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Applying the Laboratory Integration and Prioritization System (LIPS) to Decision-Making at Sandia National Laboratories

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ABSTRACT

The Laboratories Services Division of Sandia National Laboratories includes a wide variety of operations such as environmental, safety and health , safeguards and security, facilities, logistics, and sites planning and integration. In the face of declining budgets and increasing requirements, the Management Team needed some tools to assist in negotiating with customers and regulators and in consistently and cost-effectively managing all work performed and/or managed by the Division. The Integrated Services Management System (ISMS) was developed as a series of processes to provide these tools. The Laboratory Integration and Prioritization System (LIPS) was selected as the prioritization methodology for ISMS. The LIPS was chosen over three other prioritization methodologies which were evaluated because it best met the criteria for a risk-based, technically defensible methodology. The pilot application phase was begun in February 1994 and addressed planning of work and resources for FY95. Extensive training was provided for the Activity Data Sheet (ADS) preparers and the teams which would score each of the activities. After preparation of the ADSs, they were scored by the scoring teams. A division-wide review board reviewed all of the ADSs to ensure consistency of scoring across all of the functional areas. The lessons that were learned from the pilot application were evaluated and improvements incorporated for the FY96 planning and application. The improvements included upgrading the training, providing expert facilitation for scoring boards, modification of the scoring instructions to better represent local situations, and establishing a Validation Board with more authority and accountability to provide quality assurance. The participants in the LIPS process have agreed that no major bases were uncovered, "imperfect" prioritizations are better than no data, all work packages can be scored and ranked, including core activities, results were objective and quantifiable, and decisions could be made using technically defensible bases.

INTRODUCTION

The Integrated Services Management System (ISMS) is a formal system of processes designed to assist the Laboratories Services Division (LSD) Management Team of Sandia National Laboratories in negotiating with customers and regulators and in consistently and cost-effectively managing all work performed and/or managed by the Division. The ISMS strengthens and formalizes the elements of the management process, improves the benefits received from resources expended and ensures that limited resources are used to support activities that address the greatest risks and provide the greatest benefits. The current applications include environmental programs, safety and health programs, safeguards and security operations, facilities operations, logistics operations, and sites planning, integration and operations. The Laboratory Integration Prioritization System (LIPS) methodology is the basis of the work decision process of the ISMS.

BACKGROUND

The ISMS, of which LIPS is an integral part, was developed to support the Laboratories Services Division Vice President. The type of work being performed in the Division is coming under more and more scrutiny from both internal and external customers as programmatic budgets shrink, regulatory requirements increase, and accountability for actions must be demonstrated. A major portion of the work in the Division is covered by indirect funding and the emphasis is on decreasing indirect costs within the laboratories so that our services costs less to our customers. Thus, it –

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has become increasingly important to understand the work that we do, why we do the work that we do, and how to better manage the work that we do. Perhaps is was best said by Peter Drucker:

"You cannot manage what you cannot measure. You cannot measure what you cannot define. You cannot operationally define what you do not understand. You will not succeed if you do not manage."

The Services Management System Office (SMSO) began to develop the ISMS in February, 1994. The main customer for the system was the division vice president with the rest of the division management team being secondary customers. We considered all of the managers in the division as well as the DOE and the corporate financial organizations as stakeholders. The requirements for the system included developing a method of understanding and prioritizing all work in the Division for the FY95 indirect budget negotiations. We needed to understand what work was being done in the Division, what the drivers were for doing that work, and how to request funding for the work which would provide the most benefit, given that budgets would be limited. This was considered as the pilot phase of the effort and after this process was in place, we would then expand the ISMS to encompass issues management, commitments management, strategic and tactical planning, and performance assessment. We established an ISMS Process Team to assist the SMSO in understanding customer needs, reviewing processes as they were developed and recommending methodologies for several processes. A sub-team was appointed to make comparisons among a variety of prioritization methods and recommend the appropriate prioritization methodology for application within the Division, based on our customers' needs.

The Sub-team determined that the attributes against which prioritization methodologies would be rated included:

Should be available and used within the DOE Complex and/or Sandia
Must be risk-based and cost/benefit based
Applicable to a variety of non-similar activities
Able to prioritize core, compliance, and improvement activities
Consider short-term, long-term, continuous and discrete activities
Provide for QA

In addition, management wanted to make funding decisions which could be defended both mathematically and technically.

Based on the above criteria, the Sub-team chose four prioritization methodologies to evaluate. They were:

The DOE Capital Asset Management Process
The Vernon Gross Consequence-Probability-Cost Prioritization Model
The CYCLA/Martin Marietta Energy Systems Risk-based Priority Model
The LIPS model.

When the four methodologies were compared based on all of the attributes, the LIPS model scored 150% better than its nearest competitor, the CYCLA/Martin Marietta Model. The most important factors which the sub-team listed for choosing LIPS included:

Consistency among the DOE Laboratories and experience with use
Matches organization's needs better
Structures management's preferences
Independence of attributes
More flexible, wider applicability, better consequence definition

Because LIPS is based on multi-attribute utility analysis (Merkhofer, 1987; Miller & Rice, 1983) (which is mathematically and technically defensible as a method for prioritizing work and satisfies the majority of the sub-team's requirements), it was chosen as the methodology to use for the pilot phase of ISMS and the follow-on application (Div. 7000 Prioritization Methodology PMT, 1994).

PILOT PHASE--APPLICATION

Upon completion of the training, the responsible staff in each functional area began the task of preparing the work packages for their FY95 activities. We encouraged each group to prepare a work breakdown structure to assist in understanding what work was planned and how to break up the work into discreet tasks. Determining tasks and activities by using a work breakdown structure would also facilitate gathering the information from the work packages for the DOE ES&H Management Plan, thus using the data gathered for more that one purpose. Each work package was described in an Activity Data Sheet (ADS) and these were submitted to the scoring teams for scoring. We were working with a short time frame and consequently, a decision was made to submit only activities which were "compliance" or "improvement" to the scoring teams and not attempt to score "core" activities. The functional area scoring teams were trained and then met to score all of the compliance and improvement ADSs. The Review Board reviewed the scoring, looking for anomalies which would indicate inconsistent approaches. These anomalies were reported back to the various functional area scoring teams and the teams were encouraged to rethink the scoring of the suspect ADSs. The data was entered into the ISMS database and a series of prioritized lists of activities, including resources required, were provided to the Management Team to assist in making work and funding decisions for FY95.

After the FY95 pilot application a series of interviews and meetings were held with the customers and stakeholders to gather "lessons learned" and suggestions for process improvement. The SMSO worked to incorporate the suggestions, fix the problem areas, and improve the training for the FY96 application. Training began for the FY96 application, described later in this paper, in October 1994, with the work package preparation, scoring, validation, and data base maintenance taking place over the next several months.

PILOT PHASE--APPLICATIONS AND LESSONS LEARNED

The scoring and validation of the ADSs in preparation of the FY96 work and budget request were begun during the summer of 1994 with the review of the lessons learned from the pilot. The pilot showed that the scoring among the eight different center scoring boards varied significantly. The Review Board, consisting of a member from each scoring board, made recommendations to each center, but modifications based on those recommendations were inconsistently applied. Consequently, the 7000 Management Team was forced to "normalize" the scores in order to make the decisions necessary.

Lessons learned from the pilot indicated a need to significantly improve the scoring and validation processes. "Core" activities were not scored during the pilot process, only "compliance" and "improvement" activities. Consequently, the "core" activities tended to include tasks that may have otherwise been considered "improvement" or "compliance". Modifications were also needed in the scoring instructions and wording of the criteria. Additionally, training for the scoring board and review board members required improvement. Finally, the responsibilities and authority of the Review Board needed to be defined and understood.

An early decision was made to score all activities including core for the next fiscal year to ensure that all activities were being considered in the work decisions. There was concern that the independence of those core activities could not be assured. Applied Decision Analysis, Inc. (ADA) developed a process to define the dependencies and inform the decision-maker of impact of the core ADS that could not be conveyed by the scoring. This core scoring checklist included an evaluation of how various tasks within the ADS contributed to the overall benefit. Three benefit-to-cost curves (Figure 1) were portrayed to assist this evaluation. In order to allow sufficient time for scoring the approximately 540 ADSs, the process was begun in the fall of 1994 (as opposed to April 1994 for the previous fiscal year).

Benefit to Cost Curves to Assist Evaluation of Core Activities

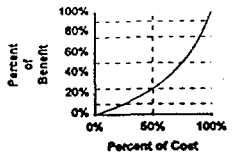
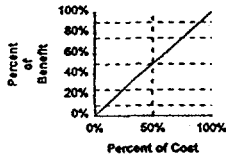
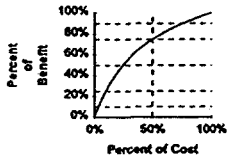
	Any attempt to make significant cost savings (say 10% or more) will likely result in proportionately *larger decrease* in total ADS benefit (say 20% decrease or more.) ADSs of this type typically should be either funded at their proposed cost or not at all; relatively small benefit is provided at partial funding.	
	All activities contained in the ADS contribute approximately equally to the total ADS benefit. From the perspective of total benefit, the ADS activities are fairly homogeneous. Few, if any, activities, may be singled out as either especially beneficial or non-beneficial.	
	A subset of the ADS activities contributes to most (say 95% or more) of the total ADS benefit. The remaining activities account for proportionately more of the total ADS cost (say 10% or more).	

Figure 1

The scoring instructions and scales were revised based on the lessons learned from the pilot. A duration scale was added to allow proper scoring of activities that incur a cost this year, but realize benefits in out years. The Safeguards and Security section was modified to include only the security of Special Nuclear Materials (SNM) and classified documents (Scoring Instructions, 1994). Protection of employees would be scored in Safety and Health category and protection of property in the Cost Savings and Losses category (Scoring Instructions, 1994). Additionally, a likelihood scale was added to the Public Assessment Scales (Scoring Instructions, 1994). The scoring was simplified by eliminating interpretation of logarithmic scales (Scoring Instructions, 1994). The instructions were also revised to help eliminate some of the double counting that had occurred.

The pilot was conducted in a compressed time frame and the time for training preparation was the most constrained. Some members of scoring teams did not attend the scoring training and relied on the instructions only to guide their decisions. Consequently, training for those involved in scoring the benefit/impact of the ADS needed improvement. ADA conducted the scoring training beginning the last week in October 1994. There was emphasis given to the centers to ensure that each scoring board member attended the training and announcements were made that some scoring instructions had changed. Sufficient sessions were scheduled to ensure maximum attendance and extra sessions scheduled to accommodate certain centers.

SCORING TRAINING FOR FY96 APPLICATION

The center scoring team members could attend any training session. The sessions were well attended and tended to have lively discussions. Most of the attendees had scored or were very familiar with the scoring from the previous year. Theoretical explanations that had no audience feedback in the previous year, had some perspicacious questions this year. Descriptions of the scoring scales led to discussions (and debates) on interpretation. Real examples were also used during the training which again resulted in discussions of scoring differences. These discussions were extremely useful in ensuring a better understanding of the criteria and consistency between the scoring boards. Suggestions from the classes also led to some wording changes in the instructions and scales.

One of the major problems found in the previous year's scoring concerned the Science and Technology Applications (Mission) category (Scoring Instructions, 1994). Many of the center boards scored in the mission because of the very high benefit score. Their logic being that if this activity were not accomplished, then facilities or programs could not function. Therefore, part of the mission of the laboratories could not be done. The score would then include the benefit of an entire facility or program. The result was very inflated scores and a lack of consistency between centers. To

alleviate this situation, training on the proper scoring of the "mission" category was emphasized. Scoring board members were told to shift the scoring to the Science and Technology Capabilities categories rather than "Mission". Examples emphasized this point.

ADS SCORING

Each center appointed members to their board to score the activities of the center. The eight boards differed widely in both numbers and type of members. The board sizes ranged from three to eleven with six being the mode. Some centers appointed staff members to the board, some a mixture of staff and managers, while others appointed all managers. Advisors from ADA and from the staff of the SMSO were offered as facilitators and consultants to assist the board in interpretation and clarification of the instructions and scoring scales. Of the eight boards, seven took advantage of this offer.

The boards that consisted of managers or included the project or program staff had several advantages over those that had mainly technical staff. Although not deliberate, these boards also reviewed the activity packaging. Many times, the discussions lead to the manager withdrawing the ADS and revising or repackaging the activities. The discussions on the reason for the activity were also very beneficial to the managers concerned. Managers also understood the activities being conducted in the other departments of the center. Better coordination resulted and some duplication eliminated. These benefits out weighed the benefit of the activity score itself.

Some scoring board members (perhaps with another agenda) tried to convince the rest of the board that a particular ADS should be scored in many categories. Their argument is that the activity will influence impact or benefit for each of the categories. For example, consider an activity that involves developing documentation that supports a decision in compliance with the National Environmental Policy Act (NEPA). The argument becomes that without this documentation, the environment suffers, employees and the public could be exposed to hazards, the public would be upset, the program it supports would be stopped, employees would be ineffective, and the organization would lose its business. A scenario can be developed that supports those impacts. Unfortunately, you could use the same logic for almost every overhead activity. The facilitator can best assist the scoring board by shifting the focus to the original purpose of the activity. In the NEPA case, the original purpose was (and is) to comply with the law. By pointing out that the decision makers had considered all the indirect factors when determining the weights assigned to each category, the scoring board realizes that in this example scoring should be in only one or possibly two categories.

The typical start for scoring boards is to flounder during the scoring of the first ADS. In the previous year, some scoring boards had taken four hours trying to score the first ADS. There had been a lot of discussion and little scoring. ADA had developed a unique method of systematically arriving at a score that eliminated some unproductive discussions. A white board or easel was used to focus the group's attention. A "T" was drawn that left a small space at the top and bottom (Figure 2). The title of the activity and any identifying numbers were written above the "T". Below the "T" was the space to describe the assumption of what would happen if the activity was not approved or funded. There were three basic assumptions. First is that the activity would continue to be accomplished but in a distributed manner. Second, the activity would simply not be done, but the need for the activity still exists. Third, the need for the activity soon would be discontinued to reflect the result of not approving or funding the activity. Most of the activities fell into the first two assumptions with the first being the most used. Clarifying the assumptions reduced much of the debate, although there were still some scoring board members that insisted that every activity they were associated could only be done by their organizations. Once the assumption was established, the discussion centered on what would happen if the activity were accomplished or not. The left portion of the "T" was used for the "accomplished (w/ADS)" with the right reserved for "not accomplished (w/o ADS)". After the consequences were written, the correct scoring categories could easily be determined. A "sanity" check can be to review the scoring categories selected against the reason the activity was first established. The scoring itself becomes relatively easy based on the consequences indicated on the chart. The facilitator should focus on the decisions already made if the scoring seems to be different from what is on the chart. Although this seems like a time consuming method, it actually saved considerable time in unproductive debate. The scoring boards found this to be of great benefit and the information was copied to provide the rational basis for selecting the scores.

"T Chart" Used by Scoring Boards

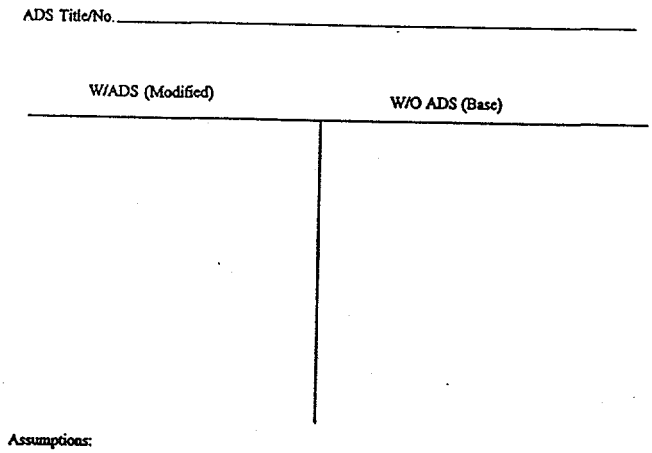


Figure 2

VALIDATION BOARD

The Validation Board consisted of some different members than the Review Board did during the pilot phase. Instead of each member being a representative of that center's scoring board, the members were appointed to represent the LSD as a whole. Although not viewed a significant change, it actually changed the focus of the members. The member was not seen as a representative trying to defend the scoring of the center, rather as someone trying to ensure consistency between centers. There were members who could not release their parochial tendencies, but overall the board took the larger view.

The board was given more authority to challenge the scoring by the individual centers. If an inconsistency was noted by the Board, a recommendation was sent to that center's scoring board. If the recommendation was not accepted by the center's scoring board, the Validation Board would note the discrepancy in the report to the Vice President. The Validation Board was also empowered to recommend an adjustment to the score.

The Validation Board chose not to review the activities packaging nor the cost associated with each ADS. They felt that it would be too time consuming to review activity packaging and this was a requirement for the center. Cost estimating is a difficult task and the board felt that they did not have the information to comment on the ADS cost estimates.

It was hoped that the Validation Board would review each ADSs scoring or, at least, the ADSs that required indirect funding. The Validation Board, however, chose to review only those ADSs whose scores appeared to be inconsistent with the others. A spreadsheet containing each center's ADS and its scoring by category was used for the screening process. The scores were then reviewed within each category and the seemingly inconsistent scores (normally the highest) were more closely analyzed. For those ADSs, the center scoring board's reason for the score was considered. If the Validation Board felt that it did not agree with the score's rationale, then a recommendation back to the center scoring board was made. Using this process, the 302 ADSs for indirect funding were reviewed.

RESULTS OF THE SCORING AND VALIDATION

Based on the scoring and validation, information was prepared for the LSD Management Team meetings. Of primary concern for those meetings were the ADSs requiring funding from the indirect budget. Consequently, lists of those indirect ADSs were prioritized by benefit-to-cost ratio and by total benefit and provided for the Management Team's decision. Additionally, prioritized lists of activities within each center were provided. A list of the centers is provided in Table 1.

Laboratories Services Division Centers

7000	Laboratories Services Division Staff
7200	Sites Planning & Integration Center
7300	Sites Operations Center
7400	Safeguards & Security Center
7500	Environmental Operations Center
7600	Logistics Management Center
7700	Safety & Health Center
7800	Facilities Operations & Maintenance Center
7900	Facilities Development Center

Table 1

The Tables shown below show the total benefit scores and benefit-to-cost ratios for each center for the FY95 indirect funding submission (pilot) and the FY96 indirect funding submission. The FY96 scoring included the "core" activities while the FY95 pilot included only "compliance" and "improvement" activities.

Total Benefit Scores ($K) for Reviewed ADSs

	Org/ Category	7000	7200	7300	7400	7500	7600	7700	7800	7900
FY95	*#ADSs*	*4*	*17*	*14*	*11*	*19*	*25*	*62*	*5*	*6*
	High	5,183	75,099	3,662	769,310	7,540	26,803	75,750	101,026	20,000
	Median	4,673	19,167	299	17,000	2,800	929	30,000	8,000	11,743
	Low	1934	-276	52	3440	86	0	26	342	830
FY96	*#ADSs*	*6*	*27*	*21*	*46*	*54*	*42*	*82*	*3*	*25*
	High	9,488	46,125	7,592	14,500	17,984	17,047	7,234	105,939	57,073
	Median	267	1,119	1,507	612	1,470	2,080	1,093	634	5,624
	Low	25	112	72	112	21	-414	0	180	320

Table 2

Benefit-to-Cost Ratios for Reviewed ADSs

	Org/ Category	7000	7200	7300	7400	7500	7600	7700	7800	7900
FY95	*#ADSs*	*4*	*17*	*14*	*11*	*19*	*25*	*62*	*5*	*6*
	High	65	165	16.9	74.6	67.5	79.8	533.0	131.2	8.7
	Median	37.6	23.6	2.9	20.4	16.3	9.2	31.5	4.6	4.3
	Low	15	-0.2	0.3	5.3	1.9	0.1	0.1	3.4	2.8
FY96	*#ADSs*	*6*	*27*	*21*	*46*	*54*	*42*	*82*	*3*	*23*
	High	19.2	41	50	155	155	113	67	106	64
	Median	3.8	2.5	3.8	3.9	21.0	6.5	5.1	1.8	14.9
	Low	0.1	0.9	0.0	0.2	0.1	-1.4	0.0	1.6	1.3

Table 3

A series of graphs were also prepared to help visualize the results of the scoring. Figure 3 shows the average benefit vs cost ratio by center, Figure 4 shows the cumulative benefit vs cost ratio curve for all activities and Figure 5 shows the cumulative benefit vs cost ratio curves for each center.

Average Benefit/Cost Ratio for Reviewed ADSs

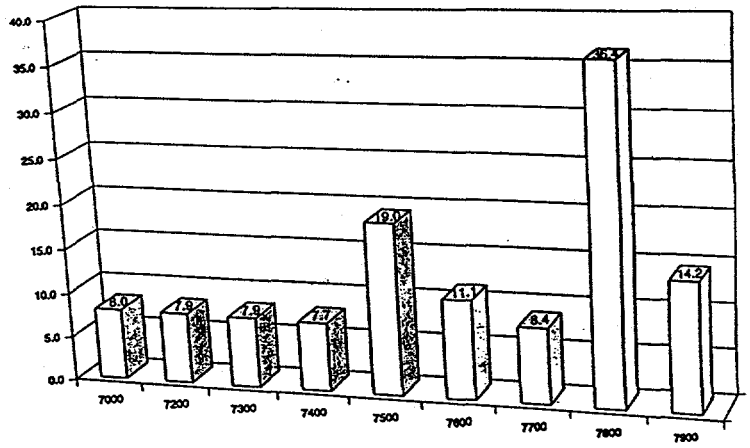


Figure 3

Benefit Vs Cost Ratio for all Activities

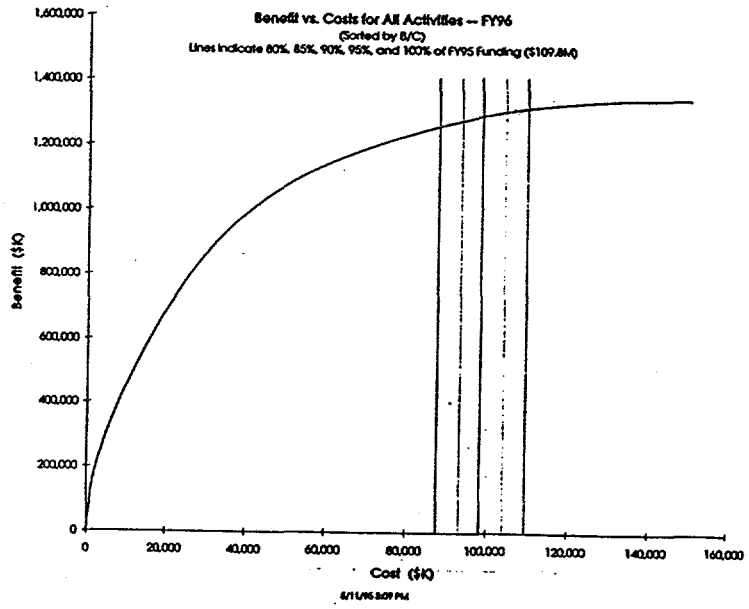


Figure 4

Chart of B/C Ratio for Individual Centers

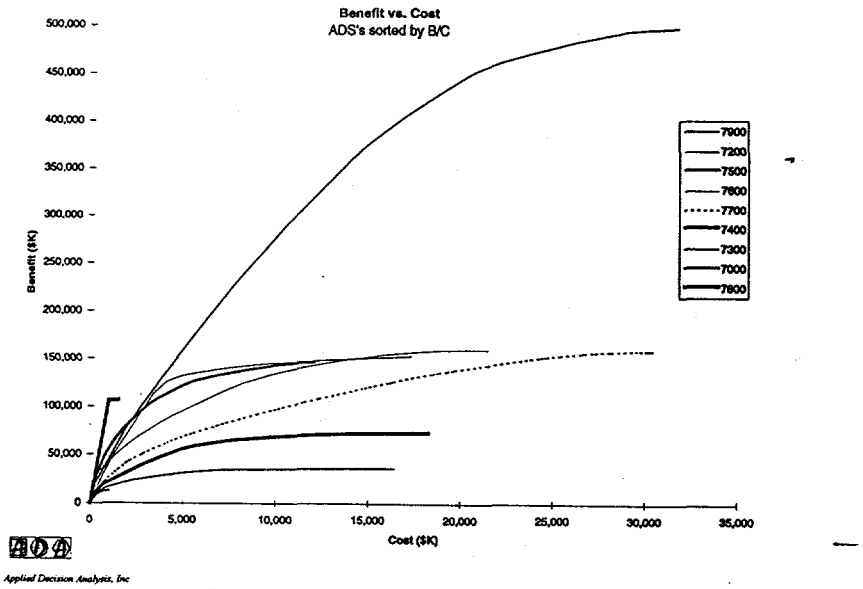


Figure 5

The Validation Board concluded that the center scoring boards had done a better job of scoring than the previous year. There was more consistency across the centers and the benefit scores were more realistic. The board commented that the use of consultants from the management office was essential to achieve consistency in the scoring process. One concern of the board was that some center scoring boards were taking credit for total project benefit in the scoring of some incremental activities. The other concern was that some center's had split their activities into small chunks such that the activities were no longer independent. Lower cost activities would tend to have higher benefit-to-cost ratios. The Validation Board also made specific recommendations by center, although only sixteen ADSs were specifically cited.

ANALYSIS OF THE SCORING AND VALIDATION

The main emphasis of this year's scoring and validation process was to ensure that the benefit scores were consistent across all the centers. This would then be used to provide the initial prioritized lists that could be used by the decision makers that is based on their weights for each category. No statistic can prove consistency, but some significant improvement in the scoring from the pilot can be seen the charts and figures shown in the result's section.

The information shown in tables 2 and 3 show the improvement in scoring between the pilot for FY95 funding and the scoring for FY96 funding. Taking the median scores as reflective of comparison, the deviation in those scores shows a marked improvement in the consistency of the scoring. Additionally, reviewing the data for FY96 shows that even with scoring "core" activities, 67% of the benefit-to-cost ratios were between 0 and 10 with 84% between 0 and 20. In FY95, only 47% of the benefit-to-cost ratios were between 0 and 10.

Figure 3 depicts the average benefit vs cost ratios for each center for FY96 scoring and those can be compared with the median benefit vs cost ratios shown in Table 3. The 7800 Center's average should not be considered since they have only three ADSs with one having a very high benefit. The 7500 Center's scores are relatively higher since more ADSs were scored in the "mission" category than any of the other centers. 7900 Center had higher benefits due to scoring in the "Facilities and Equipment" category and because the director increased the benefit scores using his management adjustment (Figure 6).

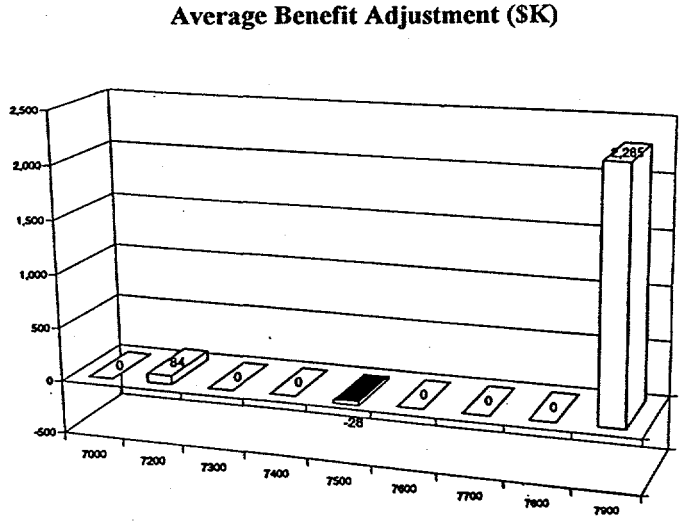


Figure 6

Figure 4 shows a benefit to cost curve that is consistent with what was expected. The figure also depicts lines for the decrement funding analysis. Figure 5 shows that curve broken down by the individual centers. Again, those curves seem consistent with that expected.

From the review of the data, it can be said that the scoring was consistently applied in each center with some exceptions. First were the relatively high scores due to scoring in the mission category in the 7500 Center. The director had somewhat mitigated this with his adjustments. Second was the relatively higher scores in the 7900 Center due to the director's adjustment. With these two exceptions understood, the Management Team could make informed, defensible decisions based on the prioritization lists developed from the scoring and validation.

LESSONS LEARNED IN SCORING AND VALIDATION

When there are eight different scoring teams, there will be some inconsistency among the scores. What the organization instituting a prioritization system such as this must attempt is to get scoring that can be used knowing some of those differences. The prioritization lists are strawmen that show relative order of benefit or impact. Scoring team must be reminded that their purpose is to give the decision makers information in specific categories concerning individual activities. The team is giving their best professional judgment, not doing a complete risk analysis. This is a decision making tool, not the decision.

Continual improvement and refining of the prioritization system for the specific application are necessary. Instructions and scoring tables must be consistent for the organizations that are using the system. Small changes in wording can have a great effect in how an activity is scored.

To obtain that relative consistency, effective scoring training is required. The members of the scoring boards must attend the training even though they had attended the previous year. This allows for policy and procedure updates, changes in instructions, and changes in the specific scoring tables to be understood. Additionally, by having a mixture of members of the scoring teams in the training sessions, the different ideas on scoring can be discussed and shared with the other scoring teams. Finally, the use of real examples of difficult scoring situations are very useful. The discussions and debates are great for achieving consistency of scoring.

Each scoring team should have consultants to assist in determining the scores. The consultants provide information concerning the weighting of the categories by the decision makers, interpretation of the instructions and scoring tables,

information on how other teams scored similar situations, and a central group for scoring problem solving. Their impact on consistency can not be overemphasized.

The Validation Board must consist of members that consider the activities from a corporate level rather than from their Center's viewpoint. The board must be given some authority in the decision making organization. Their decisions must be enforceable.

The Validation Board is given a difficult assignment to ensure that the scoring is consistently applied in each Center. In the case of our Division, the Validation Board consisted of managers. Their time was limited and it was difficult to schedule dates when they could meet. Rather than giving the Validation Board the raw data from each of the scoring boards, it would be better to have the SMSO analyze the data and provide those areas of inconsistency for decision. Thus the board would not spend time looking for problem areas, but discuss and debate a proposed list. By their decisions, the board would determine what defines being consistent.

Finally, it must be remembered that scoring an activity only provides part of the information necessary for decision making. The activities must be packaged correctly for the score to be meaningful. Work breakdown structures (WBS) are not very well understood by those that have been only submitting a budget request for the department in previous years. These organizations need assistance in work packaging. Another area is cost estimating. Neither the scoring boards nor the validation board believed that it was their responsibility to review cost estimates. A system must be established for these to be reviewed and verified.

CONCLUSIONS

The participants in both the Pilot Phase and the fully-developed phase of the management system agreed that the LIPS was applicable to the broad range of diverse activities that are accomplished in the Laboratories Services Division. We were able, generally, to overcome the skepticism that existed from prior experiences with prioritization methodologies which were weighted too heavily in ES&H or that did not address some of the functional areas in the Division. There was also agreement that there was essentially equal treatment for all activities, whether you were complying with an environmental regulation or delivering mail.

Even though the applications pointed out opportunity for a number of improvements, using LIPS was better than having no technically defensible priority system. The data which was gathered and analyzed provided a basis for negotiating with customers and regulators. When decisions were made to not continue an activity based on its low benefit and high cost, or its minimal effect on reducing risk, the decision-maker is more comfortable knowing that there were technical bases for those decisions.

There was a learning curve, more in some groups than others, with respect to formulating a work breakdown structure and actually describing the work that is being done. Feedback we received indicated that many found the exercise very useful and that for the first time they were able to understand their work and why they were doing it. Many managers said that they were forced to take a hard look at why certain work was being continued when there was little benefit or decrease in risk from doing the work.

Just as the Validation Board requires analysis of the raw data before it convenes, so do the decision makers require information summarizing the raw data. A group should analyze the data based on the constraints imposed on the organization. This group must have the time that the decision makers do not. An analogy can be drawn with the function of the Office of Management and Budget (OMB) in relation to the President of the United States. After the President gives his/her guidance, the OMB recommends and lists, and the President makes the final decision. With the amount of data which is gathered in the ISMS data base, it is possible for a group to review, interpret, question, and finally recommend a course of action. This group must be independent of all the vying functional areas and viewed as impartial. The decision makers can then have meaningful discussion and debate on the direction and courses of action.

A successful application requires that there be some level of centralized management and planning rather than each functional area simply "doing its own thing". **There must be a commitment to look at all of the work in an**

organization and make decisions based on the good of the organization rather that each functional area getting a piece of the pie to "do good things".

Above all, the successful application of LIPS, or any prioritization methodology, must have complete buy-in from the decision makers. They must understand the basics of the methodology, determine their values (weights) upon which the computations are based, provide encouragement to the staff, and commit to spending the time required to understand the information which is generated by the system.

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