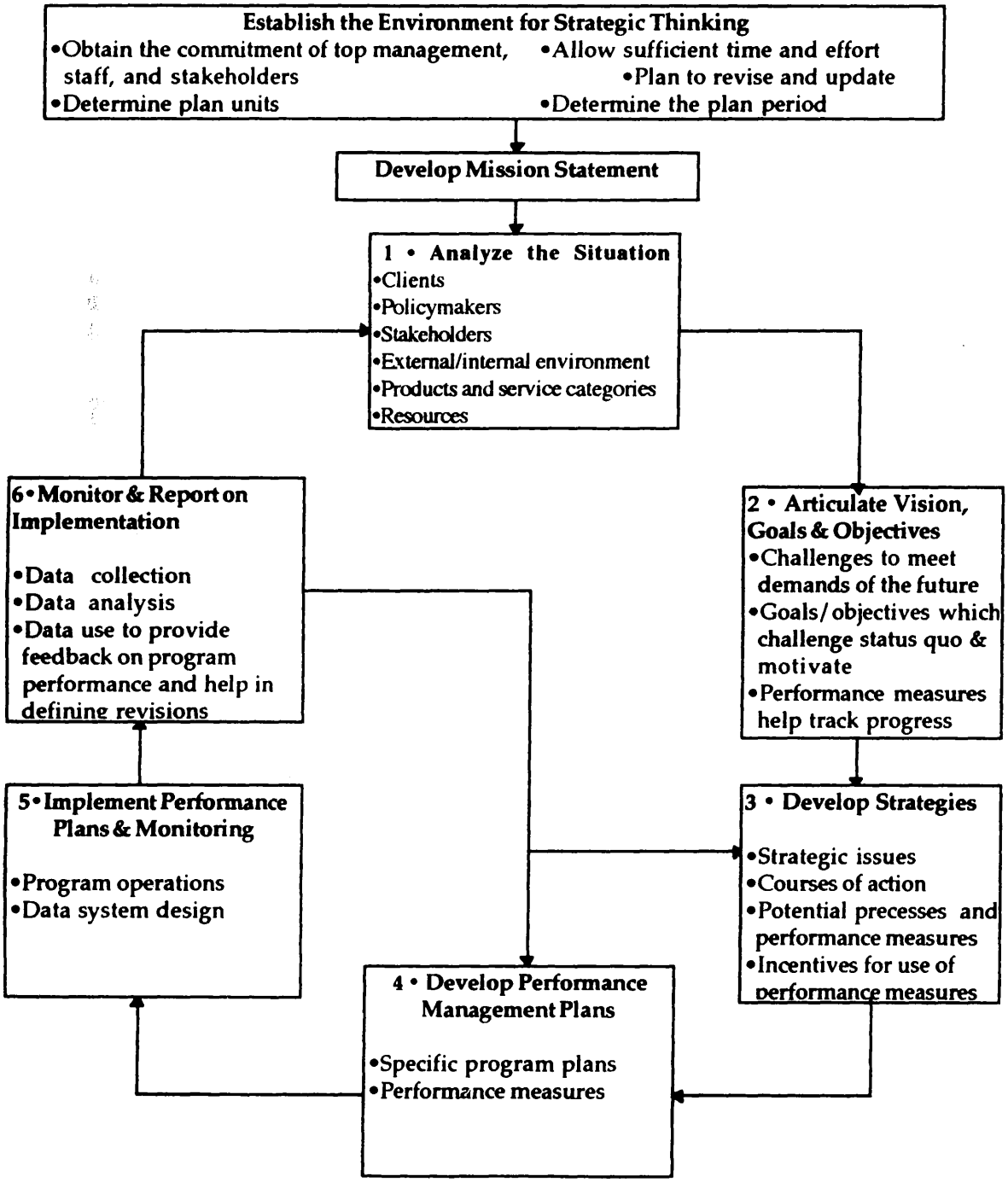
- **Report on program implementation and provide feedback.** At this point, the cycle returns to the initial analysis stage. Performance measures are one form of program data which program managers can use to make changes to the program, or to communicate the program's value to policy makers and other stakeholders.

THE ROLE OF PERFORMANCE MEASUREMENT IN THE STRATEGIC PLANNING CYCLE

Performance measures are part of each phase of the strategic planning cycle. They are used in the analysis of program status and future needs, prioritization of resources, and assessment of program results. Performance improvement is based on successive cycles. Stakeholders are involved in each of these cycles.

Performance measurement is a cycle nested within the strategic planning process. Performance measures are an important part of the entire strategic plan and cannot be separate from mission, goals, and implementation strategies. After mission and goals are clearly developed, stakeholders use this information to begin the performance measurement cycle.

EXHIBIT 4
THE STRATEGIC PLANNING AND PERFORMANCE MEASUREMENT CYCLE



Source: *Strategic Planning and Performance Measurement*, NAPA, 1993.

A PERFORMANCE MEASUREMENT CAVEAT

Multiple social, political, and economic factors affect citizens every day. It is difficult if not impossible to assess the effect of any one of these programs in isolation. Therefore, performance measures do not necessarily establish a causal relationship between the program and outcomes on customers. For example, increased availability of information technology in secondary schools may coincide with an increase in SAT scores. However, students in those schools are likely to have been affected by other factors as well such as increased teacher training, new methods, or revised SAT standards. Therefore, the availability of information technology, by itself, is not the cause of higher SAT scores.

3. PERFORMANCE MEASUREMENT

Performance outcome measures are part of an entire system of measures which can be used to analyze all aspects of a program--inputs, processes, outputs, outcomes, efficiency, and effectiveness. Recently, there has been increased emphasis on reporting and the term "outcome measures" is often used. Whether or not a measure is an "outcome measure" depends on the perspective from which it is viewed. Outcome measures are related to the goals of the program and are data which are of value to customers, program managers, or elected officials. (Some analysts use the term "intermediate outcome" to indicate program elements more closely related to inputs and processes rather than program goals.) A variety of measures are cited as outcome measures:

- Oregon established a comprehensive performance measuring system called the Oregon Benchmarks Program. Benchmarks related to the projects in this report include:

  - Percentage of students achieving established skill levels in third, fifth, eighth, and eleventh grades; student rankings on national mathematics and science assessments;
  - Behavioral crime reported per 1000 Oregonians; communities involved in community-based strategic plan for law enforcement; numbers of crimes by types; and
  - Pregnancy rate per 1000 females ages 10-17; percentage of Oregonians above 100% of the federal poverty level; percentage of Oregonians employed; percentage of Oregon households below median income spending less that 30% of their household income on housing (including utilities).

- The Eisenhower Mathematics and Science Education Program provides financial stipends for training and technology to update teaching methods in mathematics and science classes. Performance measures related to the projects in this report include:

  - Change in the number of teachers gaining certification in mathematics
  - Percentage of participants training others
  - Change in weekly hours of total mathematics instructional time
  - Student completion of mathematics courses at the upper levels
  - Changes in student achievement

Performance Measurement

- The Federal Perkins Loan Program provides financial aid to post-secondary students. Performance measures related to the projects in this report include:

  - Numbers and types of participating institutions
  - Increase or decrease in the number of students awarded loans
  - Extent to which the program serves the "neediest" students
  - Dollar value of the loans relative to the cost of the program to taxpayers
  - Changes in the extent to which students do not repay their loans

- The Department of Defense Educational Technology Plan seeks to modernize the information technology at DOD dependent schools worldwide. Performance measures include:

  - Impact of technology on the instructional program;
  - Effect of technology on student achievement as determined by performance-based assessments; and
  - Degree of parental interest and involvement.

Individuals involved in the development and use of a performance system must understand the values and limitations of such a system. Performance measures are not program evaluations. They are early warning information which may signal the need for more rigorous program assessment or revisions in program processes or inputs, or which may be used to communicate program results to stakeholders. Users of the performance measurement system must have the necessary skills to apply the measures and must be provided with incentives for doing so.

The key to developing a successful performance measurement system is to generate valid, accurate, useable information in an understandable format. A typical plan for designing indicators is based on an analysis of program goals, objectives, activities, and data from the multiple perspectives of many groups involved in the program. Designing the system itself is a six-phase cycle nested within the strategic planning process discussed above, including (See Exhibit 5.):

- Inquiry
- Definition
- Choice
- Development
- Application
- Revision

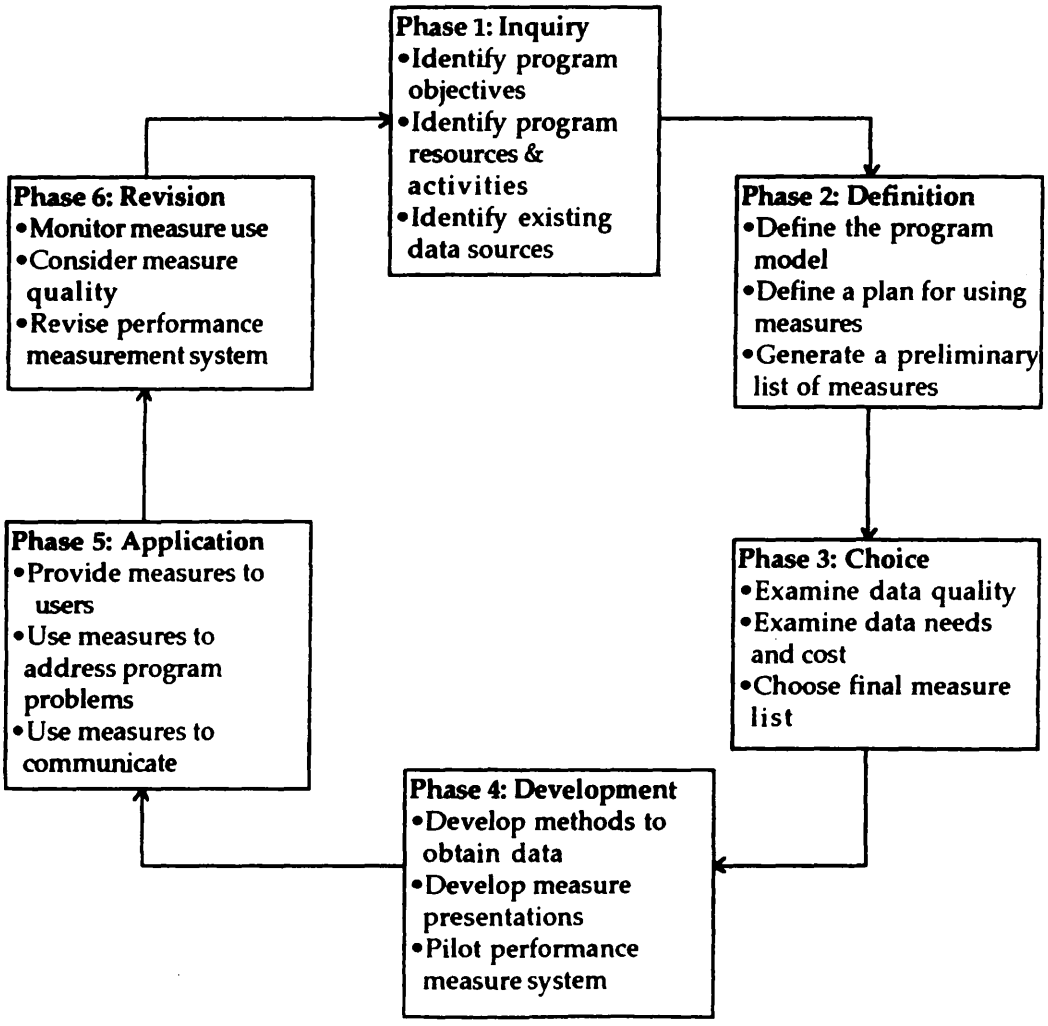
Designing a workable performance measurement system, and particularly outcome measures, involves interpretation, compromise, decision making, and attention to political realities. There are no simple, "right" sets of performance measures. The process of performance measure design is most effective if it stimulates new thought about the program, especially in ways which improve the quality of services and/or cut costs.

The following pages include practical advice based on NAPA's experience with federal and local agencies in designing performance measurement systems. The general section is followed by a discussion of specific considerations concerning measures for information technology systems.

TEAM CHARACTERISTICS

As noted earlier, the team charged with developing the performance measure system is closely tied to the program. Although program managers and implementors typically take the lead in developing performance metrics, the team must include a variety of viewpoints–managers, employees, elected officials, customers, taxpayers, and other stakeholders. It also includes individuals with technical skills in obtaining and analyzing data. Team members must be committed to using performance metrics to improve program management and to communicate program value.

EXHIBIT 5
THE PERFORMANCE MEASUREMENT DESIGN CYCLE



Source: *A Guide to Designing Performance Measures,* NAPA, 1993.

PHASE 1: INQUIRY

- **Identify program goals and objectives.**
- **Identify program resources and activities.**
- **Identify existing data sources.**

During this phase the team reviews documents and interviews individuals involved with the program. Information on data and data sources, as well as descriptive program information, perceptions of policy makers, trends in customers needs and program resources, and changing demographics and management models are important to the basic focus of this phase. The purpose of the literature search and interviews is to identify program goals, objectives, resources, and activities as perceived by the various stakeholders and to identify existing data sources.

Suggestions for data sources are:

- Legislation and regulations
- Audit and program manuals
- Program studies or evaluations
- Informal data compiled by program staff
- Annual reports to the council or executive
- Reports by professional associations, citizens' groups or other stakeholders
- Information about performance for other programs
- Individuals involved in the program
- Council members or the County Executive
- Application forms
- Professional journals and newspapers
- Reports by government bodies such as the state or by industry
- Organizational charts
- Reports by consumer, academic, or government research services
- Individuals from other government agencies or industry
- Customers, program beneficiaries, taxpayers, or members of advocacy groups or professional associations.

There are generally useful parallels among similar programs which may provide examples of performance measures. However, team members should be careful in using other programs as examples since very subtle differences in resources, activities, clientele, or stakeholder interests can have important implications for performance measures.

GETTING THE RIGHT INFORMATION

- Gather information about the program from literature and interviews with a broad spectrum of stakeholders.
- Draw parallels with other programs only if they are very similar.
- Identify goals, objectives, resources, activities, and existing data sources from a wide variety of stakeholder perspectives.

PHASE 2: DEFINITION

- **Define the program model.**
- **Define a plan for using performance measures.**
- **Generate the preliminary performance measure list.**

The program model is a description of the program which includes inputs, processes, outputs, outcomes, and context (laws, regulations, etc.). A useful set of performance measures is tied to each of these aspects of the program model. Developing an accurate program model, therefore, is an essential step. Agreement on the program model assures that stakeholders have a common understanding of the program without which a common set of performance measures cannot be built. One of the most effective ways to define the program model is to develop a diagram or flow chart of program elements, including inputs, processes, outcomes, and context.

In developing the performance measurement plan, it is important to include all aspects--inputs, processes, outcomes, and context--in the measuring system, since analysis of program efficiency and effectiveness is dependent on the relationship among them. The purpose of the performance measurement plan is to facilitate program improvement and cost reductions and/or communicate program value.

The performance measure plan is grounded in the data needs of both internal and external stakeholders such as program managers, Council members, service recipients, and taxpayers. Representatives from all of these groups are brought into the process of developing the performance measures. Each group contributes to an understanding of what elements of the program are important to measure. Generally, measures are used to:

- Focus attention on program needs and value
- Report program results
- Reduce costs
- Improve service quality
- Track specific issues
- Alter cycle times

Defining performance measures includes comparative or benchmarking standards. For example, taxpayers are interested in the program costs relative to costs in neighboring counties; program managers are interested in program achievements relative to national standards; council members are interested in program improvements and costs savings and reductions. Performance measures are most meaningful if they include useful comparisons.

SYSTEM BASICS

- Define the program model as the backbone of performance measurement.
- Balance the performance measure system to include input, process, outcome, and context measures.
- Include representatives of all stakeholder groups in developing a list of data to be presented and comparisons to use.

PHASE 3: CHOICE

- **Examine existing data quality, availability, and utility.**
- **Examine data needs and cost.**
- **Choose the final performance measure list.**

The purpose of a performance measure system is to shed light on the program itself. As with choice of measures, debates over quality and appropriateness of data chosen for performance measures can call attention away from critical program issues. It is particularly important that measures be chosen to minimize such debate. Key data characteristics to examine are technical quality, availability, and usefulness.

Whenever possible, data from existing sources should be used. In a time of limited resources, it is critical that the costs of gathering and analyzing data should not be excessive or detract from the resources used for program delivery. Careful examination of program processes usually reveals ample potential data sources. Some additional data (customer satisfaction, for example) can be obtained by limited sampling in the process of providing a service.

Thre are three types of data: quantitative, qualitative, and narrative or anecdotal. In the age of computers, the public has become accustomed to expecting "objective" numerical data. However, in many cases, anecdotal or narrative data are sufficient. For example, stating "Officers can maintain radio contact from the interior of all high-rise buildings" is as useful as technical data to express radio coverage numerically.

DATA CONSIDERATIONS IN DETERMINING A FINAL LIST OF PERFORMANCE MEASURES

- **Utility:** How can performance measures be used internally by program managers and/or externally by elected officials, taxpayers, and others?
- **Technical adequacy:** Do the data available for the performance measures meet minimal requirements for validity, reliability, and objectivity?
- **Feasibility and cost:** Are the necessary data already collected on an on-going basis? If not, can appropriate data elements be added? If not, what are the feasibility and cost of new data collection?
- **Balance:** Are measures included in the set for most of the elements of the program's design, or at least for the key elements of each of the four types--context, input, process, and outcome?
- **Propriety:** Will collecting or releasing data for the measure violate any standards of human rights or privacy considerations?
- **Political sensitivity:** Will the measure raise issues that are too emotionally loaded for rational discussion?

PHASE 4: DEVELOPMENT

- **Develop methods to obtain and analyze data.**
- **Develop performance measure presentations.**
- **Pilot the performance measurement system.**

Developing a system of performance measures requires the same processes as development of any program: designing a conceptual framework, designing processes, piloting the program, reviewing results, and revising processes. In this phase, more precise plans for obtaining, analyzing, and presenting data are developed, and pilot measurement plans are tested. If the program is operational, a pilot of the performance measurement system can be integrated into operations. If the program is being developed, the measurement system can be piloted as a parallel activity.

A performance measurement system communicates information about a program in a practical format. Performance measure presentations include:

- A statement demonstrating expected goals or directions of the program;
- Comparison data, and when appropriate, a graphic data presentation;
- Specific technical information on data quality and source; and
- Comments which clarify aspects of the program or data.

At this point, it is important to analyze the effects of the *performance measure* system. One method is to convene groups of stakeholders and determine if the measures devised are useful to them. Another is to analyze the measures in terms of historical data and determine how they would have affected decision making in the program had they been used in the past. (Note: This is a time for testing the *measures* not the *program*. For example the question to ask is: How do these measures affect implementation of the Montgomery County Global Access Program?' rather than, "How is the Montgomery County Global Access Program working?")

In this phase, critical analysis determines if new or revised methods of data analysis or aggregation are needed. When possible, existing methods of obtaining data are used; if necessary, new methods of obtaining data can be developed. Quality of data is critical.

KEY CRITERIA FOR QUALITY DATA

- Use precise definitions.
- Ensure reliability; different people reporting the same elements should report the same data.
- Ensure validity; stakeholders agree on the meaning of the data elements.
- Train the people collecting data.
- Avoid distorted and biased data.
- Follow professional standards for data analysis.
- Provide for peer review of performance measures by both content area and methodology experts.

PHASE 5: APPLICATION

- **Provide performance measures to users.**
- **Use information from performance measures to address program issues.**
- **Use performance measures to communicate to policy makers and other stakeholders.**

In this phase, measures are examined by the public, elected officials, policy makers, managers and the program staff. This is a test of whether the measurement design team chose measures which communicate a valid picture of the program.

It is important to note that performance indicators are flags marking progress toward specific goals. Performance measures alone, however, cannot improve a program. They can be a valuable tool for managers to institute change, or for policy makers who wish to communicate program value to taxpayers. It is important to recognize that performance measures are part of a complete measurement system which includes general program data and formal program evaluation mechanisms.

Time can be wasted arguing over exact technical aspects of various performance measures. The vital question is, "What do managers, policy makers, consumers, and taxpayers want to know about the program and what will help each sector contribute more effectively and economically to its value?"

TYPES OF PERFORMANCE MEASURES

- **Context measures** denote changes in social, political, economic, or technical situations which may affect the program. For example, federal policies encouraging use of 800 MHz radio systems may impact the availability of equipment using other frequencies.
- **Input measures** denote the resources, administrative arrangements, regulations, and characteristics of the population. For example, the types of human services available may affect coordination activities.
- **Process measures** include measures of activities, services, and operations. For example, the amount of time which media specialists make the Global Access Program available to students may affect its use.
- **Outcome measures** are "bottom line" program achievements. Can public safety officials communicate more effectively in emergencies? Are students better equipped to use technology in education and on the job? Are human services recipients more effectively served through cooperative case management? Are customers satisfied? Are costs reduced?

PHASE 6: REVISION

- **Monitor performance measure use.**
- **Consider performance measure quality.**
- **Revise performance measure system.**

Performance indicator design is part of a continuous cycle of use and revision. Although all measures should be designed to be relatively stable over time, some will change due to changes in the program, the "fine tuning" of the indicators themselves, or additional expectations of the stakeholders. The primary question to be asked during the review and revision is, "Is the system used to help managers and policy makers improve the performance or reduce the costs of government and to communicate program results?" As users become more adept at data use and require more complex data, the question of "What new performance measures should be added?" also becomes important.

Performance measurement systems are designed to provide specific data to varied groups. Periodically, stakeholders should be queried about use of the system. Often when data are used by program managers and policy makers, they appear in media coverage.

Performance measures are designed with sufficient attention to data quality. Professional standards are available against which to test data quality. If data are not of acceptable quality, program personnel can spend valuable time answering questions about data rather than dealing with program issues. If the data are considered by users to be of good quality, discussion will move on to vital program issues.

TYPES OF PROGRAM DATA

- **Program statistics:** general data on program background, scope, participants.
- **Performance measures:** systematic measures of program inputs, processes, and outcomes with appropriate benchmarks.
- **Impact evaluation:** specific information used to determine effects that are caused by a program.
- **Program research and special studies:** information designed to aid in understanding the basic processes involved in a program

SUMMARY

In summary, assuming that the program's mission and goals are clearly stated, and that resources and implementation plans have been developed or the program is already in progress, steps in determining a final list of performance measures include:

- Consider the implications of organizational goals and program realities.
- Identify potential performance measures for all aspects of the program: contexts, inputs, processes, and short and long-term outcomes.
- Assess which performance measures will be valuable for which purposes, and to whom.
- Eliminate performance measures not relevant to stakeholders' needs.
- State the remaining performance measures in operational terms with appropriate comparisons and aggregations.
- Review known sources of program data and identify elements which appear to match requirements of the performance measures.
- Review the reliability and validity of existing data and determine whether new data collection is necessary, feasible, and cost effective.
- Eliminate performance measures for which good quality data cannot be obtained practically and economically.

Again, note that representatives from all stakeholder groups should be involved in the process of designing and evaluating performance measurement. The key is for the performance measurement system to produce information to meet the stakeholders' needs.

4. INFORMATION TECHNOLOGY AND PERFORMANCE MEASUREMENT

Effective information technology (IT) performance measures are tied to the outcome measures for the entire program or project. Program/project performance measures make the value of the technology obvious to the customers and management. For example, the Social Security Administration did not emphasize specific IT measures when they modernized their computer system, but rather demonstrated that the new information technology significantly improved service time. Specifically, the cycle time for claims processing went from 35 to 45 days to 5 to 14 days, and general inquiries on social security matters from the public went from days to minutes using the Internet.

The key to designing outcome measures for IT then becomes the development of those measures as part of the development of measures and basic planning for a total program. IT is aligned with the mission, goals and objectives as developed by program personnel, and program personnel must collaborate with information technology personnel to establish performance measures for IT projects.

Information technology projects are developed to support the total program's service delivery. The purpose of such projects is to deliver service more efficiently, to enable service providers to offer new types of service, and to reduce the costs of government operations. Often, information technology is used to support process reengineering because it enables significant changes in the way work is done. Performance in the information technology part of a program must be measured in terms of the outcomes of the entire project.

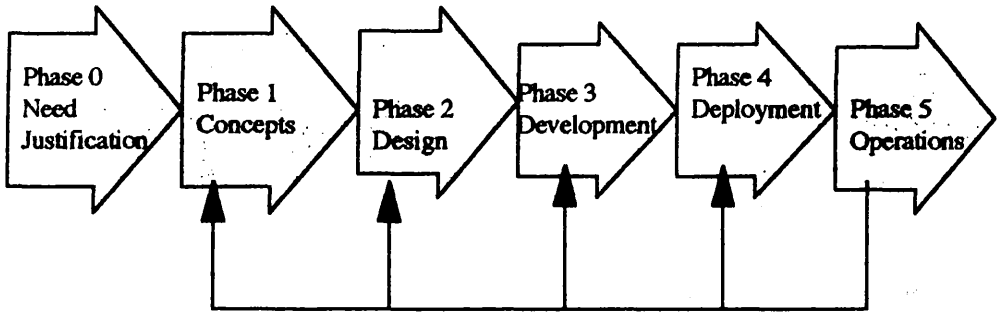
In reality, however, decision makers often see IT expenditures as quite large and are concerned about overruns in cost and schedule. Therefore, general performance measures for IT projects can be used to scope the project, improve project management, and communicate the project's value. As much as is possible, IT outcome measures should be integrated with program measures. Practically, IT project managers should use and be held accountable for general IT measures to communicate information about their projects. There are three basic measures commonly used in developing and implementing information technology projects:

- Cost,
- Schedule,
- Performance from the stakeholders' point of view and contractor performance.

Although these seem straightforward, there are a number of factors to consider in developing effective measures in each area.

Key to developing confidence in a performance measurement system is to consider all factors--cost, schedule, and performance--over the entire life cycle of the project. The life cycle of an information systems project typically has six major stages: need justification, concepts development, design, development, deployment, and operations. (See Exhibit 6.)

EXHIBIT 6
INFORMATION TECHNOLOGY PROJECT LIFE CYCLE MODEL



Source: Software Engineering Institute, Carnegie Melon University, 1995.

COST

The cost of information technology projects is often one of their most visible measures. Building confidence in cost measures, which are easily quantifiable, helps to build confidence in the entire measurement system as well as the project itself.

The basic principle in developing cost measures is that all elements of cost should be identified and accounted for. The full cost of an information technology project includes direct and indirect costs incurred by the government throughout the entire life cycle of the project. Typical costs include equipment, software, communications, personnel salaries and benefits, operating costs, facilities, contractor services, training, overhead, material, and costs incurred by other government departments.

Starting with Phase 1 of the Life Cycle Model, an independent economic analysis including all of the costs mentioned above is developed. This economic analysis includes a detailed analysis of all cost elements, savings, and benefits. The economic analysis is adjusted over the life cycle as newer or more current data sources are identified.

The metric used for the cost performance measure is a comparison of the actual project costs against the estimated project costs. An option open to decision makers is to establish a measurement for cost monitoring that states that if the actual cost exceeds the estimated cost by a certain percentage at any time during the life cycle of the project, then a "time out" is initiated by management to review, modify, and/or terminate the project. Concurrently, procedural mechanisms within the organization's planning and budget processes need to be established to accommodate this option.

SCHEDULE

Estimated time required to develop and implement projects is another element which should be questioned by decision makers. Too often, IT projects take much longer to implement than originally projected. The entire life cycle of the project should be charted. A comprehensive time line with events, dates, products, responsible agencies, and individuals is established for the entire project. Consider also charting critical path events. For large projects, consider modularizing the project to facilitate management and force tangible products earlier.

The metric used for schedule performance is actual project progress compared to the project manager's estimated project time lines. An option open to decision makers is that if actual schedule time exceeds projected schedule time by a certain percentage or date at any time during the life cycle of the project, then a "time out" is initiated by management to review and/or terminate the project. Again, procedural mechanisms within the context of the organization's business processes are established to accommodate this option.

PERFORMANCE

Performance of the information technology project from the customers' perspective is the measure most commonly used in management decision making and in communicating program value to stakeholders. Determination of IT outcomes depends on two key factors: stakeholders' requirements and what IT can enable in accomplishing mission objectives. Stakeholders' requirements need to be developed as part of the first two stages –need justification and concepts–of the project life cycle. Stakeholders' needs may vary or be conflicting, requiring careful balance in developing performance measures. Technology measures need to include efficiency and effectiveness gains.

Performance Measure Considerations for IT Projects

The National Research Council, a principal operating agency of the National Academy of Sciences, a non-profit, non-partisan research organization chartered by Congress, identified seven important considerations in measuring the impacts of IT:

- Define units of output which are stable over time;
- Define the contribution of IT to total activity needed to create a result;
- Measure benefits passed through to customers;

- Establish measures of "quality" of service such as timeliness, a broader selection of services;
- Estimate opportunity costs of services that would not have happened without the technology;
- Quantify delayed payoffs due to learning time; and
- Measure productivity changes when the implementation of IT changes the basic nature of business processes.

Individuals designing and using performance measures for IT projects need to acknowledge these considerations. Foremost in application of performance measures in IT projects, users must remember that performance measures are not formal evaluations which detail cause and effect relationships. They are rather "indicators" of the value of important aspects, in stakeholders' eyes, of complex projects of which IT developments are only one part.

EFFICIENCY AND EFFECTIVENESS MEASURES

Efficiency is a common goal of IT projects. It is measured by comparing the time and resources of delivering the same tasks before and after the IT implementation. Studying this aspect requires careful observation of the program processes to accurately determine the full impact of IT. When there have been changes in the quality of service or processes have been reengineered; however, it may be difficult to isolate the contribution of the information technology segment of the program.

Effectiveness gains are a different form of measurable improvement. In the current environment, effectiveness measures are often tied to process improvement initiatives. These measures are less tangible, and may often be difficult to quantify. Some examples include: the ability to complete a task, the relative ease of completion, the accuracy of the task, customer acceptance of the work results. Indicators of effectiveness might be developed by:

- Describing areas in which IT enabled tasks to be performed which were not performed before the implementation of the IT project;
- Reporting customer satisfaction surveys in terms of measures of customers reporting satisfaction with service, or percentage of customers reporting improved service;
- Reporting gains in terms of anecdotal evidence rather than hard, quantifiable data;
- Describing actual or perceived program change.

The U. S. Government Accounting Office (GAO) recommends considering a number of areas when establishing IT performance measures related to effectiveness and efficiency. (See Exhibit 7.).

EXHIBIT 7

TYPES OF EFFECTIVENESS AND EFFICIENCY MEASURES FOR INFORMATION TECHNOLOGY

Measurement Area	Effectiveness	Efficiency
Mission Value	Increase in program success rate of outcome	Decrease in cost, time, or staffing level per success or outcome
Customer Satisfaction	Increase in percentage of satisfied customers	Decrease in cost or staffing level per satisfied customer
Quality	Increase in correct initial determination Decrease in appeal rate Increase in sustained decisions	Decrease in cost, time, or staffing level per initial benefits determination and appeal
Responsiveness	Decrease in exception processing	Decrease in cost, time, or staffing level per exception
Capability	Increase in new or expanded service offerings	Decrease in total program costs, staffing levels, facilities, etc.

Source: U. S. Government Accounting Office, 1994.

In addition, GAO suggests that managers consider the following additional performance measures in reviewing information system projects:

Responsiveness: %of system inquiries satisfied by timely access, applications software, data availability

Interoperable Systems: % mission-critical systems which share data and software applications

Process architecture: % of business processes modeled

Data Administration: % of data subject to organization-wide definitions and standards

System Delivery: % of systems delivered on schedule

System Cost: % of systems delivered within budget

CONTRACTOR PERFORMANCE

As government expenditures come under increasing scrutiny, the past performance of contractors has become an important issue. Contractor performance can be an important input indicator, impacting the success of a project. Past performance of earlier contractor projects in terms of meeting cost, schedule and quality of product requirements is good indicator of IT contractor competence.

COMMUNICATING PROGRAM VALUE

One important element of the performance measurement of IT projects is the ability to communicate the "value added" of both the information technology and the program as a whole. Therefore, it is advantageous for the stakeholders to identify high visibility reporting areas which have been impacted positively by the use of IT and develop mechanisms to showcase this impact. Potential areas where IT can demonstrate its enabling power are:

- Public reporting requirements
- Management reporting
- Business planning
- Resource forecasting
- Quality of information and process
- Customer relations

SUMMARY

In summary, information technology performance measures can prove effective in improving government services or reducing government costs if tied to the mission and goals of the program and if reported in terms that are of value to the stakeholders. Performance measures of IT projects must be closely related to measures of the programs which they support and must be developed through collaboration of policy makers and program and IT personnel. IT projects can rarely be credited with the entire success of a program or blamed for its failure. Measures of the performance of IT projects must be interpreted and used as part of a comprehensive measurement plan aimed at determining the degree to which planned program goals are met.

5. MANAGING INFORMATION TECHNOLOGY PROJECTS

Managing large scale information technology projects is a synergistic compendium of steps reflective of "best practices" in information management adopted by both private and public sector firms in Canada and the U. S. It is not easy to assure success. In fact, according to the Standish Group, a consulting firm, for large information technology projects:

- Only 9% are completed in accordance with requirements, on budget, and on time;
- 61.5% of projects cost 178% of original estimates; and
- 29.5% of projects are canceled before completion.

With the high costs of complex information technology projects, it is well to consider, characteristics of both successful and unsuccessful projects in order to be able to avoid costly pitfalls. Examples of failed projects are numerous. Principal reasons for failure of complex information technology projects lie in the failure of management to develop the links between the information technology being implemented and the program's strategic plan. They include:

- Management's failure to analyze underlying business/program issues and processes;
- Top management's failure to commit to and sponsor the project;
- Project personnel's lack of experience or skills; and
- Users not consistently involved or accepting change as their needs change.

To improve the chances for successful project completion, the following "best practices" steps are recommended:

- Get the environment for IT implementation in order;
- Create the right foundation for the IT implementation project; and
- Manage the IT implementation project and the entire program well.

GET THE ENVIRONMENT IN ORDER

Assure that the human and financial resources are available and that there is sufficient time to complete the project. There is danger of failure when a well constructed project design requiring complex interactions is implemented piecemeal for budgetary purposes. In this scenario, "savings" can actually result in an unwanted project or there may be significant additional expenses at a later date to cure deficiencies.

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A good environment also includes a suitable structure for the project. In order for technology to be successfully used, the offices or agencies involved are structured to allow for collaboration and implementation. Project managers, customers, and policy makers are accurately identified, and their roles and the skill sets needed clearly defined.

The various agencies involved agree on funding issues and the mechanisms for monitoring expenses and revenues. These might involve determining the relative impact on each user agency or the number of employees or clients using the system.

CREATE THE RIGHT FOUNDATION

Top management and other stakeholders agree on the purpose, scope, requirements, and priorities for the project. These are integrated as part of the organization's strategic and financial planning processes.

MANAGE THE PROJECT WELL

Successful project management includes the cycles of planning, prioritizing use of resources, implementing programs, measuring and reviewing, and making appropriate revisions based on program performance data. Specific suggested steps include:

- Start with good project planning. Set goals, objectives, and performance measures.
- Get and use skilled people in both technical and managerial areas and offer incentives.
- Set short time frames and/or modularize the project so that tangible, credible deliverables are produced. Include off-ramps where the project can be effectively revised or terminated.
- Try to assure team–government and contractor–continuity, especially at the top levels.
- Anticipate and manage change. Perform business process reengineering either before or as part of the project. Plan for requirement and technology changes during the project. Develop a disciplined "gating" process for proposed changes. Ruthlessly assess need, cost, and schedule effects.
- Involve users and other stakeholders regularly.
- Manage project risks. Develop mechanisms to identify risks and procedures for dealing with them.
- Instill a culture which focuses on progress not process. Request quarterly products and reward successes.

- Manage costs and extract benefits as you go. The life cycle cost model is the preferable model and includes investment as well as sustainment costs. Life cycle costs are typically six to ten times more than cash costs. Consider giving some initial investment costs to the project and provide additional funds from the savings generated by the project's progress.

- Hold periodic sanity checks with all parties. Perform independent reviews when in doubt.

- Monitor schedules, quality of products, costs, and contractor performance.

- Keep stakeholders and other key individuals well informed.

- Provide senior management presence and focused leadership.

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6. PERFORMANCE MEASURES FOR MONTGOMERY COUNTY PROJECTS

Illustrative performance measures are presented for the three projects identified by the Office of Legislative Oversight. These projects are:

- The Montgomery County Public Schools' Global Access Project which will provide a state of the art computer and communications platform at public schools is in the pilot stage. The information technology will be used by three customer groups--K-12 students, teachers and administrators. It will eventually be part of a change in service delivery and in the "product"--student learning.

- The Public Safety 800 Megahertz Trunked Radio Project is aimed at replacing existing public safety radio communications equipment. Its primary customers are internal--the public safety professionals who will use the system. County citizens and businesses are also customers. The technical aspects of the 800 Megahertz proposal recommended by the County Government have been thoroughly researched by several consulting firms, but it has not yet received final Council approval.

- The Health and Human Services Community Services Workstation Project will provide integrated collaborative case management for county health and human services. It is in the relatively early stages of planning. It will demand an immediate change in user work patterns. It will be largely used by internal customers--the caseworkers--but will be visible to the programs' customers.

The performance measures suggested in this report are illustrative only. An effective performance measurement system must be designed with input from many stakeholders, and must be tested and monitored against the needs and expectations of these stakeholders.

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a. THE MONTGOMERY COUNTY PUBLIC SCHOOLS' GLOBAL ACCESS PROJECT

The Montgomery County Public Schools' Global Access Project will electronically connect all classrooms, media centers, and MCPS educational and administrative offices to each other and to the greater world through a variety of electronic networks. The project is designed to address two aspects of MCPS's operations: educational and administrative. Program implementation will be over a period of more than six years. Central procurement will include wiring all schools and the MCPS central offices on local area networks (LAN), obtaining PCs with a variety of software and hardware, interconnecting systems among schools, and providing Internet access.

MCPS approach to this project is a good example of NAPA's recommended approach to strategic planning and performance measurement, as previously discussed. MCPS has taken five important steps which reflect its strategic and performance measurement plans.

- MCPS clearly defined mission and goals which implicitly and explicitly included the need for this technology program. (See Exhibit 8.)
- Seven MCPS schools began pilot programs in the 1994-95 school year. The pilots included administrative as well as student/teacher use of technology.
- The Department of Evaluation and Assessment (DEA) has designed an evaluation program and has begun developing benchmark data, including cost, schedule, and customer satisfaction. DEA plans include student achievement data in the third year of evaluation.
- DEA communicated its findings to program personnel and to the public.
- DEA suggested revision of some program activities based on its findings.

An additional aspect of the program is the development and evaluation of specific classroom programs based on the use of the new technology. The purpose of this aspect of the program is for individual teachers or groups of teachers to design, test, and publish for replication in other schools specific curricula which use the technology.

EXHIBIT 8: MCPS MISSION AND IT OBJECTIVES

Goal 1: Ensure Success for Every Student

Provide the services and environment each student needs for intellectual challenge and social and emotional development. Each student will be able to communicate effectively, obtain and use information, solve problems, and engage in active , life-long learning.

Educational technology will

- Provide all students with equal opportunity in the learning environment to achieve success
- Enhance development of communication skills through writing and exchange of information with students at other sites and with professionals in their fields of expertise
- Provide students with learning and information management skills which enable them to compete in the technological environment of the workplace
- Enhance development of thinking, research and information processing, problem solving, and higher order thinking skills by accessing and analyzing information using the tools of technology
- Provide students with opportunities to observe school staff model active, life-long learning as students and teachers collaborate in information retrieval and problem solving

Goal 2: Provide an Effective Instructional Program

Teach all students a curriculum that describes what they should know and be able to do, includes that many perspectives of a pluralistic society, and establishes learning standards. Instruction must include a variety of teaching strategies and technologies, actively involve students, and result in their mastery of learning objectives.

Educational technology will

- Encourage and support joint curriculum development and sharing
- Improve capacity to individualize instruction and accommodate special needs students including gifted and talented, special education and ESOL, and Chapter 1 students
- Develop student awareness of a multicultural world through telecommunications access and communication with students and professionals at other sites throughout the world

  Provide an early intervention tool for monitoring and improving student achievement

Goal 3: Strengthen Productive Partnerships for Education

Secure commitment of the entire community to maintain quality education in Montgomery County by building partnerships of families, community, business and staff that promote and support initiatives to help all children succeed.

Educational technology will

- Facilitate greater interaction and collaboration between parents and schools
- Provide parental access to administrators and teachers via voice mail
- Provide a vehicle for collaborative partnerships with community, business, university, and government agencies

Goal 4: Create a Positive Work Environment in a Self Renewing Organization

Develop a climate in which staff effectiveness and creativity are encouraged, respected, valued and supported to promote productivity and ownership for student success. Provide efficient and effective support ad staff development for the instructional program.

Educational technology will

- Increase staff productivity through improved effectiveness and efficiency of instruction, curriculum development, and support of instruction
- Improve communication among individuals, MCPS offices, and other government service agencies
- Convert staff paper work to automated processes that improve the efficiency of applications such as grading and interim reporting systems, ordering of materials, payroll, and student monitoring systems

ISSUES ADDRESSED BY THE GLOBAL ACCESS PROJECT

Proponents of the program feel that it addresses several important issues which are important to the future of the county's children:

- **Equity.** MCPS serves children from a wide variety of socio-economic backgrounds in school buildings varying in age from one to 50 years old. Some children have access to extensive technology including Internet at home, while others do not. In addition, some new or recently renovated schools have invested in extensive technology, while older schools have few computers, many of which are obsolete. Global Access would allow schools to select technology appropriate to their programs and populations but would enable those selections to be comparable in software and hardware quality.

- **Student skills.** The U. S. Department of Labor Secretary's Commission on Achieving Necessary Skills (SCANS) report included technology in the need to prepare students for the 21st century by emphasizing skills in acquiring, evaluating and processing data; selecting, using and applying technology; and understanding technological systems. (Educational Leadership, March 1992. p. 28). These skills require extensive exposure to technology which could be achieved through the Global Access Project.

- **Managerial excellence.** The Montgomery Corporate Partnership for Managerial Excellence has recommended management changes in MCPS including streamlining the amount of time educators spend on administrative responsibilities, better record keeping, better access to records, and more efficient communications.

PERFORMANCE MEASURES IN SIMILAR PROJECTS

Introduction of communications technologies into education and administration is one part of the larger move to reinvent the U. S. education system. MCPS is one of thousands of school districts that are changing the focus of instruction from textbooks to students and the focus of management from central offices to individual schools. One result of these changes has impacted beliefs about every aspect of education from the concept of knowledge to the definition of success. (See Exhibit 9.) Another result has been an increasing emphasis on freeing teachers from excessive administrative burdens. A third result has been the movement to a sense of "teacher as researcher," in which teachers are actively involved in curriculum development and educational problem solving.

EXHIBIT 9
SHIFTS UNDERLYING NEW STUDENT COMPETENCIES

	INSTRUCTION	CONSTRUCTION
Classroom Activity:	Teacher Centered Didactic	Learner Centered Interactive
Teacher Role:	Fact Teller Always Expert	Collaborator Sometimes Learner
Student Role:	Listener Always Learner	Collaborator Sometimes Expert
Intellectual Emphasis:	Facts Memorization	Relationships Inquiry and Invention
Knowledge Content:	Accumulation of Facts	Transformation of Facts
Demonstration of Success:	Quantity	Quality of Understanding
Assessment:	Norm-Referenced Multiple Choice Items	Criterion-Referenced Portfolios and Performance
Technology Use:	Drill and Practice	Communication, Collaboration, Information, Access, Expression

Source:
Educational Leadership,
April 1994, p.6.

Performance measures are important aspects of implementing new educational concepts and related uses of information technology. Examples of such measures are found in the Department of Defense's Educational Technology Plan, Apple Classrooms of Tomorrow, the U. S. Department of Education study *Telecommunications in U. S. Public Schools*, Oregon's educational benchmarks, and the Kansas State Board of Education performance measures.

DODEA. The U. S. Department of Defense Education Activity recently published an extensive plan for technology implementation in its schools for military and civilian dependents in grades K through 12. The program is based on assumptions that information technology can contribute to more complex student learning, better equity, more effective school administration, and greater public participation in the schools. Details of the plan include primarily the numbers and types of equipment, and costs and schedules for implementation. However, the plan also includes success measures for the program and specific student outcomes.

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Among the success measures listed for the plan are:

- Development of plans for use of information technology in K-3;
- Installation of a specified amount of hardware in each classroom and office;
- Formation of a technology committee to oversee and evaluate the program;
- Development of training programs for teachers;
- Providing access to wide area networks linking all of the DOD schools and Internet; and
- Development of a technical implementation plan including student mastery in the areas of information searching, keyboarding, problem solving, and software use skills.

The DODEA plan specifically addresses student technology competencies. (See Exhibit 10.)

EXHIBIT 10
DOD STUDENT TECHNOLOGY COMPETENCIES

In the basic curricula such as mathematics, English, science, etc., the competencies required of students are determined. As we move into the 21st century, schools also need to include an area of the curricula that addresses technology and identifies the areas of competency that will be mastered by students upon graduation. Some examples include:

- Technological awareness
- Technology identification and operation
- Application of appropriate technology
- Cognitive skill development
- Acquisition of information (research)
- Presentation/production skills
- Interpersonal skills and personal growth
- Ethical use
- Occupational technology
- Adaptive/assistive skills

Source: DODEA, Educational Technology Plan, April 1995.

Apple Classrooms of Tomorrow (APCOT). In 1986, Apple Corporation studied the effect on students of routine use of computers in the classroom. The study focused on questions of how computer use would affect social interactions, how software could be adapted for classroom use, if the full power of the computers would be used, and for how long would teachers and students stay interested in the new "fad." (*Educational Leadership*, April, 1994. pp. 4-10.) Measures included:

- Standardized test scores;
- Amount of time spent on standard curriculum and on specific computer-related skills;
- Amount and quality of student writing;

- Amount of time students spent to units of study (student productivity);
- Change in types of student/teacher interactions;
- Change in student interest;
- Change in teacher hours worked;
- Change in teacher satisfaction with job;
- Change in curriculum and/or educational techniques;
- Change in number of students going on to higher education; and
- Change in methods students organized and prepared their work.

U. S. Department of Education. A 1994 study by the U.S. Department of Education used specific measures for IT which were related directly to school technology projects. Measures included:

- Number of schools having access to Internet and number of classrooms actually connected to Internet;
- Most popular Internet features;
- Source of technology plan (district or state);
- Type and amount of training offered to staff;
- Type and amount of training offered to students and parents; and
- Major barriers to Internet access.

Oregon Benchmarks. The Oregon Benchmarks are a set of performance measures developed by a large number of stakeholders in the state. Educational outcome measures are not specifically linked to IT projects. They include broad outcome measures for education:

- Percentage of students who achieve established skill levels in reading, writing, and mathematics in third, fifth, eighth, and eleventh grades, with breakouts by racial and ethnic groups;
- Percentage of students who attain Certificate of Initial Mastery;
- Percentage of high school graduates proficient in at least one language other than English; and
- Ranking on national math and science assessments, with a breakout for students from economically disadvantaged urban homes.

Kansas State Board of Education. Kansas has begun an overall reengineering program with the goal of improving students' academic performance. Schools' quality is judged on the basis of students' academic performance and their continuous improvement. Performance measures are based on a four-year improvement plan developed by the school and community. Information technology projects are central to the reengineering effort. Interactive television clusters and compressed video sites and other technology-aided instruction support student outcomes. Board staff are supported by a wide range of personal computing and communications equipment. KSBE is now tracking student performance as the performance indicator across all disciplinary areas.

SUGGESTED PERFORMANCE MEASURES FOR THE MCPS GLOBAL ACCESS PROJECT

Following are illustrative performance measures for the Global Access Project:

- **Costs.** The metric is to compare the actual development, implementation, operational and maintenance costs of the system with the estimated costs (as proposed by the project director or contractor), or with costs of similar projects in other jurisdictions. Cost elements include hardware, software, telecommunications, facilities, personnel salaries and benefits, training, technical infrastructure upgrades, systems integration, and overhead. Items financed from the individual school budgets such as personnel time and software which represent alternative uses of salaries and textbook funds should also be included.

- **Resource savings.** Savings in actual costs as well as cost avoidance are calculated. Overall costs and personnel cost savings in terms of maintenance or upgrade of the current system, time formerly spent on administrative tasks, and textbook purchase can be included in this estimate. Although cost savings to county residents and businesses through improved efficiency may be an ultimate goal, it may be difficult to measure since there is no definitive way to attach a dollar value to improved education. The metric is current expenditures versus future savings.

- **Schedule.** A timeline for the project is established. The metric is comparison of the actual schedule progress against the projected timelines. In this case, changes in program implementation plans due to funding reductions must be considered differently than delays in implementation from other factors.

- **Technical measures.** These elements include items such as hardware and software integration, hardware and software failure rates, quality of manuals, user friendliness of software, component interoperability, multimedia integration, down time, response and access times, and quantity and quality of training. Technical measures are benchmarked against current or state of the art technical standards.

- **Contractor performance.** The contractor's performance on similar or related projects is measured. This can be accomplished by asking for customer references or having the program department check the contractor's record with similar projects. The metrics to use are actual cost and schedule compared to estimates, quality of service and products, and customer satisfaction.

- **Efficiency.** Measures include time elapsed to answer maintenance calls; ratio of teachers to paraprofessionals and to students; decrease in teacher and administrative workload; change in media specialist workload; decrease in printed media; decrease in amount of time for students to complete units of study--current compared to former measures.

- **Effectiveness.** Measures of effectiveness include satisfaction of teachers and students with system integration into the instructional process; student attendance; student and teacher satisfaction, enrichment, and enthusiasm; improvement in achievement test scores and cognitive skills; satisfaction of

citizens with IT-based changes in curriculum; ability to provide new services, or use new curricula or teaching methods; student interest; student and teacher morale. Some of these elements may be measured by surveys; some may be measured by attendance data; some may be measured by formal educational assessment procedures mandated by the state of Maryland.

- **Research and development results.** A substantial effort involved in the MCPS Global Access Project is teacher research and development of curricula and approaches to presenting educational materials based on the new IT. Performance measures in this area are a special consideration. In a 1995 study of National Science Foundation Science and Technology Centers, NAPA noted the difficulties of measuring outcomes of research programs. The results of these programs are often unexpected and cannot easily be measured against projections without hampering the discovery process. Accordingly, NAPA concluded that peer reviews assessing the integrity of the research process and management of the project were appropriate as performance measures.

DEPARTMENT OF EDUCATION ASSESSMENT EVALUATION OF GLOBAL ACCESS

The DEA has begun an assessment of Global Access and has issued progress reports. The DEA assessment is designed to be in three phases:

- Year 1: Installation, training, and support
- Year 2: Administrative efficiencies, curricular integration, communications
- Year 3: Same as year 2 plus equity, student outcomes, school facilities

To date, DEA has reported findings concerning installation schedule, equipment start-up issues including technology failures and staffing, training, funding, use of Internet, necessary aspects of leadership, teacher time spent on administrative paperwork, staff support, need for formal plan to replace old equipment, and activities of technology committees. These findings have been published in a form which is clear and understandable and communicates program progress to the public. However, there has been some criticism of the effort because it has not included student outcome measures.

DEA's plans for a long term evaluation can be an important part of a performance measurement system. To develop such a system MCPS should:

- Consider the measures developed by other systems and their implications for MCPS mission and goals;
- Consider data already available and measures already used in the DEA study;

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- Define the difference between DEA's assessment study and performance measures;

- Convene a representative team of stakeholders to discuss their concerns and determine which of the above measures are necessary to communicate program value and aid in management efforts and when they can be appropriately applied to the program;

- Develop, test and publish the results of performance measurements.

b. THE PUBLIC SAFETY 800 MEGAHERTZ TRUNKED RADIO PROJECT

The purpose of the Public Safety Radio system project for police, fire, and other public safety services in Montgomery County is to enable the personnel and equipment to be deployed to best serve the safety needs of county residents and businesses. The County government has proposed an 800 Megahertz trunked system that is awaiting Council approval. Although residents and businesses are external customers of safety services, it is generally acknowledged that public safety professionals and volunteers on service calls and supervisors in stations as well as other related workers in the areas of transportation, environment, state parks, and sheriff's office are important internal customers of the communications system.

The 800 MHz project requires an investment over six years for infrastructure (towers and wiring) and radios (mobile and portable). The 800 MHz project only upgrades the public safety communications system. The project costs do not include the staffing, training, or software aspects of the system. There will be additional costs for related public safety information technology projects such as mobile computing, data base development and access, and geographic information systems or global positioning systems interfaces.

Critical technical aspects of the proposed system which proponents feel make it a necessary investment for the county include the ability to:

- Replace aging equipment with easily obtainable modern equipment. (Equipment for the current frequencies is being phased out by manufacturers and may not be readily available in the future. In addition, repair and operations costs for older equipment are often higher than for new equipment.)

- Organize communications optimally among public safety units as well as other agencies involved in emergency management through trunking. Trunking provides the seamless navigation of communications through common protocols and procedures.

- Obtain measurement data such as timeliness of response, system capacity, and system use which cannot be obtained from the current system.

Proponents of the 800 MHz project believe that it addresses several critical issues in emergency communications:

- **Management.** The new system will easily accommodate changes in redistricting or realigning police beats.

- **Coverage.** The current system does not allow communications in several areas throughout the county. Current police coverage is estimated at 84 % of the county, while the 800 MHz system would cover 95%, including the interior of large buildings.

- **Capacity.** The current system is often used to capacity, denying public safety officials access to communications at peak times.

- **Interoperability.** The current system does not allow Montgomery County public safety officials to communicate directly with each other and does not allow direct communications with other jurisdictions.

- **Telemedicine.** The current system offers limited capacity on its single channel to transmit data involved in medical emergencies. This single channel covers only about 75% of the county. There is also no current ability to transmit medical data such as EKGs directly to hospitals or doctors for assistance if complications occur.

- **Flexibility.** The current system does not permit direct access to public safety data bases such as automobile license records or those used by national law enforcement agencies. Use of the 800 MHz system would improve access times to these data bases.

PERFORMANCE MEASURES IN SIMILAR SYSTEMS

There are three similar systems (Arlington County, Virginia; Baltimore County, Maryland; and Portland, Oregon) against which outcomes might be benchmarked, but none has specific performance measures. Other jurisdictions, including the state of Oregon and the Arizona Department of Public Safety, have developed general performance measures for public safety services.

Arlington County, Virginia. The 1982 Air Florida crash near Washington National Airport highlighted Arlington's need to replace its aging communications system. The first phase began in 1984. The county now has an 800 MHz system with trunking similar to that proposed for Montgomery County. Although Arlington has different geographical and demographic characteristics, public safety professional there share the concern about communications within high rise buildings with Montgomery County's officials. Arlington officials consider the communications system as a community policing strategy implementor. Performance measures used in Arlington County include coverage and cost.

Baltimore County, Maryland. Baltimore County is at the end of its implementation process for an 800 MHz, 20 channel, trunked radio system with mobile data. The need for the new system with interoperability was highlighted by the Amtrack rail crash in Baltimore County several years ago. Planning for the system began in 1988. There are metrics for service area size, geographic and demographic characteristics, and costs. Baltimore County officials believe that having a mobile data facility (based on 800 MHz) helps facilitate community policing through the ability to easily and simultaneously talk to other public safety officials.

Portland, Oregon. Portland is a leader in the areas of community policing. Portland uses a 800 MHz trunked system. The system is being implemented in response to deficiencies in the old system that were so great that they became the object of an OSHA complaint. There are data on geographic characteristics, number of units, and costs. Portland's public safety statistics are part of the Oregon Benchmarks which include general statistics on crime and juvenile arrests by type.

Arizona Department of Public Safety. The Arizona Department of Public Safety has completed a review of budget and expenditures. Performance measures are available for

the entire program of the department on the cost to manage relative to direct labor costs and resulting annual savings; cost avoidance savings, and changes in investigation time; and staffing.

Possible performance measures suggested by interviewees. The 800 MHz systems do not use formal sets of program outcome measures. However, representatives from each system indicated that the elements of coverage, capacity, and interoperability were crucial in their purchase of the system. In addition, they made the following observations:

- The effectiveness of the system in major or minor emergencies is tested frequently in simulations and training exercises. In areas in which major disasters have resulted in communications in the past, installation of the 800 MHz system is reported to result in significantly better communication among all of the government agencies involved with emergency management and better performance in terms of greater coverage and capacity. These results are reported anecdotally rather than as metrics.

- There is some anecdotal evidence that high tech industries are attracted to areas in which safety services operate with state-of-the-art equipment. This anecdotal evidence is one of many factors in quality of life which can fuel economic development.

- Portland's system is operated as a business, with communications being "sold" to safety services and private customers. Performance measures include the ability to be self-supporting, customer service (to communications users), and maintenance records.

SUGGESTED PERFORMANCE MEASURES FOR THE 800MHZ RADIO SYSTEM

Development of outcome measures for the 800 MHz system would include satisfaction of both the internal and external customers requirements, as well as measures of cost and time involved in system development and implementation. It is extremely important that stakeholders from all areas of the community be included in designing performance measures. These include: technical experts, public safety experts, system users, manufacturers and maintainers, residents and businesses from all areas of the county, representatives of county government, and possibly representatives of public safety services providers in nearby counties. It is important to provide these stakeholders with a realistic picture of the public safety program and the contribution of the 800 MHz system to it.

A major piece of information regarding the 800 MHz system is the total environment in which public safety information technology modernization is to be considered. The 800 MHz radio is only one component of a broader system which includes mobile computing, upgrade and access to a variety of public safety data base systems, and interfaces with automatic vehicle location (AVL) systems which use Global Positioning System links. The county should identify a clearer picture of this total environment before it considers funding only the radio and communications upgrades. Such a picture should include, at a minimum, total requirements, costs, savings, benefits, and schedule. Once this picture is identified and agreed upon by all stakeholders, then its components

such as the 800 MHz radio communications system can be prioritized for funding and implementation.

A suggested set of performance measures based on the total public safety program and the 800 MHz system include:

- **Costs.** The metric is to compare the actual development, implementation, operational and maintenance costs of the system with the estimated costs (proposed by the project director or contractor), or with costs of similar projects in other jurisdictions. Cost elements include hardware, software, telecommunications, facilities, personnel salaries and benefits, training, up grades, systems integration, and overhead.

- **Resource savings.** Actual costs as well as cost avoidance are savings elements. Overall costs and personnel cost savings in terms of maintenance or upgrade of the current system are an important part of this estimate. Although cost savings to county residents and businesses through improved safety may be an ultimate goal, it may be difficult to measure relative to upgrading the communications system. The metric is current versus future costs.

- **Schedule.** A timeline for the project is established. The metric is comparison of the actual schedule results against the projected ones.

- **Technical measures.**

  Coverage: Current coverage for each of the public safety areas is compared with actual future coverage of each area; also current coverage of the total system with the future coverage of the total system is compared.

  Capacity: Current capacity for each of the public safety areas is compared with actual future capacity of each area and capacity for the total system.

  Interoperability: Current interoperability is compared with actual interoperability within and among public safety areas and organizations and for the entire system. Interoperability metrics include response times among all county public safety departments during emergency situations and comparisons of Montgomery County's system with those used by other jurisdictions in the metropolitan area.

- **Contractor performance.** The contractor's performance on similar or related projects measured. This is accomplished by asking for customer references or having the program department check the contractor's record with similar projects. The metrics are actual cost and schedule compared to estimates, quality of service and products, and customer satisfaction.

- **Efficiency.** Measures of efficiency include time elapsed to answer emergency calls; time elapsed to coordinate such areas as fire, police, transportation; accident reduction rates; number of dispatchers needed and their workload; number of supervisors and their workload. The metric is to compare the current time standards against standards in the public safety professions and in areas using the new 800 MHz system.

- **Effectiveness.** Measures of effectiveness include satisfaction of public safety personnel with coverage; satisfaction of citizens with service; direct customer satisfaction (a generally used public service satisfaction benchmark is 95%), or ability to provide new services such as community policing or use new processes. Some of these elements are measured by surveys; some are measured by simulations of equipment used in training exercises for emergencies. New services include ability to add on increased or different uses of data. New processes include different ways of using personnel such as community policing that are enabled by better communications equipment.

C. THE COMMUNITY SERVICES WORKSTATION PROJECT

The Community Services Workstation (CSW) Project is in the early stages of consideration compared to the Global Access Project or the 800 Megahertz Project. The CSW Project is part of a three part program which also includes building cooperative teams from a variety of organizations and developing service protocols applicable to those organizations. The CSW Project is envisioned as a multimedia desk-top IT system which will link various public, private, and non-profit social services agencies forming a collaborative case management environment in the health and human services area.

Proponents of the system note that it will provide a variety of communication avenues including e-mail, bulletin boards, network directories, audio and visual electronics, and video conferencing and can be used on standard PCs. They state a variety of advantages including:

- Cost savings of staff time due to single intake and ability to transfer files electronically;
- Program savings related to client completion of contracts with social services staff; and
- Space savings due to decrease in amount and duplication of paper files.

Social services staff have begun exploration of the system with the technology provider Macro International. Macro's work has largely dealt with team building among the agencies and service providers. The next step will be to develop program guidelines and protocols. This step must be part of strategic planning–answering the questions:

- What is the mission of the *group* of agencies that will use the system? (The mission of the total group may be different from individual missions.)
- What are the goals that support this mission and what roles do the various members play?
- What outcomes are desired from the total program and from the IT project which supports it?

Only after these questions are answered satisfactorily can the stakeholders continue with the project. The next step isto specify what the IT is expected to do, investigate various IT options, and test prototype hardware and software using appropriate performance measures. Based on data obtained and analyzed for these measures, revisions to the system are made before final implementation is started.

PERFORMANCE MEASURES IN SIMILAR PROJECTS

Using information technology to aid collaborative casework is an operation under development in social services areas throughout the country. The Health and Human Services Coalition in the District of Columbia is implementing a similar system from the same contractor that Montgomery County is using. In addition, the Arizona Department of Economic Security and the Oregon Employment Department have collaborative casework systems facilitated by integrated information technology systems.

A recent article in **Government Technology** (February, 1995) cautions welfare agencies about some of the risks involved in integrated health and human services information technology projects. The article discusses the problems with which several state and local systems are grappling because of geometric growth of caseloads. The most serious problem is machine capacity due to the shift from human to machine-based decisions, the complexity of the various benefit programs, the mix of program types within individual households, and changing rules. The article urges, "Vendors must be incited to do a better job of designing welfare systems that address the inherent capacity issues by tying compensation to overall outcomes." Thus, expected outcomes of any such system be clearly defined first and made a part of the contract performance for the system providers.

The Health and Human Services Coalition of the District of Columbia. This coalition of 40 agencies and several research institutions is testing the protocols designed by Macro International. The stated program goal is "one stop shopping", which expands the caseworkers' ability to respond to multiple needs. Stated performance criteria include:

- Greater worker efficiency;
- Elimination of redundant information;
- Client data storage on individual hard drives or on the server;
- Simple to use hardware and software; and
- Ability to search for all areas of eligibility.

This project is one of several Macro International projects in the design and testing phase. To date, no substantial data are available on its performance.

Arizona Department of Economic Security. The Arizona Department of Economic Security has recently reengineered programs in two departments with IT facilitating collaborative casework: the Child Support Enforcement Program and the Family Assistance Program. Performance measures include percentage of payments collected; total amount owed by absent parents; supervisor/caseworker ratio; percentage of cases reviewed by caseworkers; processing time; case backlogs; percentage of interview "no shows"; number of staff handling applications; number of trips client made to the office; cycle time; and cost of service delivery as a percentage of assistance delivered.

Oregon Employment Services. Oregon Employment Services set up a comprehensive automated delivery system in response to the pressures caused by the simultaneous rapid increase in unemployment and decrease in staff. Performance indicators include access to programs through IT; enhanced customer services; timeliness of information; hours of access; and range of services.

SUGGESTED PERFORMANCE MEASURES FOR THE COMMUNITY SERVICE WORKSTATION

Development of a system of outcome measures for the Community Services Workstation Project includes satisfaction of both the internal and external customers requirements, as well as measures of cost and time involved in system development and implementation. It is extremely important that stakeholders from all areas of the community be included in designing performance measures. These are technical experts, system users, manufacturers and maintainers, residents and businesses from all areas of the county, representatives of county government, recipients of social services, and possibly users of similar systems in similar or nearby jurisdictions.

A suggested set of performance measures based on the total social services system includes:

- **Costs.** The metric is to compare the actual development, implementation, operational and maintenance costs of the system with the estimated costs (as proposed by the project director or contractor), or with costs of similar projects in other jurisdictions. Cost elements include hardware, software, communications facilities, personnel salaries and benefits, training, up grades, systems integration, and overhead. In addition, cost related indicators of fraud and abuse should be identified.

- **Resource savings.** Actual costs as well as cost avoidance are savings elements. Overall dollar costs and personnel cost savings in terms of maintenance or upgrade of the current system are an important part of this estimate. The metric is current versus future costs.

- **Schedule.** A timeline for the project is established. The metric is comparison of the actual schedule results against the projected ones.

- **Technical measures.** Technical measures include types of hardware needed, interoperability with similar systems inside and outside of the county; ease of interfacing with existing Montgomery County, State of Maryland, and federal health and human services systems such as Medicare and Medicaid; ability to use existing IT infrastructure to implement the project; capacity of the system; estimated time required to complete specific types of activities; extent and types of training needed by service providers and offered by system suppliers; operations and maintenance costs; and costs and capabilities of the system to handle electronic bulletin boards, multimedia, and e-mail.

- **Contractor performance.** The contractor's performance on similar or related projects is measured. This is accomplished by asking for customer references or having the program department check the contractor's record with similar projects. The metrics are actual cost and schedule compared to estimates, quality of products and services, and customer satisfaction.

- **Efficiency.** Measures of efficiency include time elapsed to complete transactions; time elapsed to coordinate multiple services; number of case workers and volunteers (at non-profits) needed and their workload; number of supervisors

and their workload; increased caseworker productivity; and number of services consolidated or reduced. The metric is to compare the current cycle time or numerical standards against those in similar systems and what is required in the new system.

- **Effectiveness.** Measures of effectiveness include satisfaction of caseworkers with the system; direct customer satisfaction (generally 95%); ability to provide new services or use new processes; identification of critical cases to manage; assurance mechanisms for privacy and security of data; eligibility determination; fraud and abuse detection; and links to the public safety system. Another measure currently noted is the ability to monitor benefit receivers' completion of contract requirements. Some of these elements can be measured by surveys of a sample of customers when served; others, such as time to process cases and system capacity, can be built into software requirements. New services may include ability to add on increased or different uses of data. New processes should include a variety of forms of collaborative casework.

Montgomery County Projects

7. INFORMATION TECHNOLOGY (IT), BUSINESS PROCESS REENGINEERING (BPR) AND STRATEGIC PLANNING

An issue frequently discussed is how information technology can be used to consolidate and/or link similar processes, such as payroll or personnel, in multiple agencies within an organization while maintaining the independence of the separate multiple agencies. The first step in discussing this issue is to recognize that information technology is simply the enabler behind any such consolidation. Thus, the first steps are to identify the processes and stakeholders involved to determine where the process fits in the organization's strategic plans and priorities for change and how business process reengineering can be used to effect that change. Information technology options are considered and chosen after the process has gone through an "organizational scrubbing."

Strategic planning confirms that the process is important enough for project managers, employees, customers, elected officials, and other stakeholders to commit time and resources to changing it. BPR is a methodology that critically examines, rethinks, and redesigns mission, products, and services within the political, economic, and social environment of an organization. BPR provides the method (through procedures and tools) for all process stakeholders to describe the current process and where they want to take it in the future.

Once this future state is defined and agreed on, then the enabling capabilities of information technology are evaluated. Specifically, the new process requirements are mapped to the information technology needed to successfully accomplish them. A variety of IT options consisting of mixes of the organization's current IT capacities and new IT capacities are examined. The option is chosen that gives the organization the best value (not necessarily the lowest cost) in terms of cost, schedule, meeting customer needs, technical solution, and past performance of the IT contractor.

INFORMATION TECHNOLOGY AND BUSINESS PROCESS REENGINEERING

Use of information technology can be a critical enabler in business process reengineering efforts such as consolidating similar functions such as payroll or personnel which are common to multiple agencies while maintaining each agency's autonomy. Information technology can be used to access and manipulate data to determine savings, expenses, revenue, and resource needs for planning and budgeting purposes. Information technology can also be used to establish communications among agencies and facilitate

the work of process teams. Information technology can be the foundation, but not the driver, upon which new processes are implemented.

Local governments' core processes are frequently carried out in a functional manner, with each agency handling on its own such common aspects as payroll, maintenance, and purchasing. This organizational structure leads to higher costs through duplication of processes and services, the need for more employees, and lack of coordination or leverage of existing expertise among the agencies.

Business process reengineering establishes a process perspective of the organization which is being reengineered. BPR advantages include:

- Creating a seamless, high performance system for customers;
- Streamlining processes and shortening cycle times;
- Demanding better quality work, emphasizing error prevention;
- Using team concepts with management and employees; and
- Changing administration from rule based to enabling.

Business process reengineering is a six-phase model in which current information technology is used as an important information gathering tool, and new and old technology isused as part of process realignment. Individuals involved in BPR must:

- Understand where reengineering fits in with the organization's strategic plan and other improvement efforts, either realigning entire organizations or redesigning important processes;

- Preplan and make relevant business and political cases for the need to act, including obtaining the commitment of top management and employees and necessary resources;

- Develop a strategic plan and vision, including mission, goals; and performance measures

- Reengineer using procedures and tools such as process flow mapping, value-added analysis, and strategic visioning of ideal models;

- Integrate the new processes into the organizational context including realignment of human resources and information technologies; and

- Implement and sustain process transformation through information strategies such as performance measurement across processes, customer and stakeholder performance outcome assessments, and sharing lessons learned.

There are a number of elements and skills in each of these phases. In each phase, individuals commit to change and re-prioritize resources as appropriate. (See Exhibit 11.)

Exhibit 11

BUSINESS PROCESS REENGINEERING

UNDERSTANDING BUSINESS PROCESS REENGINEERING

PRE-PLAN NEED TO ACT

Assessing the Need to Act

- Political Environment
- Organizational climate
- Labor/management relationships
- Is there a window for change?

Pre-planning Activities

- Commitment (and continuity) of topmanagement
- Line up needed resources (internal & external
- Does the organization understand the process (and product)?

STRATEGIC PLAN VISION

Select Steering Group/Body to Coordinate Change Efforts & Select the Change

- Link change targets to organization's strategic plan
- What are Change Objectives?
- Has a "compelling case for change" been communicated?

Preparing a Foundation

- Has a baseline or benchmark been set
- Have "core" processes been identified?
- Have customers and stakeholders been targeted?

PROCESS REDESIGN REENGINEERING PLAN

Internal Process Assessment

- Sub-Process Definition & Documentation
- Process mapping (Flowcharting)
- Identify current Process & Performance Measures

Customer/Stakeholder Assessment

- Customer value-added analysis
- Concept Engineering (Expectations)
- Identify Customer Performance Measures

Process Visioning & Modeling

- Ideal Models
- Process Attributes & Enablers
- Verification & Prototyping

CONVERSION & INTEGRATION REALIGNMENT

Conversion Requirements

- Business Process Changes
- Workforce & job Changes
- Work Systems & Technology Changes
- Facilities & Communication changes

"Upskilling" Workforce

- Converting Work Group to Team
- Worldforce Planning
- Training & Development for Process Work
- Develop Implementation Plan

Implementation Transformation

Cultural Change

- Politics
- Communications
- Human Resources
- Labor Relations
- Technology

Sustaining Management by Process

INFORMATION TECHNOLOGY

Source: "Primer on Process Engineering," A. C. Hyde. *The Public Manager*. Volume 24, Number 1. Spring 1995. And *Reengineering for Results: Keys to Success From Government Experience*. Washington, DC: Center for information Management. National Academy of Public Administration. August 1994.

STAGE 1 UNDERSTANDING BPR

To understand BPR, organizations ask: What is reengineering and how does it fit in with strategic plans and other process improvement efforts?

Business process reengineering is a methodology that critically examines, rethinks, and redesigns mission product and service processes within the political, social, and economic environment of the organization. It seeks to achieve dramatic mission performance gains from multiple customer and stakeholder perspectives. It is a key part of a process management approach for optimal performance that continually evaluates, adjusts, or removes processes.

STAGE 2 PREPLANNING: PREPARE FOR CHANGE

Preplanning requires a commitment to act from the top management. Both policy-makers and organization members must be prepared for the change. Top management gathers political support for the change, and stakeholders recognize that it is necessary. Managers must assure continuity as the enterprise moves from a functional focus to a customer focus. This continuity is particularly important to maintaining customer support. For example, in the 1980s, banks consolidated their services making it possible for customers to do several types of transactions at a single desk. Employees were trained so that, except for the convenience of making only one stop, customers were not aware that major changes were made in the way their accounts were handled.

Managers must examine the planning processes and make sure resources are in place with which to make the needed changes. Often, these resources include IT or the funds to purchase the IT necessary to support new processes. The banking example above required installation of wide area network systems, the use of software which accommodated multiple transactions, and additional employee training.

In the case of consolidating payroll, adequate resources–human and IT–are committed to the change so that a smoothly functioning payroll function is not interrupted while the new system is being developed and implemented. Training is particularly important so that individuals can adjust to their new activities and support the cultural change.

STAGE 3 STRATEGIC PLANNING: SET THE VISION

Top level management chooses a team to take on the next steps in the change process. The team's function is to set the strategic vision and goals of the enterprise and identify what aspects of the organization will change to reach those goals. Members of this group must be trusted individuals since they make the case for specific changes to employees who might be affected by new or lost positions.

Information technology is important at this phase since it can be used to communicate shortfalls in efficiency or effectiveness and to develop benchmarks against which the change is measured. Members of the cross-functional team can use information

technology to communicate with one another, access data, and design data collection systems pertinent to the conduct of the BPR.

For example, one core process of providing social services is identifying eligibility. In most jurisdictions, children are not eligible for many types of benefits unless they are enrolled in school. IT which allows social workers to access school records can speed identification of eligible service recipients and help providers more readily spot cases of fraud or abuse.

STAGE 4 PROCESS REDESIGN: USE A METHODOLOGY

In this stage, the technical work of reengineering is done. There are three elements which support reengineering at this phase:

- **Internal process assessment,** which includes identification and diagramming of current processes and performance measures such as cycle time, cost, productivity, error rate, and efficiency.
- **Customer/stakeholder assessment,** which includes determining expectations and developing customer outcome measures; and
- **Process visioning,** which includes developing ideal models, identifying enabling factors to reach stakeholders' goals, and testing the model.

Computer models and simulations can be used to test the effects of new processes. For example, in converting to a single payroll office for multiple agencies, computer modeling can enable planners to track work flow fluctuations caused by differing pay cycles among county agencies. IT can make it possible to denote which elements of work, or percentages of resources, are "billable" to each individual agency to allow for comparisons with benchmarks.

STAGE 5 CONVERSION: DEVELOP A TRANSITION STRATEGY

A special transition team in this phase facilitates the organization getting its work done while new work processes are being put in place. In this phase, many aspects of the organization are realigned: policies, work assignments, employee skills, customer interfaces, organizational structures, and the configuration and capacity of the organization's information technology.

Critical at this stage is acceptance of the change by the workforce. This acceptance is more certain if employees are given the proper training to easily master their new roles. Since this is the phase in which existing information technology may be reconfigured or new technology is acquired, it is critical that employees are thoroughly trained in its use.

Introduction of MCPS Global Access Project can be seen as an example of conversion in the "reengineering" taking place in public school systems throughout the United States. The focus of education is rapidly changing from a "discipline/textbook" center to a "customer/student" center. This has brought about major redesign in both administrative and educational functions. Teachers, parents, and administrators expect detailed information on student learning patterns and academic records to be readily available.

Students expect the latest information to be readily accessible. Critical to the success of this "reengineering" effort is technology which can enable student outcomes in learning academic material and mastering the art and science of modern electronic communication. Critical to acceptance of information technology is good training for those who must guide students in its use.

STAGE 6 IMPLEMENTATION: ASSURE SUCCESS

To avoid the high failure rate of many BPR projects, managers must be aware of the effects of change on individuals and the organization. In addition, managers must be aware if IT is not supporting change and be willing and able to correct the situation. Processes can be managed by using performance data as part of a feedback loop of design-implement-review-revise, continuously improving process.

Lack of capacity in many states' information technology caused reversion from highly automated collaborative casework schemes in social services to the old methods of paper and pencil record keeping. Because of inadequate IT capacity, backlogs grew. In areas where the systems were not upgraded, employees were rapidly able to prove that the reengineering project did not bring cost savings or result in better service.

EXAMPLES OF BUSINESS PROCESS REENGINEERING

As a mode to make business and government more responsive to stakeholders, including taxpayers, clients, managers, and employees, examples of business process reengineering can be found in the private sector and in all levels of government.

DOD Business Process Reengineering Program. Over the past five years DOD has developed a program with a center of expertise for business process reengineering practices and tools. The purpose of the program is to provide BPR assistance (training, tools, guidebooks) to DOD components who are using BPR to change the way they do business. Specific center products and services include paper and CD-ROM based media on BPR, "how to" guidebooks, strategic planning guides, process analysis tools, cost/benefit tools and guides, data modeling techniques and tools, process simulation tools, and general BPR consulting services. Government owned tools can be purchased at nominal cost, and products which are specifically licensed to DOD can be evaluated for use by non-DOD organizations. In August 1995, the program will issue a new CD-ROM containing streamlined BPR guidebooks, functional economic analysis programs, activity based costing programs, and pointers for accessing the guidebooks on the World Wide Web.

North Carolina Department of Public Instruction. In the early 1980s, North Carolina had problems with its local school unit financial information. The state legislature supported significant changes in the Uniform Education Reporting System (UERS) which handled the local financial and personnel information. This led to a comprehensive reengineering study in March 1993. The reengineering drivers included the need to improve costs, cycle time, and quality in data management; to empower local personnel; to make operations and policies match the intent of the legislature; to enhance operations; and to simplify basic reporting requirements so that another generation of financial software could be considered.

The study identified 19 significant improvement opportunities. Reengineering recommendations included eliminating multiple employee paychecks, simplifying pay and grade scales, revising community school reporting, improving teacher certification processes, and improving and expanding training and support.

In the area of teacher licensure, complexities caused difficulties throughout the human resources and payroll systems. A reengineering goal was set to shorten turn around time on licensing requests and reduce the number of licensing areas to match national standards. Among targets set were to increase applications processed from 130 to 300 per day; enable applicants to submit complete applications; and increase accuracy in application screening.

The UERS effort is complete and nearly all bottlenecks are removed. The use of temporary workers to catch up on filing has helped to eliminate inefficient information gathering methods. The department has developed an electronic filing system which will be on line in the summer of 1995.

Strategic Planning: Linking Participants in a Common Process

While BPR includes realignment of basic processes, strategic planning enables programs to focus resources more effectively on long-term program goals and client needs. In a time of limited budgets, policy makers and taxpayers, as well as businesses want to limit duplication of common efforts. Planners look to telecommunications and other information technologies to link participants in a common process. When these processes cross agencies, there are significant questions of how they can be funded, how savings are estimated and how expenses, revenues, and savings are monitored.

The Community Services Workstation Project outlined above is an example of such an effort. Although having access to a common data base is a necessary part of such an effort, it is not sufficient to accomplish the efficiencies expected. Instead, users must be able to work as a team collaborating on solutions. Instead of clients simply accruing the sum of several sources of aid, the synergy resulting from caseworkers' attention to a common goal can result in more powerful combinations of aid and solutions.

Using technology to link different aspects of a common process cannot ensure successful collaboration on common practices. The individuals involved in the project have to be willing to collaborate, be involved in project design early, and be committed. Most important, they have to define common goals, missions, and processes. All of this is typically accomplished within the context of the organization's strategic planning and budgeting processes.

Costing Service Delivery in the Canadian Government.

The Canadian government, in its 1994 budget, committed departments to establish standards of service that taxpayers can understand. They also let customers know what they can do if they feel service provided does not meet the standards. Establishing service standards requires departments to identify their service lines, identify and consult with clients and staff, develop and publish standards and performance against

consult with clients and staff, develop and publish standards and performance against standards, and strive to improve service over time. The information provided to clients includes the cost associated with providing service.

The objective for costing service delivery in relation to service standards is to inform the public of the costs of the services they pay for as taxpayers and receive as service users. The practicalities and expenses to produce cost information are also important considerations. Principles for service standard costing are as follows:

- Account for all elements of cost;
- Use service costs that inform the user;
- Display costs for a sensible aggregation of services;
- Display costs along with service outputs; and
- Ensure that service costs are comparable for similar services.

Techno Project in a Fortune 500 Company. Techno Project was the development of a core information technology that promised to alter radically the way the firm operated. A case study, presented in the *MIT Sloan Management Review* (Spring 1995), tracks the strategic decision in a Fortune 500 company to implement a new information technology across functional boundaries. The purpose of the new information technology was to reduce costs and examine fundamental changes in customer service. Specifically, the new information technology would reduce the number of steps in the current process, provide instant notification to and feedback from customers, and improve service reliability. The new technology's purpose was to integrate diverse corporate services and organizational entities by creating a new information technology platform for a family of new services across functional units. The project carried a high price tag of more than $1 billion.

Successful strategic change in this example involved overcoming three hurdles:

- **Turf Barriers.** Since tasks define an organizational member's role and identity, connote prestige, and provide a power base, he or she may be reluctant to have the domain or territory altered. (Territory or turf includes an area of expertise or authority, a particular task, or access to resources.) Subunits are strongly motivated to defend against loss of status or power.

- **Interpretive Barriers.** Each participant in a strategic decision contributes special knowledge to the process. Each may have a unique interpretation of strategy goals and their importance. Certain biases may affect strategic decisions by restricting the range of alternatives and the information for evaluating them. For example, marketing personnel are interested in products that will be successful in the near-term, while R&D personnel are interested in more radical breakthrough projects.

- **Communication Barriers.** Departments develop a shared language that reflects similarities in members' interpretation, understanding, and response to information. This language enhances communication within the department. However, organizational members unfamiliar with it may distort and misinterpret it and find communications with the department members difficult.

Top managers' role in the strategic decision making process was crucial. The senior executives established broad, general goals for the project, encouraged experimentation, and demonstrated flexibility throughout the process of development and implementation. They used both formal and informal strategies to make the project a success. Examples included: choosing the leader and others for the project team, promoting an opposing project manager to head the team in phase two of the implementation, praising the team's success at each project milestone, and confirming independent departmental control over specific processes.

The Techno project was successful because of the corporation's ability to harmonize information technology with a clear understanding of customers' present and future needs. In addition, top management commitment and direction throughout the project coupled with its ability to articulate and communicate each department's distinctive skills brought to bear on the project facilitated a successful project completion. Lessons learned from the project include:

- Top management's vision for a common corporate goal and the future outcomes of the project was essential. They successfully met the fundamental challenge to link or meld the identities of the various subunits into the organization's emerging new identity.

- Top management accorded special status to the Techno project and openly acknowledged its promise for the organization.

- During the progress of the project, top management incrementally provided direction at each step of the way and controlled internal conflicts by direct interventions with the interest of the common goal at stake.

- Because the project involved cross functional departments, the team was composed of stakeholders from all departments from start to finish.

- The project team maintained ties with important stakeholder groups during the course of the project development and implementation.

- Communication was enhanced during the project by:

    - Top managers' identifying how the proposed changes will affect all stakeholders and identify zones of support and opposition.
    - Top managers' disseminating project related information early in the process.
    - Top managers' recognizing the unique goals, orientations, and priorities of each department and function.

- Team members, at key points during the project's development and implementation, divided their time equally between technical and political activities.

8. Concluding Thoughts

- Stakeholders themselves must create, use, and monitor performance measures
- Performance measures for information technology must be tied to program results.
- Information technology is an enabler/catalyst, not the "solution."
- All costs associated with implementing technology projects must be identified and reviewed throughout the projects' life cycles and be independently evaluated.
- Business process reengineering is a way to link or consolidate similar programs or processes.

Concluding Thoughts

Appendix A
Additional Project Information Sources

IT in Educational Programs

Educational Technology Plan
DS Manual 2006.1
Department of Defense Education Activity
4040 North Fairfax Drive
Arlington, VA 22203-1634

David Dwyer, Project Manager
Apple Classrooms of Tomorrow
20525 Mariani Avenue
Cupertino, CA 95014

Advanced Telecommunications in U. S. Public Schools
OERI, U. S. Department of Education
Washington, DC

Oregon Progress Board
775 Summer Street, N.E.
Salem, Oregon 97310
503-986-0039

Dr. Ann Harrison
Planning, Research, and Evaluation
Kansas State Board of Education
120 S. E. 10th Avenue
Topeka, KS 66612-1182
913-296-3604

Public Safety Radio Technology

Steve Souder
Administrator, Emergency Communications Center
1400 North Uhle Street, Fifth Floor
Arlington, VA 22201-9998

Joel Harrington
Senior Communications Engineer
Portland Bureau of emergency Communications
911 S. E. Bush Street
Portland, OR 97266-2505
503-823-0911

Corporal Chris Malinowski
Police Project Coordinator
Baltimore County Police, 800 Megahertz Project
911 Center
400 Kenilworth Drive
Towson, MD 21204
410-887-5923

Tim Boncoskey
Office for Excellence in Government
(Arizona Department of Public Safety Project)
1700 West Washington, suite 300
Phoenix, AZ 85007
602-542-7546

Health and Human Services Community Services Workstation

Tim Boncoskey
Office for Excellence in Government
(Arizona Department of Economic Security Project)
1700 West Washington, suite 300
Phoenix, AZ 85007
602-542-7546

Department of Health Services
District of Columbia
202-279-6070

Jack Kassig
Oregon Employment Department
875 Union Street NE
Salem, OR 97311
503-378-3212

Strategic Planning and Business Process Reengineering

David Roth
Assistant Auditor General
Office of the Auditor General
240 Sparks, 11th Floor, West Tower
Ottawa, Ontario
K1A 0G6
613-995-3708

DOD Business Process Reengineering Program
Mike Yeomans
Director, Business Process Improvement
1225 Jefferson Davis Highway
Suite 910, Room 28
Arlington, VA 22202

James Barber
Financial and Personnel Services
Department of Public Instruction
Education Building
301 N. Wilmington St.
Raleigh, NC 27601-2825
919-715-1371

Techno Project
"Hurdle the Cross Functional Barrier"
Michael D. Hutt, Beth A. Walker, Gary L. Frankwick
MIT Sloan Management Review, Spring 1995

Appendix B
Additional Sources of General Information

A Guide to Designing Performance Indicators. Washington, DC: National Academy of Public Administration. November 1993.

Educational Leadership. ASCD, 1250 N. Pitt St., Alexandria, VA 22314-1453. April 1994.

Educational Technology Plan. Department of Defense Education Activity. DS Manual 2006.1. Arlington, VA. April 1995.

Enterprise Reengineering. TFG Publishing Co., 7777 Leesburg Pike, Suite 315N, Falls Church, VA 22043.

Getting Results: A Guide for Government Accountability. J. A. Brizius and M. D. Campbell. Washington, DC: Council of Governors' Policy Advisors. 1991

Government Technology: Solutions for State and Local Government in the Information Age. 9719 Lincoln Village Dr., Suite 500, Sacramento, CA 95827-9818.

"Improving Government Performance," Christopher Wye. *Public Administration Review.* Winter 1992-93.

Managing Information Technology for Results: Measuring, Evaluating, and Assessing I/T Contributions to Federal Agency Program Outputs. Washington, DC: Center for Information Management, NAPA. August 1994

National Science Foundation's Science and Technology Centers: Building an Interdisciplinary Research Paradigm. Washington, DC: National Academy of Public Administration. 1995.

Oregon Benchmarks: Standards for Measuring Statewide Progress and Institutional Performance.
Salem, OR: Oregon Progress Board. December 1994.

"Primer on Process Engineering," A. C. Hyde. *The Public Manager.* Volume 24, Number 1. Spring 1995.

Reengineering for Results: Keys to Success From Government Experience. Washington, DC: Center for Information Management, National Academy of Public Administration. August 1994.

Reengineering for Results: Update. Sharon Caudle. Washington, DC: National Academy of Public Administration. March 1995.

"The Case for Performance Monitoring," Joseph S. Wholey and Harry P. Hatry. *Public Administration Review.* September/October 1992.

Toward Useful Performance Measurement. Washington, DC: National Academy of Public Administration. November 1994.

Appendix C
Individuals Interviewed in Montgomery County

Montgomery County Council Members

Nancy Halter Dacek
William E. Hanna, Jr.
Betty Ann Krahnke
Neal Potter
Marilyn J. Praisner

Office of Legislative Oversight

Karen Orlansky
Sue Richards

MCPS Global Access Project

Lani Saikeley
Joe Valani

800 Megahertz Trunked Radio Project

Sgt. Bruce Blair
MC Police Department

Chief Mike Love
MC Fire Department

Gary McKelvey
Department of Information Systems and Technology

HHS Community Services Workstation

Tom LaFleur
Department of Information Systems and Technology

Carole Johnson
Services Team Leader, HHS