

LINKING FEDERAL IT CAPITAL PLANNING AND INVESTMENT CONTROL AND PORTFOLIO MANAGEMENT: A CASE STUDY AT THE U.S. DEPARTMENT OF COMMERCE

E. Logan¹

¹ Edward Logan, is a member of the American Society for Advancement of Project Management (ASMP) and Project Management Institute (PMI). Logan is currently working as a Principal Analyst/ Senior Enterprise Architect for Project Performance Corporation (PPC)/ and is presently studying as a MIPP Fellow at The Elliott School of International Affairs, George Washington University, USA)

Short Abstract

In the United States, there is increasing competition to secure funds for Federal information technology (IT) investment projects as many departments and agencies face a tightening budget. Any major IT project, especially new initiatives, requires full compliance with the President's E-Government Initiatives and needs to score well when the Office of Management Budget (OMB) evaluates its Exhibit 300 Business Cases. The OMB ensures that every major Federal IT project goes through a rigorous process that justifies the investment. This process is known as Capital Planning and Investment Control (CPIC), a systematic approach to selecting, controlling, and evaluating information technology investments. The CPIC is mandated by the Clinger-Cohen Act of 1996 (CCA), requiring that all Federal agencies focus more on the results achieved through IT investments. The CPIC process, prescribed by OMB Circular A-130, also emphasizes thorough analysis and selection of information technology investments and seeks to ensure that senior management obtains and reviews timely information regarding the progress of an investment in terms of its milestones, cost, and its capability to meet specified mission objectives.

The purpose of this paper is to provide a brief overview of the CPIC process used at the Department of Commerce (DoC). DoC and its fourteen component bureaus create the conditions for economic growth and opportunity by promoting innovation, entrepreneurship, competitiveness and stewardship. The DoC's mission is linked directly to encouraging the economic growth that benefits all American industries, workers and consumers; enhancing technological leadership and environmental stewardship; and advocating market growth strategies. The responsibilities of DoC are to foster U.S. business and industry; stimulate international trade; measure and analyze social development and economic activity; advance our nation's scientific and technological capabilities; and understand, predict, and protect the natural environment. The paper will also discuss the application of portfolio management principles and identifying its relationships with the CPIC process. The paper will then briefly examine the benefits of using a web-based portfolio management, analysis, and reporting tool to support the budget activities of the Office of the Chief Information Officer (OCIO) during the annual planning process and throughout the year. The implementation of an effective, efficient, and repeatable IT Capital Planning process is essential to ensure that the senior management executives at the DoC can achieve sound IT investment decisions.

Keywords: Information Technology, Project Management, Portfolio Management, Capital Planning and Investment Control

Paper

1.1 INTRODUCTION

Today, funding for federal information technology (IT) investment projects in the United States is becoming more competitive as many departments and agencies face a tightening budget. Any major IT project, especially new initiatives, needs to score well when the Office of Management Budget (OMB) evaluates the Exhibit 300 Business Cases that support project investments and ensures compliance with the President's E-Government Initiatives. Annually, the DoC manages approximately a \$6.5 billion budget focused on promoting American business at home and abroad.¹ The successful implementation of these IT investments directly influences the ability of component bureaus and offices within DoC to execute business plans effectively and fulfil missions.

DoC recognizes the importance of a well-defined Capital Planning and Investment Control (CPIC) process to help ensure full compliance with the appropriate laws and regulations. In addition, an effective CPIC process ensures that major IT investments made by DoC are supported by a strong business case justification. These business cases should also be based on measurable objective criteria and aligned with the mission and goals of the agency.

1.2 BRIEF LEGISLATIVE BACKGROUND

The enactment of the Clinger-Cohen Act (CCA) in 1996 is considered the defining moment to conduct the CPIC process for all Federal agencies.² Prior to the CCA, there was the Paperwork Reduction Act (1980, revised 1995) which established a very broad mandate for agencies to perform their information resources management activities. The *Clinger-Cohen Act specifically instructs the head of each executive agency "to establish effective and efficient capital planning processes for selecting, managing, and evaluating the results of all of its major investments in information systems."*³ CCA essentially mandates that agencies make a solid business case for each IT investment.

CCA grants the Director of OMB broad authority to enforce Clinger-Cohen requirements, including the use of the budget process. *While the mechanism has existed since the enactment of Clinger-Cohen, OMB only recently began to use its enforcement authority by withholding funding when agencies cannot demonstrate a sound business case for their IT investments.*⁴ The CPIC process, along with OMB's guidance, has and will continue to evolve over the years with each change intended to refine the process.

There are also other legislations and implementing guidance that mandates the CPIC process for IT Management besides the Clinger-Cohen Act. These include the OMB's Circulars, A-11, "Preparation, Submission and Execution of the Budget⁵," and A-130, "Management of Federal Information Resources⁶," each establish, among other things, policy for implementing the mandates of Clinger-Cohen. A-130 provides detailed guidance to agencies on how they should manage their IT investment using the CPIC process and cross references OMB Circular A-11 and Clinger-Cohen in requiring a business case for all major investments. The E-Government Act of 2002 further continues to strengthen the requirement for performing the CPIC process.⁷ Other legislation requires agencies to integrate with the CPIC process and

revise their operational and management practices to achieve greater mission efficiency and effectiveness: the Chief Financial Officers Act, the Government Performance and Results Act, the Federal Acquisition Streamlining Act, the Government Paperwork Elimination Act, and the Federal Information Security Management Act.

The Office of Management and Budget (OMB) Circular A-11, Exhibits 300 (Capital Asset Plan and Business Case) and 53 (Agency IT Investment Portfolio) establish the critical building blocks for the planning, budgeting, and acquisition documentation. The DoC adopted an IT Planning and Investment Review Program Maturity Model as the capstone to the process, pulling together all the elements of the process including linkages to other areas of focus, in a comprehensive model that helps operating units to monitor, evaluate, and improve their processes over time. This maturity model, along with maturity models for IT Security and IT Architecture, are reported in Commerce's Annual Performance Plan submitted under the Government Performance and Results Act.⁸

1.3 STRATEGIC INFORMATION TECHNOLOGY PLANS (SITP)

The CPIC process begins with a request from the Department's Chief Information Officer (CIO) for operating units to develop strategic IT plans. The fourteen operating units with the DoC are asked to develop strategies to address performance gaps. The capital planning and investment control processes are based on strategic IT plans and are linked with operating unit program plans developed under requirements of the Government Performance and Results Act (GPRA).

The Strategic IT plans provide a framework for discussion and an opportunity for operating units to focus on the strategic use of IT resources to improve program delivery. Strategic IT plans also lays the groundwork for development of operational IT plans and documentation to support budget year IT initiatives. The strategic IT plans establish over-arching, operating unit-wide IT goals, such as the development of architectures, strategic use of electronic commerce, and development of IT security and privacy strategies. The plans include financial information in the format of OMB Circular A-11, Exhibit 53. This provides an overview of the operating unit's IT portfolio and provides consistency with the budgeting process. The call for strategic IT plans is usually issued in the late fall of each year with plans due annually on a schedule that best meets the needs of the operating unit.

Each operating unit addresses its program information needs in its Strategic IT Plan. The Department's Strategic IT Plan (or Strategic Information Resources Management Plan) builds on these information requirements as well as elaborates strategic goals for the Department as a whole. The Strategic IT Plan complements and supports the Commerce Strategic Plan and Annual Performance Plan. The Office of the CIO staff develops the Strategic IT Plan, with input and concurrence from the Commerce CIO Council and key stakeholders such as the Office of Budget and the Office of the Chief Financial Officer.

The *Departmental Strategic IT Plan* is available to all stakeholders.⁹ This year's plan highlights three major modernization efforts: The Census Bureau's 21st Century Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) Enhancements, the National Oceanic and Atmospheric Administration's High Performance Computing Strategy (HPCS), and the Patent and Trademark Office's E-Government Initiative. This year's plan also focuses on a streamlined set of IT goals and identifies strong performance metrics to track progress against these goals.

The DoC CIO organizational structure gives operating unit CIOs full responsibility and accountability for their strategic and operational IT planning. Consistent with the maturity of the IT planning processes at Commerce, operating unit CIOs assess their planning processes against a capability maturity scale and inform the DoC's CIO of progress.

1.4 OPERATIONAL IT PLANS (OITP)

Operational IT plans are due in the fall of each year and describe specific operating unit plans for IT activities for the coming fiscal year. As with the strategic IT planning call, the *operational IT planning call* provides an opportunity for the CIO to highlight specific areas of focus.¹⁰ As was the case last year, this year's call puts emphasis on performance measurement.

The operational IT plans are also based on OMB Circular A-11, Exhibit 300. This provides continuity with the budgeting process and a consistent set of documentation, ensuring that issues such as developing systems within the context of architecture and IT security and privacy are considered on an ongoing basis. At the point of the operational IT plans, the Exhibit 300 documentation should be well defined, identifying specific schedules, acquisition plans, and performance measures. The timing of the operational IT plan is intended to put the focus on the coming fiscal year and to promote better coordination and integration with development of performance measures required by GPRA.

1.5 COMMERCE CPIC PROCESS MODEL

The DoC information technology (IT) capital planning and investment control process is built on a foundation of strategic and operational IT plans. These plans are well integrated with processes for the selection, control, and evaluation of IT investments. The process includes linkages throughout to IT architecture, IT security and privacy, IT accessibility, electronic government, and other domains of IT management responsibility as well as linkages to the Commerce strategic planning, budgeting, and acquisition processes.

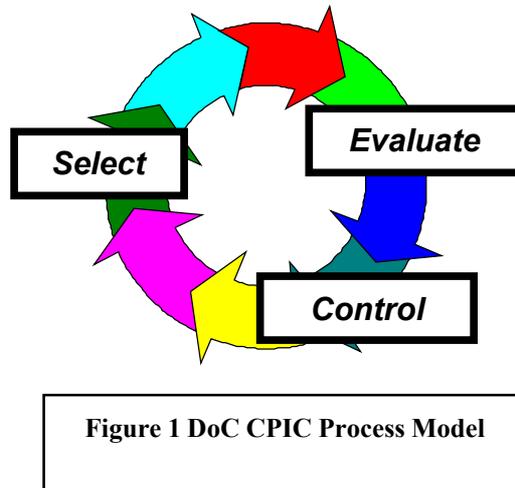
The primary purpose of CPIC process is to minimize the acquisition costs and maximize the utilization of information technology investment. The CPIC process has been through many changes as it has evolved over the years, with each change intended to refine the process. CPIC involves selection of those projects that will best support mission needs. CPIC also stipulates control mechanisms that evaluate actual results (costs, schedule, and benefits) against expected results and facilitate management decision-making and action for adjustments. At the highest level, the CPIC process is a circular flow taking agency IT investments through series of sequential phases¹¹:

Select Phase—Investment analyses are conducted and the IT projects that best support the mission of the organization are chosen, ranked in terms of supporting an approach to enterprise architecture, and are prepared for success.

Control Phase—The agency ensures, through timely oversight, quality control, and executive review, that IT initiatives are executed or developed in a disciplined, well-managed, and consistent manner.

Evaluate Phase—Actual results of the implemented projects are compared to expectations to assess investment performance. This is done to assess the project's impact on mission performance, identify any project changes or modifications that may be needed, and revise the investment management process based on lessons learned.

Each of these three phases is structured in a similar manner using a set of common elements. These common elements provide a consistent and predictable flow and coordination of activities within each phase. Figure 1 of DoC CPIC process will be discussed in detail below.



The Select Phase

Each year new information technology (IT) investments must go through the select phase to ensure that the DoC has the right mix of investments in its IT investment portfolio. The purpose of the select phase is to determine the optimal portfolio of IT investments for DoC. The IT investments that best support DoC's mission are ranked and selected for inclusion in the DoC IT investment portfolio. The fourteen operating units submit to DoC its list of investments to be funded, the criteria used to score each investment, and the associated score for each investment. Finally, DoC collectively sends the various portfolios to the Office of Management and Budget (OMB).

The Control Phase

The control phase is an ongoing activity conducted to ensure that investments selected for inclusion in the DoC information technology (IT) investment portfolio continue to:

- Meet mission needs,
- Meet approved schedule and cost baselines,
- Manage risks effectively, and
- Achieve expected benefits.

The control review should demonstrate that the IT investment is being managed in a disciplined manner using sound project management principles. The outcome of a control review is a decision to continue as is, modify, accelerate, decelerate, suspend, or terminate. If needed, a corrective action plan is developed. The control review schedule may be modified as well.

The Evaluate Phase

Investments that have been put into production are reviewed in the evaluate phase by going through a post-implementation review (PIR). The PIR compares the collected data on actual results to projected results made during the select phase. The first part of PIR validates estimated benefits and costs and ensures a positive return on investment (ROI). The second

part of PIR looks at the capital planning and investment control (CPIC) process and feeds lessons learned back into the CPIC process to ensure continual improvement of the process. Evaluations of mature steady state investments are conducted to determine whether the investment continues to support the mission, whether users/customers are satisfied with the investment, whether the investment is meeting performance goals, and to assess the cost and extent of continued maintenance and upgrades.

The DoC Chief Information Officer (CIO) reviews the PIR for investments that cost over \$5 million annually and makes recommendations to the Investment Review Board (IRB), which decides whether to continue, terminate, or make modifications to the investment.

Once an investment is implemented and the initial PIR has been conducted, the owner of the investment monitors it for performance, outages, maintenance activities, costs, resource allocation, defects, problems, and system modifications. These steady state evaluations should be conducted annually and should focus on mission support, operational capability, and costs.

1.6 BENCHMARKING IT MANAGEMENT PROCESSES

The DoC is committed to sustaining and improving its IT management processes. DoC routinely benchmarks its IT management practices against those of leading organizations with other federal agencies. DoC regularly maintains a subscription to Gartner Group, which provides benchmarking solutions using a large database of IT performance metrics, enabling their agency to compare IT functions to those of similar organizations. The Office of the CIO staff study the General Accountability Office reports of IT management processes and stays abreast of IT management best practices through participation at conferences and with professional organizations and subscriptions to professional journals, magazines, and newspapers. DoC is an active member of the Federal CIO Council's Best Practices Committee, which compiles best practices to share across the Federal IT community. DoC also reaches out across the Government to share its IT management practices through presentations at the Information Resources Management College of the National Defense University, National Academy of Public Administration, National Academies, etc.¹²

1.7 PORTFOLIO MANAGEMENT (PFM) AT GLANCE

There is great deal of history behind portfolio management (PfM) and much of it is well worth the time and effort to review. However, the scope of this paper is to briefly discuss PfM history, the practice of PfM and identify the linkages with the CPIC process used at the DoC. At its core, portfolio management describes the processes, practices, and specific activities to continually and consistently evaluate, select, prioritize, budget for, and plan those investments that offer the greatest value and contribution to the strategic interests of the agency.

The concept of business portfolios began in the late 1950s and evolved through the 1970s. Companies originally used the tool to balance business units and prioritize resource allocation. Over time, PfM became a well-established planning tool in major companies around the world.¹³ In the 1980s and 1990s, companies extended the use of portfolio management into new product selection and Research & Development resource allocation. Though the tools and uses have changed over time, the basic need remains the same.

Companies must allocate resources to projects that balance risk, reward and alignment with corporate strategy, while remaining within their resource limits.

Financial Investment Management provides a useful analogy for IT portfolio management. A client has an overall goal for his/her investment portfolio. The goal states the desired levels of stable income, liquidity, and long-term growth balanced against the tolerance for risk and the overall size of the portfolio. The investment manager allocates resources to diverse financial instruments in the proper proportions to meet the client's needs. The diversification of portfolio enables the manager to balance risk and reward in the short and long term to achieve the overall goal for the client. Balancing a financial portfolio has become a straightforward exercise using a variety of well-established methods that rely largely on quantitative metrics. The investment manager has numerous standardized ratios, formulas and graphs readily available to aid in the decision process.

IT PfM has not reached the same level of standardization as investment portfolio management, particularly in the public sector.¹⁴ Project metrics vary greatly from one agency to another. Some measures are quantitative, like estimated Return on Investment, while others are qualitative, like alignment with agency's strategy. Varieties of PfM tools have been developed to account for different types of metrics. Mathematical and scoring models are better suited to measure quantitative results. Graphic and charting formats provide a better measure of qualitative metrics. The mixture of qualitative and quantitative goals makes it difficult to define and to measure the "optimum" balance of a technology portfolio.¹⁵ Using multiple tools to balance the portfolio can lead to information overload for the portfolio managers. IT portfolio managers often develop the final portfolio balance through professional judgment or a scoring/weighting method.

Portfolio Management (PfM) in Practice

PfM has three goals to satisfy: maximize the value of the portfolio, provide balance, and support the strategy of the enterprise.¹⁶ Portfolio management focuses attention at a more aggregate level. The factors to balance may change from one agency to another. Some common factors to balance are risk and reward, near term and long term, and project type. The process of managing the portfolio brings about the activities that are normally associated with portfolios: project selection and prioritization, and resource allocation and project implementation. There have been numerous methods to carry out these tasks in pursuit of the goals and each has its strengths and weaknesses. Robert Cooper breaks technology portfolio tools into three categories: classical, mapping, and mathematical programming.¹⁷

PfM considers the aggregate costs, risks, and returns of all projects within the portfolio, as well as the various tradeoffs among them. Of course, the portfolio manager is also concerned about the "health" and well being of each project that is included within the organization's IT portfolio. After all, portfolio decisions, such as whether to fund a new project or continue to finance an ongoing one, are based on information provided at the project level.

1.8 STRATEGIC INTEGRATION OF PORTFOLIO MANAGEMENT (PfM) AND CPIC PROCESS

PfM is an integral component of the CPIC process, however, IT PfM cannot be accomplished without first establishing an IT investment foundation. Building an IT investment foundation, using GAO's IT Investment Management maturity model as described in GAO/AIMD-10.1.23, requires that DoC first establish IT investment management processes to ensure the following activities:

- IT investment is selected based on established selection criteria;
- An Investment proposal is business driven;
- IRB establishes and maintains an asset inventory of current IT investments;
- IRB oversees these investments.

With maturity and experience in establishing an IT investment foundation, DoC moves forward with developing a complete investment portfolio. Based on the GAO model cited above, portfolio management maturity efforts to develop the DoC IT portfolio are based on the following principles:

- Ensuring the alignment of the various IRBs;
- Developing portfolio selection rating, and ranking criteria that supports DoC mission and strategic goals.
- Conducting continuous analysis of each investment at every phase of its life-cycle;
- Developing IT portfolio performance measures.

The purpose of IT PfM process is to ensure that an optimal IT investment portfolio with manageable risk and returns is selected and funded. *Figure 2* illustrates an overview of the three processes in PfM that map with similar processes in CPIC:

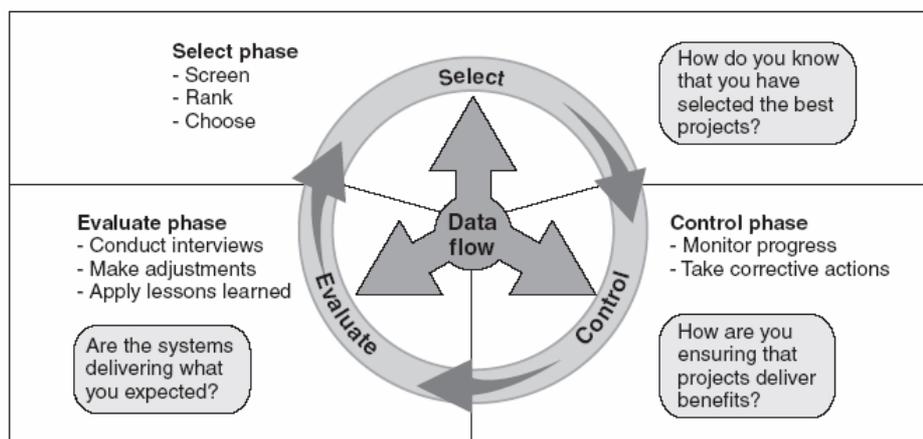


Figure 2: PfM Process Model

PfM is the strategic management of the enterprise's investments and projects to blend IT investments with related business initiatives. PfM recognizes that the value of each project changes over time. The benefits to be realized from a program will change in relative value to other programs in the portfolio as each program is better understood and as internal and external factors tend to change. These changes are better understood through the use of Enterprise Architecture to identify and map the internal and external factors of change, performance gaps, and fluctuations in business strategies.¹⁸ PfM is centered on the CPIC process defined by legislation and supported by OMB and GAO Federal guidance for IT capital planning and IT investment management.

PfM Web Based Tools

Managing an agency's portfolio management system is very time consuming and data intensive. CIOs and senior government executives are relying heavily on PfM software tools to make this process more efficient, but even so, considerable human intervention is necessary. PfM software tools have been in existence for a number of years. Good PfM software tools can promote greater visibility and instill improved confidence during the analysis and decision-making process. It is very important to note that a good portfolio management process must be in place before any software package can take effect.

Before purchasing a new portfolio management tool, the portfolio manager should assess existing licensed software and determine whether it is adequate. The portfolio manager must look at functionality and scalability when judging the tool's adequacy. All technology is replaceable; however, a wrong decision will waste a tremendous amount of resources, therefore the portfolio manager's decision is extremely important.

Working at portfolio level is about working with summary or key data. It is important to avoid information overload. The detail of each project should be kept at the project team level and administered by the individual project managers. Key information should be rolled up and presented at each level within the agency as appropriate. At the senior executive level, it is important to focus on providing a summary of performance, progress, a measurement of estimates against actuals and costs.

When selecting a PfM tool, an agency should use criteria based on identified needs and objectives. It is advisable to start small, introducing aspects of PfM one element at a time.¹⁹ Many commercial tools can seem overwhelming at first, simply because of the amount of functionality they offer. These are the key features of a PfM system:

- Portfolio planning
- Project evaluation process
- Progress reporting
- Executive dashboard
- Resource planning
- Cost and time tracking²⁰

1.9 CONCLUSION

The Department of Commerce uses the Capital Planning and Investment Process (CPIC) to maximize its IT investments. The CPIC process has proven helpful for the agency to collect and track investment data needed to effectively manage IT investments. The CIO at the DoC is the ultimate portfolio manager and is responsible to effectively manage IT investments. IT investment strategies and spending are tightly aligned with expected improvements in performance and results. The inability to track IT development and implementation effectively can result in a failure to identify cost and schedule overruns, and ultimately leading to failure to meet performance expectations. Management plans and reporting are critical to providing continuity in planning from year to year and in measuring the contribution of IT to mission performance across the agency.

A strong and comprehensive IT capital planning process is necessary to ensure that agency IT expenditures receive the executive-level oversight required for confidence that the agency head is executing IT investment management responsibly as specified in the CCA. The use of Portfolio Management software tools can greatly enhance the further improvement of CPIC process to effectively manage IT investments. Finally, CPIC ensures that the investments are successful as part of the overall IT portfolio that support the agency mission.

REFERENCES

1. Department of Commerce Website: <http://www.doc.gov>
2. Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-Making, U.S. General Accounting Office, Accounting and Information Management Division, February 1997.
3. Capital Programming Guide, Office of Management and Budget, July 1997.
4. Ibid.
5. Circular A-11: Preparing and Submitting Budget Estimates, Office of Management and Budget, July 2004
6. Circular A-130: Management of Federal Information Resources, Office of Management and Budget, January 28, 2000.
7. U.S. Government Accountability Office, Executive Guide: Improving Mission Performance Through Strategic Information Management and Technology, GAO/AIMD-94-115 (May 1994).
8. Clinger-Cohen Act of 1996 (formerly the Information Technology Management Reform Act [ITMRA]).
9. Department of Commerce Website: <http://www.doc.gov>
10. Ibid.
11. Ibid.
12. Citizen-Centered Governance: Customer Value
13. Rousel, P.K. Saad and T. Erickson. Third Generation R&D: Managing the Link to Corporate Strategy, Boston, Massachusetts: Harvard Business School Press and Arthur D. Little Inc., 1991.
14. Cooper, R.G., Edgett, S.J., Kleinschmidt, E.J., "Best Practices for Managing R&D Portfolios," Research & Technology Management, July-August 1998.
15. Cooper, R.G., Edgett, S.J., Kleinschmidt, E.J., "Portfolio Management in New Product Development: Lessons from the Leaders-I," Research & Technology Management, September-October 1997, pp 16-27
16. Cooper, R.G., Edgett, S.J., Kleinschmidt, E.J., "Portfolio Management in New Product Development: Lessons from the Leaders-II," Research & Technology Management, November-December 1997, pp 43-52
17. Groenveld, P, "Road mapping Integrates Business and Technology," Research & Technology Management, September-October 1997, pp 48-55
18. Baker, N.R., "R&D Project Selection Models: an Assessment," IEEE Transactions on Engineering Management, EM-21, 4, 1974, pp165-171.
19. Danila, N., "Strategic Evaluation and Selection of R&D Projects," R&D Management, 19, 1, 1989, pp 47-62
20. Liberatore, M.J., "A Decision Support system Linking Research and Development Project Selection with Business Strategy," Project Management Journal, 19, 5, 1988, pp 14-21.