SELECTING A RISK-BASED TOOL TO AID IN DECISION MAKING*

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ABSTRACT

Selecting a risk-based tool to aid in decision making is as much of a challenge as properly using the tool once it has been selected. Failure to consider customer and stakeholder requirements and the technical bases and differences in risk-based decision making tools will produce confounding and/or politically unacceptable results when the tool is used. Selecting a risk-based decision-making tool must therefore be undertaken with the same, if not greater, rigor than the use of the tool once it is selected. This paper presents a process for selecting a risk-based tool appropriate to a set of prioritization or resource allocation tasks, discusses the results of applying the process to four risk-based decision-making tools, and identifies the "musts" for successful selection and implementation of a risk-based tool to aid in decision making.

INTRODUCTION

CYCLA/MMES Risk-Based Prioritization

The Prioritization Methodology Process Management Team (Team) was chartered by Sandia National Laboratories (SNL) Laboratories Service Division senior management as part of the initiative to implement a method to better manage issues and customer requirements. The initiative began in the first quarter of 1994 based on prior work within the United States Department of Energy (DOE) Complex to develop an integrated resource management system (IRMS) to tie together and coordinate the management functions needed to allocate resources so as to achieve the organization's objectives, and to assess the efficacy of the resulting actions. Based on review of the existing Laboratory Services Division management systems and responsibilities, the decision was made to first focus on the three elements of the IRMS involved in the management planning process: describing work (activities); setting priorities; and organizing and reporting information. A Division objective was established to implement these three elements of management planning for the next annual budget cycle.

Overall responsibility to meet this objective was assigned to one organization within the Division. Four Process Management Teams were created to accomplish the required work: a Project Team with overall project responsibility; an Activity Packaging Team to recommend how work should be described; an Information Integration Team to recommend how information produced by the planning process should be managed and integrated; and a Prioritization Methodology Team to recommend a methodology for determining the relative importance of work (activities) done by the Division. The application of the IRMS approach was named the Integrated Services Management System (ISMS) to identify the specificity of the IRMS concept to the SNL Laboratories Services Division (Figure 1).

The responsibilities of the Laboratories Services Division include Environment, Safety, and Health (ES&H); Safeguards and Security (S&S); Transportation and Logistics; Facility Engineering, Operations, and Maintenance; Emergency Operations; Information Management; and Planning. The Division supports the other Sandia organizations in their responsibilities as a multiprogram laboratory operated for the U.S. Department of Energy by the Sandia Corporation. Because of the diverse responsibilities within the Laboratory Services Division and the Sandia organizations it supports, the prioritization methodology to be recommended must be capable of considering a wide range of risk-based factors. Accordingly, the charter developed for the Prioritization Methodology Team was to the point:

Objective: Provide definitive recommendations on the desired characteristics of a prioritization methodology.

Membership: A mix of Sandians who must advise the Laboratory Services Division program managers on the relative importance of the work to be performed. Staffing should emphasize potential users of the prioritization methodology rather than modeling experts.

Minimum Activities:

1. Suggest available prioritization methodologies that might be adapted for the Sandia ISMS and indicate the types of decisions to which these methods have been applied previously, giving careful consideration to the needs of new users from organizational elements not considered in the original development of the model.

2. Identify different ways that the basic prioritization method might be utilized to assist in decision making for which work should be done with the available resources.

3. Suggest improvement or refinement needs for adaptable prioritization methodologies (e.g., benefit/cost output presentation versus benefit only output).

4. Recommend a process for participatory scoring and/or review of scoring.

TEAM FORMATION & OPERATION

A formal memo signed by the Vice President of the Laboratories Services Division was distributed to each second level manager within the Division outlining the Team's purpose and objective, the duration of the effort and source of funds to support the effort, and requesting a representative from each organization. A 12-member Team resulted from this request. In addition, a representative from the SNL Quality Management Organization was invited as an ad-hoc member. The Team agreed to hold eight one-half day working sessions to accomplish the Team objectives during a single month. The Team also established

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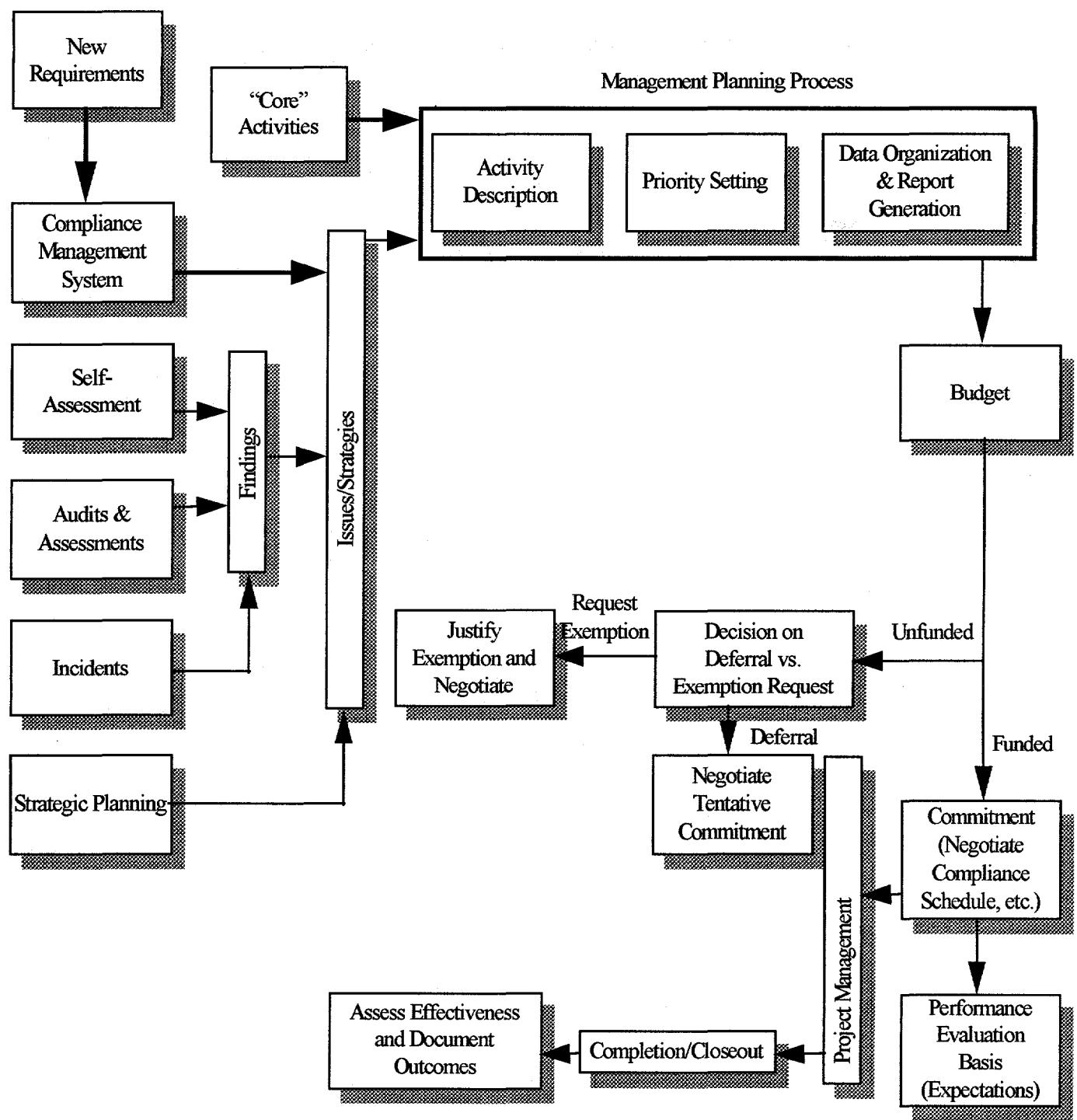
Figure 1: ISMS Process Diagram

a set of common definitions (e.g.: "risk," "hazard," "benefit," "prioritization") and operating rules (e.g.: methods to be used to reach a Team decision; participation by Team members; issuing formal minutes for each meeting).

The Team selected the following process for completing the Team's objectives:

1. Review available prioritization methodologies used within the DOE Complex and SNL;
2. Establish the attributes needed by the Laboratories Services Division for a prioritization methodology;
3. Evaluate the methodologies against the attributes;
4. Select the methodology which best met the attributes;
5. Evaluate the impact of the selection and the challenges in implementing the methodology; and,
6. Report on the process and results.

PRIORITIZATION METHODOLOGIES

The Team selected four prioritization methodologies for review: 1) CYCLA/MMES Risk-Based Priority Model (RPM); 2) DOE Capital Asset Management Process (CAMP); 3) Vernon Grose's Consequence-Probability-Cost (GROSE); and, 4) the LLNL/LANL/SNL Laboratory Integration and Prioritization System (LIPS). Users or experts of each methodology were invited to make a formal presentation to the Team concerning the technical basis for the methodology, implementation experience, and advantages/disadvantages. Two hours were allocated for each presentation and questions from the Team. The Team then met after each presentation to identify what it believed were the strengths and weaknesses of each methodology if the methodology were used to prioritize the Division's work (activities). The strength/weakness summary then formed the starting points for the Team's development of a set of desired attributes for the Division's prioritization methodology.

CYCLA/MMES Risk-based Priority Model (RPM)

The CYCLA/MMES Risk-based Priority Model (RPM) uses a matrix methodology to derive scores for activities based on the magnitude of potential consequence impacts and the likelihood of occurrence. Each of the seven impacts in the matrix are evaluated using a four-level risk scale: very high, high, medium, and low (Figure 2). Weights for each of the risks are relative (i.e: not traceable to a common basis such as dollars), and typically change in value on a logrithmic basis between the levels on the scale. The seven impacts are 1) public safety and health; 2) environmental protection; 3) site safety and health; 4) compliance; 5) external confidence; 6) mission; and, 7) business efficiency/investment impact. Activities are scored twice in the RPM methodology. The first score is for the existing situation. The second score is for the situation which would exist after the activity is completed. The two scores are subtracted to give a "reduced risk" score which can then be used to rank the activities based on the reduction in risk achieved by the activity. Hence, benefit in the RPM model is defined as reduction in risk.

Cost in completing the activity is not a consideration in the RPM methodology. Resources are allocated first to those activities resulting in the highest reduction of risk, regardless of cost. The model originally included safeguards and security considerations, but these considerations were removed because

the prime user found it was difficult to reach a consensus regarding weights for the levels of risk.

The RPM process is as follows: 1) activity owners describe and characterize the activity to be prioritized; 2) activity owners describe the risk characteristics of the activity; 3) a scoring committee scores (i.e.: calculates the benefit of the activity using the RPM model); and, 4) senior management reviews the ranking and scores and adjusts scores as appropriate. Management may adjust scores based on factors not included in the RPM model. Examples of such factors include the expected life of a facility, changes to a facility mission, staff workload, the ability to hire additional staff, uncertainties, grouping of activities or precedence relationships among activities.

The benefits of the RPM process are that senior management "owns the budget" and customer acceptance of the process in the sense that the supplier and the customer reach agreement on funding of activities, milestones, and deliverables. Those requirements which generated unfunded activities are therefore inherently accepted by senior management and the customer as being waived. Limited information was obtained by the Team from users of the RPM methodology. One user believes that the RPM model is skewed towards ES&H activities, and therefore should be used only for ES&H-related prioritization. He noted that it is important to quantify the expected benefits and costs in implementing an integrated resource management system (including a priortization methodology) before implementing the system. He also emphasized the importance of everyone involved in the prioritization and decision making process recognizing that the methodology is a tool, not an end. In this user's experience, implementation led to an overwhelming amount of paperwork and cynicism towards management because of the amount of effort required and the perception that the prioritization ranking of activities was strongly skewed towards ES&H-related activities. Team discussion of the RPM methodology resulted in the strengths and weaknesses shown in Table 1.

DOE Capital Asset Management Process (CAMP).

The CAMP methodology considers four categories of impacts: 1) Health & Safety, 2) Environmental, 3) Programmatic, and 4) Safeguards and Security. Each impact is rated for severity on a scale from 10 to 80. In essence, a rating of 10 indicates acceptable risk and a rating of 80 represents an unacceptable level of risk involving a highly likely life-threatening situation. Each of the four impact categories is divided into subcategories. For example, the health and safety category consists of nine subcategories: regulatory compliance; best management practice; special action/team findings; technological base (R&D); industrial hygiene; industrial safety; fire protection; health physics; and criticality. Hence, a total of 35 sub-categories of impacts are scored against an eight level scale. The prioritization process is based on scoring the subcategories, selecting the highest scored subcategory as the score for the category containing the subcategory, then computing an overall rating score in which the maximum score is 80 and the score of the highest scored category is the driver for the total score. CAMP is used throughout the DOE to allocate funds to capital asset projects. It has been widely accepted, but is recognized to be cumbersome and does not focus on operations and services. The Team's discussion of CAMP resulted in Table 2.

Consequences	A Very High	B High	C Medium	D Low
PUBLIC HEALTH & SAFETY				
1. Immediate or Eventual Loss of Life/Permanent Disability	3000	300	30	0.3
2. Excessive Exposure and/or Injury	300	30	3	0.03
3. Moderate to Low-level Exposure	30	3	0.3	0.003
ENVIRONMENTAL PROTECTION				
4. Extreme Damage To the Ecological System	1000	100	10	0.1
5. Extensive Damage To the Ecological System	200	20	2	0.02
6. Significant Damage To the Ecological System	50	5	0.5	0.005
SITE PERSONNEL SAFETY				
7. Immediate or Eventual Loss of Life/Permanent Disability	1500	150	15	0.15
8. Significant Injury Requiring Hospitalization With Significant Lost-Time, or Exposure > Occupational Limits	150	15	1.5	0.015
9. Exposure Near Limits (20 to 100%) or Lost-time Injury Requiring Medical Treatment, or Contaminated Wound	15	1.5	0.15	0.0015
10. Minor Injury Requiring First Aid, or Exposure < 20% of Limits, or Reportable, Removable Skin Contamination	1	0.1	0.01	0.0001
REGULATORY COMPLIANCE				
11. Noncompliance With Federal, State, or Local Law Involving Significant Potential Fines or Penalties	100	10	1	0.01
12. Noncompliance With DOE Category "A" Orders	50	5	0.5	0.005
14. Noncompliance With Federal, State, or Local Law Not Involving Significant Fines or Penalties	10	1	0.1	0.001
15. Noncompliance With DOE Orders, Exclusive of Category "A"	5	0.5	0.05	0.0005
16. Significant Deviation From Recognized Good Practices or Energy Systems Directives	1	0.1	0.01	0.0001
EXTERNAL CONFIDENCE				
13. Issues That Have or Could Cause Major Protest or Outcry From Public, Employees, Customers, Suppliers	20	2	0.2	0.002
MISSION/OPERATION PERFORMANCE				
17. Serious Negative Impact on Business Unit's Ability to Accomplish Its Mission by Sustaining Key Aspects of its Operation	220	22	2.2	0.022
18. Moderate Negative Impact on Business Unit's Ability to Accomplish Its Mission by Sustaining Key Aspects of its Operation	60	6	0.6	0.006
BUSINESS EFFICIENCY				
19. Loss of Investment or Production or Loss of Opportunity to Increase Quality or Productivity or Decrease Cost > $25M, or Annual Cost > $5M	40	4	0.4	0.004
20. Loss of Investment or Production or Loss of Opportunity . . . $5-25M, or Annual Cost $1-5M	15	1.5	0.15	0.0015
21. Loss of Investment or Production or Loss of Opportunity . . . $1-5M, or Annual Cost $0.2-1M	3	0.3	0.03	0.0003
22. Loss of Investment or Production or Loss of Opportunity . . . < $1M, or Annual Cost < $0.2M	1	0.1	0.01	0.0001

Figure 2: CYCLA/MMES RPM Matrix

TABLE 1

STRENGTHS AND WEAKNESSES OF THE CYCLA/MMES RISK-BASED PRIORITY MODEL (RPM)

Strengths	Weaknesses
Flexible: can be tailored to needs	Weighting basis is not defensible (values stated to be "willingness to pay" but not visibly so).
Part of CYCLA/MMES IRMS Software (hence known compatible)	Not a short term answer
Scoring done by "calibrated" teams	"Figure of merit" basis vs. cost/benefit
Rationale for score part of the activity description package	Doesn't allow interpolation: uses a rigid matrix
Multiple-attribute for summary effects	Consequences are poorly or incompletely defined for non-ES&H categories
Customer accepted.	Detailed training required
	Significant management effort to rank
	Documentation for activities required may be excessive.
	Appears different scenarios could be used for scoring different attributes
	Resource intensive
	Little experience in use for "core" activities
	Can artificially inflate cost/benefit
	Perceived to be strongly skewed towards ES&H by some users.
	Does not handle high consequence/low likelihood activities

TABLE 2

THE STRENGTHS AND WEAKNESSES OF THE DOE CAPITAL ASSET MANAGEMENT PROCESS (CAMP)

Strengths	Weaknesses
Customer driven/input	No provision for QA
Simple: "select the box"	True "Black Box": No technical basis for calculations/weights
Possible short term: "Quick and Dirty"	Focus on capital improvements (operations and services not included)
Attempts to cover wide range of alternatives (e.g. impacts and likelihood) within categories being scored	May not discriminate between activities
	Easy to "game"
	No cost consideration
	Doesn't carry basis with the score
	Difficult to validate/confirm weights and values
	May not have enough time to develop all likelihoods/new matrix needed for prioritizing Div. 7000 activities.
	Does not consider "before" vs. "after"

Vernon Grose's Consequence-Probaility-Cost Methodology (GROSE)

The Grose model is a systematic, qualitative method to document expert opinion. The model uses three factors (consequence; Probability; (Cost) and four levels of consideration for each factor (High, Medium, Moderate, Low). The levels are coded A, B, C, D. An activity coded AAA would have high consequence, high probability that the consequence would occur, and low cost. An activity coded DDD would have low consequence, low probability, and high cost. Sixty-four combinations of the coded levels are possible. The decision maker defines the relative importance among each of the three factors. For example, an activity with a high consequence but low probability might be ranked ahead of another activity with a low consequence and high probability although both activities would have approximately the same risk (consequence x probability). Rules for prioritizing activities of equal risk can be developed by each user. For example, give first preference to consequence, second to probability, and third to cost. After all activities have been coded and ranked, available funding can be allocated to activities according to the code precedence.

The GROSE model allows activities to be prioritized based on both cost and the degree to which an activity reduces risk. Costs to implement/complete an activity are included as an integral part of the process. The basis for ranking an activity is inherent in its ranking, therefore it is easy to see how an activity is positioned in the ranking with respect to other activities. The methodology ensures that high-risk, very-high cost activities do not go to the bottom of the ranking; neither do low-risk, low-cost activities go to the top of the ranking. The model requires a dedicated panel of experts to score activities. The GROSE model has not been implemented within the DOE although it is used in industry, the most notable example being to evaluate design alternatives for the Washington DC METRO.

Team discussion established the strengths and weaknesses of the GROSE model is shown in Table 3.

The Laboratory Integration and Prioritization System (LIPS)

A Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratories team developed LIPS during 1993 to meet specific criteria including: 1) calculate risk and benefits in real dollars; 2) provide a basis for comparison among the three Laboratories; 3) prioritize a large number of diverse activities; 4) analyze both risk and added benefit; 5) give credit for partial, phased, and sequential actions and activities; 6) be easy to communicate; and 7) be technically defensible. LIPS uses multi-attribute utility analysis (MUA) as its basis. MUA provides the capability to evaluate an activity by combining scores from measures consistent with pre-established value relationships (or value functions) for each measure and the relative importance of the measure as established by trade-off coefficients. The benefit of an activity is quantified in real dollars consistent with the decision maker's values. The decision maker's "willingness to pay" values are determined by formal elicitation procedures which follow well defined preference theorems.

The end result of prioritization using MUA is a dollar benefit which results from doing an activity. Hence, this process provides a "stopping point" for funding/investment: resources should not be allocated to activities in which a dollar of funding no longer buys a dollar of benefit. The LIPS objective hierarchy is shown in Figure 3. Activity owners determine the consequences, severity, and likelihoods (i.e.: risk) shown or the hierarchy. Decision makers determine the weights that are applied to each objective in the hierarchy (regulatory compliance, for example) as "willingess to pay to avert the risk." The decision maker's weights in terms of dollars are multiplied by the risk determined by the activity owner to produce a dollar value for the risk. Activities are scored twice by the activity owner: the first scoring establishes the dollar value of risk for all the objectives in LIPS if the activity is not done; the second scoring establishes the dollar value of risk after the activity is complete. The two dollar values are subtracted to obtain a dollar value for the benefit of averting the risk. This dollar value of averted risk can then be compared to the dollar cost of the activity to obtain a cost-benefit ratio.

Users of the LIPS methodology stated that it provided "valuable discipline" in generating information and costs, but emphasized that the work breakdown structure and activity descriptions are key to the prioritization process. One user concluded that at his facility, people were generally frustrated because of the way in which LIPS had been implemented: poor training, too many activities scored, "gaming" by some users, no calibration of scores. Another user stated that use of the LIPS methodology had shown that approximately 80% of the benefit from corrective actions could be achieved for about 16% of the total cost for completing all the actions.

Table 4 shows the strengths and weaknesses developed by the Team for LIPS.

SELECTION AND IMPLEMENTATION

Selection

The Team developed a list of twenty-two attributes which were desired in a methodology to be used prioritize the Division's work. These attributes were developed from the Team's review of the CYCLA/MMES RPM, the DOE CAMP, GROSE, and LIPS methodologies and discussions with the presenters and users of the methodologies. A scoring worksheet was then developed using the twenty-two attributes and the four Prioritization methodologies which had been reviewed by the Team (Figure 4). The Team discussed methods to score the methodologies against the attributes and decided to use as a first cut a simple "yes/no" comparison of attributes to each methodology. If this scoring resulted in a clear separation between the methodologies, no further scoring would be done. If no clear separation resulted, the methodologies would be scored again using another method such as the Kepner-Tregoe weighted attribute/methodology ranking for each attribute (Kepner-Tregoe). The sum of each Team member's "yes/no" scoring resulted in the following Team scores:

CYCLA/MMES: 93.5 points
DOE CAMP: 56.0
GROSE: 88.0
LIPS: 135.5

TABLE 3

STRENGTHS AND WEAKNESS OF THE VERNON GROSE CONSEQUENCE-PROBABILITY-COS PRIORITIZATION METHODOLOGY (GROSE)

Strengths	Weaknesses
Expert panel scoring ensures consistency.	Panel scoring is resource intensive.
Simple: "select the box"	May not be easy to prioritize all impacts.
No pretense of being quantitative.	Reactive/CYA oriented rather than proactive outcomes.
Grid definitions guide activity descriptions.	Uncertain how to include strategic goals. Requires additional consideration for short term use.
Defined (set) number of bins.	No success basis presented.
Can pick precedence in breaking ties.	Unclear on the cost or benefit of using.
Reduces the number of activities requiring management review or rescoring.	Must put all activities into only 64 (or 125) bins with 10 steps (levels of essentially equal ranking).
Possible to modify the model to eliminate weaknesses.	No well developed or understood process for establishing grid boundaries within the scoring matrix.
	Weak in being able to fit Division 7000 activities.
	Calibration of panel(s) difficult.
	Lack of flexibility to manage an entire program.
	Difficult to determine dependencies between activities.
	Assumes the correct activity has been chosen to reduce a specific risk.
	No discrimination between types of resources ($s, FTEs, outsourced).
	Only roll-up for reporting purposes.

TABLE 4

STRENGTHS AND WEAKNESSES OF THE LABORATORY INTEGRATION AND PRIORITIZATION SYSTEM (LIPS)

Strengths	Weaknesses
More things to rate.	Must be customized.
Structured.	Complex (may be too structured).
Structures subjective elements and considerations.	Time to implement may be greater than the time available for the FY95 Budget Call.
Flexible.	"Services" may not get enough consideration: e.g.; library, training.
More upper management participation. Their values are visible.	Does not address FTE issue, or out-sourcing, or new space needs.
Success in using, proven capability	Not a quick fix- requires resources to do (long term).
Addresses activities and programs.	More expensive to do than simpler models. Potential difficulty for long term projects/ activities.
Implied method to terminate activities.	Does not carry the basis with it (*a la* Grose).
Risk, cost, and benefit based.	
Separates technical and policy decisions.	
Opportunity for consistency.	
Defensible/systematic: buy-in at all levels.	
Policy flows into decisions.	
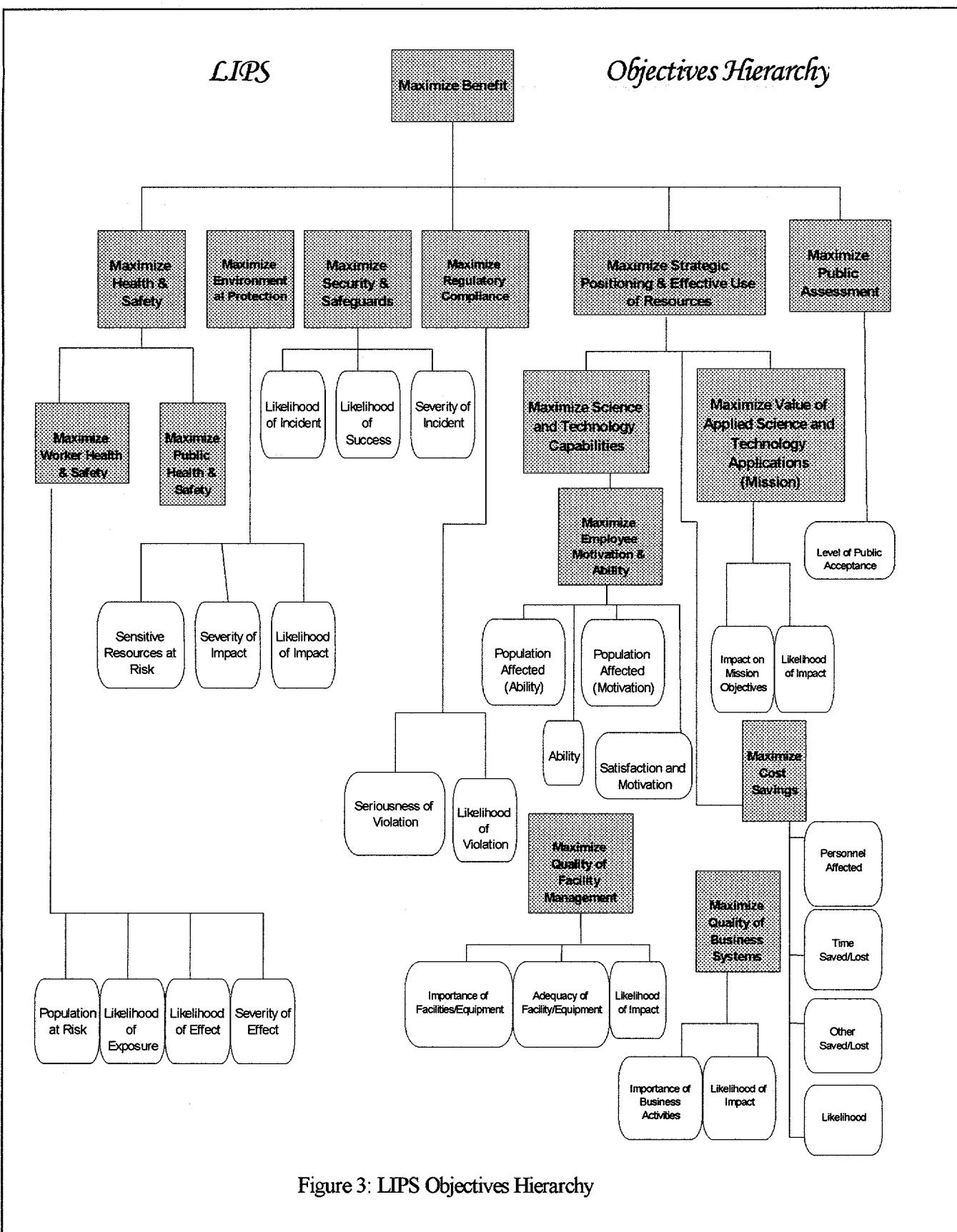
Figure 3: LIPS Objectives Hierarchy

Prioritization Methodology Selection Scoring Worksheet

ATTRIBUTE	CYCLA/MMES	CAMP	GROSE	LIPS	COMMENTS
1. Manage both FTE & Dollars					
2. Risk-based					
3. Best to fit existing LSD methods					
4. Common basis for all LSD					
5. Pass sanity check					
6. Separates work: do/don't ?					
7. Cost-benefit based					
8. Consider short-term & long term activities					
9. Consider continuous vs. discrete activities					
10. Flexible weights					
11. Relative, not comparison to a standard					
12. Provides for QA					
13. Fit ISMS functions occurring before & after					
14. Carry basis for ranking with the method					
15. Consider interdependency of priority & activity					
16. Able to prioritize core, excellence, & compliance activities					
17. Minimum resources required to implement					
18. Minimum resources required to maintain					
19. Able to provide/allow accurate measures of consequences (i.e. , flexible)					
20. Able to provide/allow accurate measures of likelihoods (i.e., flexible)					
21. Easy to understand					
22. Independency of attributes used in the model					
TOTAL					

Figure 4: Prioritization Methodology Score Sheet

The Team decided to use only the "yes/no" scoring method because of the clear separation of the methodologies. It also decided to eliminate the DOE CAMP methodology from further consideration because of its low score. Comments were then elicited from each Team member to identify what they believed to be the most important factor in their scores. The comments were:

CYCLA/MMES:
Doesn't properly consider costs.
Full implementation nearly impossible in the short term.
Directed more towards ES&H.
Didn't see much difference between CYCLA and LIPS: need to modify both.

GROSE:
Simpler for the short term.
Impossible to implement because decision/ attributes are not congruent
Do not like.
Like the simplicity.

LIPS:
Consistency between Labs; experience in use.
Matches the Division's needs better.
Structures management's preferences.
Could use short term so could gain long term.
More elements applicable to the Division's responsibilities & activities.
Crucial for success to get management's buy in and values.
Attribute independence; more flexible, wider applicability, better consequence definition.
Hard to implement short term.
An improvement over CYCLA/MMES method.

Implementation

After discussing the results of comparing the methodologies to the list of twenty-two attributes, the Team tentatively selected the LIPS methodology and turned to issues concerning implementing LIPS for the next budget cycle. Eight specific issues were noted:

1. The availability of resources to implement the LIPS methodology. The Team believed that implementation will require the near full-time support of 12-24 FTEs for two months.

2. The ability to establish SNL-specific value functions. Establishing senior management's value functions is estimated to require two full days of the Division Vice President's and Directors' effort.

3. The ability to establish enough buy-in by activity owners, program mangers, and decision makers to not compromise results and damage buy-in for the long term. Effective communication of the prioritization and ranking process and its results were deemed by the Team to be essential to obtain buy-in. Senior management and program managers are focal points for the required communication.

4. Relevance of decision objectives to all the Division's work. The Team noted that the existing LIPS objectives did not meet all the Divisions needs. However, because of the short time to implement LIPS for the next budget call, the Team concurred that LIPS should be implemented without modification, and subsequently modified based on the lessons learned from its use in the next budget cycle. Developing function-specific objectives requires approximately one day per objective.

5. Feedback of decisions to the activity owner. The Team believes that feedback of decisions to the activity owner must be a mandatory element of the ISMS process. The reasoning which led to the decision must be communicated as well as the decision itself. The Team did not address the need for an appeals process, but clearly such a process must be part of the ISMS.

6. Enforcing a "cut" approach for activities not receiving funding, rather than "shaving" other activities to release funds to cover "below the line" activities. In the past, the impact of below-requirements funding has resulted in cutting back other activities in order to fund activities which "fell below the line." The Team strongly believes that such action undermines the purpose and efficacy of the prioritization process, and weakens the process of negotiating requirements and exceptions with customers.

7. Recognition that staffing levels must be developed in concert with the LIPS process.

8. Success of prioritization depends on clarity and consistency of activity descriptions in the work breakdown structure (WBS). It is essential that the WBS establish the level of activity to be considered for prioritization.

It was the consensus that LIPS should be implemented for the next budget cycle without modification to the decision objectives. Further, all activities should be scored to establish a baseline and to help management determine the set of "core activities" for all Division responsibilities.

Activity Scoring

After much discussion, the Team developed the consensus that each activity owner should score his/her activities. Activity owners should be supported by a calibrated scoring board which will ensure consistency in scoring. Further, each major organization should have a calibration board, and Division Board should be established which would ensure consistent scoring among organizations within the Division. The scoring and roll-up process should progress from activity owners providing scored activity data sheets to their Center's program managers/ Directors. Center program managers, who are responsible for funding and program work breakdown structure, combine the ADS by programs to form ranked lists for each program. Centers, with the support of the Division Scoring Board, score programs. The scored programs are then ranked into a Division priority list. Management overrides of any scores must be communicated to program managers and activity owners, including the reasons for the override.

CONCLUSION

The Team reviewed four prioritization methodologies: the CYCLA/MMES "Risk-based Prioritization Model" (RPM) used at Martin Marietta Energy Systems' Pinellas Plant and Oak Ridge National Laboratory; the DOE Capital Asset Management Process (CAMP); the Vernon Grose Consequence-Probability-Cost methodology (GROSE); and the LANL, LLNL, and SNL-developed Laboratory Integration and Prioritization System (LIPS). A formal presentation on each methodology was made to the Team by a non-team member who was familiar with the methodology. The Team developed a set of strengths and weaknesses for each methodology immediately after the formal presentation. A list of 22 desired attributes for a Laboratories Services Division prioritization methodology was developed from the discussion of the strengths and weaknesses of each methodology. Individual Team members scored each methodology against each attribute using a "meets" or "does not meet" categorization. The individual Team member's "meets" scores were summed to produce a total Team score for each methodology.

The resulting scores were discussed by the Team and a consensus reached on the methodology which best met the Division's needs. After the preliminary selection of a methodology, the Team extensively discussed the implementation issues and concerns and developed recommendations which the Team believed would enhance the likelihood of short term and long term success of prioritizing the Division's work. The Team then developed the following recommendation:

"The Prioritization Methodology Process Management Team recommends that the Laboratory Integration and Prioritization System (LIPS) be implemented as part of the overall Integrated Services Management System (ISMS) process. Further, the Team recommends that the use of LIPS for the Laboratory Services Division Budget be defined as an opportunity to evaluate the LIPS methodology and the overall work description-prioritization-management process, and an opportunity to collect baseline data with the goal of customizing the LIPS for future budgets based on lessons learned from its use. The Team emphasizes that LIPS, or any prioritization methodology, is a tool for facilitating and adding discipline to decision making. It does not create decisions of itself."

In addition, the Team provided the following implementation guidance:
1. Activity descriptions in the work breakdown structure must be clear and consistent.
2. Adequate, dedicated staff must be made available to implement the LIPS methodology.
3. SNL-specific value functions must be established.

4. Activity owners, program managers, and decision makers must buy-in to the prioritization methodology and implementation process.
5. The LIPS decision objectives must be determined to be relevant to all the Division's work.
6. Funding decisions must be promptly fed back to the activity owner.
7. A "cut" approach should be used for activities not receiving funding, rather than "shaving" other activities to release funds to cover "below the line" activities.
8. All activities should be prioritized, not just those determined to be in addition to a "core" level of activity.

In reviewing the Prioritization Methodology selection process, the Team identified several requirements for success:
1. Senior Management must provide a clear mandate, support, and charter for the Team.
2. The Team's work must be completed in a short (4-6 weeks) time.
3. The Team must establish and agree on definitions of the terms which are unique to the Team's objective.
4. The Team must establish and operate to a set of rules appropriate to the Team's task.

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