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Prototype Prosperity-Diversity Game for the Laboratory Development Division of Sandia National Laboratories

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**PROTOTYPE
PROSPERITY-DIVERSITY GAME**

for the

**LABORATORY DEVELOPMENT DIVISION
of
SANDIA NATIONAL LABORATORIES**

Focusing on

**Strategic Restructuring for Reduced Budgets
Among the
Family of DOE Laboratories**

May 24-25, 1995

**Fred Harvey Hotel Ballroom
Albuquerque, New Mexico**

by

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Abstract

The Prosperity Game conducted for the Laboratory Development Division of Sandia National Laboratories on May 24-25, 1995, focused on the individual and organizational autonomy plaguing the Department of Energy (DOE)-Congress-Laboratories' ability to manage the wrenching change of declining budgets.

Prosperity Games are an outgrowth and adaptation of move/countermove and seminar War Games. Each Prosperity Game is unique in that both the game format and the player contributions vary from game to game. This particular Prosperity Game was played by volunteers from Sandia National Laboratories, Eastman Kodak, IBM, and AT&T. Since the participants fully control the content of the games, the specific outcomes will be different when the team for each laboratory, Congress, DOE, and the Laboratory Operating Board (now Laboratory Operations Board) is composed of executives from those respective organizations. Nevertheless, the strategies and implementing agreements suggest that the Prosperity Games stimulate cooperative behaviors and may permit the executives of the institutions to safely explore the consequences of a family of DOE laboratories acting in concert.

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Executive Summary

Teams that work together succeed more often than those that work towards conflicting objectives. Therefore, inappropriate competition arising from excessive individual and organizational autonomy inhibits the full and effective use of the national resources entrusted to the national laboratories. The Prototype Prosperity-Diversity Game explores the potential for competition, cooperation, and consolidation for reforming the Department of Energy's (DOE) national laboratory system for the future with less funding. Specifically, the game had three objectives to explore alternatives to autonomy:

1. Confront the expected budget reductions for all of DOE's national laboratories in 1996 and beyond.
2. Explore options for synergism among the laboratories and industry that enhance the services the laboratories can provide to the nation.
3. Explore the role of inclusive behaviors and their value in addressing very complex issues.

The full Prosperity Game has 15 teams, shown in Figure ES1. For the Prototype game, the Green Team (representing the Rest of the World and the Game Process Agents) played BNL, PNL, and Allied Signal Kansas City. The remaining 11 teams constructed plans and implemented them with negotiated agreements in a socially constructed reality.

The players were mostly volunteers from Sandia with a sampling of participants from industry. The diversity of thought from this broad sampling of the corresponding cultures produced specific outcomes that may not be replicated if executives from the respective institutions played the game. Nevertheless, the players' self-assessments of success and behavioral inclusiveness were both high (on a scale of 1 meaning very little to 5 meaning very much) and were well correlated, as shown in Figure ES2.

The general feedback indicates that the game process stimulates synergistic interdependency and inclusive behaviors with specific and thought-provoking outcomes. Those outcomes are reported in detail in this report and are summarized in Table ES1.

Caution: The specific outcomes are strongly dependent on the players, who were not from the respective entities in this prototype. When each entity participates, the specific agreements will change.

Each team recorded how successful it was, and each team's success was judged by all the participants. The correlation of the two votes was 86%, indicating that a team's success is evident to almost everyone in this open and interactive format (Figure ES3).

Playing the prototype game let us learn a great deal that will improve the Prosperity-Diversity Game. Once those improvements are implemented, another Prototype Game should be played by individuals from each of the laboratories, DOE, Congress, and industry, representing the Laboratory Operations Board.

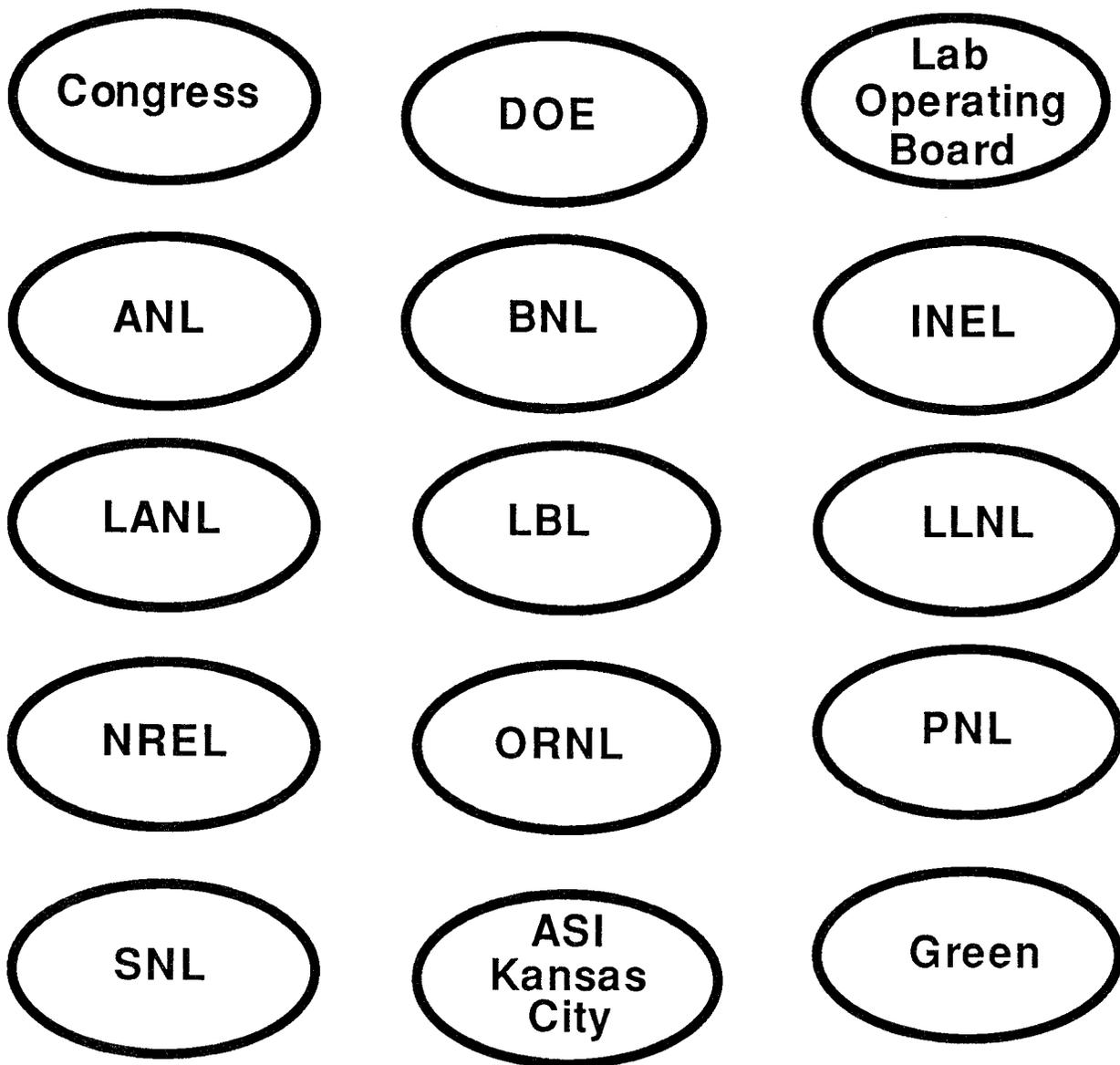


FIGURE ES1. Teams Playing the Prosperity-Diversity Game

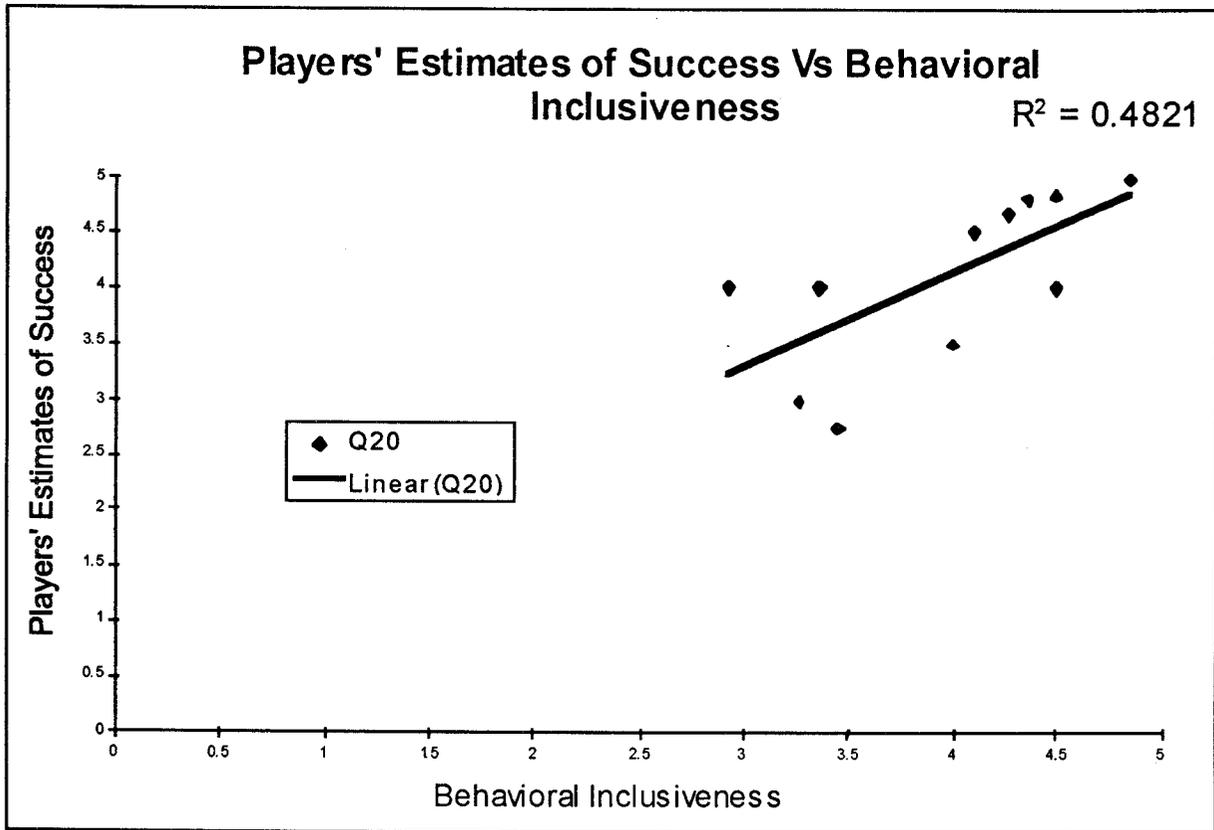


FIGURE ES2. Players' Estimates of Success Vs Behavioral Inclusiveness

TABLE ES1

Team	Guiding Strategic Intent or Challenges	Releases to Others	Gains from Others
Laboratory Operating Board (LOB)	Foster collaborative synergy. Position LOB to effect collaboration and efficiency.	Required multi-laboratory business case for proposals. Incremented funds to cooperating laboratories. Negotiated with Congress and DOE for a common set of criteria for approving programs.	Built relationships with other teams. Obtained a charter from Congress for oversight accountability of the Laboratory System. Reorganized the DOE and the family of labs to serve multiple agencies.
Congress	Cut the Budget. Retain war and science capabilities.	Implemented Galvin Report. Deferred closure until report. Closed one lab. Discussed retirement incentives for downsizing. Funded collaborative projects. Authorized accountable LOB.	Established (with LOB and DOE) new model for DOE and its national laboratories.
Department of Energy (DOE)	Define role of DOE as strategist for labs' abilities. Assure nuclear weapon stockpile stewardship. Downsize DOE. Find new markets for labs. Designate lead labs. Develop contingency plan for elimination of DOE.	Aligned with LOB lead. Downsized DOE 27% and delegated authority to labs. Made lead labs accountable. Accepted congressionally mandated restructure. Designated \$50M for DOE closure costs as contingency.	Required business plans. Teamed with LOB to stop overlap with industry and encourage collaboration. Funded tritium production, DARHT, CRADA incentives, clean-up technology.
Argonne National Laboratory (ANL)	Fill void of no national energy policy. Maintain world-class talent base.	Distributed \$65M to ORNL, LBL, and BNL. Funded university-industry R&D and \$10M to build DOE nuclear clean-up program. Funded \$15M for cleanup on Mescalero depository. Adopted ES&H best industry practices.	Allied with BNL, LBL, ORNL to acquire lead lab role from Congress/DOE. Secured \$50M for NEP at ANL and \$50 M for LANL. Opened user facilities. Acquired ER Program from LLNL and \$32M from INEL for cleanup.

(continued)

TABLE ES1 (continued)

Team	Guiding Strategic Intent or Challenges	Releases to Others	Gains from Others
Idaho National Engineering Laboratory (INEL)	Collaborate with energy labs. Find new markets. Strengthen nuclear fuel disposal competence. Collaborate with defense labs. Collaborate with Lockheed-Martin labs.	Gave \$1M to LANL for reengineering. Gave ORNL \$20M for tritium production. Gave \$10M to supercomputing.	Proposed consolidation with PNL. Collaborated with LBL, ORNL, and ANL on cleanup. Collaborated with LANL, ORNL, SNL, ANL, and BIA on Mescalero Project. Gained \$1M from lab agreement, \$5M from BIA, and \$35M to manage clean-up tech program.
Lawrence Berkeley National Laboratory (LBL)	Adopt collaborative strategy. Address labs' image problem. Preserve funding.	Contracted with ORNL for marketing metrics. Contracted with university for benchmarking labs. Invested in supercomputing.	Collaborated in efficient transportation initiative. Participated in cooperative projects for 10% kicker from LOB.
Lawrence Livermore National Laboratory (LLNL)	Preserve weapon role. Grow other major programs by arranging competitive procurement and winning through super marketing. Exchange value with other labs.	Secured LLNL weapon role, but it was superseded. Tried nonproliferation agreement but it failed. DOE approved competitive system, then assigned lead-labs that preempted LLNL advantage.	Sold LBL computer services. Collaborated successfully in supercomputing and clean-up lab groups.
Los Alamos National Laboratory (LANL)	Maintain strengths. Change perception of LANL and its management. Accommodate budget cuts.	Gave up management of energy research to ANL. Fund supercomputing. Gave up Renewable Energy Program to NREL. Gave up APT Project. Privatized LAMPF. Supported LBL lighting.	Secured DARHT funding. Consolidated with SNL. Consolidated three weapon labs. Agreed to joint reviews. Adopted LBL system to reengineer management. Supported LBL's image building of all labs. Teamed on Mescalero project. Sold computing to LBL.
National Renewable Energy Laboratory (NREL)	Counter threat of extinction. Increase financial base. Market to public.	Gave \$1M to LBL for public perception campaign for all labs and served on board. Pushed to increase renewable energy program.	Negotiated with LANL, ANL, and SNL for all renewable energy work to be NREL's. Used Galvin Report's endorsement of energy to enhance funding from Congress.

ix.

(continued)

TABLE ES1 (concluded)

Team	Guiding Strategic Intent or Challenges	Releases to Others	Gains from Others
Oak Ridge National Laboratory (ORNL)	Secure tritium production using commercial reactors as an ORNL mission. Secure role in energy and environment area.	Miscommunications during first round cost a lot. Negotiated agreements with ANL, LANL, SNL, and INEL for cost of \$37M to secure support for ORNL missions.	Leveraged mission for tritium into \$195M from Congress, ANL, SNL, INEL, DOE, LANL, and LOB. Followed LBL on improving perception of all labs.
Sandia National Laboratories (SNL)	Assure success of nuclear weapon mission. Maintain tech base.	Consolidated nondefense missions at INEL & NREL. Cut cost of operations by 20% over 7 years by efficiencies from consolidation.	Consolidated with ASI, then LANL, then LLNL for superlab. Supported ORNL for tritium production in commercial reactors. Invested in tri-lab high-performance computing. Obtained charter for WMD work.

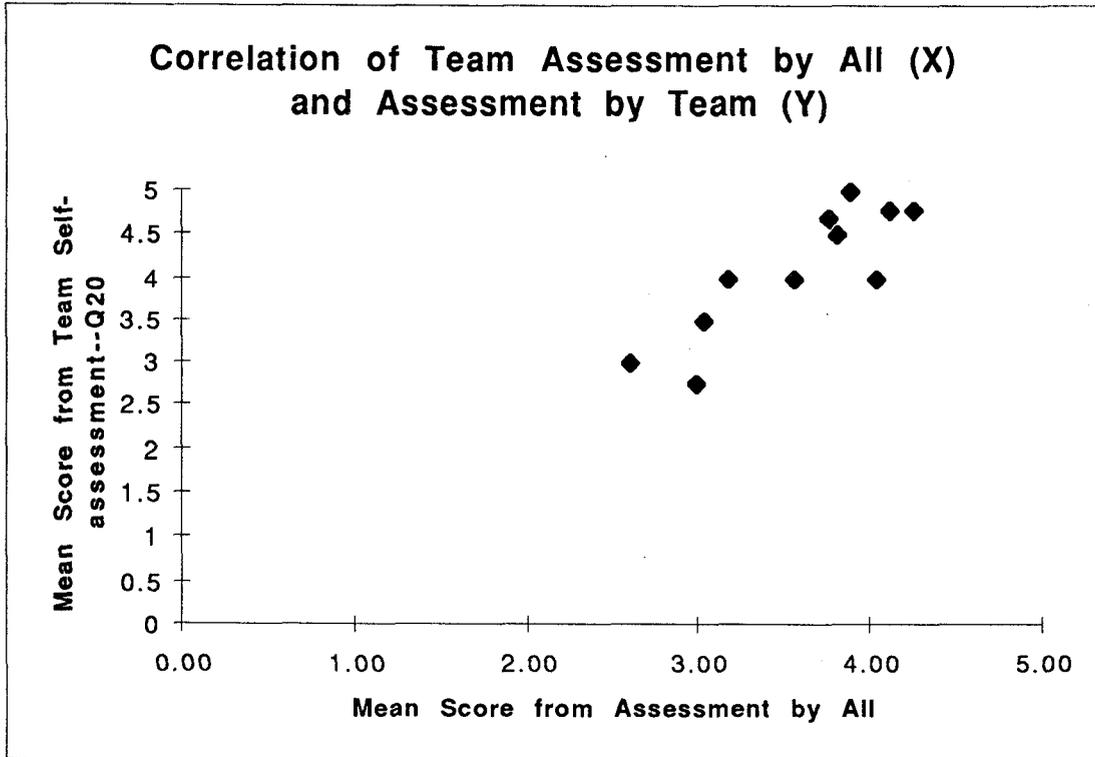


FIGURE ES3. Correlation of Team Assessment by All (X) and Assessment by Team (Y).

Acronyms

ACTA	Arms Control Disarmament Agency
ALS	Advanced Light Source
ANL	Argonne National Laboratory
ANS	Advanced Neutron Source
APS	Advanced Photon Source
APT	Accelerator Produced Tritium
ASI	Allied Signal Inc.
ASKC	Allied Signal Kansas City
AT&T	American Telephone and Telegraph
BIA	Bureau of Indian Affairs
BNL	Brookhaven National Laboratory
CRADA	Cooperative Research and Development Agreement
DARHT	Dual Axis Radiographic Hydrotest
DOD	Department of Defense
DOE	Department of Energy
EE	Engineering Evaluation
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ER	Energy Research
HFBR	High Flux Beam Reactor
IBM	International Business Machines, Inc.
INEL	Idaho National Engineering Laboratory
LAMPF	Los Alamos Meson Physics Facility
LANL	Los Alamos National Laboratory
LBL	Lawrence Berkeley National Laboratory
LLNL	Lawrence Livermore National Laboratory
LOB	Laboratory Operating Board
MIT	Massachusetts Institute of Technology
MOU	Memorandum of Understanding
NASA	National Aeronautics and Space Administration
NEP	National Energy Policy
NIF	National Ignition Facility
NIST	National Institute of Standards and Technology
NOAA	National Oceanographic and Atmospheric Administration
NREL	National Renewable Energy Laboratory
NSC	National Security Council
NSF	National Science Foundation
OFA	Other Federal Agencies
OMB	Office of Management and Budget
ORNL	Oak Ridge National Laboratory
OSTP	Office of Science and Technology Policy
PNL	Pacific Northwest Laboratory
POC	Point of Contact
R&D	Research and Development
RE	Renewable Energy
RHIC	Relativistic Heavy Ion Collider
ROI	Return on Investment
S&E	Science and Energy
S&T	Systems and Technology
SNL	Sandia National Laboratories
TPX	Tokamak Physics Experiment

Acronyms (continued)

TQM	Total Quality Management
USGS	US Geological Survey
WMD	Waste Management Defense

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Game Objectives

This was the tenth Prosperity Game. The general objectives of all these games have been to:

- Stimulate thinking;
- Develop relationships and partnerships among industry, government, labs and universities;
- Explore long-term strategies and policies;
- Lay the foundation for strategic action; and
- Provide informed input for possible future legislation.

This game was held in conjunction with the Laboratory Development Division's National Industrial Alliances Center and Division Diversity Council. The three main objectives of the game were:

- Confront the expected budget reductions for all of DOE's national laboratories in 1996 and beyond.
- Explore options for synergism among the laboratories and industry that enhance the services the laboratories can provide to the nation.
- Explore the role of inclusive behaviors and their value in addressing very complex issues.

Strategic Planning Before Funding Reductions

Most organizations treat downsizing as a tactical issue that leaves both those who are outplaced and the survivors feeling devastated. The resulting distrust and disillusionment can inhibit the organization for decades, as the 1973 layoff

affected Sandia. Jensen and Katz advocate a more strategic approach:

"However, if the downsizing is a result of a thoughtful strategic plan that addresses long term business issues and the need for fundamental change in the nature and concept of the company, then the opportunity for positive growth can be maximized. The framework for this kind of thoughtful, paradigm-shifting strategic plan must include a clear vision of the future of the organization:

- Identifying and articulating the mission of the organization.
- Identifying the key assets of the organization for achieving that mission.
- Identifying what it will take to be competitive in the next century and beyond."¹

Martin Marietta considered three approaches to the plummeting reductions in the defense business after the end of the Cold War: Competition, Evaporation, and Consolidation. They chose Consolidation as the successful strategy and have maintained overall value to their stockholders and customers as a result. The same decisions faced the teams in the Prosperity-Diversity Game.

¹Marjane Jensen, Ph.D. and Judith H. Katz, Ed.D., in "Downsizing and Diversity: Navigating the Path between Trauma and Opportunity," The Kaleel Consulting Group, Inc., 1994, unpublished.

Situation at the Beginning of the Game

Key Events and Trends

The end of the Cold War has resulted in a series of intense examinations of the role of the national laboratories. The defense laboratories (Sandia, Los Alamos, and Lawrence Livermore) have been most directly affected. The funding for defense in DoD and DOE has been reduced by 30% since 1992. The backlog of work from long-term programs is almost completed and few new projects are being initiated.

Although the general economic activity of the country has grown, the defense sector continues to be hard hit. DoD contractors lobby effectively to keep programs from the national laboratories; the resulting guidance requires all substantial work by other agencies to have the equivalent of flag level approvals, which reduces the work flow from other agencies into the DOE laboratories.

The growing budget deficit and the Republican's Contract With America resulted in a major realignment in Congress in 1994. The Republican majority in Congress acts on its perceived mandate to reduce government size and spending dramatically. The experiences of corporate re-engineering affirm that the only real way to save money is to eliminate functions; Congress is exploring the dissolution of the Departments of Energy, Commerce, Education, and Housing and Urban Development. The initiative is budget driven.

Advocates in Congress are preparing to debate the formation of a Department of Science composed of the science capabilities of DOE, NASA, NIST, NSF, USGS, EPA, and NOAA with a \$35B budget. Whether the new department would function as a synergistic whole or simply be like a holding company is a key question. If the latter, the activities will go to the agency level and not have cabinet status.

The formation of a Laboratory Closure Commission is driven by concerns over the budget deficit. The process will result in closure of one or more DOE labs unless unified action by the laboratories consolidate the activities in a business-like manner.

The Roemer Bill to cut the Energy Labs by 30% over five years (from 45,000 people to 30,000 people) is pending. The move to support basic research during budget cuts encourages some in Congress to consider turning the national laboratories with special facilities into user facilities with dormitories for visiting university and industry scientists. These user facilities would have very little in-house scientific capability. The cost of the infrastructure to support the user facility has not been determined.

The DOE is restructuring into four lines of business: defense, energy, environment, and science. The resulting confusion leaves DOE immersed in internal reform and temporarily disadvantaged in advocating its own value and the value of its laboratories to the nation. The Secretary has committed to cutting costs by \$14.1B over 5 years (about 15% of the Department's budget). As explained in the press release of May 3, 1995, and included in the Appendices, approximately \$1.7B of savings are to come from the strategic realignment of the department and an additional \$5.3B from the legislative package submitted to Congress.

In FY96, the cuts are predominately in the environment area (including waste management), and the energy area (specifically, renewable energy demonstrations and fusion's TPX project at Princeton). Additional defense cuts of \$0.5B are delayed until 1997.

The Galvin Commission provided far-reaching advice to DOE and highlighted the need for reform of its business practices to reduce regulation and shift to a results-based management to replace the present process-based audit system. It projected a 20% to 30% savings and corresponding reduction in the number of people to do the same work if the reforms were implemented. The Galvin Commission also recommended corporatizing the Department with a board from industry to set direction. The proposal infringed on the direct accountability of DOE to Congress and was rejected. The Appendix B provision of the Galvin was changed into the Laboratory Operating Board. Whether it becomes a weak advisory board or a meaningful agent of change will be determined by the actions of the board during the Games.

In spite of the benefits delivered to industry by the national laboratories, the Galvin Commission recommended that the public mission of the laboratories should not be extended to include economic security. Industrial competitiveness is to be an incidental benefit to the laboratories' work on their public missions. The income from work with industry cannot alleviate the impact of falling budgets.

Study groups, task forces, and preparation of Programmatic Environmental Impact Statements (PEIS) will help resolve major issues during FY96.

- An Interagency Study Group (DOE, NSC, DOD, ACTA, OSTP, and OMB) will address the future of LLNL. The decision will impact LANL and SNL. The report is due October 31, 1995.
- The Programmatic EIS for the billion-plus-dollar National Ignition Facility will address the continuation and siting of the project by the fall of 1996. LLNL is the advocate and recommended site for NIF. Every member of the California congressional delegation endorsed NIF and endorsed its siting at LLNL. The large expenditure in tight times will

impact all DOE labs, especially LLNL, LANL, and SNL.

- The Programmatic EIS on a facility to produce tritium is due in the fall of 1995. LANL will benefit if Accelerator Produced Tritium (APT) is selected. ORNL will benefit if a new reactor (or tritium-producing fuel rods in a commercial reactor) is selected. Sandia will provide risk assessments in either case. Congress will decide on the reactor approach or the accelerator approach.

Teams

The players are shown with their teams in Appendix A. In the full Game, fifteen teams are to work an interdependent, socially constructed reality simulating Congress, the Department of Energy, The Laboratory Operating Board (subsequently renamed and rechartered as the Laboratory Operations Board), DOE's 10 multi-program laboratories, industry, and a Green Team, which represents the Rest of the World. (See Figure 1.)

Three teams (PNL, BNL, and ASI) were not used in the prototype to limit the number of players required for the prototype. The eleven remaining operational teams were composed of vertically integrated task forces from each organization responsible for defining and negotiating a preferred strategy for the family of laboratories. This action is intended to accommodate downsizing DOE before a Laboratory Closure Commission does it for them. The teams represented very different entities, as illustrated in the summaries of core competencies, laboratory budgets by program element, congressional connections described in Appendix B, and further detailed in the team summaries.

Intra-organizational issues had been delegated to others so the teams could focus on this strategic situation. The actions of each team were subject to the discipline of a working consensus; i.e., every member of the team had to be able to

live with the consensus position and no member of the team could do anything that was unacceptable to any other member of the team. Therefore, it was not necessary to choose manager-subordinate roles within teams.

Each team was briefly described, as shown in Appendices B and C, and most teams received supplementary materials obtained from the World Wide Web Home Page of the respective institution.

Schedule of Play

The two-day, one-evening game was prototyped in one day and one evening. The compressed schedule did not permit the checks and balances in the negotiations that might have restrained the play to more closely resemble reality. The agenda is given in Appendix D and is divided into the following sections:

- Orientation
- Planning
- Implementation
- Self-assessment
- Improvement
- Group assessment

After the team members got to know each other and the strengths and weaknesses of their assigned institutions, they conducted

a strategic planning session and then were encouraged to leave their groups and seek allies through negotiations for the Toolkit Process.

Technology and Policy Toolkit

The teams had resources that could be invested to realize one or more options provided in the Toolkit and could create options for valuation by the Green Team. Each option was granted probabilistically with chances of success increasing with the amount of investment. Combining one's investment with that of other teams to realize an option increased the probability of success. A normal cumulative probability distribution with mean equal to the price for a 50% chance of success and standard deviation of half that amount was used to calculate the probability of success for the total amount invested. If a random number (between 0 and 1) from the computer was less than the calculated probability, the option succeeded. As an example, an investment of \$150M in an option with a price of \$100M would yield a success probability of 0.84; an investment of \$200M, twice the mean, would result in a probability of almost 0.98. If the random number was less than or equal to 0.84 or 0.98 respectively, the option was implemented.

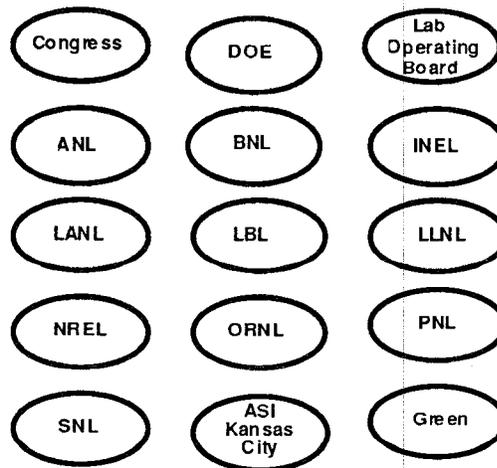


FIGURE 1. Teams Playing the Prosperity-Diversity Game

Each team was assigned initial resources (dollars) that were proportional to the team's total current assets for investing during the game. Government teams were arbitrarily assigned an initial balance of \$500M (Table 1). These funds could be invested in business deals, R&D investments with other teams, purchasing patents and rights, etc. However, for investments in Toolkit Options only, the initial capital of the smaller organizations was increased by an *influence factor* (see Technology and Policy Toolkit). This factor simulated the relatively larger influence per unit size that smaller but well connected organizations could exert on policy changes. Toolkit options and the investments required for a 50% probability of success are given in the Technology and Policy Toolkit.

Results of Toolkit Interactions and Subsequent Negotiations

The players had difficulty meeting the time constraints on the Toolkit. The Green Team extended the time limit and accepted stragglers (without the multiplier). The resulting deals are summarized in Table 2 and suggest priority investments for DOE.

The teams continued to negotiate, encountering the agendas of the other teams and adjusting their moves to advance their strategies in the context of the other teams' moves. In essence, they produced an interdependent, socially constructed reality. Some of the teams created their own plans and found that the plans of the other teams forced radical adjustments to their strategies.

TABLE 1. Initial Resources Assigned

Team	Total Assets
Congress	\$500M
Department of Energy	\$500M
Laboratory Operating Board.....	\$500M
Argonne National Laboratory (includes an influence factor of x2)	\$ 89M
Brookhaven National Laboratory (influence factor of x2).....	\$ 56M
Idaho National Engineering Laboratory (influence factor of x1.5).....	\$ 95M
Los Alamos National Laboratory	\$108M
Lawrence Berkeley National Laboratory (influence factor of x2).....	\$ 42M
Lawrence Livermore National Laboratory	\$ 95M
National Renewable Energy Laboratory (influence factor of x2).....	\$ 27M
Oak Ridge National Laboratory (influence factor of x1.5).....	\$ 83M
Pacific Northwest National Laboratory	\$ 80M
Sandia National Laboratories	\$132M
Allied Signal of Kansas City (influence factor of x1.5).....	\$ 60M

Investments could be made to support (+) or block (-) any option. The sum of all investments in an option (+ and -) was used in the calculation.

TABLE 2. Toolkit Options: Success/Failure Calculation as a Function of Total Dollars Invested

Technology and Policy Options ---- Team Name: _____															
Assume standard deviation = 0.5 x mean (50%) investment															
	Total funds invested (\$M)	\$M for 50% Probability	Probability	Success or failure	Congress	DOE	LOB	ANL	INEL	LANL	LBNL	LLNL	NREL	ORNL	SNL
Assets available (\$M) ®					500	500	500	89	95	108	42	95	27	83	132
National Ignition Facility is approved for construction at LLNL.		700	0.023	Fail											
Accelerator-Produced Tritium, advocated by LANL and to be sited at Savannah River, is chosen over a new reactor.	50	700	0.032	Fail		50									
High-performance computing initiative for LLNL, LANL, and SNL assure state-of-the-art computational capabilities in a central site for use by all three labs.	520	400	0.726	Success	150	100	100		10	40	10	50		10	50
DOE creates program in the national laboratories for new technologies to clean up contaminated sites.	450	160	1.000	Success	50	100	100	10	40	5	25	20		40	20
DOE concludes agreement with the nuclear reactor industry to insert tritium-producing systems into commercial reactors to provide tritium for future weapon needs, obviating the need for a new reactor or accelerator for tritium production. (2nd try!)	265	160	0.905	Success	50	50	50	10	20	10				60	15
Interagency Study Group recommends a team of 6 nuclear weapon designers remain at LLNL with support by a team of 50 weapons-code builders to provide an independent design code for peer review of LANL designs. All experiments are done at LANL.	60	160	0.106	Fail			50			10					

(continued)

TABLE 2. (concluded)

	Total funds invested (\$M)	\$M for 50% Probability	Probability	Success or failure	Congress	DOE	LOB	ANL	INEL	LANL	LBNL	LLNL	NREL	ORNL	SNL
DARHT Program EIS is approved for LANL.	40	20	0.977	Success		20				20					
Public pressure for downsizing the national laboratory system results in Congress deciding to close one laboratory, which relieves pressure on the others to the extent that costs are saved. Congress decides on which one.	8	20	0.115	Fail				2			6				
Add your own options here:															
Galvin & public pressure for increased funding for renewable energy, efficiency, & observation leads to 10% increase in funding.	20	60	0.091	Fail									20		
New business development model on how labs will team.	5	4	0.691	Success			5								
Following is new, after 2:00 PM															
Public pressure saved. Congress decides on which one, after findings of report in 2 years, if they support such action. (Modification of 10 above.)	40	20	0.977	Success											
Galvin & public pressure for increased funding for renewable energy, efficiency, & observation leads to 10% increase in funding. (2nd try.)	97.2	60	0.893	Success	30	30	30						7.2		
DOE adopts best complex practices for regulations and processes	40	30	0.748	Success		10	10	1	1	14	1	1		1	1
Totals =	1463	2554			250	320	305	27	70	85	41	70	20	110	85

7

Team-to-Team Deals and Negotiations

Each team endeavored to advance its strategies by negotiating agreements with other teams. Frequently players learned that the framework in which they had been operating was very different from that of the other teams. Agreements, therefore, depended on flexibility, innovation, and persuasive powers of the participants. Each agreement was recorded on a special form and signed by a representative of each participating team. The Green Team reviewed the agreements for completeness and consistency and entered them into the game's database with the time of the agreement. Appendix E provides the most complete record of the sequence of agreements in this Prosperity Game.

Each team reviewed its own agreements and how they did or did not support their intended strategies for meeting the key challenges. The resulting deliberations were translated into a strategy matrix and scored by each team as described in Appendix F. Each team then prepared a final presentation based on its strategy matrix and presented it to the audience for voting on two metrics: the degree to which the team advanced its own interests, and the degree to which the team advanced the interests of DOE.

Team Outcomes

The Final Reports from each team were presented as the strategy matrices for that team and delivered in oral presentations edited for this report and presented in the following section.

4000 Prosperity Game Report

Laboratory Operating Board (LOB)

A comparison of the team's initial and final challenges and strategies showed that the team did implement its initial set of strategies as planned.

Key Challenges	Strategy
Foster teaming & efficiency - Labs, industry, universities.	Require business case before we distribute funds.
To position ourselves to be relevant (value added).	Sell our view of LOB to Congress, Labs, DOE.

Laboratory Operating Board Agreements Terms and Conditions	Funds Transfer	Time
LOB will provide program development funds of 10% of total assets for signed agreement that all proposals presented to LOB in future will have sign-off by each lab.	\$8.9M to ANL \$10.8M to LANL \$9.5M to INEL All \$ from LOB	1040
We will provide program development funds of 10% of your operating budget for signed MOUs between labs and LOB. All proposals presented to LOB in the future will have sign-off by each lab.	\$9.5M to LLNL \$4.2M to LBNL \$2.7M to NREL All \$ from LOB	1040
We will program 10% of total assets for signed agreements; will be partnered between all labs (all proposals signed by all labs).	\$13.2M to SNL \$8.3M to ORNL All \$ from LOB	1040
LOB proposes that DOE and Congress not accept proposals for funding w/o a business plan that includes other lab, industry and university participation.		1059
ANL leads the effort for development of a National Energy Program w/ANL acting as lead integrator with the other ER labs (BNL, LBL, ORNL).	\$50M from LOB to ANL; \$50M from DOE to ANL; \$50M of ANL funds used	1100
LOB/DOE/Congress agree on baseline set of criteria to apply to all funding projects: synergy across labs; clear focus of Centers of Excellence; efficiency; integrating mechanisms; involvement of university and industry research efforts.		1120
The three weapons labs support the lead lab concept for weapons design, development and stewardship.		1141
LBL to assess public/business/education perceptions of role of national labs. Complex will record assessments and models. New business models to develop national advocacy.	\$5M from LOB to LBL; \$1M from each other lab to LBL	1217
LOB becomes a vital, relevant, value-adding mentor to the national lab system by becoming congressionally appointed. and recognized.		1329

Laboratory Operating Board Agreements Terms and Conditions	Funds Transfer	Time
Agreement on redesign of the National Lab system per flip chart. LOB, DOE and Congress will work out implementation terms and carry out in 2 moves.		1418
Multi-lab partnership to work with Mescalero Apaches on storage of nuclear waste to ensure safety, security, proper handling, etc. Bureau Indian Affairs to provide educational support. Lab funds to labs.	\$5M from ANL, INEL, LANL, ORNL (4), SNL, PNL, LOB, Con, BIA	1438
All labs participate in lab implementation group: POC, public assessment, business modeling, review results, refocus per gaps, address perception gaps, evaluation and continuous improvement	\$1M to each other lab from LBL	1440
Endowment to create national S&T university to mentor industry; university and lab relations to solve to be defined national needs of import. Endowment will facilitate opportunities for future National Industrial alliances.	\$30M to MIT from LOB	1443

The final strategy matrix presented by the team follows:

LOB Key Challenges	Strategy	Move 1	Move 2	Move 3	Move 4
Foster teaming & efficiency - Labs, industry, universities	Require business case before we distribute funds	Agreement to provide program development of 10% for signed MOU	Agreement based on matrix that provides operating expenses based on # of participants	Contingency - LOB, DOE, Congress jointly allocate project by project	Agreement on national energy program that promotes efficiency across labs
					Labs get agreement on business analysis tool - all labs
					Invest \$100M in cooperative computer initiative
					clean-up
					Tritium production
					Weapons design
					Energy program
					Process model
					Reusables
					Business model

LOB Key Challenges	Strategy	Move 1	Move 2	Move 3	Move 4
To position ourselves to be relevant (value added)	Sell our view of LOB to Congress, Labs, DOE	Agreement w/DOE/Congress to require collaborative business plan before allocation of dollars	Agreement w/DOE/Congress leverage \$1.5M for Business plan approval (shared sub-criteria)	Formalize relationship w/DOE/Congress so that LOB role is clear/recognized (Congressionally appointed)	Obtain agreement of model to reorganize DOE

The Team described its experience as follows:

“We decided there were two key strategies for us: foster collaborative synergy across the labs, industries, and universities—a role that only we could play—and position ourselves to provide that facilitative role for greater collaboration and efficiency in the labs wherever the structure of the organization went. We saw them as two separate strategies, but there were a number of moves in each one that supported the other, so they were highly interdependent.

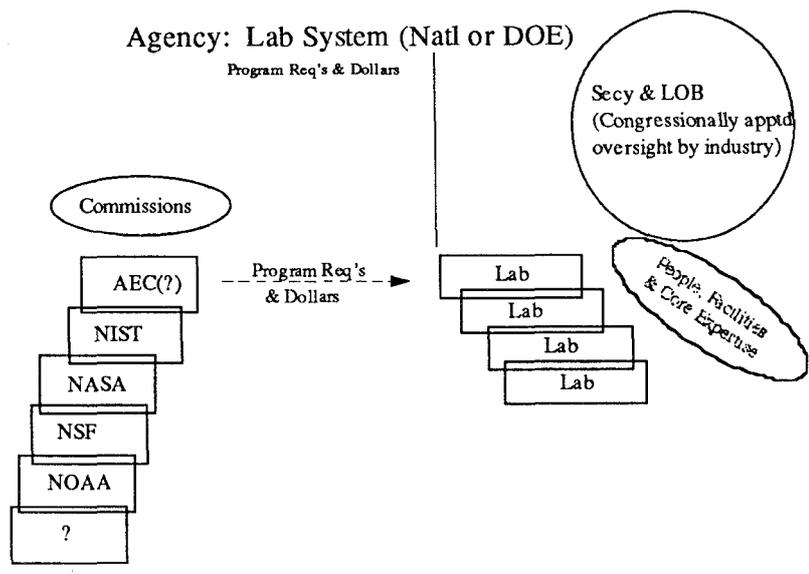
“In fact we had moves in some that were contingencies for moves in others.

“Challenge One was to foster teamwork and efficiency, and the corresponding strategy was to require a multi-laboratory business case before we allocated any resources. We advocated this requirement to Congress and DOE as a standard. Our implementing moves were to get all labs to follow that model; if they did, we would provide 10 percent seed money up front—10 percent of their operating budget. We were successful at that.

“We discussed having a collaborative approval process with Congress and DOE. Congress declined. Therefore, we fell back to a contingency: have a common set of criteria for selecting programs. Then we proceeded to cut all kinds of deals very specifically, always using the guiding principles of collaboration and efficiency.

“In terms of the second challenge, to position ourselves to be relevant, we decided the most useful way to begin that was by doing some things that were relevant, by being helpful, by showing that we could in fact foster collaboration and efficiency in the labs. Therefore, we went out and built relationships.

“When we came back, we understood that our being buried in DOE, at the whim of the DOE Secretary, did not position us to effectively encourage collaboration and efficiency. We sold our proposal to be more significantly placed to Congress, the labs, and DOE by getting agreements on the business plans, by working the shared criteria issue, and by getting Congress to formalize the new relationship of accountability. We proceeded to provide the following model for reorganizing DOE and the whole national lab structure.



“Incidentally, the scoring system did not give us many points for such far-reaching actions. In the real world, the conse-

quences of what we did would have been enormous.”

Congress

Comparison of the team's initial and final challenges and strategies revealed that the team dropped the strategy to be a coordinating agent.

Congress Key Challenges	Strategy
Cut Budget	Identify duplication
	Re-align remaining
	Implement Galvin
	Commercialize tritium
Retain war & science capability	Identify duplication
	Establish roles & responsibilities
	Create integrating mechanisms

Congressional Agreements Terms and Conditions	Funds Transfer	Time
LOB proposes that DOE and Congress not accept proposals for funding w/o a business plan that includes other lab, industry and university participation.		1059
LOB/DOE/Congress agree on baseline set of criteria to apply to all funding projects: synergy across labs; clear focus of Centers of Excellence; efficiency; integrating mechanisms; involvement of university and industry research efforts.		1120
LOB becomes a vital, relevant, value-adding mentor to the national lab system by becoming congressionally appointed and recognized.		1329
LBL is performing a jointly funded complex-wide study of perceptions/realities w/in DOE lab system. Results avail in 2 years. Congress agrees not to make decisions about lab closures before study complete. Congressional input to study will be sought.		1400
Increase R&D tax credits for CRADA funding for dual (weapons programs/industry) benefit. Tax revenue foregone in near term will be recouped or increased by taxes from new prods from new CRADAs.		1405
Agreement on redesign of the National Lab system per flip chart. LOB, DOE and Congress will work out implementation terms and carry out in 2 moves.		1418
Congress passes legislation to allow for commercial reactor production of tritium.		1435
Multi-lab partnership to work with Mescalero Apaches on storage of nuclear waste to ensure safety, security, proper handling, etc. Bureau Indian Affairs to provide educational support. Lab funds to labs.	\$5M from ANL, INEL, LANL, ORNL (4), SNL, PNL, LOB, Con, BIA	1438
SNL and LANL agree to phased lab consolidate that will reduce total operating costs by 20% in 7 years in return for funded program (DOE-DOD) in defense w/r/t weapons (including smart weapons). Support role in EE only.		1519

The final strategy matrix presented by the team follows:

Congress Key Challenges	Strategy	Move 1	Move 2
Cut Budget	Identify duplication	Agreement w/LOB: proposed criteria	
	Re-align remaining	Early retirements	
	Implement Galvin	Signed legislation	Close one lab
	Commercialize tritium	\$1 to ORNL to oversee	
Retain war & science capability	Identify duplication	Signed agreement w/LOB & DOE re lab collaboration & proposals	Signed and gave \$ for super computer consortia
	Establish roles & responsibilities	Legislated new model for national labs	Publicized new model with labs
	Create integrating mechanisms	Lunch with DOE & LOB	Congressional appointment of LOB

The team described its actions in the following summation:

“We came up with two challengers. When we first developed them we really got excited, and we came up with a vision on the way things should be. However, before we could implement the vision, the first visitors to our table were the LOB, who had a different vision, which brought us to a screeching halt at the very beginning of the game. We had really never considered that other people would have different ideas than ours. After all, we're Congress. So we had to readjust right at the beginning and listen a little more closely to other people's ideas.

“Our two main challenges were to cut the budget and to retain our science and defense capabilities. We split the DOE into defense and science capabilities. Our strategies for cutting the budget were to identify and cut duplications and realign the remaining entities to implement some of the recommendations from the Galvin Committee. In addition, we embraced solving the tritium supply problem by using special fuel rods in commercial power reactors.

“The moves we took to correct the duplication were to look at the Galvin Report,

agree with the LOB on the criterion that all the labs work together in formulating proposals. In realigning the remaining people we talked about legislation for early retirement incentives program. We signed legislation to study further the duplication and the needs of the labs in realignment. We agreed that we would not close one of the labs until that report was issued in two years. We closed one lab after the two years had elapsed in ‘Game Time.’

“We signed the agreement with LOB and DOE that the labs would collaborate on each proposal. We funded the super computing consortia project and several other consortium projects at Ktech, so we funded people who were working together.

“In establishing rules and responsibilities, we felt we needed to redefine DOE's role and the LOB's role, so we had a model that we had already initiated when the LOB approached us. After we agreed to elevate the LOB, we decided that there was something they could do to help. Therefore, they sat down and came up with a new model; it was wonderful. Then we planned publicizing our new model at the Labs. We decided we needed to create integrating mechanisms to figure out what these new roles would be. Since we got off to a rocky start, we invited DOE and

the LOB to have lunch with us so we could learn more about their visions, and what they wanted out of the congressional elevation of the LOB.

“One other thing we discovered about one o'clock or so, there is no way that Congress could win this game, and that we don't really make moves until people come to us with things.”

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Department of Energy (DOE)

A comparison of the team's initial and final challenges and strategies showed that the team did implement its initial set of strategies as planned.

DOE Key Challenges	Strategy
Perceived as having no value & no clear mission/role	Define role as strategist for lab technology capability
	Assure stewardship of nuclear weapons stockpile (including weapon design/test)
Perceived as being too big, complex, bureaucratic & costly	Reduce DOE size & cost impact on labs
Public perception of limited benefit of labs (outside of national defense)	Find new technical areas to use labs technical capabilities (beyond industrial efforts)
	Create program to designate lead labs for designated technology areas
Contingency	
Will DOE continue to exist in the future?	Develop a contingency plan for elimination of DOE

DOE Agreements Terms and Conditions	Funds Transfer	Time
LOB proposes that DOE and Congress not accept proposals for funding without a business plan that includes other lab, industry and university participation.		1059
ANL leads the effort for development of a National Energy Program with ANL acting as lead integrator with the other ER labs (BNL, LBL, ORNL).	\$50M from LOB to ANL; \$50M from DOE to ANL; \$50M of ANL funds used	1100
LOB/DOE/Congress agree on baseline set of criteria to apply to all funding projects: synergy across labs; clear focus of centers of excellence; efficiency; integrating mechanisms; involvement of university and industry research efforts.		1120
Policy has been adopted to establish competitive bid process for non-nuclear weapons work at labs and facilities. This will promote teaming on proposals to assure best capabilities, locations, etc. on DOE programs.		1125
DOE list of lead labs - Rules: All funding for programs goes to lead lab; all decision making on collaboration to lead lab; no overlap.		1128
DOE to appoint NREL as lead lab in RE. DOE will centralize and focus the RE program. No fee. Total funding \$300M. Value to DOE \$30M. Value to other labs - subcontract.		1135
The three weapons labs support the lead lab concept for weapons design, development and stewardship.		1141
SNL and ASKC agree to collaborate on agile manufacturing upgrade and electromechanical manufacturing at ASKC site until end of ASKC contract and then consolidate ASKC with Lockheed Martin-SNL. DOE provide \$20M. SNL assists in tech transfer and privatization.	\$20M from DOE to SNL; cost savings to DOE of \$200M/year after 3 years.	1325

DOE Agreements Terms and Conditions	Funds Transfer	Time
Increase R&D tax credits for CRADA funding for dual (weapons programs/industry) benefit. Tax revenue foregone in near term will be recouped or increased by taxes from new product from new CRADAs.		1405
LBL will seek support from Green team and DOE for a high-efficiency lighting program. All labs must be aware of this effort. Electrical industry guarantees purchase at \$10M/year for 5 years if specs met.	\$10M purchase guarantees from industry	1410
LLNL to be designated lead lab in lasers (following guidance from the Galvin report).		1420
All labs participate in lab implementation group: POC, public assessment, business modeling, review results, refocus per gaps, address perception gaps, evaluation and continuous improvement	\$1M to each other lab from LBL	1440
SNL and LANL agree to phased lab consolidate that will reduce total operating costs by 20% in 7 years in return for funded program (DOE-DOD) in defense w/r/t weapons (including smart weapons). Support role in EE only.		1519

The final strategy matrix presented by the team follows.

DOE Key Challenges	Strategy	Move 1	Move 2
Perceived as having no value & no clear mission/role	Define role as strategist for lab technology capability	Align w/LOB for partnering w/industry & labs	LOB/DOE/Congress agree on baseline set of criteria. LOB business plans required
	Assure stewardship of nuclear weapons stockpile (including weapon design/test)	Fund labs for tritium production alternative process development (fund ORNL \$50M)	Establish competition process to select tritium production process alternative
		Fund DARHT EIS at LANL (\$20M)	
		Increase R&D tax credits for dual benefit CRADA	
Perceived as being too big, complex, bureaucratic & costly	Reduce DOE size & cost impact on labs	Reorganize to close 24 DOE offices & reduce federal staffing by 3788 (27%)	
		Rewrite or eliminate DOE orders to increase delegation of management authority to labs	
Public perception of limited benefit of labs (outside of national defense)	Find new technical areas to use labs technical capabilities (beyond industrial efforts)	Align with LOB to eliminate LOB overlap with industry & encourage collaboration	Fund INEL for new R&D technology for cleanup (\$100M)
			Fund LBL lighting research

DOE Key Challenges	Strategy	Move 1	Move 2
	Create program to designate lead labs for designated technology areas	Designate lead lab INEL clean-up, NREL renewable energy, SNL defense programs, ANL energy research	Participate in lab implemented group
Contingency			\$30M to NREL response to Galvin
Will DOE continue to exist in the future?	Develop a contingency plan for elimination of DOE	Save a \$50M contingency fund to be used as needed: Outplacement assistance; closure costs, i.e. sale of equipment & facilities; redeployment of personnel to other agencies	

The team described its experience as follows:

“Many of DOE’s challenges were related to the realities of public perception. Certainly the first challenge was the perception we have no value and no clear mission or role. The second was the public perception of the labs limited benefit outside the national defense effort. The third was that DOE is perceived as being too big, too complex, too bureaucratic, and too costly.

“The strategies of the first challenge were to define ourselves in the role of the strategist for the laboratories technical capability. We have observed over the years that we (DOE) have been getting into a much too detailed role. We have been auditors, we have been quality controllers, we have been micro-managing the labs. We don't want to do that anymore. We want to be strategists, and we want to be much more efficient.

“We also want to assure the stewardship of the nuclear weapon stockpile, including weapons design and tests. It was very interesting, stockpile stewardship was a primary objective, but we got so deluged with other things we never got to it. Certainly we funded a number of related projects: funding the labs for tritium production, funding the DARHT Project at Los Alamos, and increasing R&D credits for dual benefit CRADAs, which was approved by Congress. As reported by the

LOB, we endorsed the agreement for a baseline set of criteria and an LOB Business Plan.

“The implementing strategy was finding new technical areas for the labs to address. We got involved in a number of collaborations with the labs, but the primary approach was to designate lead laboratories. Instead of spreading all these duplicate activities over different labs, we wanted to identify activities that certain labs were expert in, designate those as lead laboratories and say okay you have control of the funds for that particular activity. If you don't have the expertise in that area you have the responsibility of going to other laboratories and subcontracting that work to them, but you still have accountability for those funds. We are not going to micromanage those funds.

“There were five designated laboratories: Sandia was responsible for the defense programs, ANL for energy research, NREL for renewable energy and INEL for cleanup. Also Lawrence Livermore was designated lead lab in laser research. There was a deal in process, just before the end, comprising a relationship between Sandia and Los Alamos, but I'm not sure if it ever got consummated.

“To address the idea of being too big, complex, bureaucratic, and costly, we proposed to reduce the size of the DOE and the cost impact on the labs. There were two moves:

reorganize and close 24 DOE offices and reduce staffing by approximately 27 percent and rewrite and eliminate DOE orders to increase delegation of management and authority of the labs. We were delegating audits to the laboratories while basically acting like an IRS entity by retaining the right for a final audit. The labs will manage their business. If you think about the application of TQM, operating as an auditor (Quality Control) is not consistent with TQM, so we are delegating audits back to the laboratories.

"We discussed whether DOE will continue to exist in the future? Our contingency plan was to assign \$50 million as a contingency in case DOE does disappear, to be used for out placement and closure costs, and redeployment to other agencies. Down-sizing was therefore, our backup plan."

Argonne National Laboratory (ANL)

Comparison of the team's initial and final challenges and strategies revealed that the team added three strategies during the implementation phase: develop user facilities to address energy issues; restructure energy programs at national labs; promote

efforts to develop spent nuclear fuel storage facilities.

The resulting strategy matrix of key challenges, strategies and implementing agreements follow.

ANL Key Challenges	Strategy
Respond to lack of National Energy Policy (NEP)	Establish ourselves as lead integrator for DOE NEP
"	Develop user facilities to address energy issues
"	Restructure energy programs at national labs
Reserve ANL's world class capabilities in science and materials	Maintain world class professional talent in science and technology
	Promote efforts to develop spent nuclear fuel storage facilities

Argonne National Laboratory Agreements Terms and Conditions	Funds Transfer	Time
LOB will provide program development funds of 10% of total assets for signed agreement that all proposals presented to LOB in future will have sign-off by each lab.	\$8.9M to ANL \$10.8M to LANL \$9.5M to INEL All \$ from LOB	1040
ANL leads the effort for development of a National Energy Program with ANL acting as lead integrator with the other ER labs (BNL, LBL, ORNL).	\$50M from LOB to ANL; \$50M from DOE to ANL; \$50M of ANL funds used	1100
ANL supports NREL as lead lab for RE programs. NREL agrees to support ANL's proposal to create an overarching program to manage all of DOE's energy programs.		1120
The three weapons labs support the lead lab concept for weapons design, development and stewardship.		1141
LBL to assess public/business/education perceptions of role of national labs. Complex will record assessments and models. New business models to develop national advocacy.	\$5M from LOB to LBL; \$1M from each other lab to LBL	1217
Collaborate with academia, industry, OFAs to open user facilities at LBL, ORNL, ANL, BNL for new material research with application in energy efficient transportation.	\$1M to ANL from each of ORNL, LBL, BNL.	1400

Argonne National Laboratory Agreements Terms and Conditions	Funds Transfer	Time
New technology funding for ANL is proportional to original contribution.	\$32M to ANL from INEL	1415
LANL will turn over ER program to ANL. LANL will allow ANL to manage program, but experiments best done in LANL facilities will remain.		1426
ANL funds university research in advanced materials at national lab user facilities. Funding to be matched by industry up to \$1M per participant. Maintains expertise at ANL.	\$1M to Univ. from ANL	1435
ANL implements initial studies in lead role: ORNL/LBL \$20M clean car; ANL/BNL \$30M global climate change; ANL/ORNL \$25M alt energy sources. Follow-on funding from DOE for implementation.	\$35M to ORNL; \$10M to LBL; \$30M to BNL; all \$ from ANL	1435
Multi-lab partnership to work with Mescalero Apaches on storage of nuclear waste to ensure safety, security, proper handling, etc. Bureau of Indian Affairs to provide educational support. Lab funds to labs.	\$5M from ANL, INEL, LANL, ORNL (4), SNL, PNL, LOB, Congress, BIA	1438
All labs participate in lab implementation group: POC, public assessment, business modeling, review results, refocus per gaps, address perception gaps, evaluation and continuous improvement	\$1M to each other lab from LBL	1440
LLNL will turn over \$50M ER program to ANL. ANL will manage, but still do experiments in LLNL facilities. ANL will give \$50M in virology, biochem warfare, biotech, genetic engineering, etc.		1500
SNL and LANL agree to phased lab consolidate that will reduce total operating costs by 20% in 7 years in return for funded program (DOE-DOD) in defense w/r/t weapons (including smart weapons). Support role in EE only.		1519

The final strategy matrix presented by the team and their description of their approach follow.

ANL Key Challenges	Strategy	Move 1	Move 2	Move 3	Move 4	Move 5
Respond to lack of National Energy Policy (NEP)	Establish ourselves as lead integrator for DOE NEP	Formed Alliances with BNL, LBL, ORNL to support our role designation as lead integrator	Secured designation as lead integrator for NEP and \$50M from DOE to implement role	Secured support from LOB as lead integrator, backed by \$50M	Established Congress support with integrator prototype	Implementation of integration NEP-distributed seed \$65M to ORNL, LBNL, BNL
"	Develop user facilities to address energy issues	Collaborated with LBL, ORNL, BNL to open user facilities to universities, industry & other federal labs for new material research for application to energy efficient transportation	Funded university research program matched by industry for advanced materials research at user facilities			
"	Restructure energy programs at national labs	Secured \$50M of energy research program at LANL for ANL to manage	Traded biotechnology capability to LLNL in exchange for energy research program			
Reserve ANL's world class capabilities in science & materials	Maintain world class professional talent in science & technology	Toolkit #4 - contributed \$10M to DOE's program for clean-up technology	Negotiated \$32M from INEL to support new technology development for cleaning contaminated sites			
	Promote efforts to develop spent nuclear fuel storage facilities	Joined & funded \$15M to consortia w/INEL, LANL, ORNL, SNL for Mescalero MRS	Funded university research program matched by industry for advanced material research w/user facilities			
		Support adoption of DOE adopting best industry practices for ES&H regulations				

The team described its work as follows:

"After we assessed our strengths, weaknesses, opportunities, and challenges, we prioritized and decided to address two key challenges. The first challenge was to

respond to the lack of or need for a national energy policy and program. We wanted to establish ourselves as the lead integrator for that program and try to consolidate and manage the energy research that was going on at the other laboratories. The

second challenge was to preserve the world-class capabilities in science and materials that we believed we had established at Argonne.

"In looking at the need for a national energy program, we felt we were uniquely suited to be the lead integrator, and we were able to form alliances with Berkeley, Brookhaven, and Oak Ridge to support that role. We signed an agreement with DOE for \$50 million to help us implement that role. The LOB supported us in that endeavor. Once we secured the funding, we were able to implement a program and distribute that money out to the laboratories supporting us. Our second strategy in the energy program was to develop our user facilities, prepare them to market their capabilities, and get universities, industry, and other federal agencies to use them. We then funded a research program with universities to do some materials development research at our users facilities. Our third strategy was to restructure the energy program at national laboratories, and we were very pleased with our cooperating sister laboratories, Los Alamos and Lawrence Livermore. Los Alamos agreed to transfer \$50 million worth of their research programs to our laboratory for us to

manage, even though they would retain some of their facilities and expertise to support their programs. We negotiated an agreement with Lawrence Livermore to turn over our biotechnical capabilities in exchange for their energy research program. We felt we made a sacrifice for the national interest, but both of us divested those things that were not primary so it was a win/win for both labs.

"To preserve our world-class capabilities in science and materials, we felt a very important strategy was to keep our talent involved in projects that not only kept them in our laboratories but kept them in the world-class status. Another strategy was to promote efforts to develop spent-nuclear-fuel storage facilities. We needed to find the best way to utilize our talent on problems of national interest. We partnered with INEL to develop new technologies for cleanup capabilities for our contaminated sites. We joined the consortium with INEL, LANL, ORNL, and SNL for funding the Mescalero Apache spent-fuel storage site.

"We focused on keeping our scientists active by getting the most out of the challenges we took on."

Idaho National Engineering Laboratory (INEL)

Comparison of the team's initial and final challenges and strategies revealed that the team added three challenges and two strategies during the implementation phase. Challenges added: collaborate with

energy labs; maintain expertise; consolidate with other Lockheed Martin sites. Strategies added: collaborate with LLNL; collaborate with LBL, ANL and ORNL.

INEL Key Challenges	Strategy
Collaborate with energy labs	Collaborate with LBL
"	Collaborate with ANL
Find new markets	Work with Mescalero nation on waste storage
"	Form consortium to work with Mescalero nation
Collaborate with energy labs	Collaborate with ORNL
Find new markets	Build team for DOE clean-up of sites
Find new markets	"
Become bigger & stronger in our specialty	Consolidate with PNL - combine mixed waste with radioactive waste technology
"	Collaborate with PNL
"	Explore collaboration with ORNL
Collaborate with defense labs	Collaborate with SNL
"	Collaborate with LANL
"	Collaborate with LLNL

Idaho National Engineering Laboratory Terms and Conditions	Funds Transfer	Time
LOB will provide program development funds of 10% of total assets for signed agreement that all proposals presented to LOB in future will have sign-off by each lab.	\$8.9M to ANL \$10.8M to LANL \$9.5M to INEL All \$ from LOB	1040
Idaho Governor agrees to use political influence on behalf of INEL to Congress and DOE in exchange for perceived economic value to the state of Idaho.		1045
ANL leads the effort for development of a National Energy Program with ANL acting as lead integrator with the other ER labs (BNL, LBL, ORNL).	\$50M from LOB to ANL; \$50M from DOE to ANL; \$50M of ANL funds used	1100
The Mescalero Apache tribe agrees to empower INEL to represent the tribe in discussions and negotiations with PNL, Congress, DOE. PNL and INEL agree to provide in kind technical services, related tech transfer, etc. for Management and Operation of fuel storage facility.		1104
The three weapons labs support the lead lab concept for weapons design, development and stewardship.		1141
PNL agrees to invest \$40M in new environmental technologies in exchange for a proportional share of the work.	\$40M from PNL to INEL	1152

Idaho National Engineering Laboratory Terms and Conditions	Funds Transfer	Time
LBL to assess public/business/education perceptions of role of national labs. Complex will record assessments and models. New business models to develop national advocacy.	\$5M from LOB to LBL; \$1M from each other lab to LBL	1217
New technology funding for ANL is proportional to original contribution.	\$32M to ANL from INEL	1415
New technology funding for PNL is proportional to original contribution.	\$128M to PNL from INEL	1415
New technology funding for LBL is proportional to original contribution.	\$32M to LBL from INEL	1415
New technology funding for LANL is proportional to original contribution.	\$64M to LANL from INEL	1415
New technology funding for LLNL is proportional to original contribution.	\$64M to LLNL from INEL	1415
New technology funding for ORNL is proportional to original contribution.	\$128M to ORNL from INEL	1415
New technology funding for SNL is proportional to original contribution.	\$64M to SNL from INEL	1415
Multi-lab partnership to work with Mescalero Apaches on storage of nuclear waste to ensure safety, security, proper handling, etc. Bureau of Indian Affairs to provide educational support. Lab funds to labs.	\$5M from ANL, INEL, LANL, ORNL (4), SNL, PNL, LOB, Congress BIA	1438
All labs participate in lab implementation group: POC, public assessment, business modeling, review results, refocus per gaps, address perception gaps, evaluation and continuous improvement	\$1M to each other lab from LBL	1440
SNL and LANL agree to phased lab consolidate that will reduce total operating costs by 20% in 7 years in return for funded program (DOE-DOD) in defense w/r/t weapons (including smart weapons). Support role in EE only.		1519
LBL will help leverage INEL and rest of supporters to Toolkit #4 option. LBL contributes \$10M in return for \$5M later	\$10M from LBL to INEL	x

The final strategy matrix presented by the team follows.

INEL Key Challenges	Strategy	Move 1	Move 2	Move 3
Collaborate with energy labs	Collaborate with LBL	INEL agrees to \$1M for Lab Implementation Group	INEL receives \$1M from Lab Implementation	
"	Collaborate with ANL	INEL offers expertise on clean-up of site		
Find new markets	Work with Mescalero nation on waste storage	Wendell Chino agreed to collaboration - INEL may speak for Mescalero nation	BIA agrees to fund training of technical workers \$5M	
"	Form consortium to work with Mescalero nation	Signers - INEL, LANL, LOB, ORNL, SNL, ANL, Congress. ABL, BIA (3 bonus points)		

INEL Key Challenges	Strategy	Move 1	Move 2	Move 3
Collaborate with energy labs	Collaborate with ORNL	\$40M from ORNL on Toolkit #4	Alliance - ORNL reduces waste efforts in our collaboration	INEL gave ORNL \$20M for tritium facility
Find new markets	Build team for DOE clean-up of sites	Toolkit #4 form consortium (3 bonus points)	Distribute allocations (3 bonus points)	INEL as administrator distributes \$675 with 5% administration fees = \$35M
Find new markets	"	Meet with Idaho governor, get political influence with Congress and DOE		
Become bigger and stronger in our specialty	Consolidate with PNL - combine mixed waste with radioactive waste technology	Propose consolidation to PNL - REJECTED		
"	Collaborate with PNL	Collaborate with PNL on Mescalero fuel storage	Collaborate with PNL on Toolkit #4	
"	Explore collaboration with ORNL	Work together on Toolkit #4	Form Alliance - ORNL reduces waste remediation efforts in our favor	
Collaborate with defense labs	Collaborate with SNL	Toolkit #4 - SNL gave \$20M	Gave \$10M to supercomputing	
"	Collaborate with LANL	INEL contributes \$1M towards LANL's complex-wide reengineering	Gave \$10M to supercomputing	
"	Collaborate with LLNL	Toolkit #4 LLNL gave \$20M	Gave \$10M to supercomputing	

The team described its experience as follows:

"It was an interesting experience to be INEL; we enjoyed it and learned some things about the laboratory that we didn't know. Our specialty is fairly narrowly focused in the clean-up area, but we learned some of the defense labs are also getting into that area. It used to be that the energy labs, INEL and PNL, were primarily the clean-up labs. So we took the consolidation and collaboration approach.

"We looked at our strategies of finding new markets and maintaining our strong expertise in the clean-up area. We wanted to collaborate with defense labs and other

energy labs coming into our territory, and we looked at consolidation opportunities with Lockheed Martin since we are a Lockheed Martin laboratory. We were looking at combining with PNL (represented by a member of the Green Team) but soon realized that because we were two separate companies with two different administrative systems, trying to consolidate these two laboratories was beyond the scope of this exercise. So we abandoned that plan.

"We started looking at Tool Kit Option No. 4, and it was really a fun exercise. We spent a lot of time working with almost all the laboratories trying to come to an agreement for a win/win situation for everyone in terms of looking at new tech-

nologies for cleanup. We received points because so many laboratories were willing to sign up to that, and we were able to allocate funds and return proportionally what the laboratories had put into the investment, so they also got money to spend.

“We collaborated with PNL through Tool Kit Option No. 4. We also explored collaborations on several fronts with ORNL. Since ORNL is also a Lockheed Martin facility, we had a lot of discussions on that, and we also talked to SNL a little bit about that, but again we knew time was just a factor. We couldn't get it finished because ORNL was

working on their tritium facility, and we just couldn't finish the deal. But that's one logical area that we really could have pursued. We also collaborated with some of the defense labs, SNL, LANL and LLNL, and everyone was very cooperative.

“We spent a little bit of time working with the Mescalero Indian Reservation and the BIA. We also worked on the reengineering effort at the ORNL tritium facility. One of our strategies was to maximize the number of partners we used, and we also were looking for inclusiveness, including a lot of the different laboratories.”

Lawrence Berkeley Laboratory (LBL)

A comparison of the team's initial and final challenges and strategies showed that the team did implement its initial set of strategies as planned.

LBL Key Challenges	Strategy
Develop national advocacy for labs	Business development plan for complex
	Build relations with DOE/other labs
Preserve funding for LBL	Congressional support
	Cooperate with other labs
	Reduce overhead
Build alliances outside complex	Computing power availability
	Light bulb technology alliances
	Genome technology alliances

Lawrence Berkeley National Laboratory Terms and Conditions	Funds Transfer	Time
We will provide program development funds of 10% of your operating budget for signed MOUs between labs and LOB. All proposals presented to LOB in the future will have sign-off by each lab.	\$9.5M to LLNL \$4.2M to LBNL \$2.7M to NREL All \$ from LOB	1040
ANL leads the effort for development of a National Energy Program with ANL acting as lead integrator with the other ER labs (BNL, LBL, ORNL).	\$50M from LOB to ANL; \$50M from DOE to ANL; \$50M of ANL funds used	1100
LBL will invest \$15M to Toolkit option #4. LANL will pay LBL \$12M after exercise of Toolkit option.	\$15M from LBL to LANL	1125
The three weapons labs support the lead lab concept for weapons design, development and stewardship.		1141
Collaborate with academia, industry, OFAs to open user facilities at LBL, ORNL, ANL, BNL for new material research with application in energy efficient transportation.	\$1M to ANL from each of ORNL, LBL, BNL.	1400
LBL is performing a jointly funded complex-wide study of perceptions/ realities within DOE lab system. Results avail in 2 years. Congress agrees not to make decisions about lab closures before study complete. Congressional input to study will be sought.		1400
LBL will seek support from Green team and DOE for a high-efficiency lighting program. All labs must be aware of this effort. Electrical industry guarantees purchase at \$10M/year for 5 years if specs met.	\$10M purchase guarantees from industry	1410
LBL gives \$10M for computer consortium (at LANL, SNL, LLNL) in return for access to the system at reasonable user charges for actual services.	\$10M from LBL to toolkit #3	1410
New technology funding for LBL is proportional to original contribution.	\$32M to LBL from INEL	1415
University executes assessment of perceptions per LOB/Lab process. Effort to develop national advocacy for labs by identifying/closing perception and performance gaps.	\$5M to Univ. from LBL	1430

Lawrence Berkeley National Laboratory Terms and Conditions	Funds Transfer	Time
Develop and implement business models that reflect national assessment and create national advocacy (research/productivity model).	\$1M to ORNL from LBL	1431
ANL funds university research in advanced materials at national lab user facilities. Funding to be matched by industry up to \$1M per participant. Maintains expertise at ANL.	\$1M to Univ. from ANL	1435
ANL implements initial studies in lead role: ORNL/LBL \$20M clean car; ANL/BNL \$30M global climate change; ANL/ORNL \$25M alt energy sources. Follow-on funding from DOE for implementation.	\$35M to ORNL; \$10M to LBL; \$30M to BNL; all \$ from ANL	1435
All labs participate in lab implementation group: POC, public assessment, business modeling, review results, refocus per gaps, address perception gaps, evaluation and continuous improvement.	\$1M to each other lab from LBL	1440
SNL and LANL agree to phased lab consolidate that will reduce total operating costs by 20% in 7 years in return for funded program (DOE-DOD) in defense w/r/t weapons (including smart weapons). Support role in EE only.		1519
LBL will help leverage INEL and rest of supporters to Toolkit #4 option. LBL contributes \$10M in return for \$5M later.	\$10M from LBL to INEL	x

The final strategy matrix presented by the team follows.

LBL Key Challenges	Strategy	Move 1	Move 2	Move 3	Move 4	Move 5	Move 6
Develop national advocacy for labs	Business development plan for complex	Access to high-performance computing (toolkit)	Funding from all labs and LOB (perception/tools)	University execution of perception assessment	Congressional buy-in to provide data for lab closure	ORNL contract to develop business models for ROI research	Formed all-lab implementation group with LOB/DOE support to review/act on previous findings
	Build relations with DOE/other labs	LOB agreement for group acknowledgement for 10% funding increase					
		Energy efficient transportation group					
		Clean car group					
Preserve funding for LBL	Congressional support	Toolkit anti-closure initiative					
		Congressional buy-in for closure delay (contingency move)					
	Cooperate with other labs	Toolkit money swap with LANL/INEL					
	Reduce overhead						

LBL Key Challenges	Strategy	Move 1	Move 2	Move 3	Move 4	Move 5	Move 6
Build alliances outside complex	Computing power availability	Agreement with computer consortia					
	Light bulb technology alliances	Industry/DOE/LBL agreement					
	Genome technology alliances						

The team described its experience as follows:

“Lawrence Berkeley Laboratory is one of the smallest laboratories. Our strategy was to be collaborative, and we identified opportunities for three different challenges.

“The first challenge was to recognize that we’re going to have to leverage some of our resources. We developed a strategy to try to develop some advocacy in the country for the laboratory complex—for a system of national laboratories. We realized this would be risky, and the laboratories needed to present a unified front to the LOB to get funding to do the baseline assessment. We were very encouraged that every laboratory was supportive of the plan and willing to participate, and we did get LOB support. Our focus was to try to identify what our baseline was in terms of perception in the national community and to develop some business tools that would allow us to make business decisions in a consistent way to show Congress and DOE a sense of collaboration in the complex as opposed to a sense of competitiveness. First, we bought into the toolkit of high performance computing because we knew that was going to be a necessary tool. Then we tried to find funding from the LOB and the labs to start doing this collaborative effort, and identify a university that would have credibility in the country for doing this independent assessment of the nation’s perception of the laboratories system, making sure to get congressional buy-in so the nation’s

perceptions of the laboratories really were consistent with Congress’s concerns. We contracted with Oak Ridge who had experience in this kind of metric models to develop these specific business tools that would be offered to the laboratories. As a final move in that thrust, we set up a laboratory implementation board, comprised of all the laboratories, to help identify what questions needed to be asked and to make sure that the identified gaps were perceived or actual gaps and actions necessary to resolve those gaps. We actually got some very positive feedback from the LOB because we accelerated the effort to gather this information.

“Another key challenge was in the area of preserving funding. We worked with the congressional support strategy, but that didn’t go very far. We also had an opportunity to get some buy-in from Congress on the closure delay consideration until we could get this baseline assessment done, again emphasizing cooperation with the other labs.

“Our only other challenge was to try to build some alliances outside the complex, reinforcing the idea of being more collaborative, making some of the complexes computing power available. We were looking at taking advantage of our research in light bulb research development, but ran out of time.

“Most of our other work was in the area of building relationships by participating in initiatives from other groups.”

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Lawrence Livermore National Laboratory (LLNL)

A comparison of the team's initial and final challenges and strategies showed that the team did implement its initial set of strategies as planned.

LLNL Key Challenges	Strategy
Maintain our key role in the nuclear weapons business	Ally w/SNL, LANL to cement a 3 lab weapons system
	Create non-proliferation counter proliferation work for labs
Gain market share in other major programs	Create a competitive playing field with access to non-weapon funding
"	Active teaming
"	Create non/counter proliferation work for labs
Program exchange with ANL	Participate in LAB implementation group

Lawrence Livermore National Laboratory Terms and Conditions	Funds Transfer	Time
We will provide program development funds of 10% of your operating budget for signed MOUs between labs and LOB. All proposals presented to LOB in the future will have sign-off by each lab.	\$9.5M to LLNL \$4.2M to LBNL \$2.7M to NREL All \$ from LOB	1040
Policy has been adopted to establish competitive bid process for non-nuclear weapons work at labs and facilities. This will promote teaming on proposals to assure best capabilities, locations, etc. on DOE programs.		1125
The three weapons labs support the lead lab concept for weapons design, development and stewardship.		1141
LBL to assess public/business/education perceptions of role of national labs. Complex will record assessments and models. New business models to develop national advocacy.	\$5M from LOB to LBL; \$1M from each other lab to LBL	1217
LBL gives \$10M for computer consortium (at LANL, SNL, LLNL) in return for access to the system at reasonable user charges for actual services.	\$10M from LBL to toolkit #3	1410
New technology funding for LLNL is proportional to original contribution.	\$64M to LLNL from INEL	1415
LLNL to be designated lead lab in lasers (following guidance from the Galvin report).		1420
All labs participate in lab implementation group: POC, public assessment, business modeling, review results, refocus per gaps, address perception gaps, evaluation and continuous improvement	\$1M to each other lab from LBL	1440
LLNL will turn over \$50M ER program to ANL. ANL will manage, but still do experiments in LLNL facilities. ANL will give \$50M in virology, biochem warfare, biotech, genetic engineering, etc.		1500
SNL and LANL agree to phased lab consolidate that will reduce total operating costs by 20% in 7 years in return for funded program (DOE-DOD) in defense w/r/t weapons (including smart weapons). Support role in EE only.		1519

The final strategy matrix presented by the team follows.

LLNL Key Challenges	Strategy	Move 1	Move 2	Move 3	Move 4	Move 5
Maintain our key role in the nuclear weapons business	Ally w/SNL, LANL to cement a 3 lab weapons system	Agreement reached by 3 labs & LOB (tri-lab weapons) - got stuck at DOE & didn't go on	Signed new agreement—tri-lab to maintain weapons work at LLNL			
	Create non-proliferation counter proliferation work for labs	Agreement failed				
Gain market share in other major programs	Create a competitive playing field with access to non-weapon funding	DOE approval of competitive bid process	LOB agreement to collaborate	Invest in high performance computing (joint venture)		
"	Active teaming	LOB agreement to collaborate	Invest in high performance computing (joint venture)	Invest in environmental clean-up technology (joint venture)		
"	Create non/counter proliferation work for labs			Invest in environmental clean-up technology (Joint venture)	Designated as lead lab for lasers	
Program exchange with ANL	Participate in LAB implementation group	High computer services to LBL				

The team described its experience as follows:

“Our two main challenges were: to maintain our key role in the nuclear weapons area and to gain the market share in our other program areas needing expansion, i.e., technology, energy, and environment. We had a hybrid strategy for those two major challenges.

“The main strategy in the nuclear weapons program was to collaborate with Sandia and Los Alamos to cement

ourselves as one of the nuclear weapons program labs. We also wanted to reinforce our position as a nuclear weapons laboratory by emphasizing activities we play a role in, such as nonproliferation activities. We succeeded in getting an agreement signed between all three of the laboratories, but that was superseded by other events in the game. Even though this was one of our major challenges, we found there were other players with strong feelings against us being in the nuclear weapons business, so our efforts were thwarted a bit at that point. Towards the

end of the game we did manage to sign a collaborative agreement with Sandia and Los Alamos that left open what the relationship would be between the defense sectors and some of the energy environments (that would be worked out later), but this did move us towards at least cementing some role within the nuclear weapons program. It was not an easy association—there were strong feelings on that particular issue.

“Our second major challenge was to try to gain the market share in our different areas of expertise. Since one of our strengths is marketing, we really adopted a competitive strategy to get DOE to adopt a competitive bid process for work that we could do for them. We submitted a proposal for policy change within the DOE, and it was approved. It became clear, as the game progressed, that it conflicted with some other things—in particular the

lead lab concept. If the lead lab concept wasn't designated on a competitive basis it was at odds with this whole principle.

“As it became clear we were having trouble with that strategy, we did try to broaden our approach. We collaborated with other laboratories and were successful in those endeavors. We participated in the tool kit option of the super computing center, the environmental cleanup task with INEL, and the exchange program with Argonne National Laboratory.

“In addition, one of our strategies for maintaining a role in nuclear weapons research was to become active and broaden our role in nonproliferation. We felt that was a parallel strategy with creating other markets and spinning-off other activities.”

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Los Alamos National Laboratory (LANL)

Comparison of the team's initial and final challenges and strategies revealed that the team dropped one strategy during the

implementation phase: Complete an internal mission and strategic plan.

LANL Key Challenges	Strategy
Maintain areas of strength	Obtain funding to support strengths
Change perception of LANL and its management	Develop and use measurement system
	Collaborate with other labs
Accommodate budget cuts	Eliminate lab redundancies by distributing work to labs with n specific core competencies

Los Alamos National Laboratories Agreements Terms and Conditions	Funds Transfer	Time
LOB will provide program development funds of 10% of total assets for signed agreement that all proposals presented to LOB in future will have sign-off by each lab.	\$8.9M to ANL \$10.8M to LANL \$9.5M to INEL All \$ from LOB	1040
ANL leads the effort for development of a National Energy Program w/ANL acting as lead integrator with the other ER labs (BNL, LBL, ORNL).	\$50M from LOB to ANL; \$50M from DOE to ANL; \$50M of ANL funds used	1100
LANL will give up Renewable Energy program. We propose that NREL be the lead lab in RE. Good will and cost savings for LANL.		1117
ANL supports NREL as lead lab for RE programs. NREL agrees to support ANL's proposal to create an overarching program to manage all of DOE's energy programs.		1120
LBL will invest \$15M to Toolkit option #4. LANL will pay LBL \$12M after exercise of Toolkit option.	\$15M from LBL to LANL	1125
The three weapons labs support the lead lab concept for weapons design, development and stewardship.		1141
LBL to assess public/business/education perceptions of role of national labs. Complex will record assessments and models. New business models to develop national advocacy.	\$5M from LOB to LBL; \$1M from each other lab to LBL	1217
LBL gives \$10M for computer consortium (at LANL, SNL, LLNL) in return for access to the system at reasonable user charges for actual services.	\$10M from LBL to toolkit #3	1410
Privatize LANL accelerators & SNL Solar tower. Labs provide \$5M startup costs from LDRD. Industry pays 20% of user fees to labs. Labs pay for use. Industry operating costs result in 25% savings per hour tower usage to labs.		1411
New technology funding for LANL is proportional to original contribution.	\$64M to LANL from INEL	1415
LANL will turn over ER program to ANL. LANL will allow ANL to manage program, but experiments best done in LANL facilities will remain.		1426

Los Alamos National Laboratories Agreements Terms and Conditions	Funds Transfer	Time
Multi-lab partnership to work with Mescalero Apaches on storage of nuclear waste to ensure safety, security, proper handling, etc. Bureau Indian Affairs to provide educational support. Lab funds to labs.	\$5M from ANL, INEL, LANL, ORNL (4), SNL, PNL, LOB, Con, BIA	1438
All labs participate in lab implementation group: POC, public assessment, business modeling, review results, refocus per gaps, address perception gaps, evaluation and continuous improvement	\$1M to each other lab from LBL	1440
SNL and LANL agree to phased lab consolidate that will reduce total operating costs by 20% in 7 years in return for funded program (DOE-DoD) in defense w/r/t weapons (including smart weapons). Support role in EE only.		1519

The final strategy matrix presented by the team follows.

LANL Key Challenges	Strategy	Move 1	Move 2	Move 3	Move 4	Move 5	Move 6	Move 7	Move 8
Maintain areas of strength	Obtain funding to support strengths	Funding from DOE to support DARHT	Funding from LBL for super-computing in exchange for 5 year use	Funding from LOB in exchange for agreement on new review process	Fund super-computer initiative	Receive funding from DOE/DOE for weapons research	Teamed with industry to privatize acceleration	Consolidate with SNL	Partnership between labs & Mescalero Indians on nuclear waste - INEL, ORNL, BIA, Congress, SNL, ANL, LOB
Change perception of LANL & its management	Develop and use measurement system	Agreed to use tools developed by LBL for all labs	DOE complex reengineering	Assess public perceptions					
	Collaborate w/other labs	Agreed to participate in all lab review of proposals	LANL give up renewable energy program to NREL	Fund NREL in creating environmental cleanup programs	Agreed to use tools developed by LBL to assess perception of all labs	Support collaboration w/LBL for development of new lighting			
Accommodate budget cuts	Eliminate lab redundancies by distributing work to labs w/specific core competencies	Consolidate all weapons work to 3 labs (SNL, LLNL, LANL)	LANL gives up interest in renewable energy program	Support development of new energy efficient lighting (LBL)	Fund DOE agreement w/nuclear reactor industry	Give up APT program	Consolidate SNL & LANL over 7 years. Rev. funding from DOD/DOE for weapons research	Privatize acceleration facility	Give up management of energy program

The team described its work as follows:

"Our approach was to use a balanced approach based on collaboration and consolidation where it was appropriate. The balance we were attempting to find was what was best for LANL in terms of strengths, what was best for the DOE complex, and how we could reduce the impact on the community. We came up with three challenges.

"The first challenge was to accommodate budget cuts. Our strategy was to eliminate lab redundancies by distributing work to labs that had specific core competencies or specific strengths. We wanted to consolidate all weapons work to three labs—Sandia, Lawrence Livermore, and Los Alamos. As we progressed with this strategy we turned over our interest in the renewable energy program to NREL, we funded the DOE agreement with the nuclear reactor industry, and gave up the APT program. Finally, we consolidated with Sandia and Lawrence Livermore on one super lab. At one point we privatized our accelerator facility and turned it over to private industry. We gave up management of the energy research program to ANL. We kept the tasks that we could do best with our facilities. The point was to achieve budget cuts and allow us to use our resources in our strong areas.

"Our second challenge was to change the perception of Los Alamos and its management. There were two strategies to do that: one was to develop and use a measurement system. We agreed to use the tools that were developed at Lawrence Berkeley which led to discussions about the idea of reengineering the DOE complex. We also agreed to support Lawrence Berkeley's assessment of the public's perception of the labs. Under collaboration with the other labs we agreed to participate in an all labs' review of proposals. We collaborated with several labs, as well as the BIA and Congress, on a partnership agreement between the labs and the Mescalero Indians on nuclear waste.

"Our third challenge was to maintain our areas of strength. Our strategy was to obtain funding in the support of those strengths. We received funding from DOE to support the DARHT facility. We participated in the super computing initiative. We assisted Lawrence Berkeley in obtaining access into that market. We received funding from DOD and DOE on weapons research. A lot of our efforts crossed back and forth meeting several of our strategies."

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National Renewable Energy Laboratory

A comparison of the team's initial and final challenges and strategies showed that the team did implement its initial set of strategies as planned.

NREL - Today's Achievers, Tomorrow's Leaders Key Challenges	Strategy
Counter threat of extinction	Grow renewable energy programs
Increase financial base	Leverage Galvin recommendation
Increase financial base	Leverage Galvin recommendation
Raise public awareness	Public Relations Meeting

National Renewable Energy Laboratory Agreements Terms and Conditions	Funds Transfer	Time
We will provide program development funds of 10% of your operating budget for signed MOUs between labs and LOB. All proposals presented to LOB in the future will have sign-off by each lab.	\$9.5M to LLNL \$4.2M to LBNL \$2.7M to NREL All \$ from LOB	1040
ANL leads the effort for development of a National Energy Program w/ANL acting as lead integrator with the other ER labs (BNL, LBL, ORNL).	\$50M from LOB to ANL; \$50M from DOE to ANL; \$50M of ANL funds used	1100
LANL will give up Renewable Energy program. We propose that NREL be the lead lab in RE. Good will and cost savings for LANL.		1117
SNL supports NREL as lead lab in ER. NREL will subcontract work in efficiency and renewable energy to SNL.		1128
DOE to appoint NREL as lead lab in RE. DOE will centralize and focus the RE program. No fee. Total funding \$300M. Value to DOE \$30M. Value to other labs - subcontract.		1135
The three weapons labs support the lead lab concept for weapons design, development and stewardship.		1141
LBL to assess public/business/education perceptions of role of national labs. Complex will record assessments and models. New business models to develop national advocacy.	\$5M from LOB to LBL; \$1M from each other lab to LBL	1217
All labs participate in lab implementation group: POC, public assessment, business modeling, review results, refocus per gaps, address perception gaps, evaluation and continuous improvement	\$1M to each other lab from LBL	1440
SNL and LANL agree to phased lab consolidate that will reduce total operating costs by 20% in 7 years in return for funded program (DOE-DOD) in defense w/r/t weapons (including smart weapons). Support role in EE only.		1519

The final strategy matrix presented by the team follows.

NREL Key Challenges	Strategy	Move 1	Move 2	Move 3	Move 4	Move 5
Counter threat of extinction	Grow renewable energy programs	DOE designates as lead Lab	DOE reallocated \$300M budget from other Labs	LANL consolidates renewable energy to NREL	ANL to sub-contract to NREL	SNL to sub-contract to NREL
Increase financial base	Leverage Galvin recommendation	\$2.7M from LOB to collaborate or consolidate				
Increase financial base	Leverage Galvin recommendation	Toolkit option \$20M - NREL	Toolkit Option \$30M Congress	Toolkit option \$30M DOE	Toolkit option LOB \$30M	Toolkit option \$7.2M NREL
Raise public awareness	Public Relations Meeting	Committed \$1M to LBL for public awareness	Serve on Board of Public Awareness Task Force w/LBL			

The team described its work as follows:

"We're definitely the smallest lab and started off feeling small and picked on. But we became more bold and confident and characterized ourselves as "the little lab that could do more." Our vision became "Today's Achievers Are Tomorrow's Leaders." We were really successful in doing things which agreed with that vision.

"Our challenge was to counter the threat of extinction since we were a prime candidate to be eliminated. We took an aggressive stance to grow and our strategy was to increase renewable energy programs at NREL. We were successful in

bringing all the renewable energy work into NREL and obtained DOE designation as a lead lab which reallocated all the renewable energy funds to flow through NREL. Los Alamos, Argonne, and Sandia relinquished their renewable energy work although part of it would be subcontracted back to Sandia. We unsuccessfully tried for a 10 percent increase in funding for renewable energy. Then using the Galvin Committee's recommendation that DOE should pay more attention to energy research especially in renewable energy and the public's incentive for DOE and the country to spend more attention in renewable energy, we successfully obtained funding from Congress, LOB, and DOE."

Oak Ridge National Laboratory

A comparison of the team's initial and final challenges and strategies showed that the team did implement its initial set of strategies as planned.

ORNL Key Challenges	Strategy
Become a benchmark org. for tritium production & energy and environment.	Offer \$12M to ANL, LANL, SNL for tritium R&D
	Contingent to become lead in transferring technology to commercial industry for tritium production
	Open up K-25 & offer to PNL, INEL to become center for environmental activities
Obtain \$160M for tritium production	Get support/dollars from tritium production

Oak Ridge National Laboratory Agreements Terms and Conditions	Funds Transfer	Time Green
We will program 10% of total assets for signed agreements; will be partnered between all labs (all proposals signed by all labs).	\$13.2M to SNL \$8.3M to ORNL All \$ from LOB	1040
ANL leads the effort for development of a National Energy Program w/ANL acting as lead integrator with the other ER labs (BNL, LBL, ORNL).	\$50M from LOB to ANL; \$50M from DOE to ANL; \$50M of ANL funds used	1100
The three weapons labs support the lead lab concept for weapons design, development and stewardship.		1141
LBL to assess public/business/education perceptions of role of national labs. Complex will record assessments and models. New business models to develop national advocacy.	\$5M from LOB to LBL; \$1M from each other lab to LBL	1217
Collaborate with academia, industry, OFA's to open user facilities at LBL, ORNL, ANL, BNL for new material research with application in energy efficient transportation.	\$1M to ANL from each of ORNL, LBL, BNL.	1400
New technology funding for ORNL is proportional to original contribution.	\$128M to ORNL from INEL	1415
Develop and implement business models that reflect national assessment and create national advocacy (research/productivity model).	\$1M to ORNL from LBL	1431
ANL funds university research in advanced materials at national lab user facilities. Funding to be matched by industry up to \$1M per participant. Maintains expertise at ANL.	\$1M to Univ. from ANL	1435
ANL implements initial studies in lead role: ORNL/LBL \$20M clean car; ANL/BNL \$30M global climate change; ANL/ORNL \$25M alt energy sources. Follow-on funding from DOE for implementation.	\$35M to ORNL; \$10M to LBL; \$30M to BNL; all \$ from ANL	1435

Oak Ridge National Laboratory Agreements Terms and Conditions	Funds Transfer	Time Green
Multi-lab partnership to work with Mescalero Apaches on storage of nuclear waste to ensure safety, security, proper handling, etc. Bureau Indian Affairs to provide educational support. Lab funds to labs.	\$5M from ANL, INEL, LANL, ORNL (4), SNL, PNL, LOB, Con, BIA	1438
All labs participate in lab implementation group: POC, public assessment, business modeling, review results, refocus per gaps, address perception gaps, evaluation and continuous improvement	\$1M to each other lab from LBL	1440
SNL and LANL agree to phased lab consolidate that will reduce total operating costs by 20% in 7 years in return for funded program (DOE-DOD) in defense w/r/t weapons (including smart weapons). Support role in EE only.		1519

The final strategy matrix presented by the team follows.

ORNL Key Challenges	Strategy	Move 1	Move 2	Move 3	
Become a benchmark org. for tritium production & energy and environment.	Offer \$12M to ANL, LANL, SNL for tritium R&D	Went to SNL for support to build facility - NO			
	Contingent to become lead in transferring technology to commercial industry for tritium production	Went to SNL - collaborative agreement for \$15M - SNL does security/surety	Went to ANL for support & funding - got \$10M	INEL - got support & \$20M collaboration to provide environmental structure for continued tritium production	
		ANL - \$10M collaboration to maintain core capabilities	Presented to DOE & obtained agreement & \$50M support	Presented to LOB/Congress - got law changed then got \$40M support	Congress got support - law changed \$50M
	Open up K-25 & offer to PNL, INEL to become center for environmental activities	Agreed to be lead lab w/INEL on environmental			

ORNL Key Challenges	Strategy	Move 1	Move 2	Move 3	
Obtain \$160M for tritium production	Get support/dollars from tritium production	SNL \$15M	INEL - \$20M	LANL - \$10M	
		ANL - \$10M	DOE - \$50M	LOB - \$40M	
		Congress \$50M			

The team described its work as follows:

“In looking at our capabilities we decided that our real challenge was to try to become a benchmark organization in tritium production and in the energy and environment area. We recognized funding was critical.

“We acquired support, but because of confusion it went into the wrong places and a substantial amount of support and funding was lost. We reapproached Congress and piqued their interest. Then we went to the other labs. We felt Sandia, Los Alamos, and Lawrence Livermore support was critical because of the weapons complex. We collaborated with Sandia to provide security and surety, and Argonne and INEL to look at the environmental impact requirements of tritium. We convinced DOE that this was their primary responsibility and that they should help fund us and assist us in getting support

for the program, which they did. Then we went to the LOB for their support. They brought up the industry tritium situation and that it was illegal for commercial reactors to do this, so we prepared our case, presented it to Congress and got legislation passed to allow this to happen. We received LOB support and Congressional support for funding—building on the different collaborations, and the interactions were very positive.

“The other challenge was in the environmental area. We agreed to work in collaboration with Lawrence Berkeley Lab as a lead lab. They were doing such a good job and we thought all we needed to do was agree that we had the expertise required to work with them and that was successful. We obtained funding so we did succeed in reaching our goals, our objectives, and our strategies even though it was a little frustrating when we started.”

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Sandia National Laboratories

A comparison of the team's initial and final challenges and strategies showed that the team did implement its initial set of strategies as planned.

SNL Key Challenges	Strategy
Redefine core nuclear mission	Support lead lab concept
	Consolidation of non-defense missions
Maintain tech base	Expand mission to include weapons of destruction

Sandia National Laboratories Agreements Terms and Conditions	Funds Transfer	Time
We will program 10% of total assets for signed agreements; will be partnered between all labs (all proposals signed by all labs).	\$13.2M to SNL \$8.3M to ORNL All \$ from LOB	1040
SNL supports NREL as lead lab in ER. NREL will subcontract work in efficiency and renewable energy to SNL.		1128
The three weapons labs support the lead lab concept for weapons design, development and stewardship.		1141
LBL to assess public/business/education perceptions of role of national labs. Complex will record assessments and models. New business models to develop national advocacy.	\$5M from LOB to LBL; \$1M from each other lab to LBL	1217
SNL and ASKC agree to collaborate on agile mfg. upgrade and electromechanical mfg. at ASKC site until end of ASKC contract and then consolidate ASKC with Lock-Martin-SNL. DOE provide \$20M. SNL assists in tech trans. and privatization.	\$20M from DOE to SNL; cost savings to DOE of \$200M/year after 3 years.	1325
LBL gives \$10M for computer consortium (at LANL, SNL, LLNL) in return for access to the system at reasonable user charges for actual services.	\$10M from LBL to toolkit #3	1410
Privatize LANL accelerators & SNL Solar tower. Labs provide \$5M startup costs from LDRD. Industry pays 20% of user fees to labs. Labs pay for use. Industry operating costs result in 25% savings per hour tower usage to labs.		1411
New technology funding for SNL is proportional to original contribution.	\$64M to SNL from INEL	1415
Multi-lab partnership to work with Mescalero Apaches on storage of nuclear waste to ensure safety, security, proper handling, etc. Bureau Indian Affairs to provide educational support. Lab funds to labs.	\$5M from ANL, INEL, LANL, ORNL (4), SNL, PNL, LOB, Con, BIA	1438
All labs participate in lab implementation group: POC, public assessment, business modeling, review results, refocus per gaps, address perception gaps, evaluation and continuous improvement	\$1M to each other lab from LBL	1440
SNL and LANL agree to phased lab consolidate that will reduce total operating costs by 20% in 7 years in return for funded program (DOE-DOD) in defense w/r/t weapons (including smart weapons). Support role in EE only.		1519

The final strategy matrix presented by the team follows.

SNL Key Challenges	Strategy	Move 1	Move 2	Move 3	Move 4	Move 5	Move 6
Redefine core nuclear mission	Support lead lab concept	Agreements w/all labs re: lead lab roles	Collaborate w/LANL, KC, LLNL (signed agreement re: defense work)	Consolidate w/KC & Allied Signal w/DOE approval (Allied to be part of SNL in 3 years)	LANL, LLNL, & SNL consolidate - save 20% in overhead	Tri-lab high performance computing (accepted)	Tritium production in private sector (SNL in support role.)
		Agreement w/DOE & Congress (verbal)					
	Consolidation of non-defense missions	Agreement w/INEL clean-up lab (Toolkits)	Agreement w/LBL to provide economic modeling for business strategies	Agreement w/NREL to be lead lab in renewable energy			
		Agreement w/DOE, LOB, Congress re: baseline set of criteria					
Maintain tech base	Expand mission to include weapons of destruction	Signed agreements w/DOD, DOE, labs, Congress, LOB					

The team described its work as follows:

"We saw two primary challenges: one was to redefine and focus ourselves on a core nuclear mission defense program for the Department of Energy and the second was to maintain our technical base and a full employment in the laboratory.

"For the first challenge we had two strategies, the first was to support the idea of the lead lab concept in the defense program area and in nondefense areas as well. We received almost every laboratory's agreement that Sandia, Los Alamos, and Lawrence Livermore would lead in defense areas, and let them know that Sandia would be interested in divesting in other areas as necessary. The second step was to get collaborative memos signed with Los Alamos, Lawrence Livermore, and Allied Signal Kansas City to help find interests in defense related areas. We approached them with some collaborative

programs in computing or similar interests. The result of those negotiations was a consolidation of Allied Signal Kansas City and Sandia. We proposed creating a super defense laboratory, focusing this laboratory system in New Mexico at the Los Alamos and Sandia facilities, to include Lawrence Livermore if they were willing. Lawrence Livermore agreed at the very end, so it became a tri-facility/super lab concept. To get Congressional, DOE, and LOB approval, we pledged to reduce operating costs by 20 percent over seven years, and we received approval. Also, we sponsored two tool kit options to support the core competency idea, we again sponsored and heavily funded the tri-lab high performance computing competency capability. That was the largest successful tool kit option, and we were rewarded handsomely, as were our collaborators. We also sponsored the tritium production capability knowing how important it was to the defense complex.

"For the second challenge, we supported the INEL cleanup activities, and when the Lawrence Berkeley Lab and the National Renewable Energy Lab and others proposed being lead labs in nondefense areas, we wholeheartedly supported them. Taking a 20 percent cut across the three laboratories would probably reduce our tech base. We then made efforts to maintain that tech base and shore up employment here in Albuquerque. One way of doing that was our takeover of Allied Signal Kansas City, perhaps moving some of their activities here to Albuquerque, or at a minimum maintaining employment

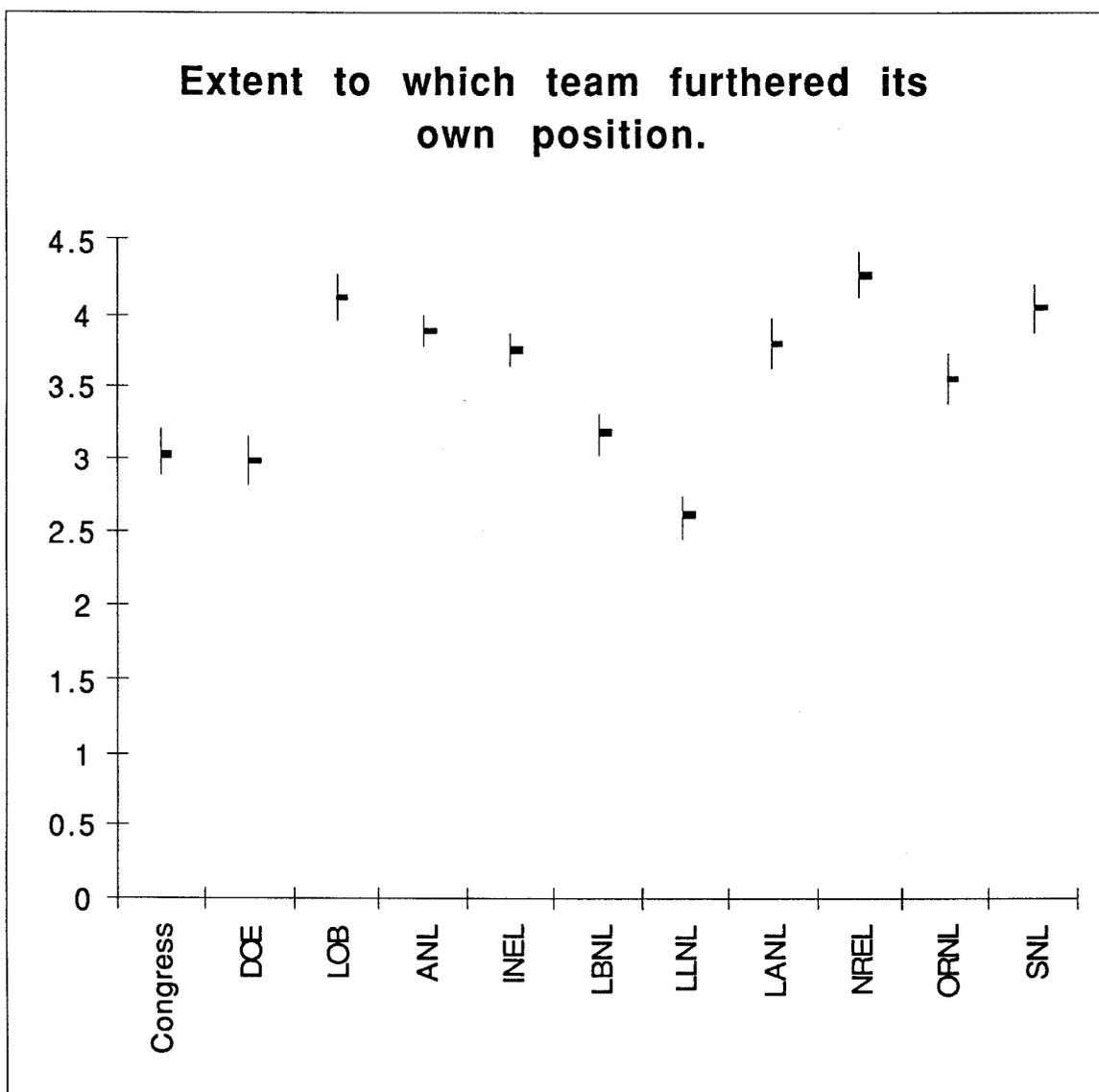
at Kansas City. The second way was to create the super lab and take a 20 percent cut in total budget. We received DOE's, DoD's, Congress's, and the LOB's permission to expand into other defense related areas in work for others programs, focusing initially on weapons of mass destruction, then using our expertise from the nuclear arena to help DoD develop those types of weapons, or countering them with ballistic missile defense or similar weapons. That way we wouldn't be shut out of nonnuclear work completely. Those were the two ways we tried to maintain our tech base at Sandia."

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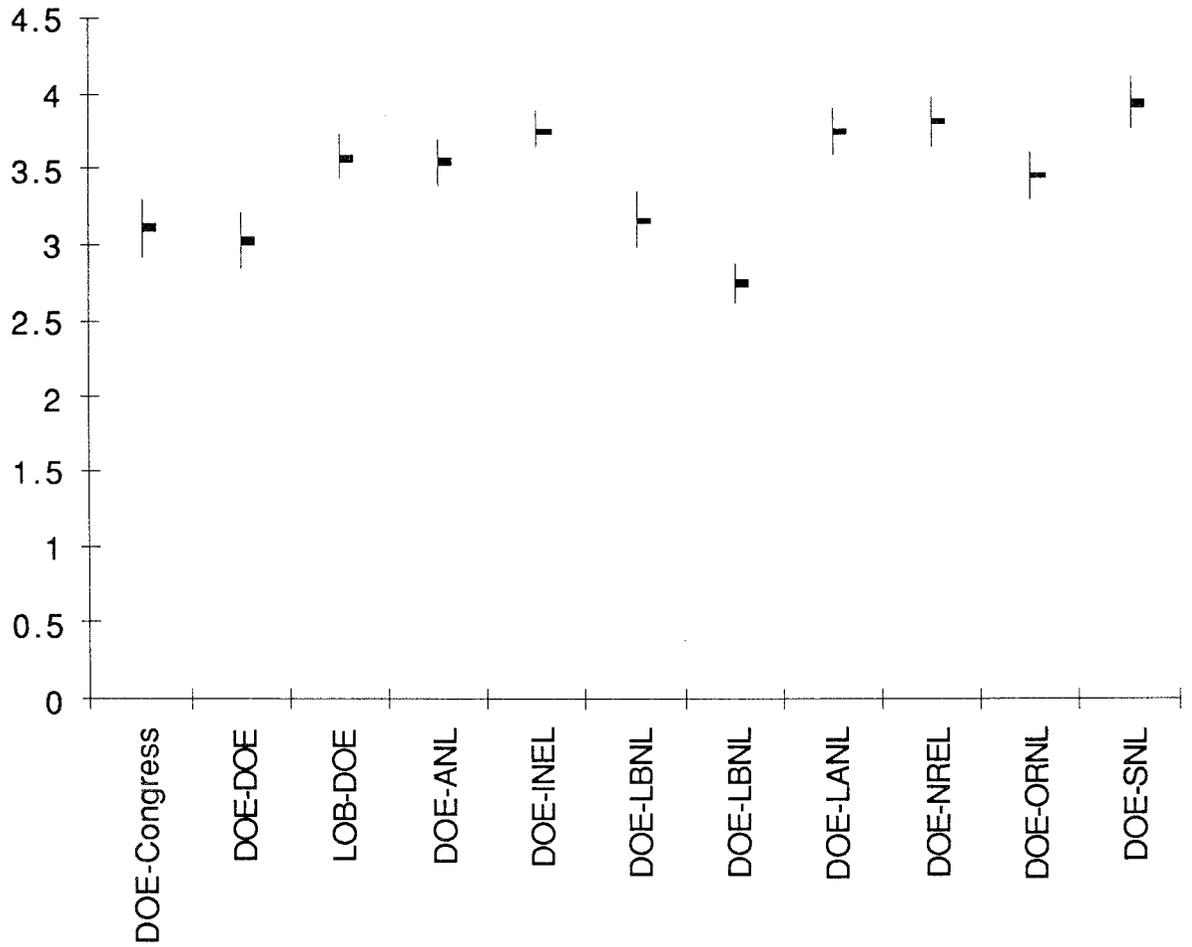
Overall Evaluation of Each Team's Outcomes

At the end of each presentation all players were invited to vote, through an anonymous electronic voting technique, on the extent to which the team advanced their own institution's position and, separately, the extent to which that team advanced DOE's position. The results are

shown in the following charts depicting the average vote for each team by all participants. The error bars show +/- one standard deviation of the mean of the voting. The scale is from 1=very little, 2=little, 3=moderate, 4=much, and 5=very much. The meaning of these voting results is uncertain. However, they are reported to support additional interpretations of the other data from the Game.

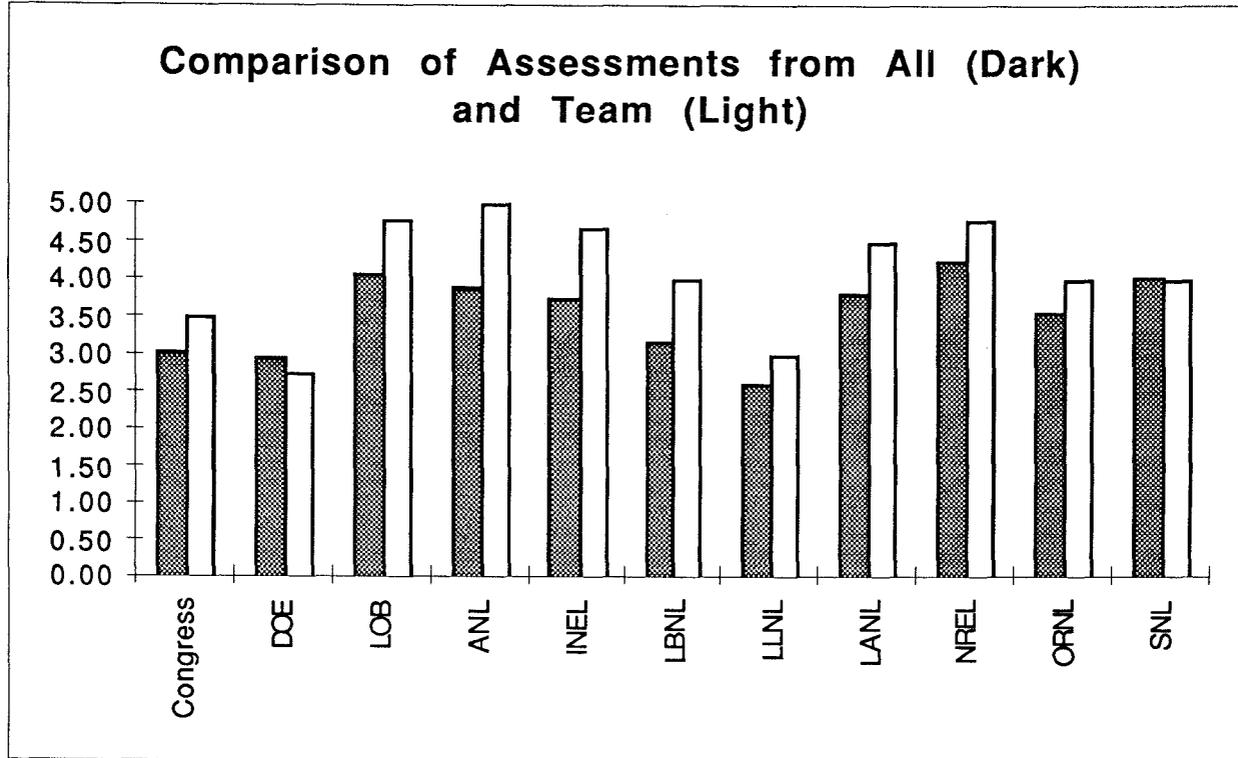


Extent to which team furthered DOE's position.



Each Team rated its own success in Question 20 of the anonymously recorded feedback (shown below). The correlation of a team's self assessment of success is correlated with the group's assessment of

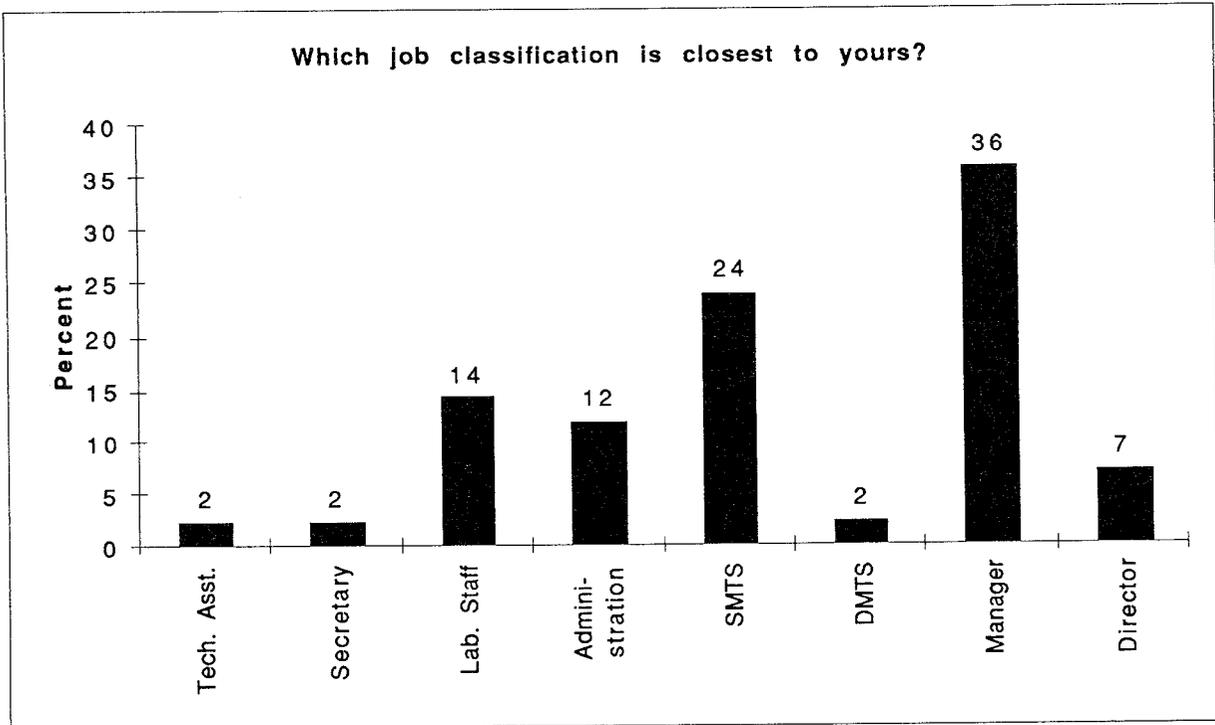
how well a team furthered its own position with a correlation coefficient of 0.86. A comparison of the two metrics indicates the success is self-validating in the Game:



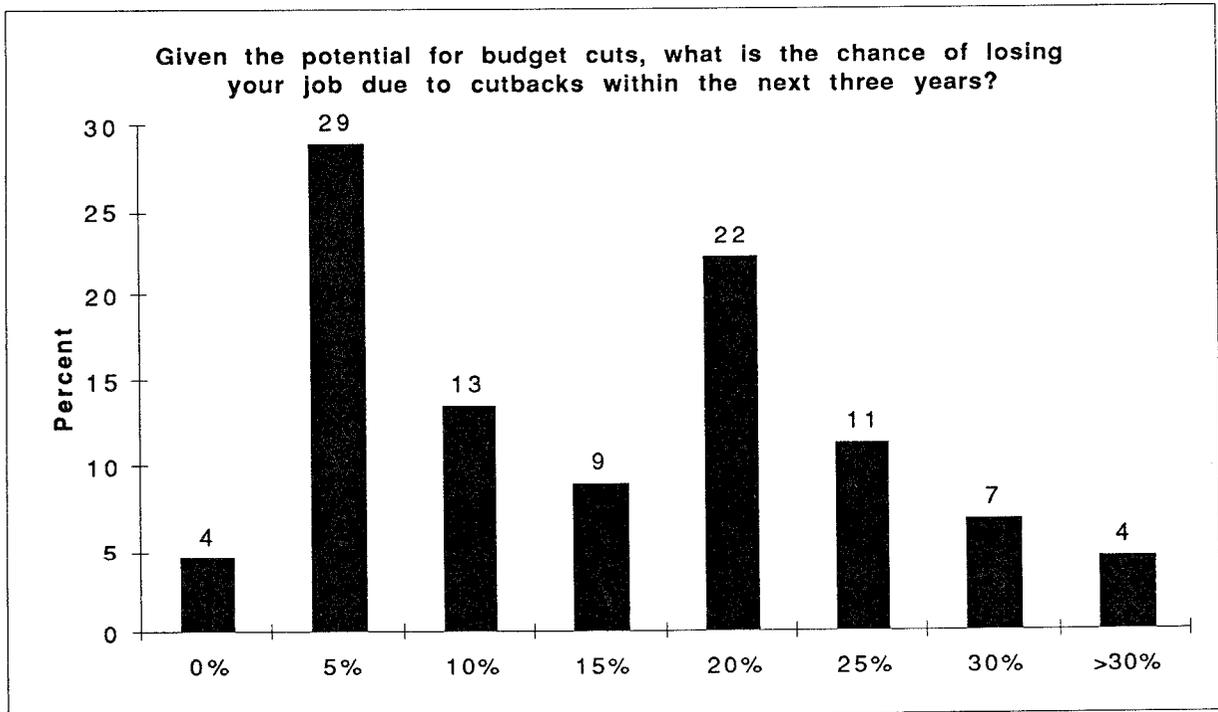
Electronic Voting Results

The same anonymous electronic voting technique was used to capture the demographics, pre-game bias, and various evaluations and judgments by the participants. For each question, the distribution of votes is shown in the following figures. When the question is answered by the

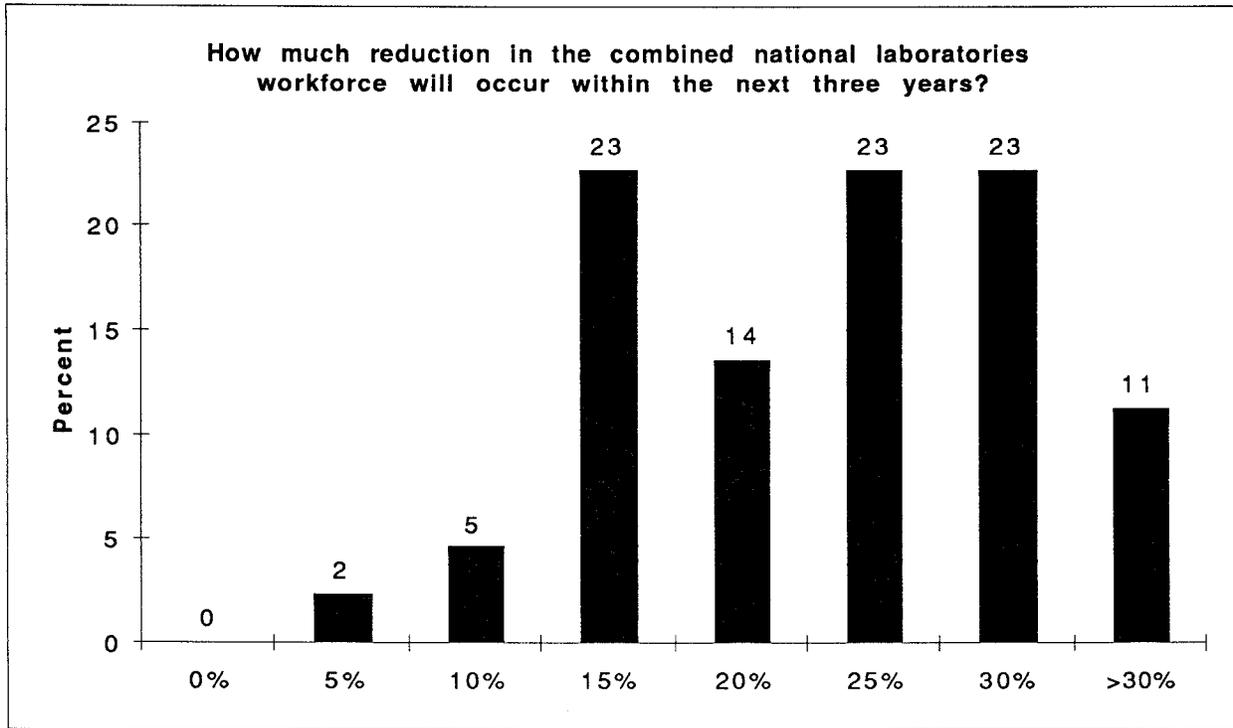
degree to which the proposition is supported (1=very-little, 2=little, 3=moderate, 4=much, and 5=very-much, unless otherwise noted), the mean and the standard deviation of the mean (the standard deviation of the distribution divided by the square root of the number of participants voting on that question) are provided below the figure.



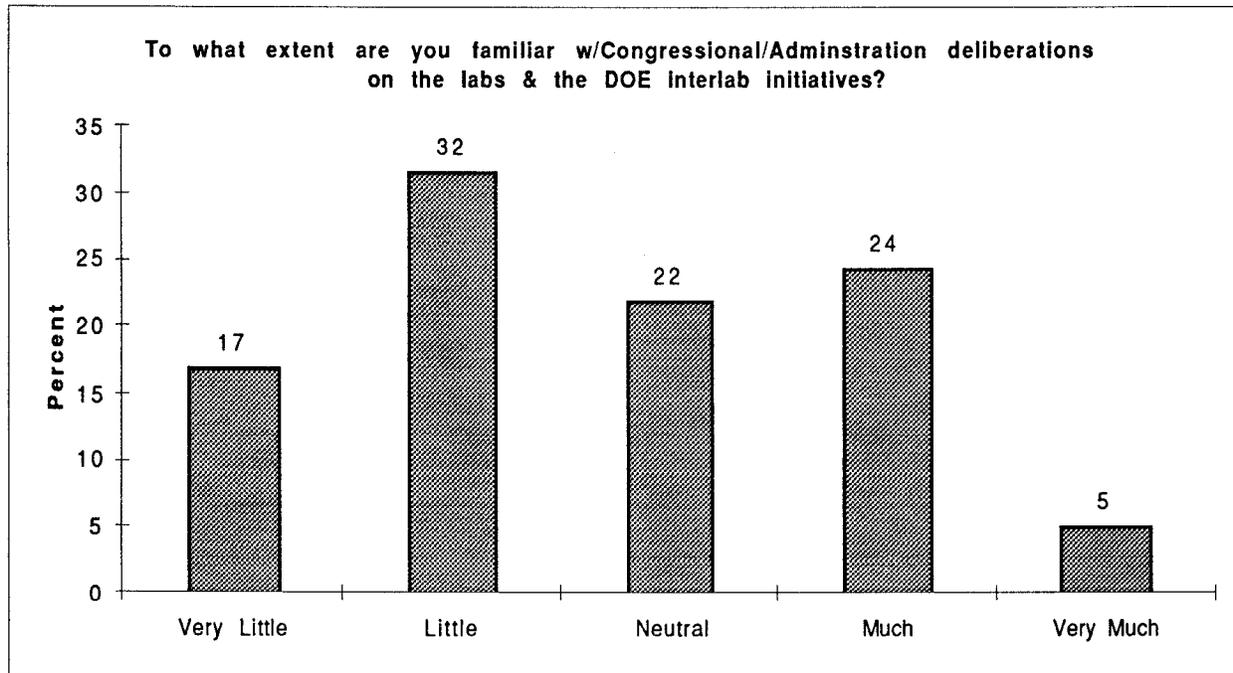
With respect to levels in the managerial and individual-contributor hierarchy, a very diverse set of people participated in this Prototype Prosperity Game.



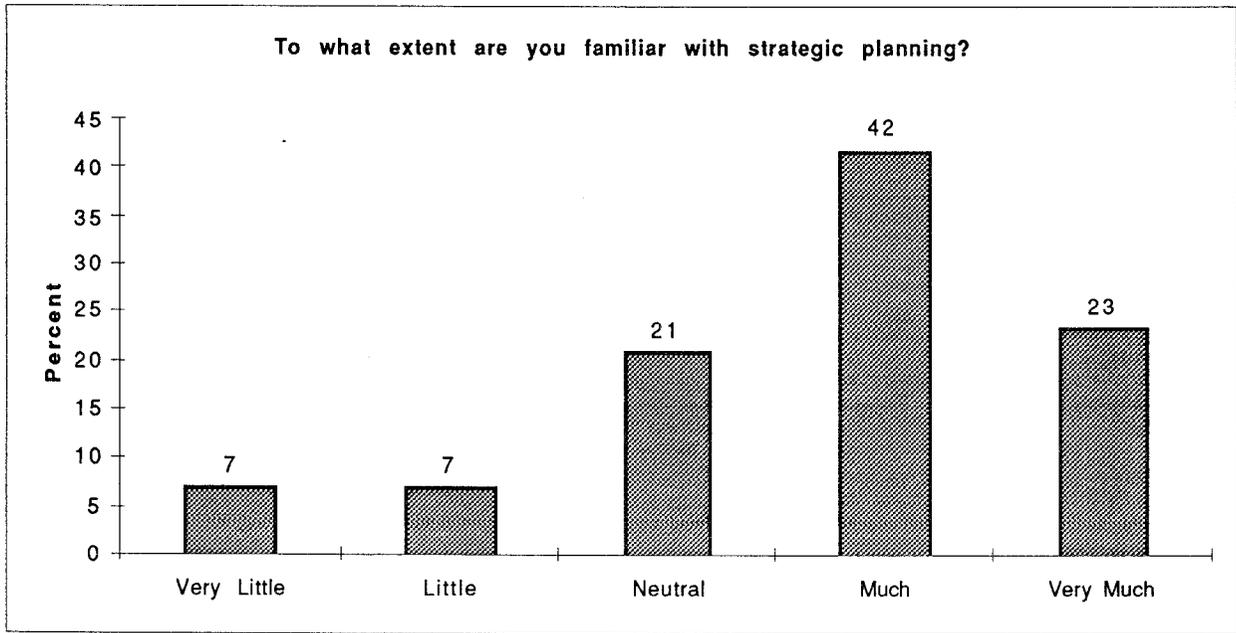
The budget reductions postulated in the Game are close to the perceived situation.



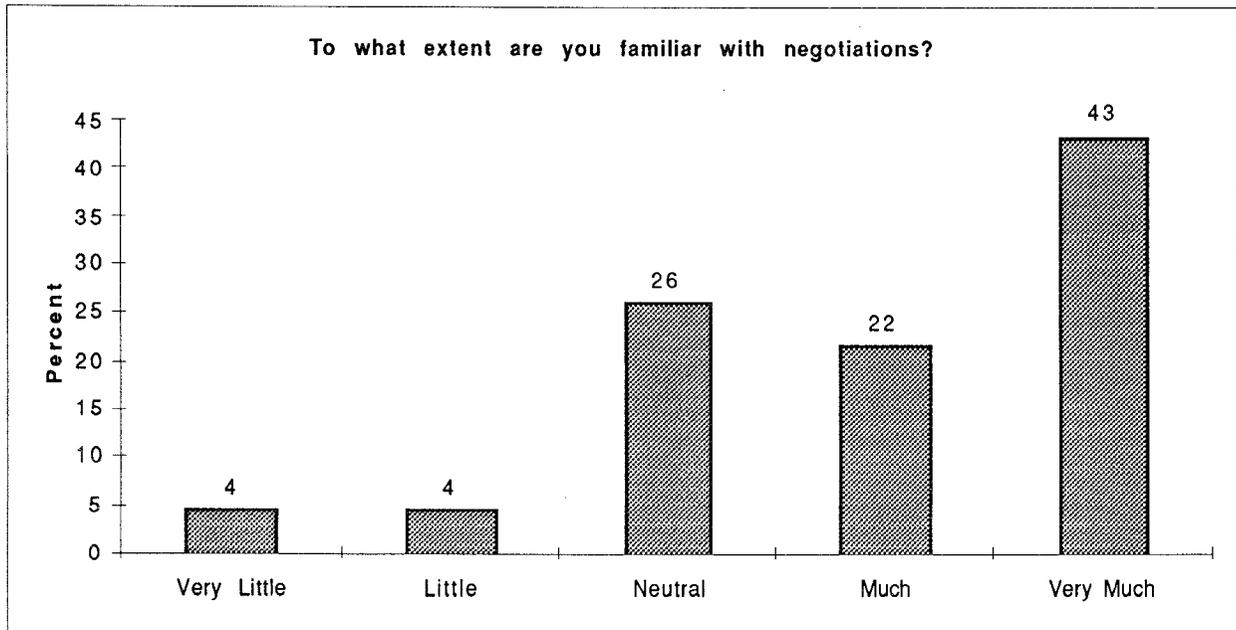
The announced number is 10%. The participants believe it will be substantially more.



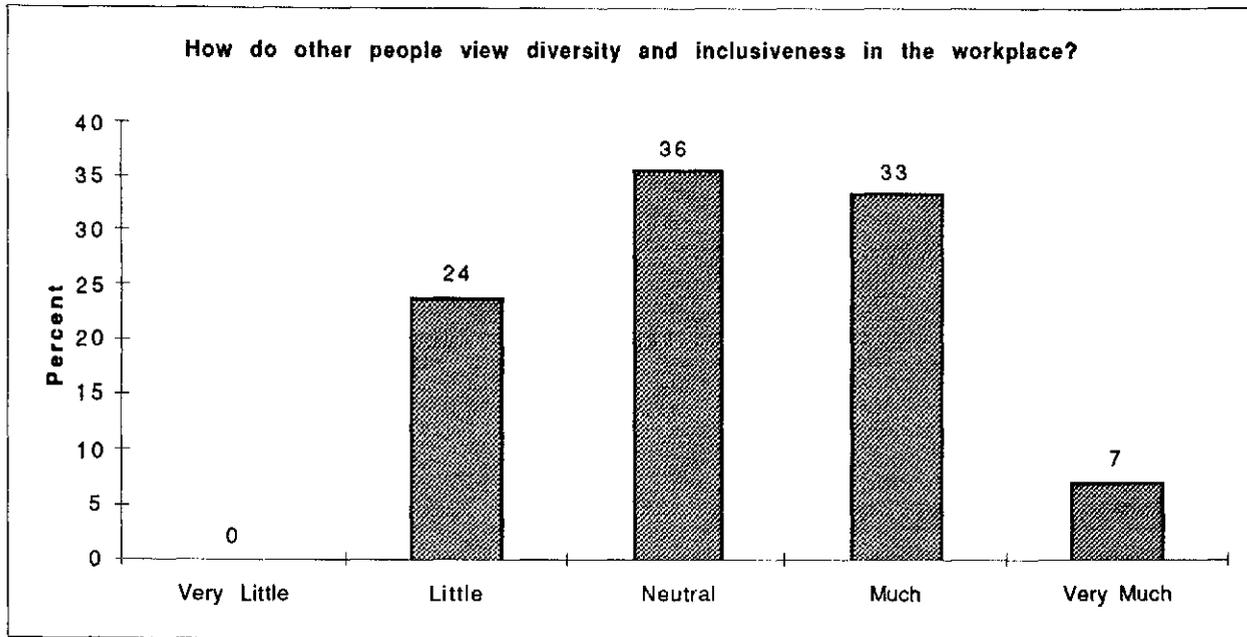
The mean +/- the standard deviation of the mean for this question, in the table above, is 2.68 +/- 0.18. The participants in this prototype are surprisingly unfamiliar with the deliberations affecting their future but are, nevertheless, fearful of budget reductions.



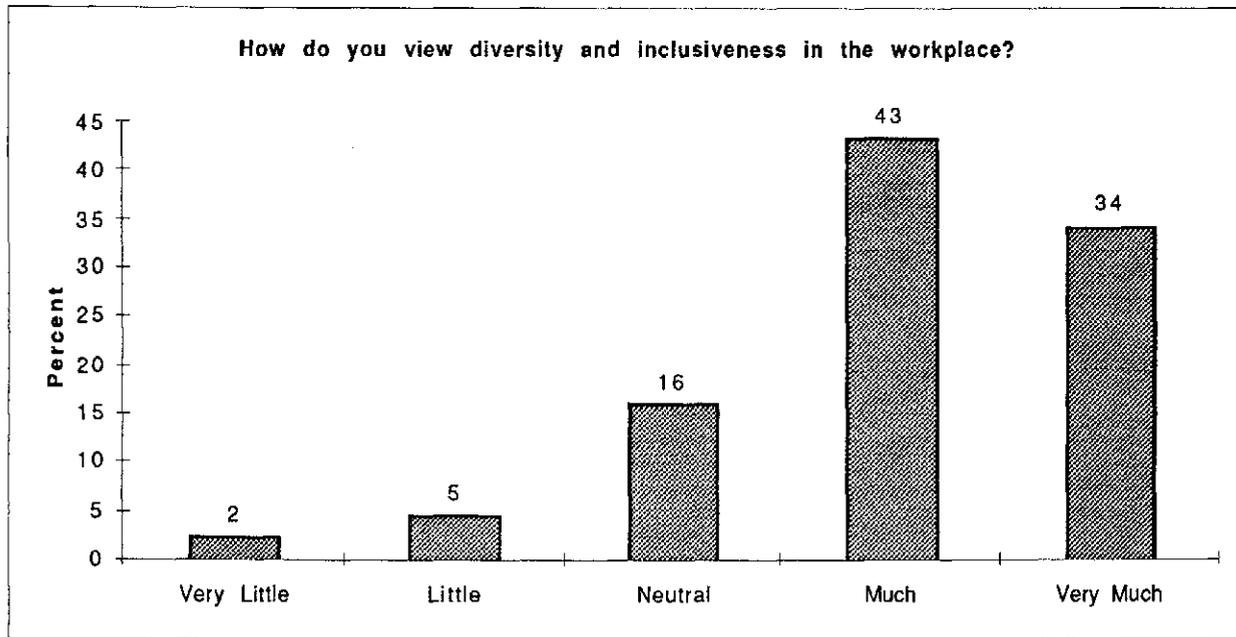
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.67 +/- 0.17. Most participants from all job categories have participated in strategic planning exercises in their organizations and should quickly engage in the Games.



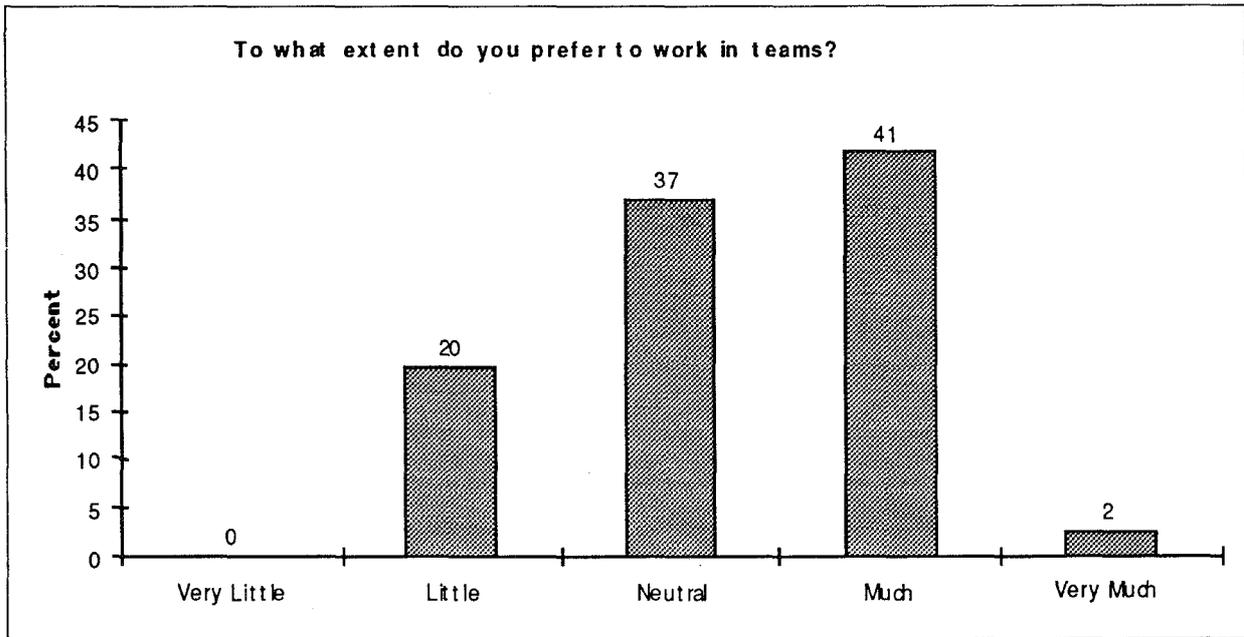
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.53 +/- 0.18. Negotiating is the primary interaction in the Games; most of the participants perceive that they are prepared.



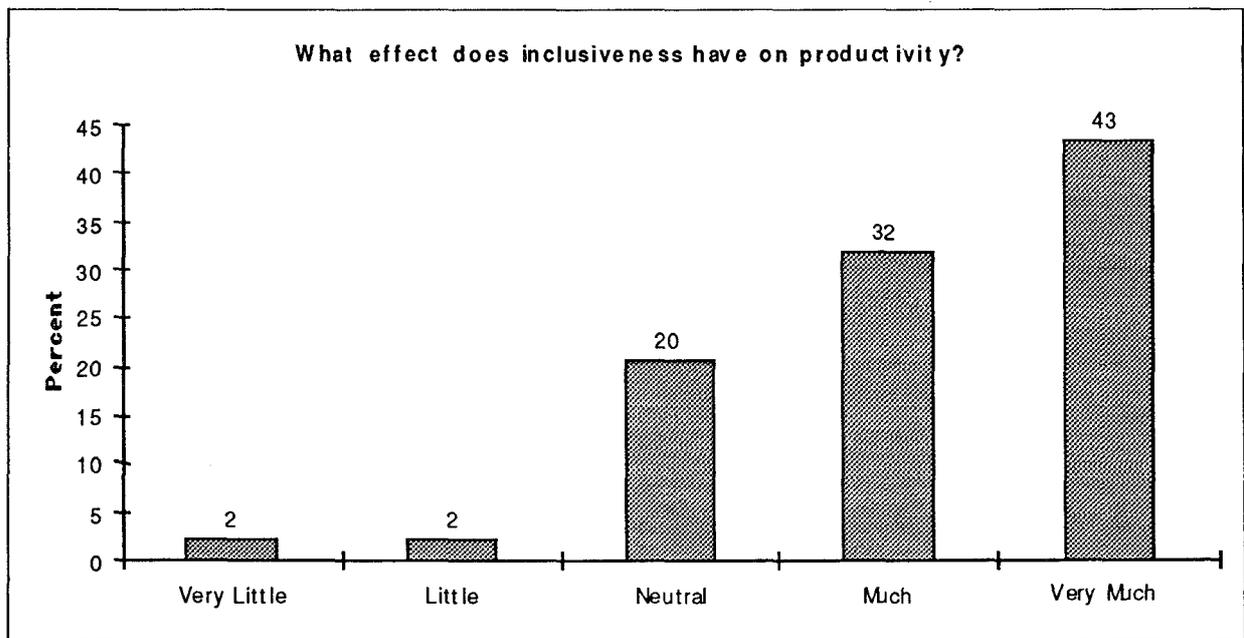
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.24 +/- 0.14. The participants perceive the Sandia climate as moderately supportive of diversity.



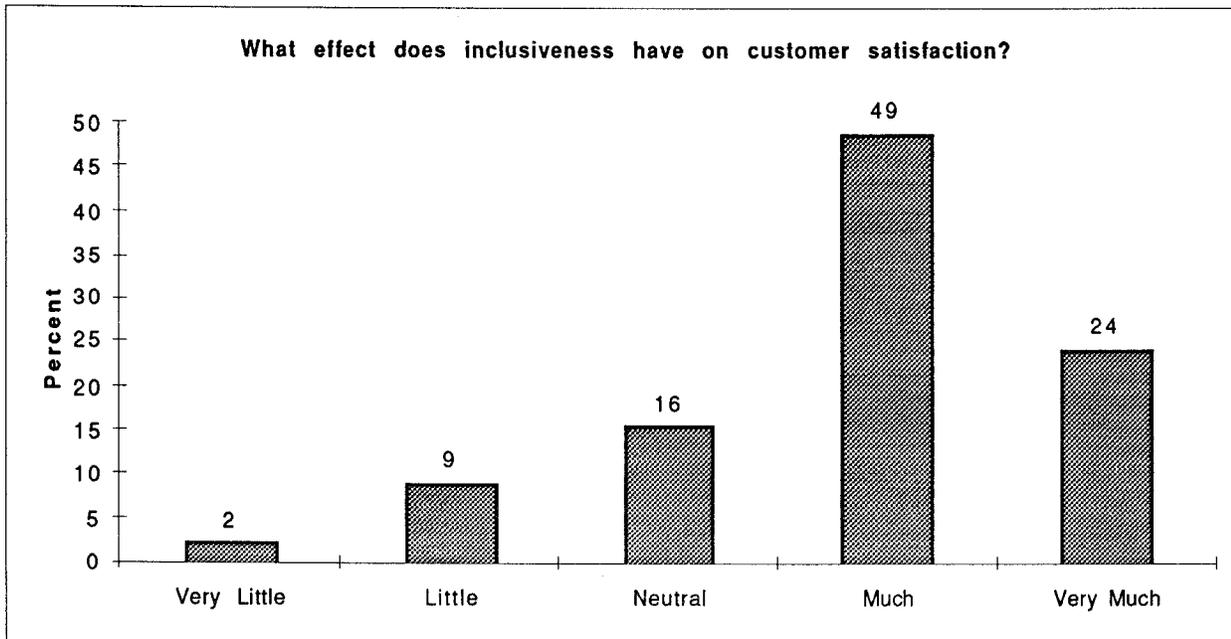
The mean +/- the standard deviation of the mean for this question, in the table above, is 4.02 +/- 0.14. The participants see themselves as champions of diversity; the act of volunteering to participate in this prototype has biased the composition of the participants.



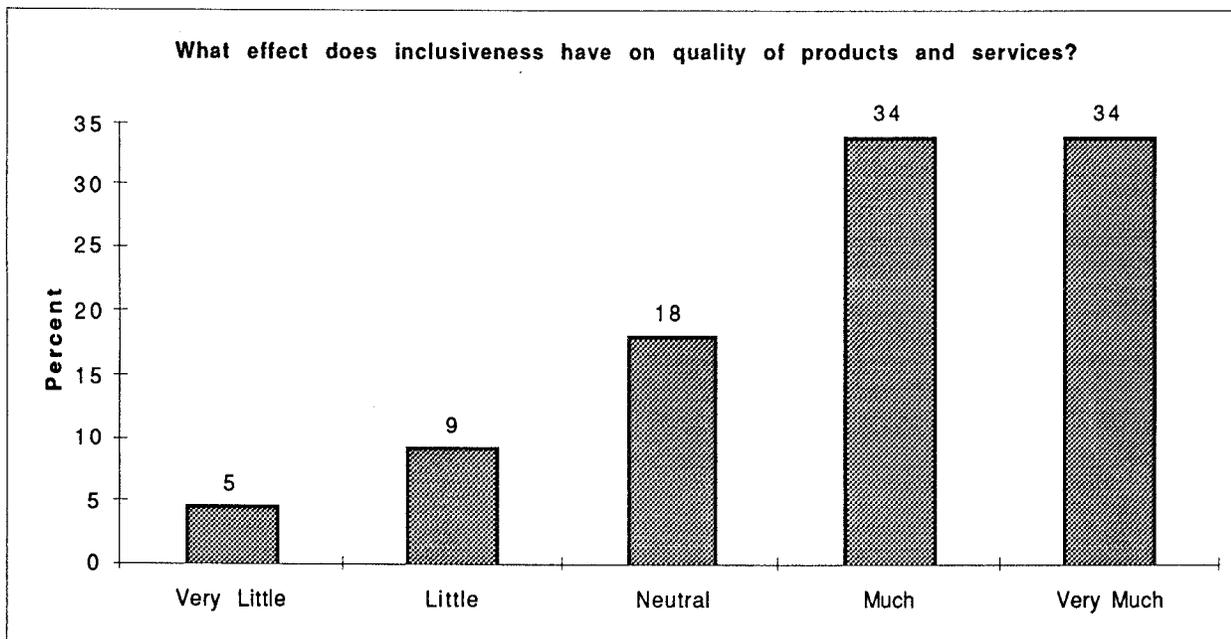
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.27 +/- 0.13. Teaming is slightly preferred to individual action but not strongly so.



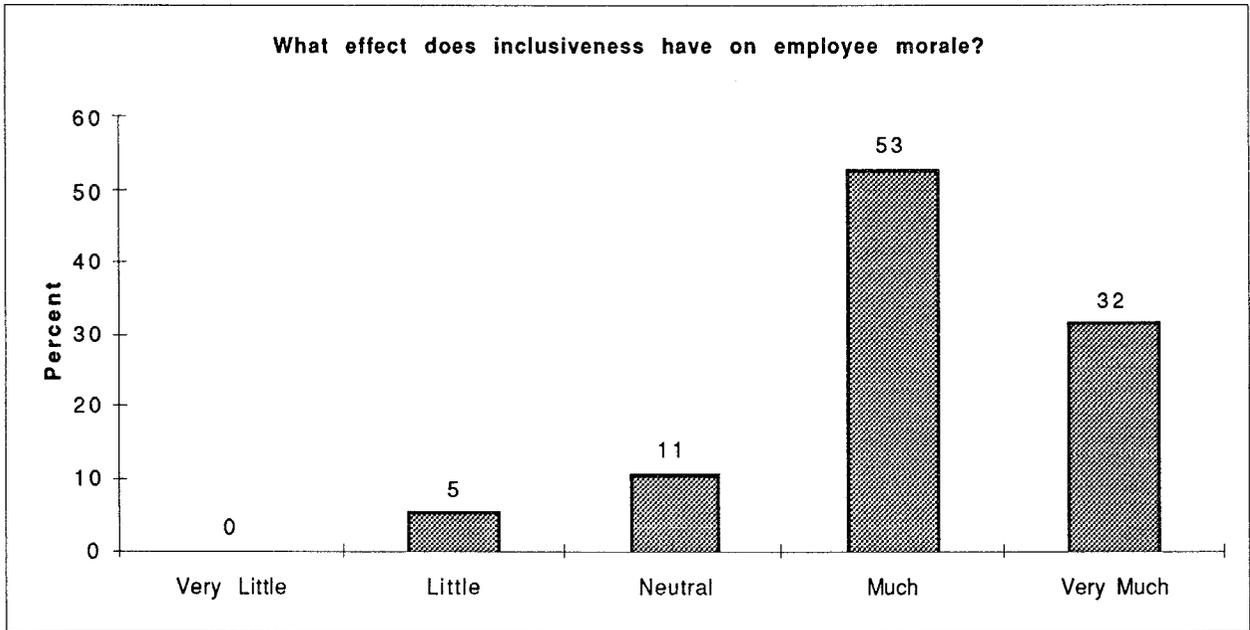
The mean +/- the standard deviation of the mean for this question, in the table above, is 4.11 +/- 0.15. Behavioral inclusiveness is recognized as a strong advantage to increasing productivity.



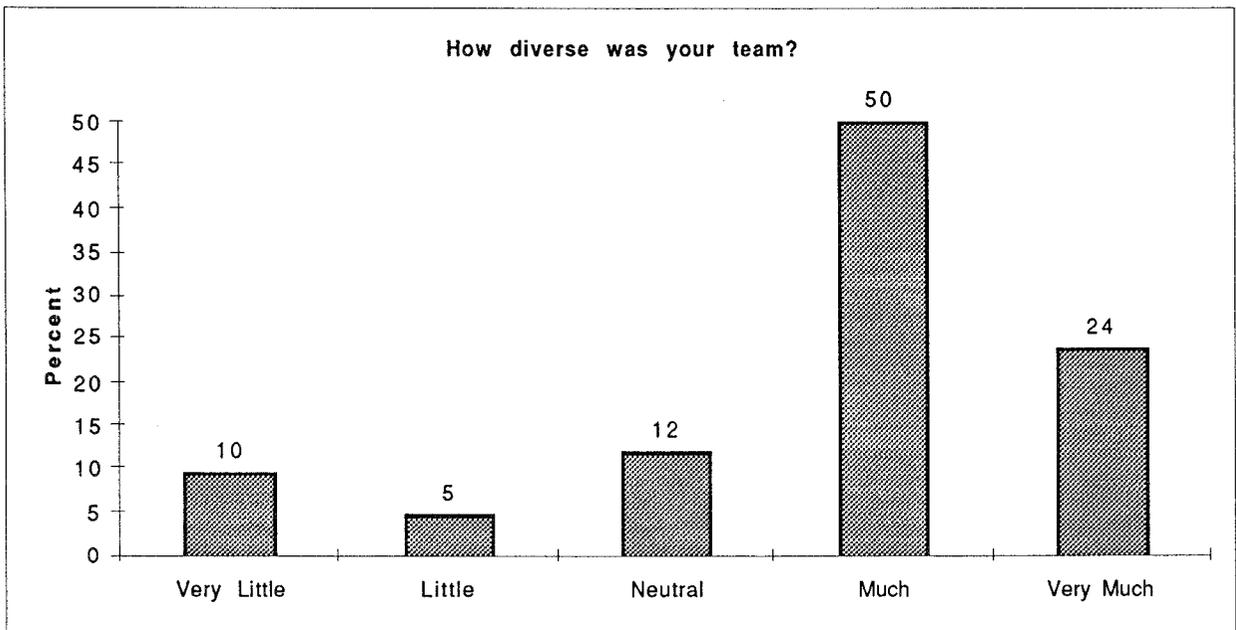
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.84 +/- 0.15. Behavioral inclusiveness is recognized as a strong advantage to customer satisfaction.



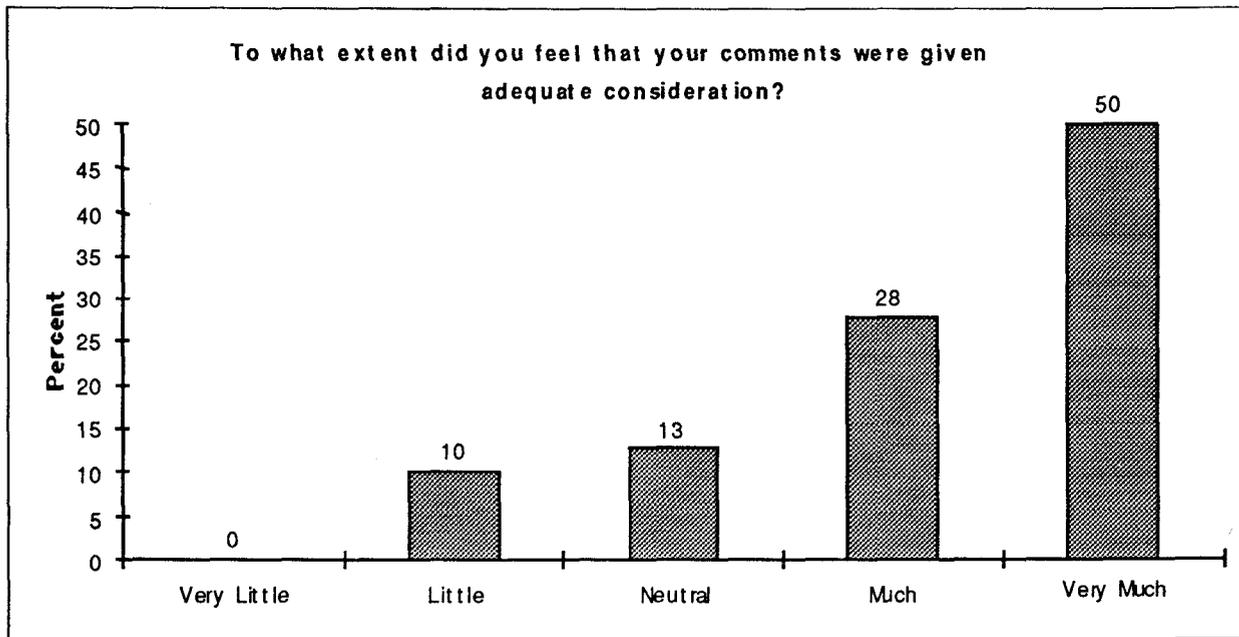
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.84 +/- 0.17. The participants perceive the behavioral inclusiveness does positively affect the work we do at Sandia.



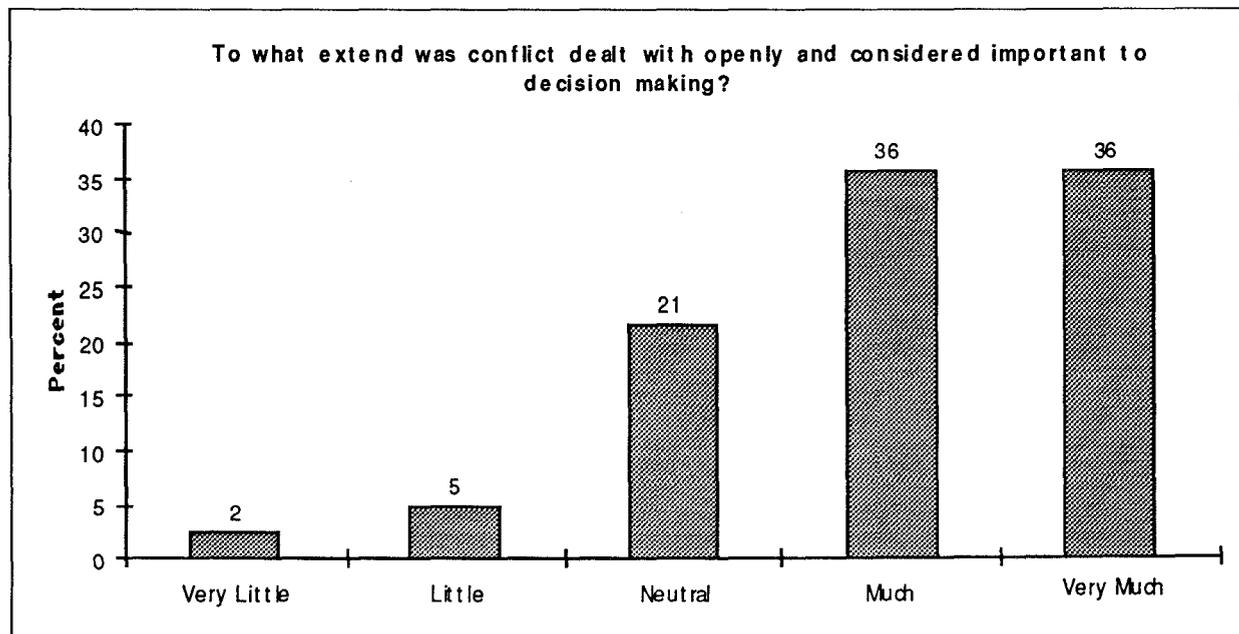
The mean +/- the standard deviation of the mean for this question, in the table above, is 4.48 +/- 0.11. Behavioral inclusiveness is perceived to increase employee morale; people like to be respected.



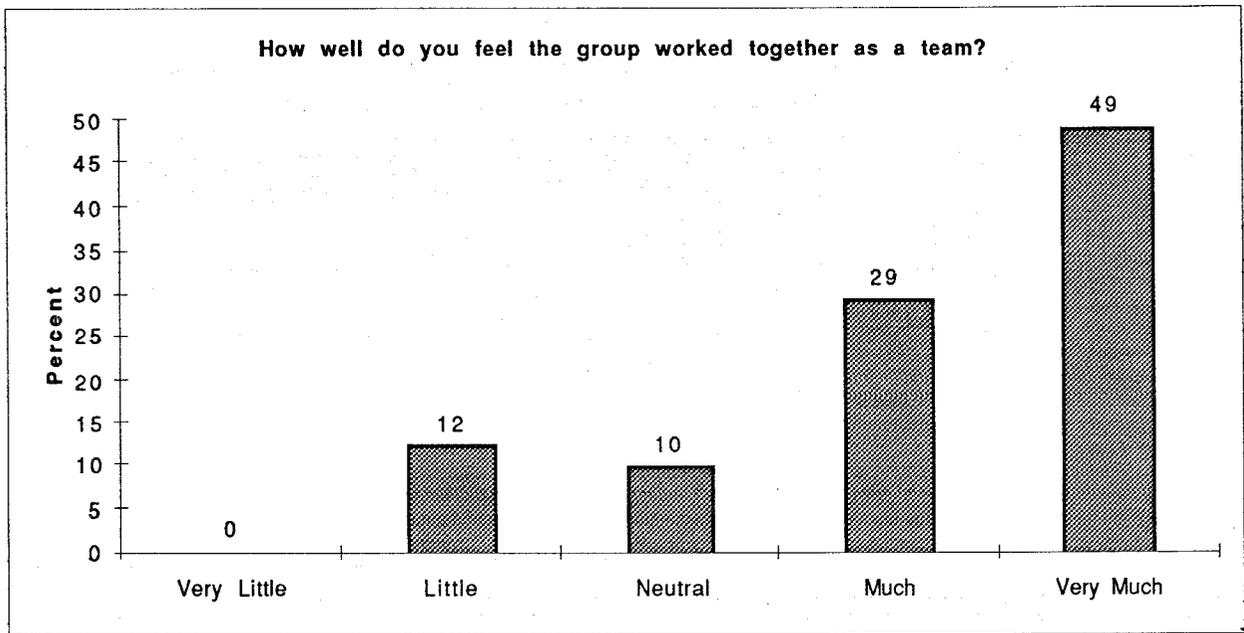
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.74 +/- 0.18. In this question, diversity was broadly defined (race, age, class, gender, sexual orientation, and manager/individual-contributor.)



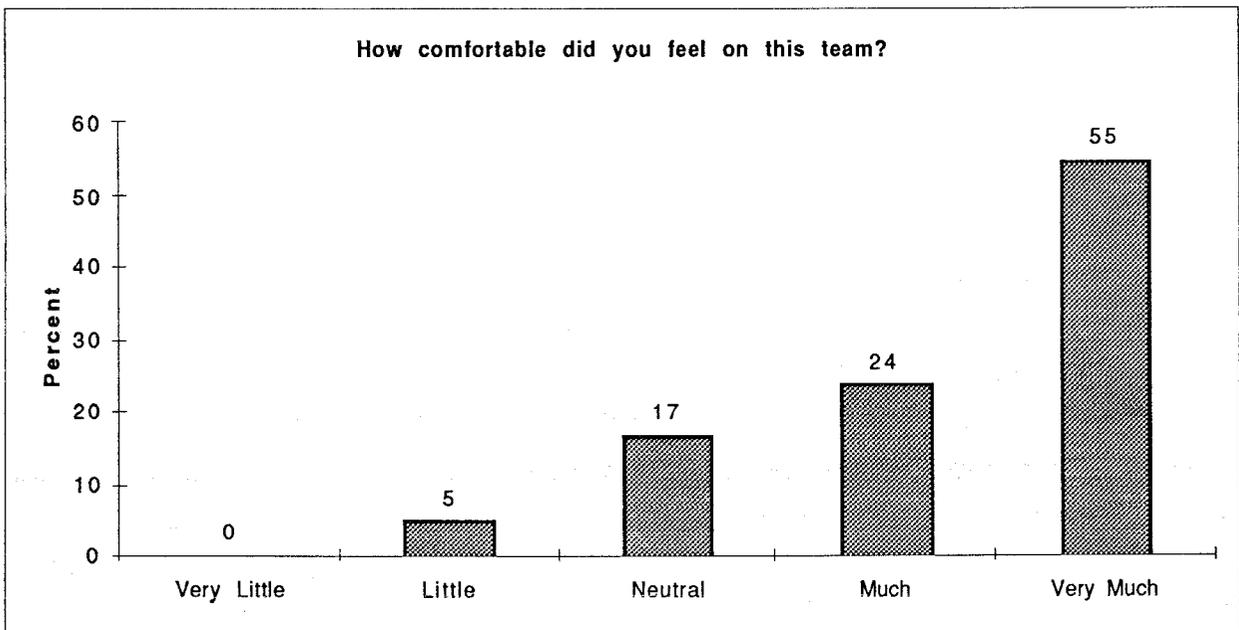
The mean +/- the standard deviation of the mean for this question, in the table above, is 4.18 +/- 0.16. Behavioral inclusiveness was dominant in the Games.



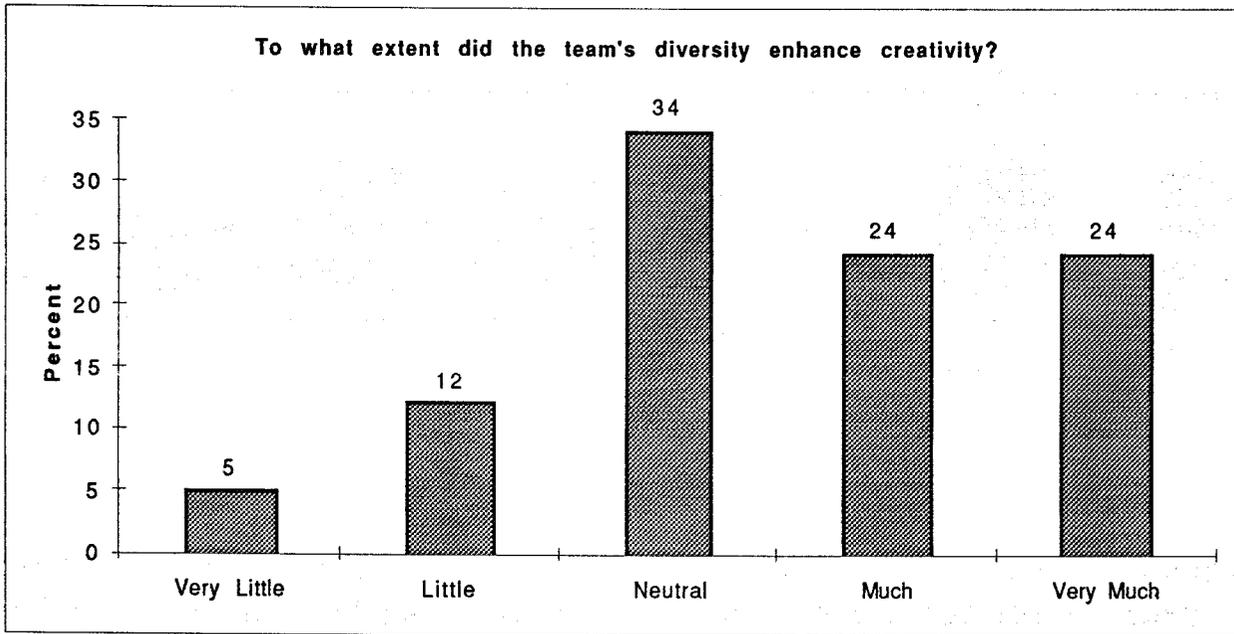
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.98 +/- 0.15. Conflict was successfully utilized in a surprisingly large percentage of the teams.



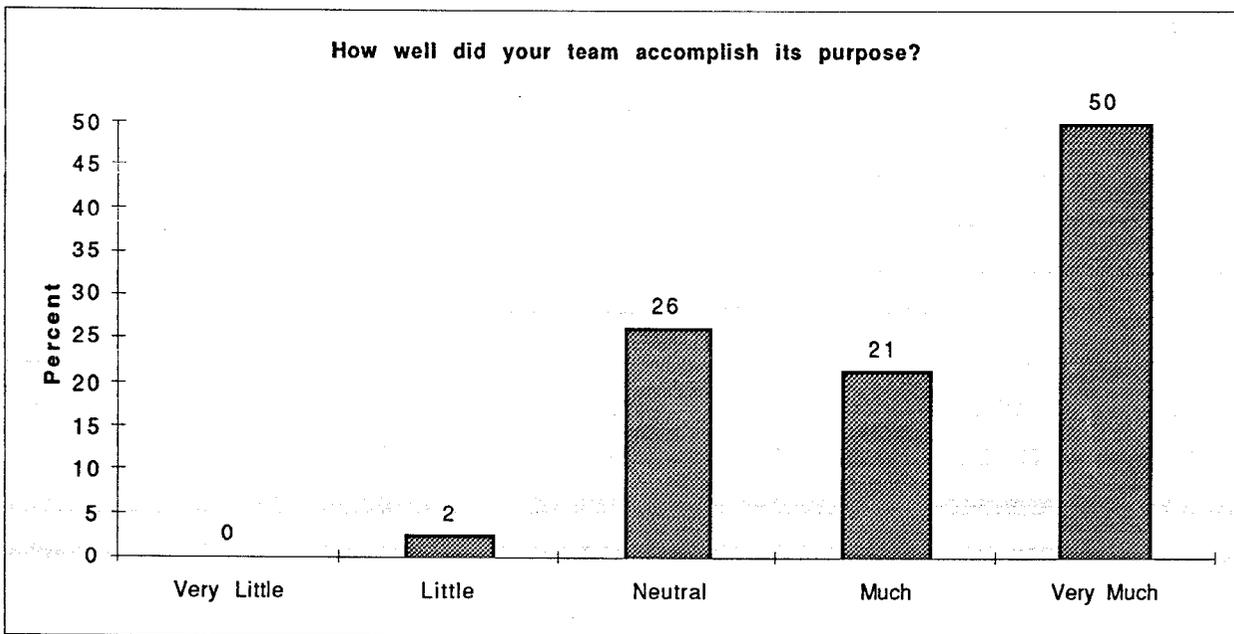
The mean +/- the standard deviation of the mean for this question, in the table above, is 4.15 +/- 0.16. The Games favor teams that work together and the team behaviors reflect this subtle imperative.



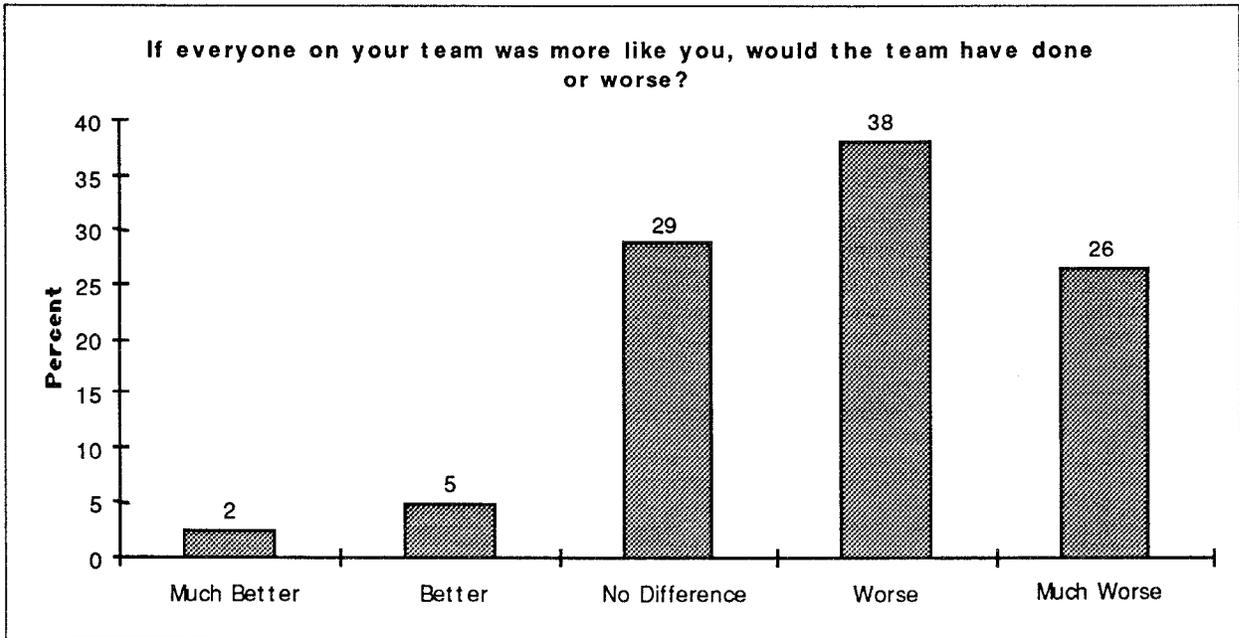
The mean +/- the standard deviation of the mean for this question, in the table above, is 4.29 +/- 0.14. Behavioral inclusiveness was well practiced by the participants.



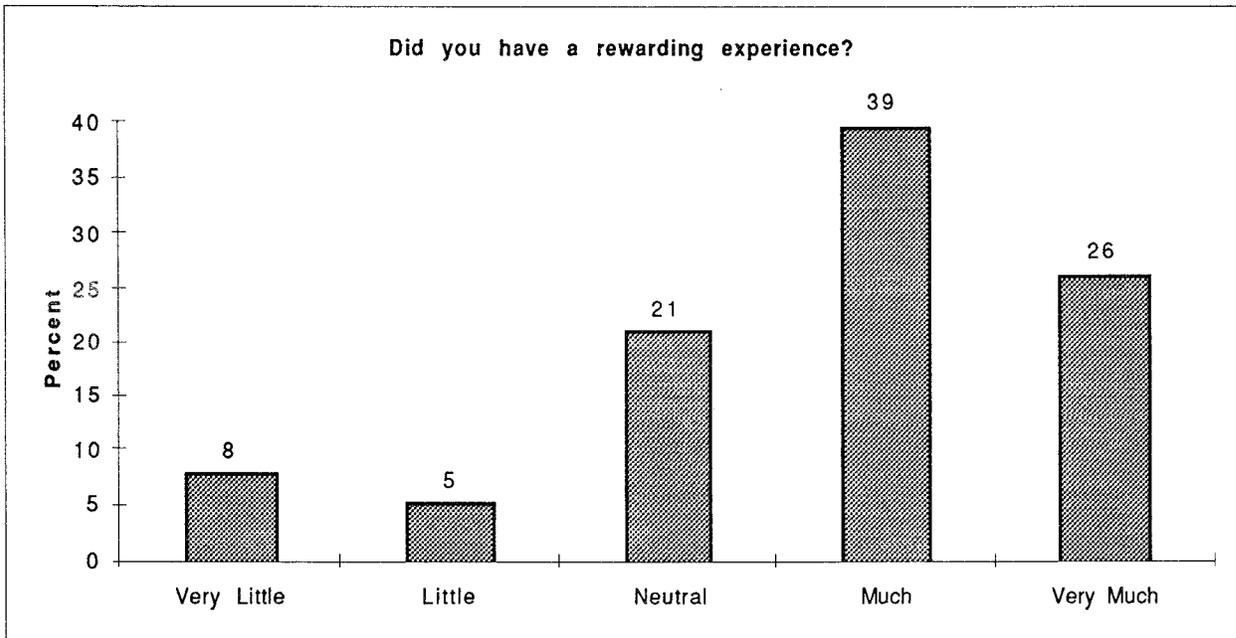
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.51 +/- 0.18. Diversity was generally, but not universally, appreciated.



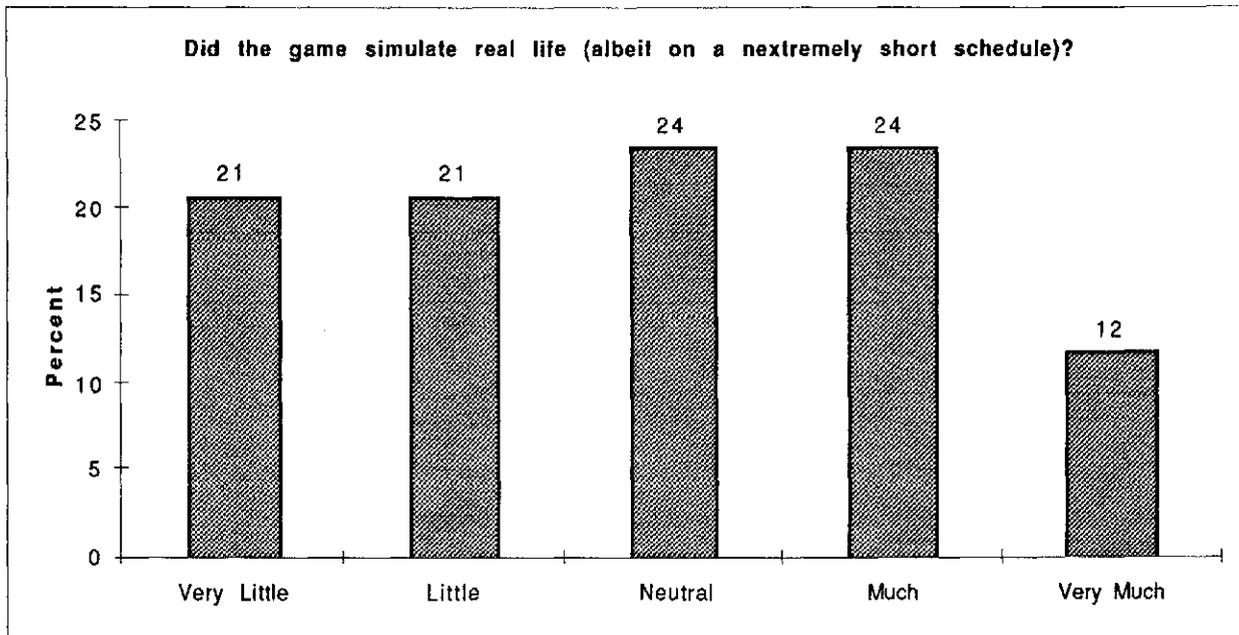
The mean +/- the standard deviation of the mean for this question, in the table above, is 4.19 +/- 0.14. The players perceived that they were reasonably successful. See the correlation with the Group's assessments for each team.



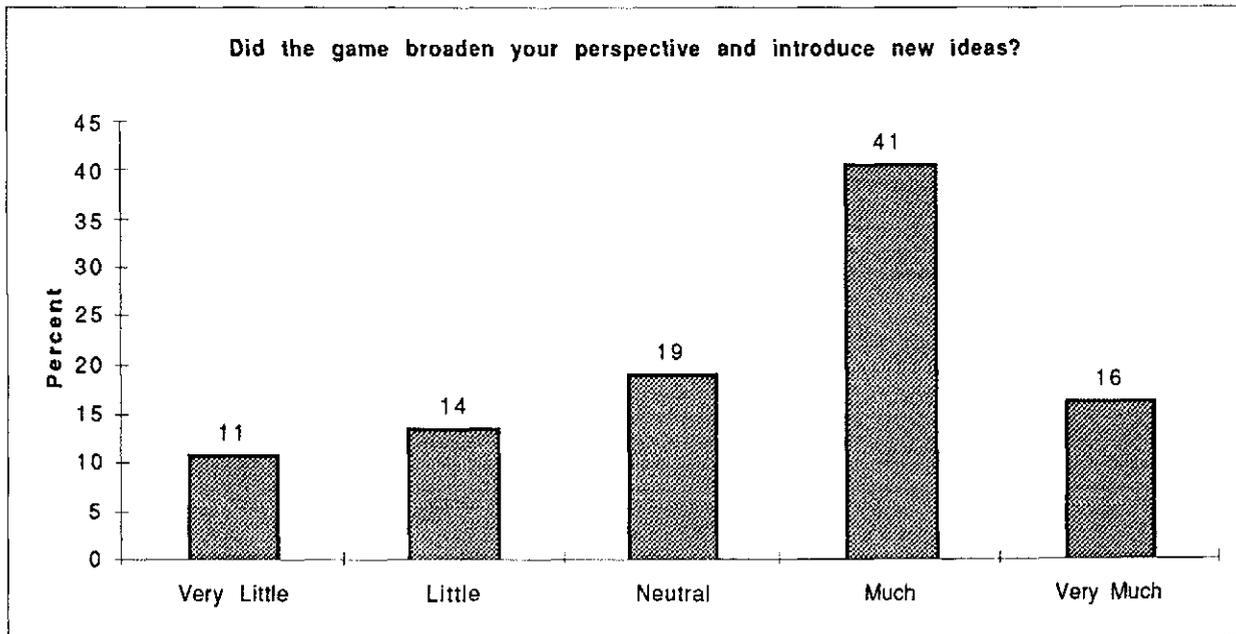
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.81 +/- 0.15. Diversity and behavioral inclusiveness are apparently appreciated by this particular set of participants, who volunteered for the experience.



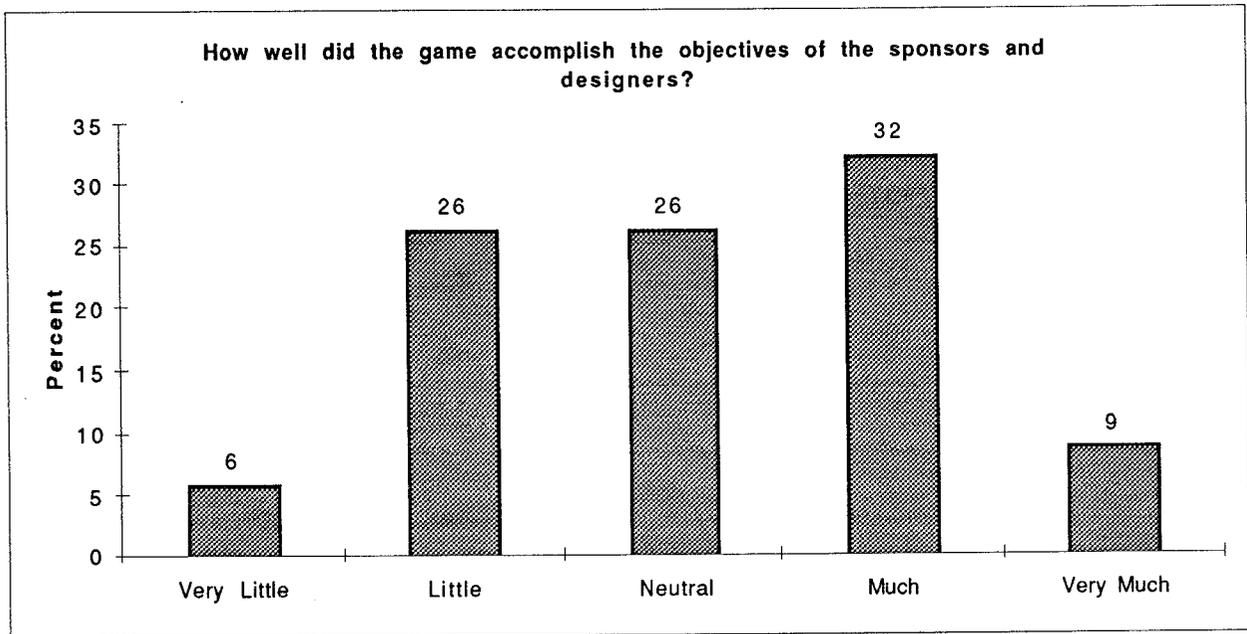
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.71 +/- 0.19. The Game dynamic is generally appreciated.



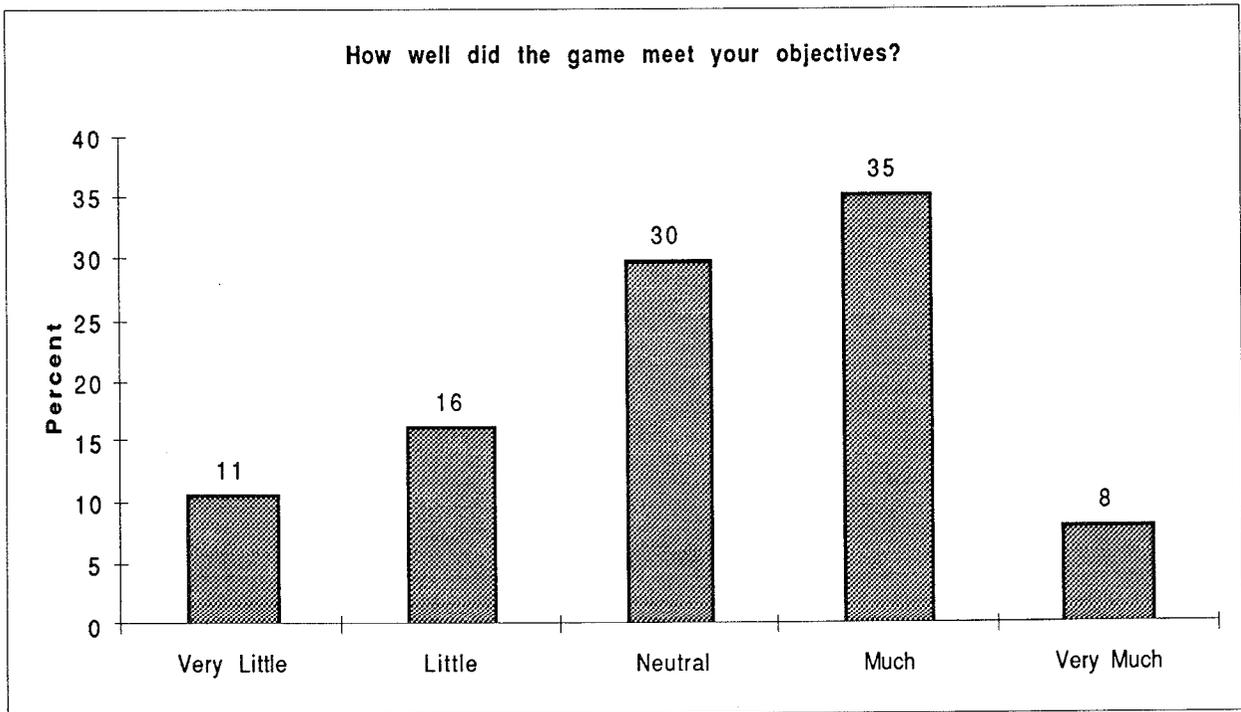
The mean +/- the standard deviation of the mean for this question, in the table above, is 2.85 +/- 0.23. The variation is too large to extract a meaningful inference.



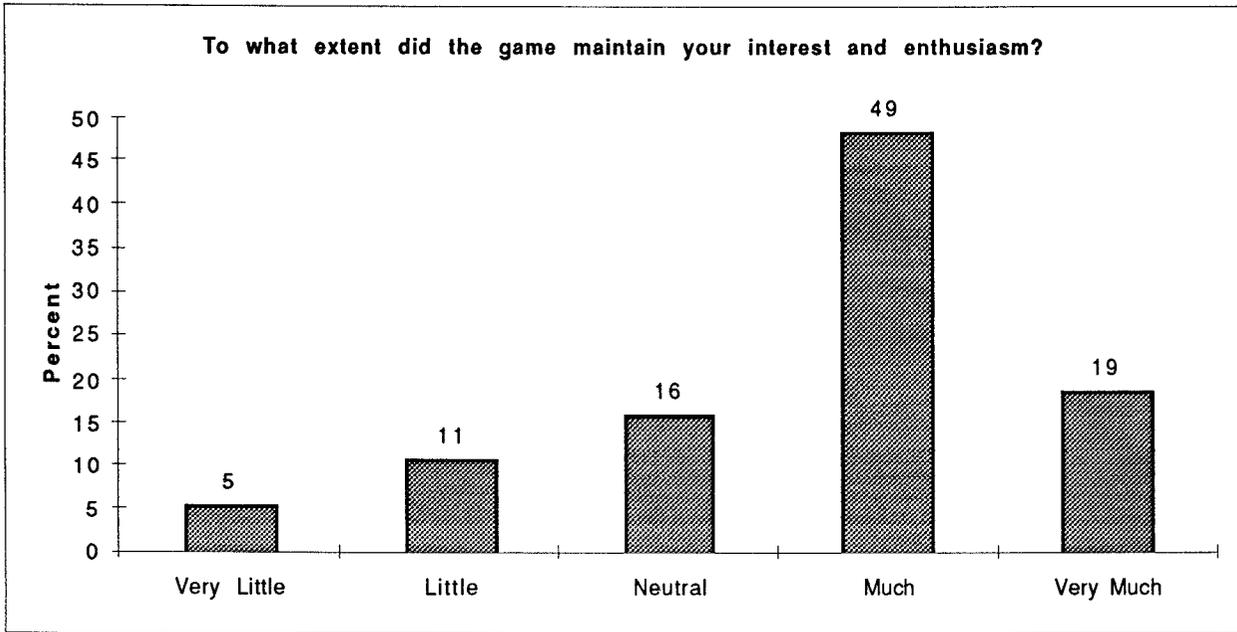
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.38 +/- 0.20. The generally positive response suggest considerable potential for an improved Game, based on this prototype.



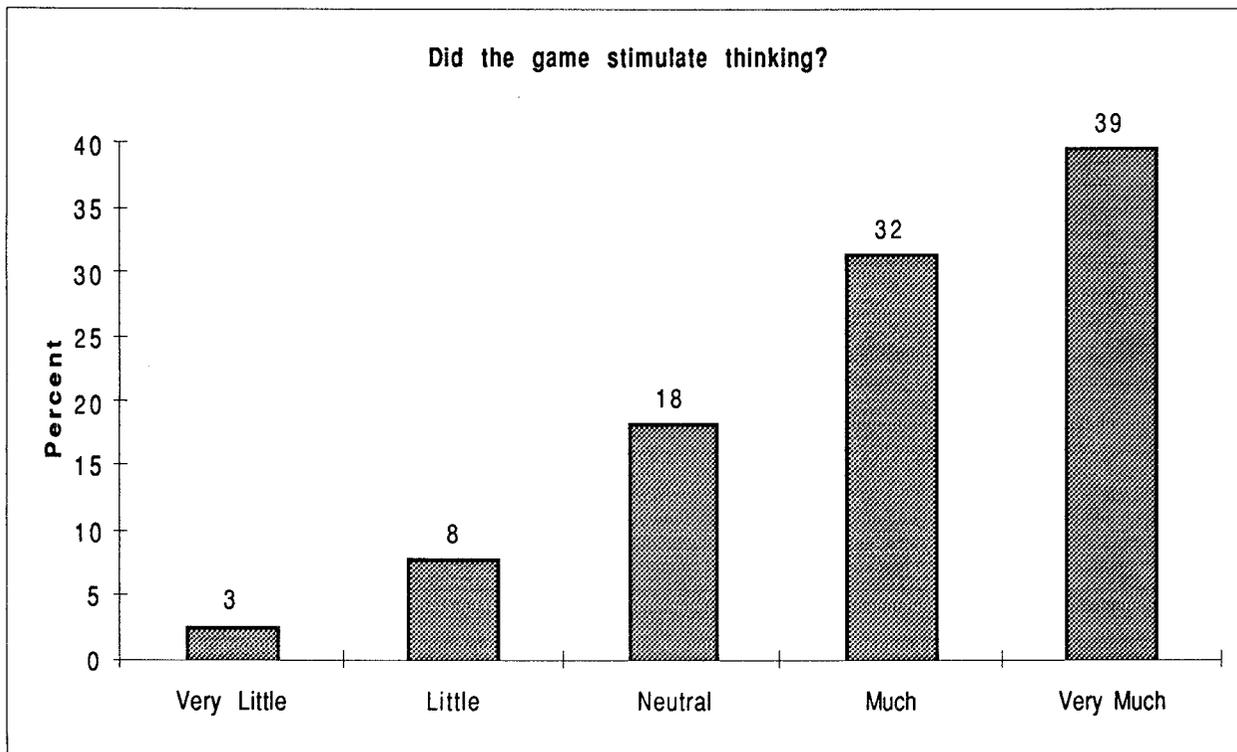
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.12 +/- 0.19. The Prototype needs improvement and the debriefing must bring the group to a consensus for action.



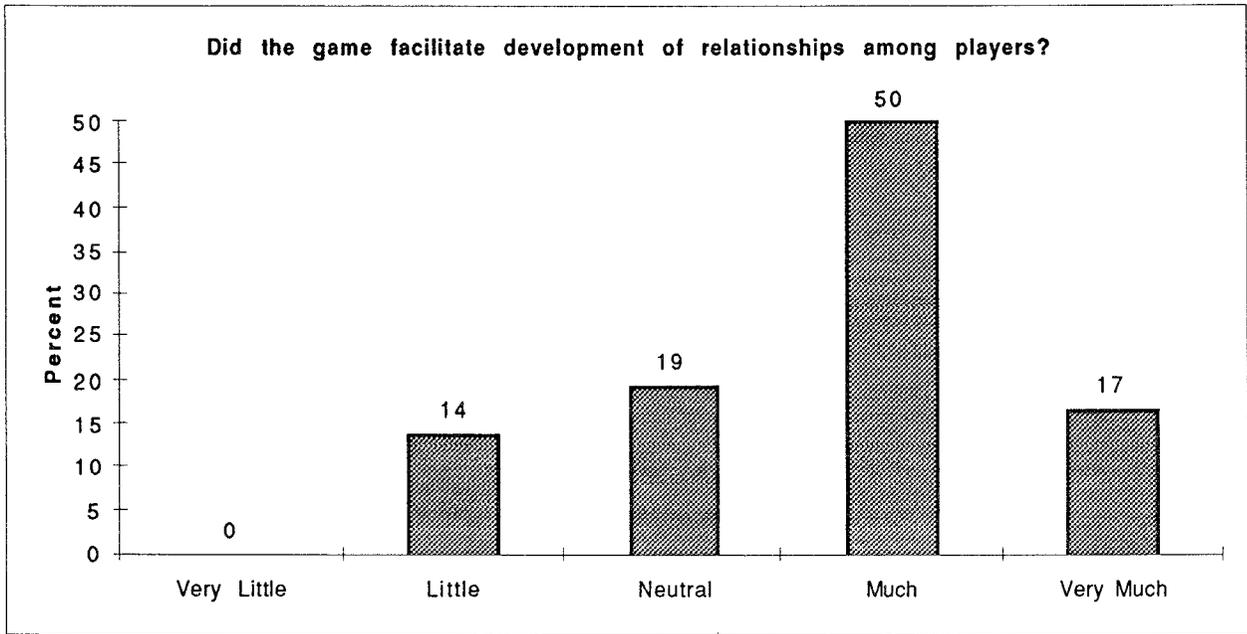
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.14 +/- 0.19. The objectives need to be better defined.



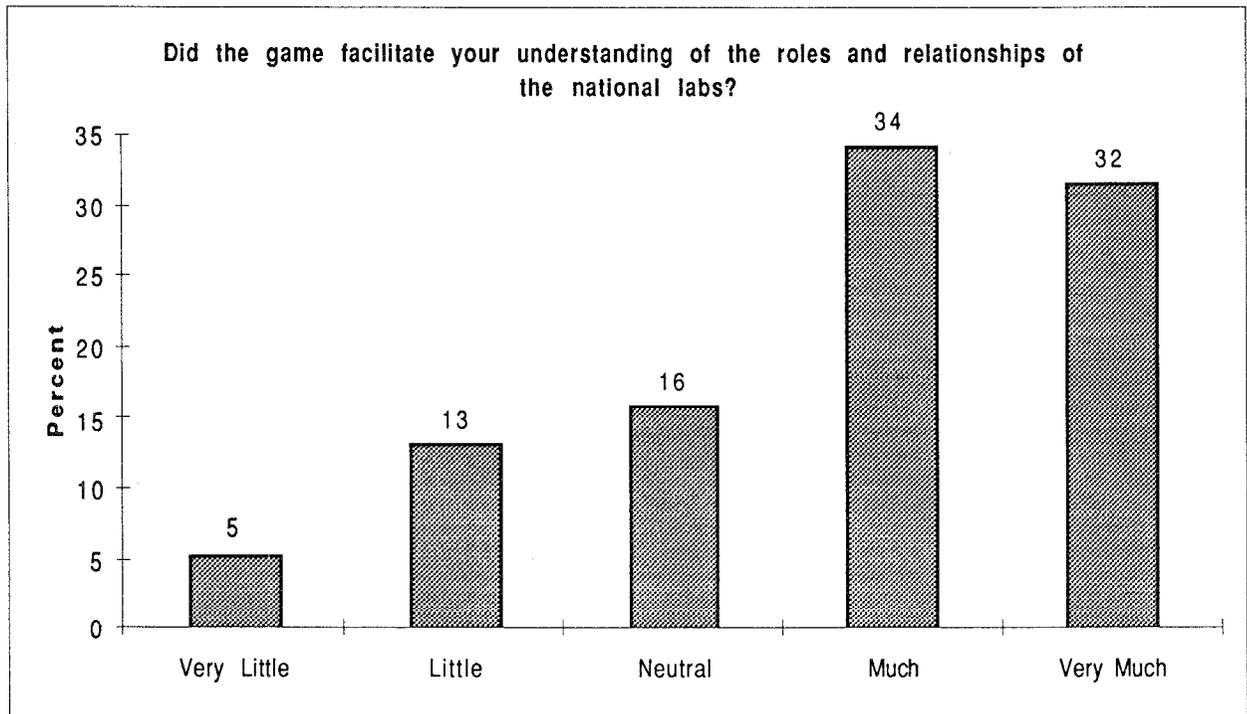
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.65 +/- 0.18. The Game was very engaging.



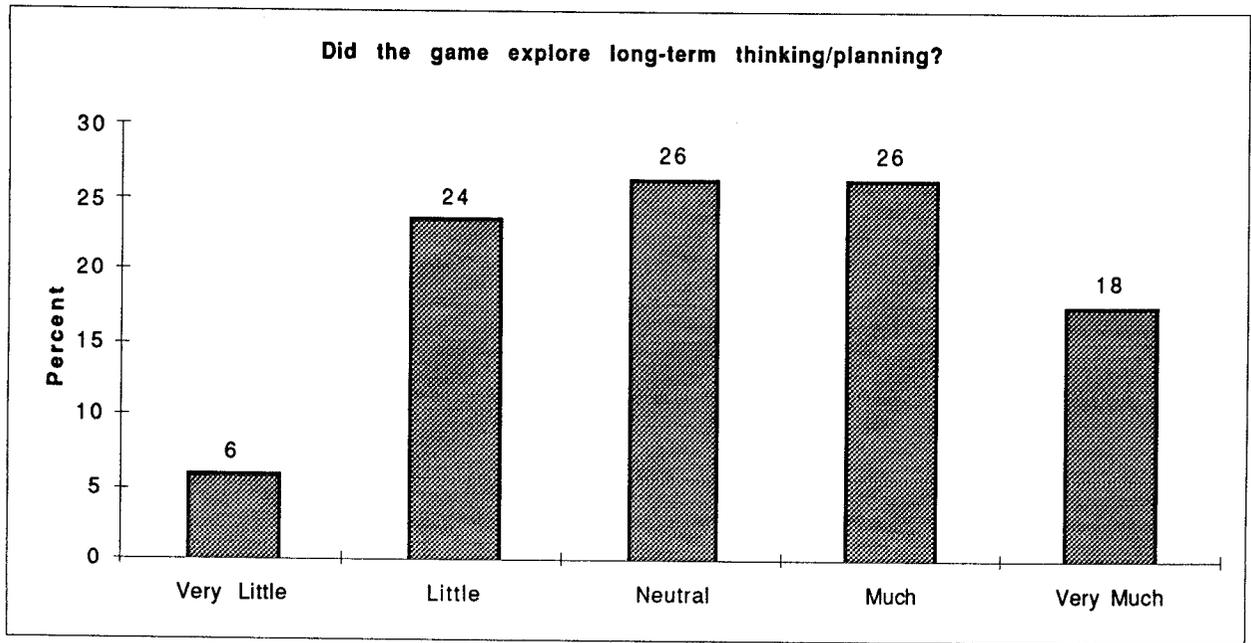
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.97 +/- 0.17.



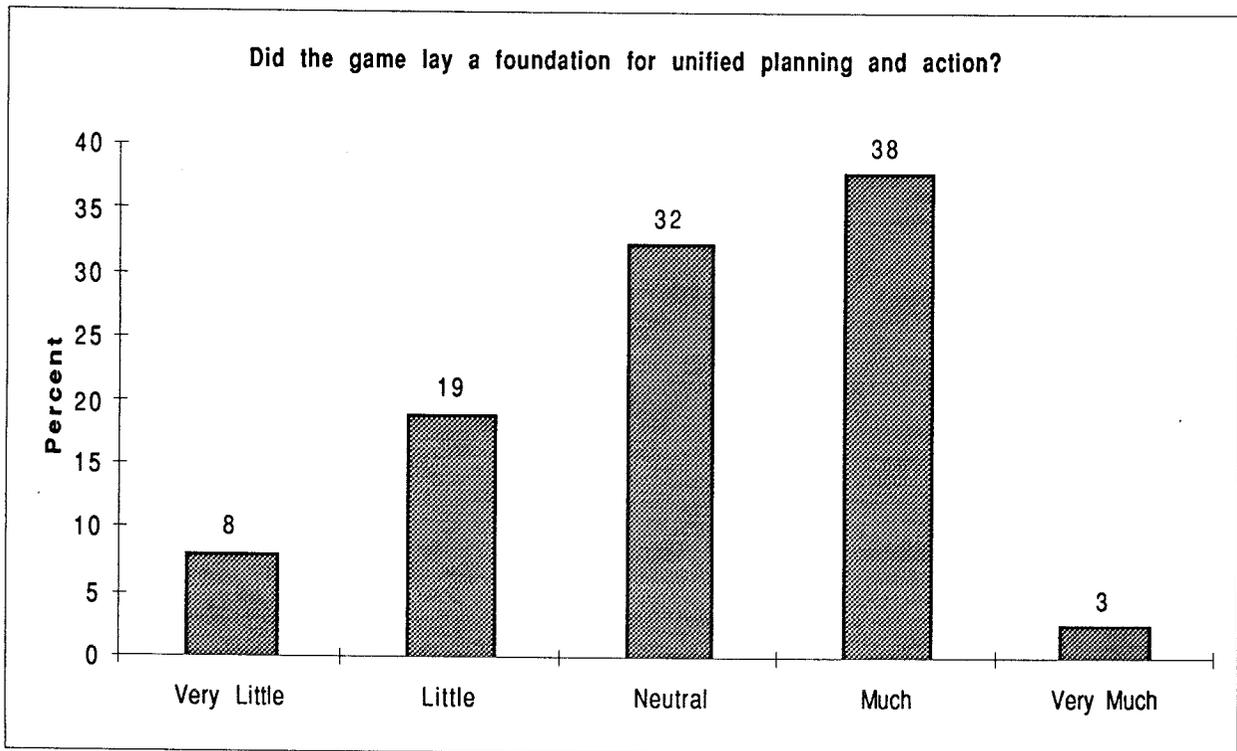
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.69 +/- 0.15. The inclusiveness character of the Game is evident in this relatively high score.



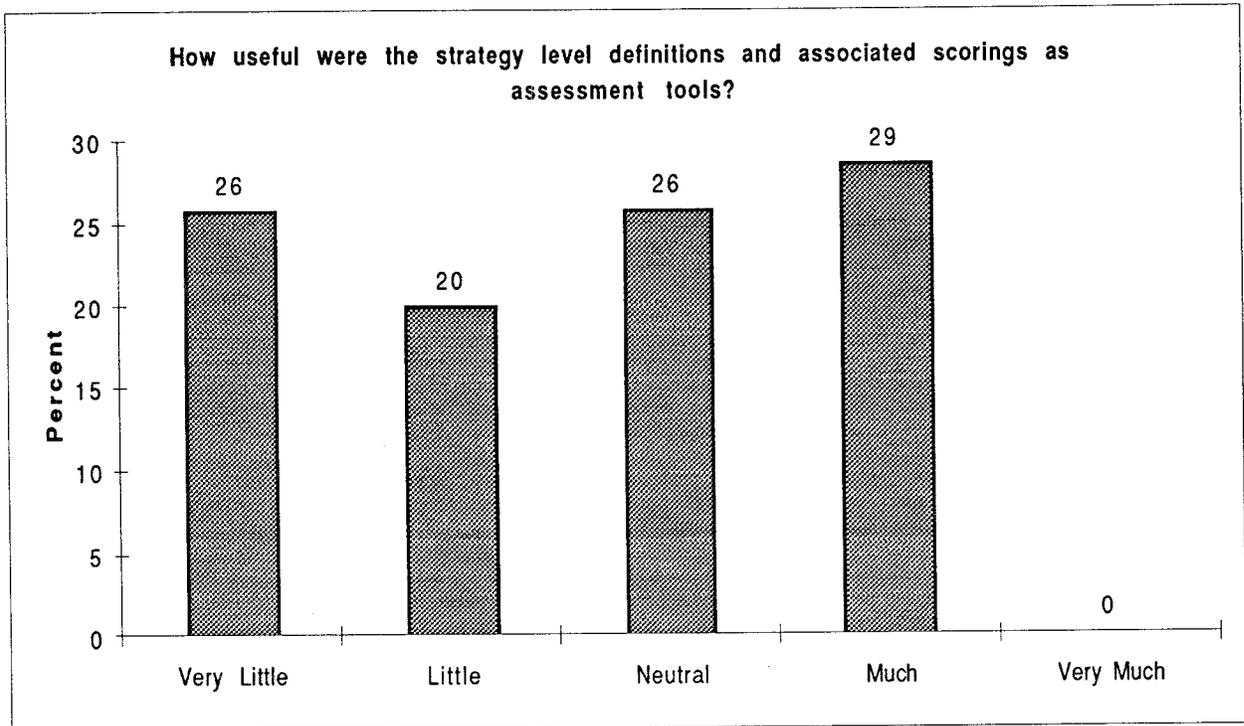
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.74 +/- 0.19. The Games are apparently a useful tool for interactive learning.



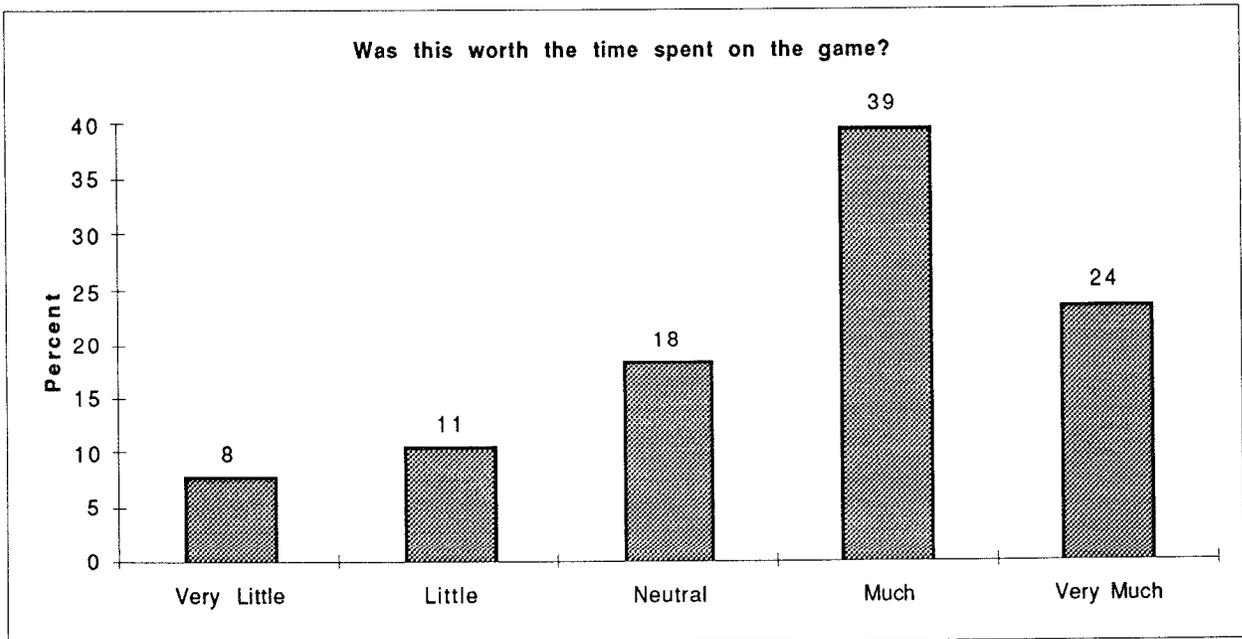
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.26 +/- 0.20. The wide variation in the assessments reflect the diversity of the participants.



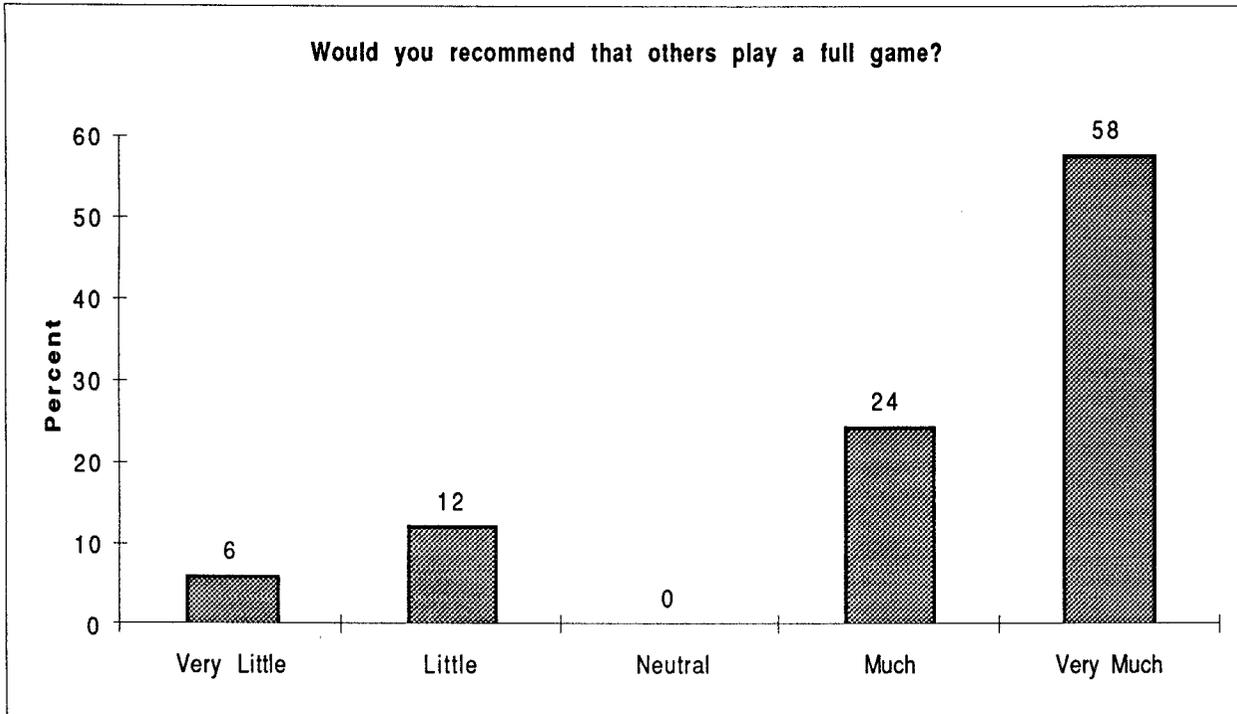
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.08 +/- 0.17. The Prototype did not debrief the experience sufficiently to score highly in this category.



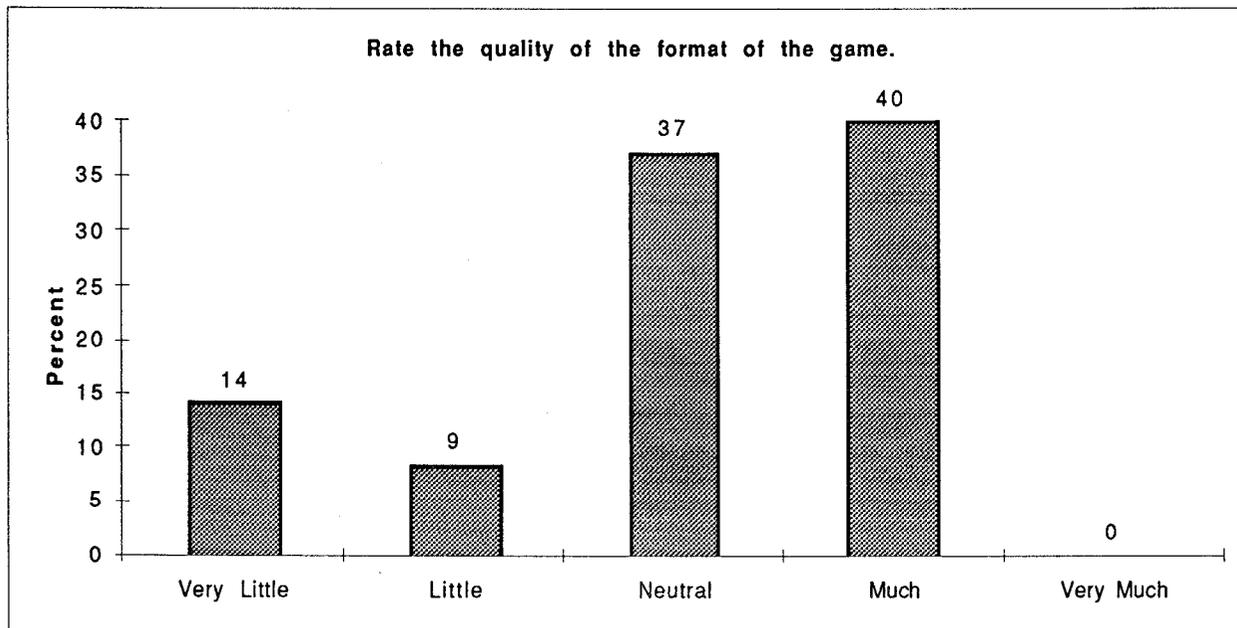
The mean +/- the standard deviation of the mean for this question, in the table above, is 2.57 +/- 0.20. The scoring system and the accompanying strategy discussion have been redesigned.



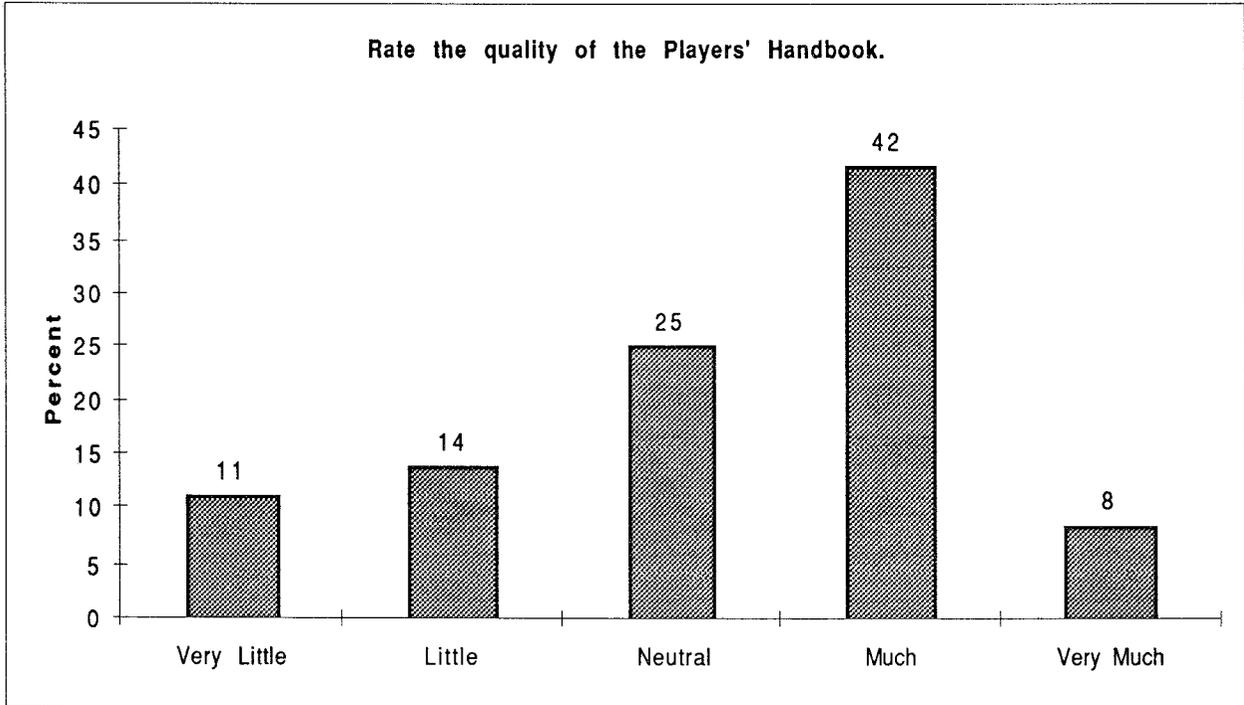
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.61 +/- 0.19. Improvements can increase this score.



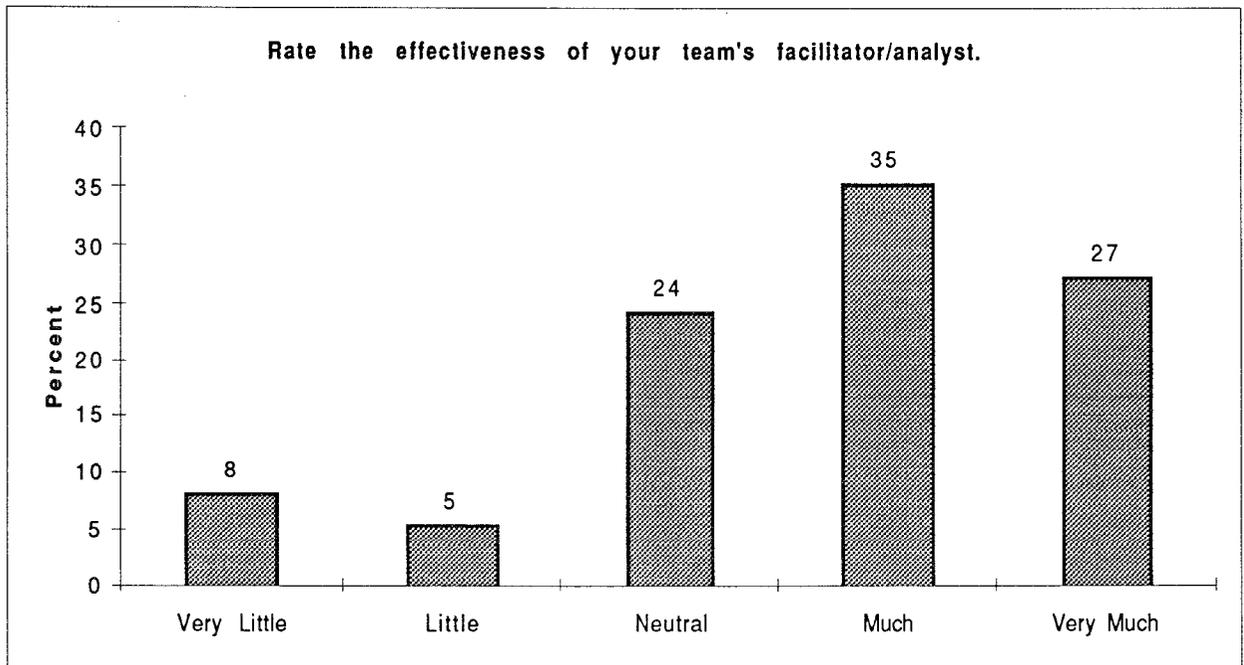
The mean +/- the standard deviation of the mean for this question, in the table above, is 4.15 +/- 0.22. The bi-modal distribution is unusual. It is consistent with the need to improve many aspects of the Game that led to the lower scores and capitalize on the engaging aspects that led to the higher scores.



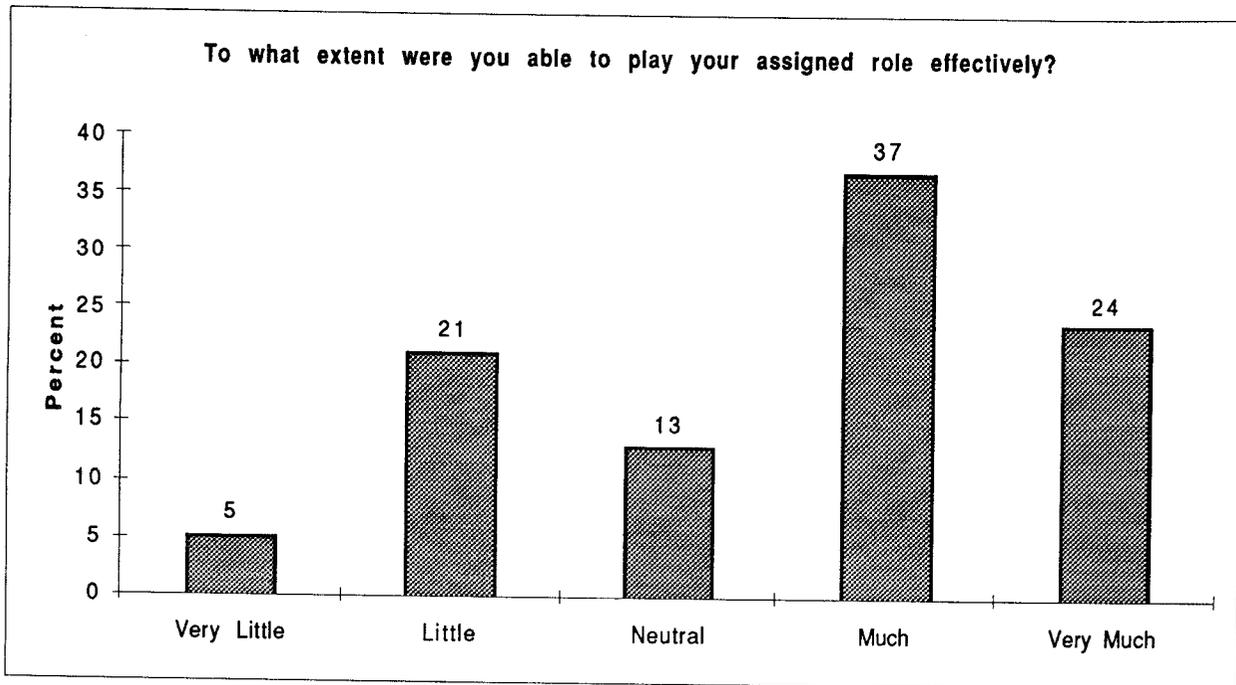
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.03 +/- 0.18. Many things need to be improved, as specified in the following section. They are all being addressed.



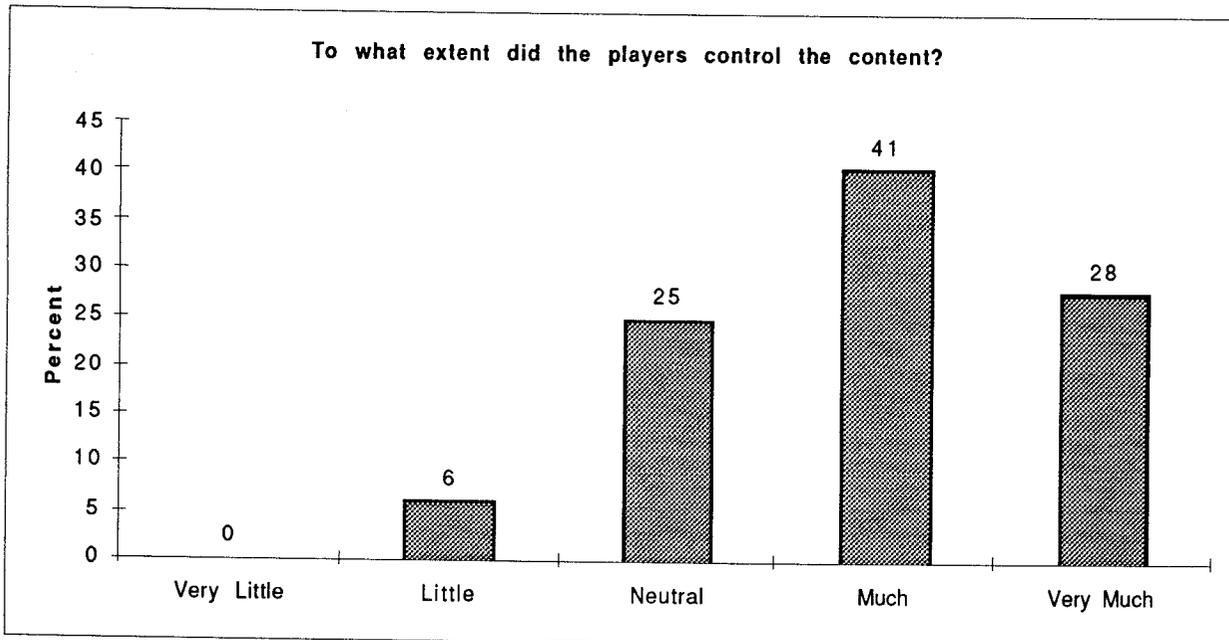
The mean +/- the standard deviation of the mean for this question, in the table above, is 3.22 +/- 0.19. The Player's Handbook must be made more user friendly; a professional writer has reformatted and edited the Handbook.



The mean +/- the standard deviation of the mean for this question, in the table above, is 3.68 +/- 0.19. The individual ratings were used to qualify facilitators for future Games.



The mean +/- the standard deviation of the mean for this question, in the table above, is 3.53 +/- 0.20. The spread in scores illustrates the need for the lab teams to be staffed by upper managers from the respective laboratories.



The mean +/- the standard deviation of the mean for this question, in the table above, is 3.91 +/- 0.16. We achieved our objective of the players' controlling the content, with some room to improve.

Correlations

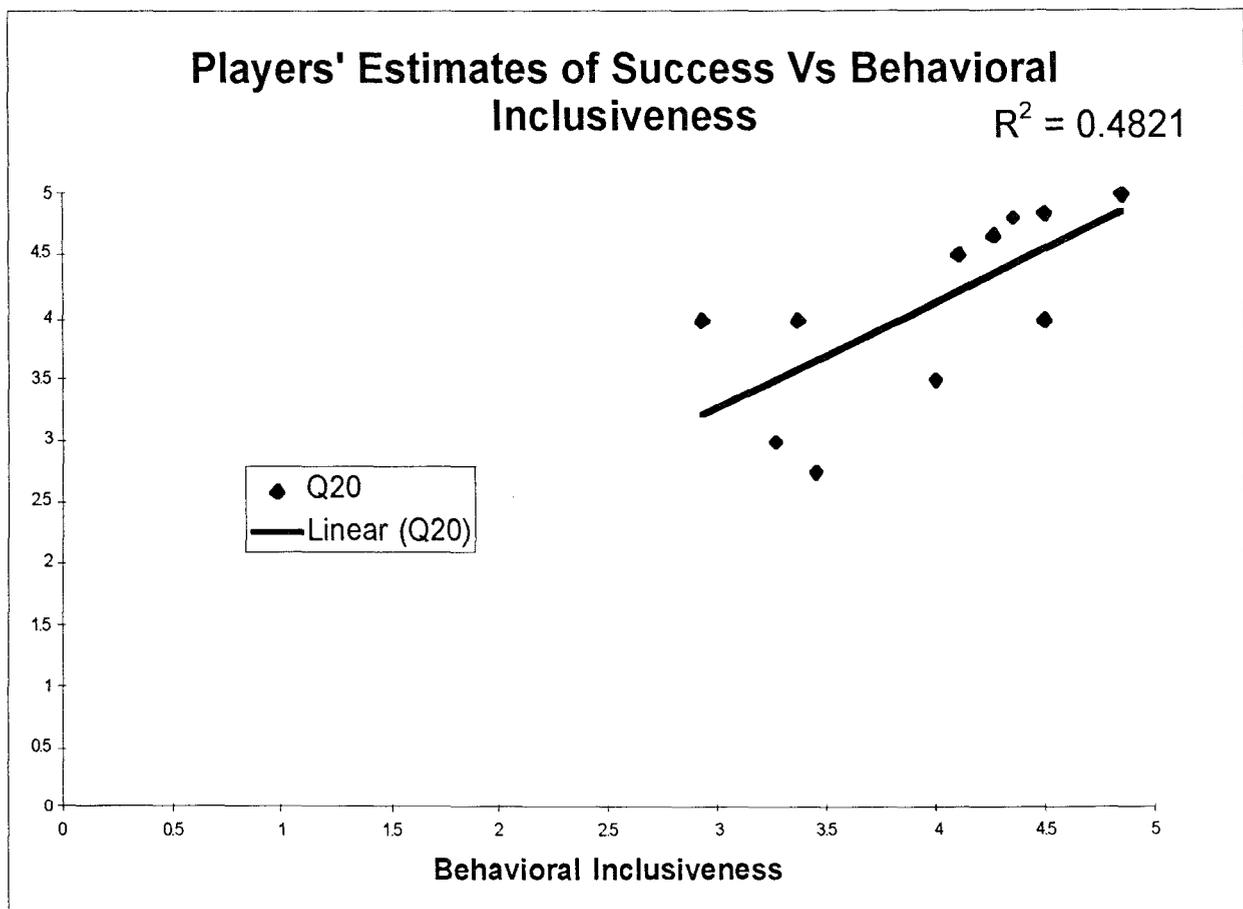
The business case for Diversity through Behavioral Inclusiveness was a key objective of this game. The perceived behavioral inclusiveness for each team was calculated for each team from that team's voting on the following questions:

- To what extent did you feel that your comments were given adequate consideration?
- To what extent was conflict dealt with openly and considered important to decision-making?

- How well do you feel the group worked together as a team?
- How comfortable did you feel on this team?
- To what extent did the team's diversity enhance creativity?

The resulting score for perceived behavioral inclusiveness was correlated with perceived team success and shown in the following figure:

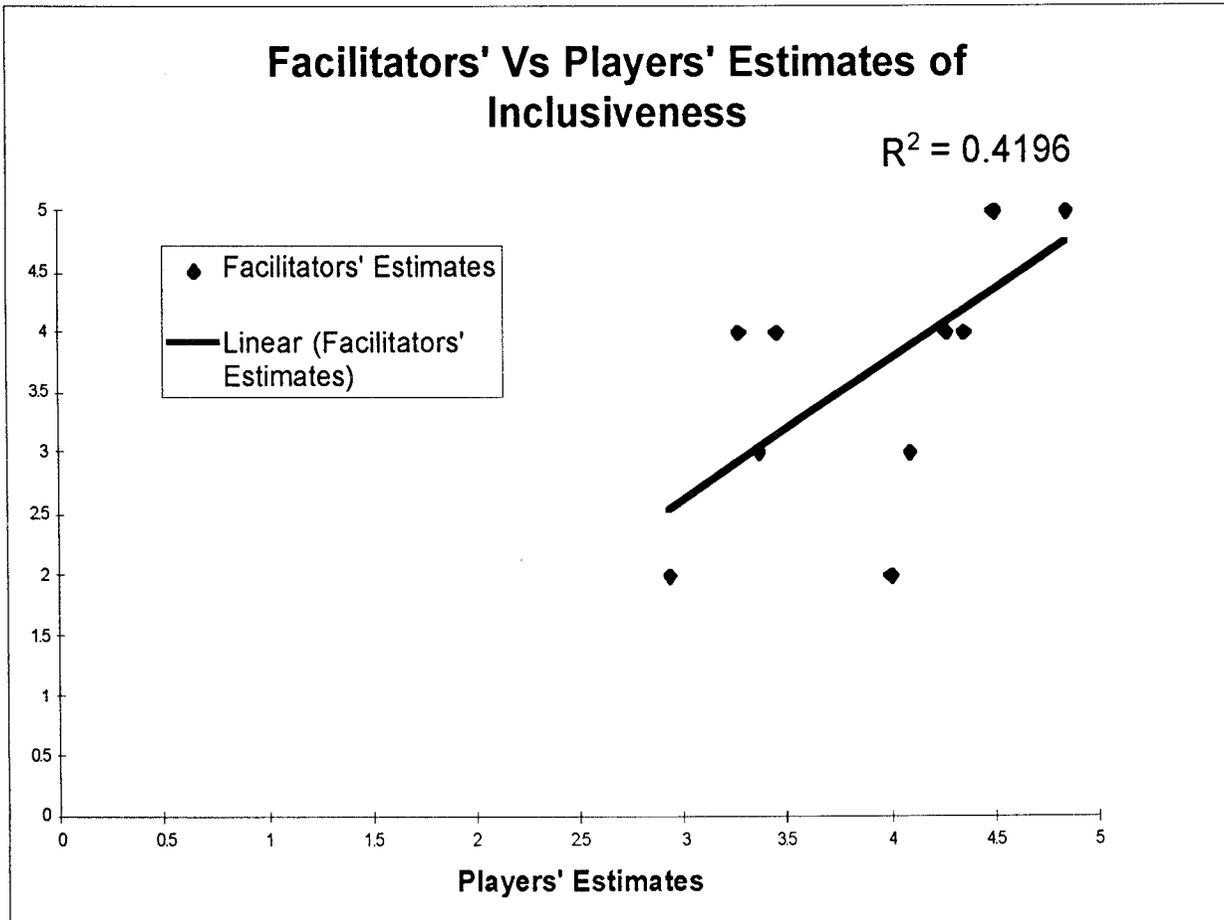
The R^2 value of 0.48 indicates that about half of the effect can be attributed



to perceived behavioral inclusiveness in this game, which implicitly promoted collaboration by the process of reaching agreements. The corresponding correlation coefficient is 0.7.

In addition, the perceived behavioral inclusiveness score by the team is

correlated with the assessment by the facilitator/analyst with a correlation coefficient of 0.64 and is illustrated in the following figure:



The players were also asked to assess the sophistication of their strategy, as defined in the Scoring methodology of Appendix F and the result was correlated with many variables: Familiarity, experience in strategic planning, job classification, vote on likelihood of being laid off, experience in negotiating, team's physical diversity, players' evaluation of

team's level of inclusiveness, and facilitator's estimate of team's level of inclusiveness. None of the resulting correlations were significant, i.e. the correlation coefficient was less than 0.4. Either the results are not correlated or the players could not reliably assess the level of their strategy.

Comments and Suggestions

Diversity and Inclusive Behavior

- Great to focus on inclusion.
- The questions on diversity were appropriate.
- I had a great team—we worked very well together.
- Our team knew each other so we got to start right into the game. My comfort level was high, so I was very active in the negotiations.
- The opportunity to meet new Sandians, Eastman-Kodak, AT&T folks, and others was great.
- The requirement for collaboration among the labs was a strength. This forced the groups to work together and prevented the process from breaking down into hostile takeovers and other combative approaches.

Scoring

- Scoring system seemed to be quite artificial. The concepts behind the scoring system do appear to be sound however. It seems that one who knows how to play the game well could easily “rig” lots of deals that lead to a lot of points. The relative size and importance of deals may be possible variables to consider in the scoring.
- The scoring seemed complex. We were disappointed that the scoring was not supportive of strategies that supported teaming and interrelationship building. The polling by teams had stronger support for our strategies than the scoring process.
- Scoring ourselves was very difficult.
- The scoring system is confusing—a sample scenario with a completed score sheet would be helpful.

- Scoring needs to be clarified.
- Weighting factors needed for “impact” of moves (a series of small impact moves count for more than a few moves with large impact).
- Scoring should be revamped...i.e., a big move is much bigger than many small moves.

Schedule

- There was insufficient time devoted to lead-in.
- We need to move to 2 1/2 days...covering a decade—1995 decisions - 2000 consequences & 2000 decisions - 2005 consequences.
- Allow more time for strategy development (initially, before negotiations start).
- Increase the length of time for the Game to 2 - 2 1/2 days. Define more clearly the relationship (at game beginning) between the DOE and LOB.
- Go to a full 2 1/2 days—we need more time to construct strategies and moves.
- Carry out a full prosperity game in this area (2 - 2 1/2 days) involving decision makers in all of the selected areas.

Inbriefing

- Game worked well—was very engaging. Not always clear that the same rules worked for LOB/DOE/Congress as for the labs. For optimal learning, it might be useful to emphasize the collaborative model up front.
- Give detailed explanations on process beforehand (how/when to use which forms).
- Format for reporting could be more consistent so it is clear what the challenges, strategies, and moves are.

Debriefing

- We need to figure out a better way for processing information at the end of the game.
- Group presentations should be more of a lessons-learned session, highlighting insights what we should do different.
- Develop a better evaluation form—ask participant's satisfaction—what was best about the program—what needs to be improved—quality of the program—quality of facilitators.

Innovator Polling

- Capturing perceptions on downsizing (general and personal perceptions) added realism.
- The Game was well thought out. The ability to poll and get instant feedback was very effective.
- There should be room for a negative answer to some questions.
- How you will use the information to make effective business decisions, is unclear.
- I like the electronic polling—change “neutral” to “moderate.”
- The electronic polling is an excellent mechanism for input from large number of respondents with quick turn-around and display. But are we measuring the critical parameters?
- Providing the results to team members for review later would be good. It would allow them to think about the relationship between diversity and team outcomes.
- Innovator is a good tool to use. I like the fact that we can view results immediately.
- The Games are an excellent resource for establishing a starting point for

diversity; they immediately introduced the “people” aspect to a technical process.

- Electronic polling is useful in defining audience make-up; it gives instant feedback.
- The appropriate questions were asked; it was nice to receive immediate results.

General Comments on Game and Suggestions for Improvement

- The overall idea of the game was quite intriguing. If money and scoring can be made a little more realistic, it could work very well.
- The Game was energizing, frustrating, frighteningly real.
- If there is a real-world working definition of “Lead Lab” it would have helped to know it.
- We need more detailed budget information.
- Explain the rules better, for example: Toolkit options are on separate sheets and don't require signature.
- Include more information about the labs in the manual.
- Very enlightening.
- Game gets the adrenaline flowing.
- Interacting with the other teams was insightful.
- I experienced lots of interesting information. I enjoyed the game after I caught on.
- Great fun and insight!!
- Too much chaos!
- Stimulating, fun and complicated.

- Thanks for inviting me! I enjoyed the Game and my team.
- Toolkit options explanation was not clear.
- The game was very well organized and well facilitated; the scenario was real.
- Funds should be one metric of success and need to be tracked carefully.
- The situations you used were very real; real jobs and careers are at risk.
- Team composition should include at least 5-6 players (less than 5 creates a stressful environment for the players and limits their engagement compared to larger teams).
- The Game needs a comprehensive explanation of toolkit options to participants and the benefits/disadvantages of spending and keeping funds in reserve.
- The Game needs market data about industry to show areas where we might divest—if industry is better in a particular area.
- The Game needs more information about the purpose/use of certain facilities (NIF, DARHT).
- The Manual needs more data .
- The Game should be extremely interesting as an exercise with the “real” participants.
- The Game was extremely realistic and timely—but watch out for emotional aspect as “real jobs of real people” are debated.
- An “empathy building” exercise (changing places) could be valuable if it was well executed.
- Please provide a report, to players of this prototype Game, on the outcome of this game if it is played by real lab and agency leaders.
- Ask players if participation in game changed/improved anything about their regular work.

All suggestions are appreciated and are being evaluated to redesign this and other Prosperity Games for the future.

APPENDIX A - LIST OF PARTICIPANTS

NAME	COMPANY	ADDRESS	TEAM
Mary Ann Zanner	Sandia National Labs	Org. 1000, MS 1431	ANL
James I Crowther, Jr.	Sandia National Labs	Org. 4112, MS 0419	ANL
Judith McKinney	Sandia National Labs	Org. 1000, MS 1431	ANL
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Patricia Knighten	Sandia National Labs	Org. 4221, MS 1380	ANL
Denise Sawyer Johnson	Eastman Kodak Company	Educ. & Dev. Center; Rochester, NY	Congress
Curtis Hines	Sandia National Labs	Org. 4101, MS 0421	Congress
Dru Popper Lopez	Sandia National Labs	Org. 4202, MS 1380	Congress
Linda Lovato	Sandia National Labs	Org. 3612, MS 1087	Congress
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Gail Willette	Sandia National Labs	Org. 7000, MS 1067	DOE
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APPENDIX A - LIST OF PARTICIPANTS (continued)

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Berweida Learson	Sandia National Labs	Org. 3612, MS 1087	SNL
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Cheryl Mitchell	Sandia National Labs	Org. 4701, MS 1151	GT
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APPENDIX A - LIST OF PARTICIPANTS (concluded)

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Lori Teller	Growth Technologies	2489 Manzano Loop, Rio Rancho, New Mexico 87124	LLNL
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Venus Sanford	Business Solutions	PO Box 35627, Albuquerque, NM	NREL
LaVonne Wahl	Communication Consultant	3011 Jane Place NE, Albuquerque, NM 87111	ORNL
Dragana Kvajic	Kaleel Jamison Consulting Group	3610 Yacht Club Drive, Ste 210, Aventura, FL 33180	SNL

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APPENDIX B - MANY CORE COMPETENCIES ARE SHARED AMONG THE LABS

Core Competencies	ANL	BNL	INEL	LANL	LBL	LLNL	NREL	ORNL	PNL	SNL
Nuclear ordnance										X
Lasers						X				
Microelectronics and photonics										X
Chemical Sciences	X				X					
Nuclear explosives S&T				X		X				
Plasmas and beams				X						X
Neutron-based S&T	X							X		
Science-based engineering of fission energy systems	X		X					X		
S&E Education	X	X						X		
Advanced manufacturing						X		X		X
Accelerator-based user facilities	X	X		X	X					
Energy supply and efficiency					X		X	X		X
Sensors and instrumentation					X	X			X	X
Bioscience and biotechnology	X			X	X	X		X		
modeling and simulation	X			X		X		X		X
Energy systems	X						X	X	X	X
Materials sciences	X				X	X	X	X		X
Industrial partnerships	X	X					X	X	X	X
Environmental technology			X	X	X	X	X		X	X

Program Balance is Revealed in 1993 Budgets

Program Area	ANL M\$	BNL M\$	INEL M\$	LANL M\$	LBL M\$	LLNL M\$	NREL M\$	ORNL M\$	PNL M\$	SNL M\$
Energy Research	133	187	13	65	130	86	4	177	51	26
Defense Programs	2	11	25	542	0	390	0	11	4	712
Restoration and Waste Mgmt.	75	19	392	195	11	76	0	105	177	132
Efficiency & Renewables	16	3	6	11	15	0	130	66	20	40
Fossil Energy	8	0	0	0	2	10	0	6	0	13
Nuclear Energy	115	3	89	22	0	86	0	28	0	0
Other DOE Programs	17	8	25	33	8	76	1	22	43	26
Other DOE Contractors	16	8	25	54	6	57	0	66	16	0
Work for Others	71	39	57	163	40	171	0	72	87	369
Totals	454	279	632	1084	212	952	136	552	398	1318

Congressional Connections

Facility	Senator, Year Committees	Senator, Year Committees	Representative, Year, Committees
Allied Signal Kansas City	John Ashcroft (R), 1/95 Commerce, Science & Transport Foreign Relations Labor & Human Resources	Christopher S. Bond (R), 1/87 Appropriations Banking, Housing & Urban Aff. Budget Environment & Public Works Small Business	Karen McCarthy (D), 1/95 Small Business Science
Argonne National Laboratory	Carol Moseley-Braun (D), 1/93 Banking, Housing & Urban Aff. Finance Special Aging	Paul Simon (D) 1/85 Budget Indian Affairs Judiciary Labor and Human Resources	Harris W. Fawell (R), 1/85 Economic & Educational Opp. Science
Brookhaven National Laboratory	Alfonse M. D'Amato (R), 1/81 Banking, Housing & Urban Aff. (Chairman) Finance	Daniel P. Moynihan (D), 1/77 Environment and Public Works Finance Rules and Administration Joint Library of Congress Joint Taxation	Michael P. Forbes (R), 1/95 Appropriations
Idaho National Engineering Laboratory	Larry E. Craig (R), 1/91 Agriculture, Nutrition & Forestry Energy and Natural Resources Veterans Affairs	Dirk Kempthorne (R), 1/93 Armed Services Environment and Public Works Small Business	Michael D. Crapo (R), 1/93 Agriculture Commerce
Lawrence Berkeley Laboratory	Barbara Boxer (D), 1/93 Banking, Housing & Urban Aff. Budget Environment and Public Works	Dianne Feinstein (D), 11/92 Foreign Relations Judiciary Rules & Administration	Ronald V. Dellums (D), 1/71 National Security

Congressional Connections (concluded)

Facility	Senator, Year Committees	Senator, Year Committees	Representative, Year, Committees
Lawrence Livermore National Laboratory (also Sandia California)	Barbara Boxer (D), 1/93 Banking, Housing & Urban Aff. Budget Environment and Public Works	Dianne Feinstein (D), 11/92 Foreign Relations Judiciary Rules & Administration	Bill Baker (R), 1/93 Transp. and Infrastructure Science
Los Alamos National Laboratory	Jeff Bingaman (D), 1/83 Armed Services Energy and Natural Resources Joint Economic Committee	Pete V. Domenici (R), 1/73 Appropriations Budget (Chairman) Energy & Natural Resources Indian Affairs	Bill Richardson (D), 1/83 Select Com. on Intelligence Resources
National Renewable Energy Laboratory	Hank Brown (R), 1/91 Budget Foreign Relations Judiciary	Ben N. Campbell (R), 1/93 Agricul., Nutrition & Forestry Energy and Nat. Resources Indian Affairs Veteran's Affairs	Dan Schaefer (R), 3/83 Commerce Veterans Affairs
Oak Ridge National Laboratory	Bill Frist (R), 1/95 Banking, Housing & Urban Aff. Budget Labor & Human Resources Small Business	Fred D. Thompson (R), 1/95 Foreign Relations Governmental Affairs Judiciary Special Aging	Zach Wamp (R), 1/95 Transp. and Infrastructure Regulation and Paperwork Science
Pacific Northwest National Laboratory	Slade Gorton (R), 1/89 Appropriations Budget Commerce, Science & Transp. Indian Affairs Labor & Human Resources	Patty Murray (D), 1/93 Appropriations Banking, Housing & Urban Aff. Budget	Richard Hastings (R), 1/95 National Security Resources
Sandia National Laboratories, NM	Jeff Bingaman (D), 1/83 Armed Services Energy and Nat. Resources Joint Economic Committee	Pete V. Domenici (R), 1/73 Appropriations Budget (Chairman) Energy & Natural Resources Indian Affairs	Steven Schiff (R), 1/89 Govt. Reform and Oversight Judiciary Science Standards of Official Conduct

APPENDIX C - TEAM DESCRIPTIONS

Congress

Congress is the equivalent of a board of directors for the government and represents and interprets the interests of the voters, who are the corporate equivalent of shareholders.

The growing budget deficit and the Republican's Contract With America resulted in a major realignment in Congress in 1994. The Republican majority of Congress acts on its perceived mandate to reduce government size and spending dramatically. The experiences of corporate re-engineering affirm that the only real way to save money is to eliminate functions; Congress is exploring the dissolution of the Departments of Energy, Commerce, Education, and Housing and Urban Development. The initiative is budget driven.

Advocates in Congress are preparing to debate the formation of a Department of Science composed of the science capabilities of DOE, NASA, NIST, NSF, USGS, EPA, and NOAA with a \$35B budget. Whether the Department would function as a synergistic whole or simply be like a holding company is a key question. If the latter, the activities will go to the agency level and not have cabinet status.

Driven by concerns over the budget deficit, Congress studies the formation of a Laboratory Closure Commission. The process will result in closure of one or more DOE labs unless unified action by the laboratories address the budget reductions in a business-like manner.

The Roemer Bill to cut the "Energy Labs" by 30% over five years (from 45,000 people to 30,000 people) is pending.

Department of Energy

DOE is accountable primarily for the nuclear stockpile, for energy policy, for cleaning up the nuclear legacy of the cold war, and the utilization of the national laboratories for the national interest. As manager of the largest national laboratories, DOE has the basis for a Science Department.

DOE is being reorganized and restructured into four lines of business; defense, energy, environment, and science.

The confusion associated with the restructuring and realignment has left the department at a disadvantage in advocating programs and initiatives with Congress, the rest of the Administration, and the American people.

Press reports and DOE announcements of nuclear practices of the last 50 years that do not meet the higher standards of today have resulted in general distrust of DOE and of science in general.

DOE is currently under stress from Congress to undergo major reform or dismantlement. The Roemer Bill calls for a 30% cut in the energy labs (defense labs excluded) over the next 5 years. Secretary of Energy has pledged to cut spending by \$14.1B over the next 5 years, an average of about 15%.

The Department has responded to the Galvin Commission's call for corporatizing the DOE with a counterproposal that implicitly argues that the Department is already corporatized except for an Advisory Committee, which prompted the formation of the Laboratory Operating Board. The concept is summarized in the following figure:

"Corporatizing" the Department of Energy	
XYZ Corporation	Taxpayers
Board of Directors	Congress
CEO & Office of Chairman	Secretary, Deputy, Under Secretary Chief Financial Officer, etc.
Senior Vice Presidents	Senior Political Officials
Vice President /General Managers	Civil Servant Deputies
Business Division R&D Labs	National Labs
Corporate Technology Council	"Missing Link" (DOE Lab Operating Board)

"Corporatizing" the Department of Energy

Laboratory Operating Board

The actual Laboratory Operating Board (LOB) will be chaired by the Under Secretary of Energy. Membership will consist of the senior management officials within the Department as well as a subgroup of private sector executives who compose an external advisory panel. In the Prosperity Game, the DOE Officials compose the DOE and the industry executives compose the LOB Team. Members of the external advisory panel would be appointed to six year, overlapping terms in order to provide continuity and institutional memory through changes of Administration. This new Board would be expected to meet quarterly, and would have jurisdiction over issues such as:

- High-level strategic direction for the laboratories, including validation of strategic plans, cross-cutting programmatic and management issues, and facility rationalization;
- Managing development and implementation of a Strategic Laboratory Mission Plan, which will include a mission statement for the entire laboratory system and more tightly focused missions for each of the laboratories; this plan will serve as the

framework for down-sizing and "rightsizing" efforts that would tailor laboratories to the size of their purpose;

- Monitoring, expanding upon, and ensuring implementation of the Management Improvement Roadmap;
- Cost-containment, including ensuring application of best business practices, addressing cost-benefit issues related to administrative and regulatory requirements;
- Analysis and determination of Centers of Excellence and lead-laboratory designations.

Through these authorities, the Lab Operating Board could play a major role in the issues of mission allocation and laboratory sizing raised by the Galvin Task Force.

Argonne National Laboratory

The Advance Photon Source is the state of the art synchrotron x-ray source that is nearly completed. It will form a major user facility for a wide range of materials and biological research by government, university, and industry personnel for the next several decades. The APS may provide the focus to compensate for the loss of nuclear reactor and neutron physics programs, the historic mainstay of the Argonne Mission.

The move to support basic research during budget cuts encourages some in Congress to consider turning the national laboratories with special facilities into user facilities with dormitories for visiting university and industry scientists but with very little in-house scientific capability. The cost of the infrastructure to support the user facility has not been determined.

Brookhaven National Laboratory

The National Synchrotron Light Source has a strong customer base but may be vulnerable as the ALS at LBL and the APS at Argonne attract customers for different but related work.

The Relativistic Heavy Ion Collider (RHIC) construction project is approximately 50% completed with 14% of its life cycle costs expended. The facility will assure BNL a future as at least a user facility.

The High Flux Beam Reactor (HFBR) is aging. It could be upgraded in lieu of the stalled Advanced Neutron Source if the Accelerator Produced Tritium project loses to a new reactor for tritium production. However, selling the upgrade would be hard in this decade of severe concern over the budget deficit.

The move to support basic research during budget cuts encourages some in Congress to consider turning the national laboratories with special facilities into user facilities with dormitories for visiting university and industry scientists but with very little in-house scientific capability. The cost of the infrastructure to support the user facility has not been determined.

Idaho National Engineering Laboratory

DOE guidance provides for INEL to lead in the clean up of mixed waste—the combination of chemical and radioactive waste.

Under new management, INEL is aggressively marketing its capabilities in large-scale testing and in engineering.

Lawrence Berkeley National Laboratory

LBNL has very strong ties with professors in the sciences at the University of California at Berkeley and enjoys general support from academia. They will be hurt somewhat by the reductions in energy conservation R&D but their Advanced Light Source (ALS) is an anchor that assures its future as a user facility with strong coupling to academia and industry. Its program in Human Genome decoding is growing.

Lawrence Livermore National Laboratory

The Galvin Commission and derivative reports slates LLNL to divest its nuclear weapon design work to LANL, possibly in return for increasing its role in non-proliferation, counter-proliferation, and environmental work.

Its future will be considered in the Interagency Study Group reporting on October 31, 1995, in the Programmatic EIS on Stockpile Stewardship reporting in the Fall of 1996, and in the EIS for the National Ignition Facility also reporting in the fall of 1996.

LLNL is the advocate and obvious site for the National Ignition Facility. Every member of the California Congressional Delegation has pledged his or her support for the NIF at LLNL. Many consider it essential for the future of LLNL. However, its billion-dollar-plus price tag comes at a difficult time while the nation is trying to cut back on expenditures.

Los Alamos National Laboratory

DOE guidance provides for LANL to become the focus of work on the design of the "physics package" in a nuclear weapon and to become the plutonium parts production facility for the few new weapon assemblies that are needed in the future.

The construction of the Dual-Axis Radiographic Hydrotest (DARHT) Facility has been delayed by a successful protest from an environmentalist group. The Environmental Assessment is in process to resume construction. The facility is broadly supported as necessary to partially compensate for the cessation of underground nuclear testing.

The Interagency Study Group examining the future of LLNL will report on 10/31/95. Proactive management of the Laboratory in the context of other laboratories can best be done now with coordinated input to this study.

National Renewable Energy Laboratory

The reductions in funding for demonstration projects in renewable energy are serious threats to NREL. As the newest laboratory with ambitions of being a full multiprogram national laboratory, this is a critical time for NREL. It is trying to grow while the country is dedicated to cutting back. In addition, opponents claim that it exists as a politically created entity and will live or die on that basis. Such claims may be validated or rejected when the Laboratory Realignment and Closure Board assess the cost of keeping NREL open.

Oak Ridge National Laboratory

ORNL had hoped that the Advanced Neutron Source (ANS) would provide the key facility to assure its future. However, the severe budget deficit makes the ANS unlikely. If the Accelerator Produced Tritium (APT) project goes ahead, the neutron community will use the spallation source for intense neutrons in lieu of the ANS.

If Congress decides that a nuclear reactor is the viable way for the country to assure its tritium supply, the APT project will be terminated but the ANS will probably still not be built. ORNL can help in the design of the reactor for tritium production, which will likely be built at Savannah River, unless that site is closed down over the objections of its strong congressional delegation. ORNL could also develop a process for using substitute fuel rods and auxiliary tritium producing and collecting systems in commercial nuclear reactors although that practice is presently prohibited by law.

Fusion and conservation are going down. The materials expertise at ORNL is world class. ORNL's aggressive outreach to industry has been successful during the years of technology transfer. ORNL has traditionally enjoyed excellent congressional support.

Pacific Northwest National Laboratory

PNL's traditional strengths in the environment and in assisting innovation in industry have resulted in substantial growth in budget and personnel in recent years:

Year	FY93	FY94	FY95
Budget (M\$)	466	530	625
Personnel	3978	4239	4695

However, the budget deficit is threatening PNL with some downsizing, although attrition can probably handle it.

There is a general recognition that the Hanford nuclear waste legacy must be addressed. The proximity of Hanford to PNL and PNL's expertise in environmental technologies lead the DOE and Congressional policy makers to favor PNL for help. DOE guidance lists PNL as the lead laboratory in the clean-up of nuclear waste.

In addition, it enjoys a unique position through Battelle Memorial Institutes, a resource for innovations to commercial industry. The strong program of work for industry is stable.

Sandia National Laboratories

Sandia researches, develops, and designs the non-nuclear parts of nuclear weapons and is accountable for the continued surety of the nuclear. As the production complex shrinks, Sandia is moving some specialized production back on site and relying more on industry for other production capabilities.

The increasing resistance to national laboratories working for the Department of Defense has resulted in substantially decreasing budgets for its Work for Others program. Their Energy Programs are increasing slightly but are not sufficient to compensate for the budget cuts in other programs. Attrition is not sufficient to handle the projected budget shortfall.

Allied Signal, Kansas City

The Kansas City Plant of the Department of Energy manufactures electrical, mechanical, and plastic parts and assemblies for DOE nuclear weapons. Their facilities are available to other government agencies and to industry, academia, and the local community to help improve industrial competitiveness. Flexible, environmentally conscious manufacturing of precision components is a strength forged from their experience in manufacturing weapon components.

The plant was established in 1949 and was operated by the Bendix Corporation until Bendix was taken over in 1992 by Allied Signal Inc., the 35th largest company in the US with sales of approximately \$11.8B. In 1993, DOE established the Kansas City Plant as the consolidated site for manufacturing all non-nuclear components for nuclear weapons. In 1994, the 258,000 square-foot Technology Transfer Center opened at the Plant.

The decrease in weapon production led the Galvin Commission to recommend consolidation of the production complex to Pantex, Sandia, and LANL, which opens the question of closing Kansas City. However, the management of Allied Signal at Kansas city recalls the painful downsizing of Kansas City from a peak of 8,000 in 1985 to about 3,300 in 1994 and are motivated to maintain or increase their position. A plan is in progress for providing to LANL the same services traditionally provided by Sandia. The champions argue that DOE should take the lessons from industry and move research and development closer to production (move design to Kansas City) rather than move production to research (move production to Sandia).

Facilities

Kansas City Production Plant
Flexible Manufacturing Center
Electronics Training Center
Metrology and Precision Measurement Center
Analytical and Testing Centers in chemical, physical, mechanical, and metallurgical analysis
Nondestructive and environmental test capabilities.

Green Team

The Green Team orchestrates the game process—the players control the content—to produce the greatest opportunity for the players to address the objectives of the Games. They represent the rest of the world. The team represents finance, investors, consumers, suppliers, voters, the media, labor, and other governments and industries as needed. The Green Team will:

- 1) Participate as the rest of the world in team negotiations as requested
- 2) Provide information and responses as needed
- 3) Determine probabilistic outcomes of investments and negotiations
- 4) Keep the game interesting and moving.
- 5) Avoid manipulative actions so players can control the content of the games.

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APPENDIX D - SCHEDULE

PROSPERITY-DIVERSITY GAME

Focusing on

Strategic Restructuring for Reduced Budgets Among the Family of DOE Laboratories

Schedule for May 24, 1995

Fred Harvey Hotel Ballroom

- 6:00 pm No host bar, complimentary appetizers, and "Hello" Process.
- 6:30 pm Inbriefing on what this is all about, introduction to electronic tools, and pregame survey—Pace VanDevender, Game Director
- 7:00 pm Complimentary fiesta dinner with your team members —Get to know each other's strengths.
- 7:50 pm Questions and clarifications from the audience - Pace VanDevender, Game Director
- 8:00 pm Discuss the merits of competition, collaboration, evaporation, and consolidation in the context of the anticipated Lab Closure Board. Decide on your team's fundamental approach. Since players control the content of the game, deception is not ruled out, but it is not recommended.
- 9:00 pm Adjourn for the evening.

Schedule for May 25, 1995

- 7:30 am Coffee, tea, and calories.
- 8:00 am Morning "Hellos" and one word individual check-in with group.
- 8:20 am Divide into your teams, review and amend proposed ground rules, and brainstorm your organization's strengths, challenges (weaknesses and threats) and options (opportunities).
- 9:00 am Use voting system and discussion of significant variations from consensus to develop priority options for the organization.
- 10:00 am Choose which (if any) Technology and Policy Toolkit Options you wish to advance or retard with your initial budget allocations. Solicit information and co-investments from other teams by negotiation or persuasion. All agreements must be in legible writing on Prosperity Games forms.

- 11:00 am **Final team allocations of Toolkit investments are turned in to Green Team. After this time, the influence factors all equal one.**
- Open negotiation period between and among all teams to work issues and opportunities that will build new capabilities for more penetrating and robust strategies for providing service in the national interest.
- 12:00 pm Working lunch in which individuals report to their own team what they learned. (Green Team: Toolkit Options are tabulated, probabilities calculated, successes and failures determined, and the results of the voting are determined.) Facilitator/analysts lead teams through charting of priority challenges, corresponding strategies, and proposed thrusts, which contain moves to make the most penetrating and robust, growth-oriented strategies. Each team scores the proposed strategic structure and use results to improve plan. Facilitator/analyst selects spokesperson for team.
- 1:30 pm Implement improved strategies by negotiating moves with other teams; legibly document all agreements on the official forms and obtain signature of Green-Team member who will copy form for official record and provide copy to DOE, LOB, and Congress. Public release of each deal is preferred, but optional. If consolidations have occurred, rearrange groups to reflect the new teams.
- 2:30 pm Teams reassemble to discuss their progress and make any changes in their planning matrix based on the actions implemented, and score the resulting matrix.
- 3:15 pm All participants assemble for recording metrics on inclusiveness. Facilitator/analysts adjourn with results to correlate facilitator/analysts' qualitative observations on inclusive behavior with quantitative team metrics on inclusiveness and to correlate team score on inclusiveness with score on penetration and robustness.
- 3:45 pm Team spokespeople present strategy matrices and explain advances in plenary session (4 minutes each). Everyone votes on the potential for each team's (or consolidated team's) accomplishments to prepare the organization for upcoming budget cuts.
- 4:45 pm Review voting results.
- 4:55 pm Spokesperson from facilitator/analysts reports conclusions.
- 5:15 pm Record feedback on game processes with Innovator. Thank all participants.
- 5:30 pm Adjourn

APPENDIX E - AGREEMENTS AND CONTRACTS

Rank	Terms and Conditions	Funds		Agreement Times													Time	
		Transfer	CON	DOE	LOB	ANL	BNL	INEL	LBLL	LLNL	LANL	NREL	ORNL	PNL	SNL	ASKC	Green	
	LOB will provide program development funds of 10% of total assets for signed agreement that all proposals presented to LOB in future will have sign-off by each lab.	\$8.9M to ANL \$10.8M to LANL \$9.5M to INEL All \$ from LOB			1024	1025		1031			1030							1040
	We will provide program development funds of 10% of your operating budget for signed MOUs between labs and LOB. All proposals presented to LOB in the future will have sign-off by each lab.	\$9.5M to LLNL \$4.2M to LBNL \$2.7M to NREL All \$ from LOB			x				x	x		x						1040
	We will program 10% of total assets for signed agreements; will be partnered between all labs (all proposals signed by all labs).	\$13.2M to SNL \$8.3M to ORNL All \$ from LOB			x								x			1032		1040
	Idaho Governor agrees to use political influence on behalf of INEL to Congress and DOE in exchange for perceived economic value to the state of Idaho.							1042										1045
	LBL will help leverage INEL and rest of supporters to Toolkit #4 option. LBL contributes \$10M in return for \$5M later	\$10M from LBL to INEL					1055	x										x

APPENDIX E - AGREEMENTS AND CONTRACTS (continued)

Rank	Terms and Conditions	Funds		Agreement Times													Time	
		Transfer	CON	DOE	LOB	ANL	BNL	INEL	LBL	LLNL	LANL	NREL	ORNL	PNL	SNL	ASKC	Green	
	Debt to LBL paid	\$5M from INEL to LBL																1205
	LOB proposes that DOE and Congress not accept proposals for funding w/o a business plan that includes other lab, industry and university participation.	1058	x	1058														1059
	ANL leads the effort for development of a National Energy Program w/ANL acting as lead integrator with the other ER labs (BNL, LBL, ORNL).	\$50M from LOB to ANL; \$50M from DOE to ANL; \$50M of ANL funds used		1100	1100	1100	x	x	x		x	1100	x					1100
	The Mescalero Apache tribe agrees to empower INEL to represent the tribe in discussions and negotiations with PNL, Congress, DOE. PNL and INEL agree to provide in kind technical services, related tech transfer, etc. for M&O of fuel storage facility.							1103										1104
	PNL agrees to invest \$40M in new environmental technologies in exchange for a proportional share of the work.	\$40M from PNL to INEL						1037							1040			1152
	LANL will give up Renewable Energy program. We propose that NREL be the lead lab in RE. Good will and cost savings for LANL.										1108	1108						1117
	LOB/DOE/Congress agree on baseline set of criteria to apply to all funding projects: synergy across labs; clear focus of Centers of Excellence; efficiency; integrating mechanisms; involvement of university and industry research efforts.	1115	1115	1120														1120
	ANL supports NREL as lead lab for RE programs. NREL agrees to support ANL's proposal to create an overarching program to manage all of DOE's energy programs.				1113						1115							1120

APPENDIX E - AGREEMENTS AND CONTRACTS (continued)

Rank	Terms and Conditions	Funds	Agreement Times													Time	
		Transfer	CON	DOE	LOB	ANL	BNL	INEL	LBL	LLNL	LANL	NREL	ORNL	PNL	SNL	ASKC	Green
	Policy has been adopted to establish competitive bid process for non-nuclear weapons work at labs and facilities. This will promote teaming on proposals to assure best capabilities, locations, etc. on DOE programs.			x						x							1125
	LBL will invest \$15M to Toolkit option #4. LANL will pay LBL \$12M after exercise of Toolkit option.	\$15M from LBL to LANL							1105		1105						1125
	Debt to LBL paid	\$12M from LANL to LBL															1202
	DOE list of lead labs - Rules: All funding for programs goes to lead lab; all decision making on collaboration to lead lab; no overlap.			x													1128
	SNL supports NREL as lead lab in ER. NREL will subcontract work in efficiency and renewable energy to SNL.											1127				1125	1128
	DOE to appoint NREL as lead lab in RE. DOE will centralize and focus the RE program. No fee. Total funding \$300M. Value to DOE \$30M. Value to other labs - subcontract.			1130									1130				1135
	The three weapons labs support the lead lab concept for weapons design, development and stewardship.			x	x	x		x	x	1125	1125	x	x			1125	1141
	LBL to assess public/business/education perceptions of role of national labs. Complex will record assessments and models. New business models to develop national advocacy.	\$5M from LOB to LBL; \$1M from each other lab to LBL			x	x	x	x		x	x	x	x	x	x		1217

APPENDIX E - AGREEMENTS AND CONTRACTS (continued)

Rank	Terms and Conditions	Funds		Agreement Times													Time		
		Transfer	CON	DOE	LOB	ANL	BNL	INEL	LBL	LLNL	LANL	NREL	ORNL	PNL	SNL	ASKC	Green		
	SNL and ASKC agree to collaborate on agile mfg. upgrade and electromechanical mfg. at ASKC site until end of ASKC contract and then consolidate ASKC with Lock-Martin-SNL. DOE provide \$20M. SNL assists in tech trans. and privatization.	\$20M from DOE to SNL; cost savings to DOE of \$200M/year after 3 years.		125													1035	1039	1325
	ASKC drops deal with LANL to compete with SNL.																		
	LOB becomes a vital, relevant, value-adding mentor to the national lab system by becoming congressionally appointed. and recognized.		120		120														1329
	LBL is performing a jointly funded complex-wide study of perceptions/ realities w/i DOE lab system. Results avail in 2 years. Congress agrees not to make decisions about lab closures before study complete. Congressional input to study will be sought.		x						x										1400
	Collaborate with academia, industry, OFA's to open user facilities at LBL, ORNL, ANL, BNL for new material research with application in energy efficient transportation.	\$1M to ANL from each of ORNL, LBL, BNL.				200	200		x					x					1400

APPENDIX E - AGREEMENTS AND CONTRACTS (continued)

Rank	Terms and Conditions	Funds Transfer	Agreement Times													Time Green		
			CON	DOE	LOB	ANL	BNL	INEL	LBL	LLNL	LANL	NREL	ORNL	PNL	SNL		ASKC	
	Increase R&D tax credits for CRADA funding for dual (weapons programs/ industry) benefit. Tax revenue foregone in near term will be recouped or increased by taxes from new prods from new CRADAs.		x	x														1405
	LBL gives \$10M for computer consortium (at LANL, SNL, LLNL) in return for access to the system at reasonable user charges for actual services.	\$10M from LBL to toolkit #3							1100	200	200					1100		1410
	LBL will seek support from Green team and DOE for a high-efficiency lighting program. All labs must be aware of this effort. Electrical industry guarantees purchase at \$10M/year for 5 years if specs met.	\$10M purchase guarantees from industry		x					210									1410
	Privatize LANL accelerators & SNL Solar tower. Labs provide \$5M startup costs from LDRD. Industry pays 20% of user fees to labs. Labs pay for use. Industry operating costs result in 25% savings per hour tower usage to labs.											x				158		1411
	New technology funding for PNL is proportional to original contribution.	\$128M to PNL from INEL						210								210		1415
	New technology funding for LBL is proportional to original contribution.	\$32M to LBL from INEL						210	210									1415
	New technology funding for LANL is proportional to original contribution.	\$64M to LANL from INEL						210				210						1415

APPENDIX E - AGREEMENTS AND CONTRACTS (continued)

Rank	Terms and Conditions	Funds		Agreement Times													Time
		Transfer	CON	DOE	LOB	ANL	BNL	INEL	LBL	LLNL	LANL	NREL	ORNL	PNL	SNL	ASKC	Green
	New technology funding for LLNL is proportional to original contribution.	\$64M to LLNL from INEL						210		210							1415
	New technology funding for ANL is proportional to original contribution.	\$32M to ANL from INEL				210		210									1415
	New technology funding for ORNL is proportional to original contribution.	\$128M to ORNL from INEL						210					210				1415
	New technology funding for SNL is proportional to original contribution.	\$64M to SNL from INEL						210							210		1415
	Agreement on redesign of the National Lab system per flip chart. LOB, DOE and Congress will work out implementation terms and carry out in 2 moves.		210		210												1418
	LLNL to be designated lead lab in lasers (following guidance from the Galvin report).			217						217							1420
	LANL will turn over ER program to ANL. LANL will allow ANL to manage program, but experiments best done in LANL facilities will remain.					225						225					1426
	University executes assessment of perceptions per LOB/Lab process. Effort to develop national advocacy for labs by identifying/closing perception and performance gaps.	\$5M to Univ. from LBL							230								1430

APPENDIX E - AGREEMENTS AND CONTRACTS (continued)

Rank	Terms and Conditions	Funds		Agreement Times													Time	
		Transfer	CON	DOE	LOB	ANL	BNL	INEL	LBL	LLNL	LANL	NREL	ORNL	PNL	SNL	ASKC	Green	
	Develop and implement business models that reflect national assessment and create national advocacy (research/productivity model).	\$1M to ORNL from LBL							230					230				1431
	Congress passes legislation to allow for commercial reactor production of tritium.		230															1435
	ANL implements initial studies in lead role: ORNL/LBL \$20M clean car; ANL/BNL \$30M global climate change; ANL/ORNL \$25M alt energy sources. Follow-on funding from DOE for implementation.	\$35M to ORNL; \$10M to LBL; \$30M to BNL; all \$ from ANL			230	235			234					232				1435
	ANL funds university research in advanced materials at national lab user facilities. Funding to be matched by industry up to \$1M per participant. Maintains expertise at ANL.	\$1M to Univ. from ANL			225				225					225				1435

APPENDIX E - AGREEMENTS AND CONTRACTS (continued)

Rank	Terms and Conditions	Funds	Agreement Times													Time		
		Transfer	CON	DOE	LOB	ANL	BNL	INEL	LBL	LLNL	LANL	NREL	ORNL	PNL	SNL	ASKC	Green	
	Multi-lab partnership to work with Mescalero Apaches on storage of nuclear waste to ensure safety, security, proper handling, etc. Bureau Indian Affairs to provide educational support. Lab funds to labs.	\$5M from ANL, INEL, LANL, ORNL (4), SNL, PNL, LOB, Con, BIA	x		x	x		x			x			x	x	x		1438
	All labs participate in lab implementation group: POC, public assessment, business modeling, review results, refocus per gaps, address perception gaps, evaluation and continuous improvement	\$1M to each other lab from LBL		x	x	x	x	x	x	x	x	x	x	x	x	x		1440
	Endowment to create national S&T university to mentor industry; university and lab relations to solve to be defined national needs of import. Endowment will facilitate opportunities for future National Industrial alliances.	\$30M to MIT from LOB			230													1443

APPENDIX E - AGREEMENTS AND CONTRACTS (concluded)

Rank	Terms and Conditions	Funds			Agreement Times											Time	
		Transfer	CON	DOE	LOB	ANL	BNL	INEL	LBL	LLNL	LANL	NREL	ORNL	PNL	SNL	ASKC	Green
	LLNL will turn over \$50M ER program to ANL. ANL will manage, but still do experiments in LLNL facilities. ANL will give \$50M in virology, biochem warfare, biotech, genetic engineering, etc.					x				x							1500
	SNL and LANL agree to phased lab consolidate that will reduce total operating costs by 20% in 7 years in return for funded program (DOE-DOD) in defense w/r/t weapons (including smart weapons). Support role in EE only.		x	311		x		x	x	x	200	x	x		203		1519

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APPENDIX F - SCORING SYSTEM FOR STRATEGIES

The facilitator/analyst will help the team score their own strategies and all the players will vote on the overall penetration and robustness of each team's score at the end of the day. Therefore, the players do not have to be experts in the scoring system. However, the background to the scoring system, a proprietary Prosperity Games feature, is summarized in this section for your general information.

Many executives have played business simulations in which the company with the highest profits won. Business simulations usually focus on profits and losses of individual corporations or their business units. However, Prosperity Games are games of discretion and judgment at the executive level of industry and government. These executives are concerned with networking, mergers, acquisitions, and joint developments and with synergistically exploiting national and international trends to advance their organization's interests. Since there are no validated models for predicting the profits resulting from such high-level strategies in life, attempting to do so in the Prosperity Games might be trivial or manipulative. Consequently, we looked at the sophistication of the strategies to explore how these games might be productively scored.

Scoring of Strategies - Analysis and Synthesis

The Prosperity Game for the National Electronics Manufacturing Initiative involved over 1000 people-hours of high level executives interacting with trained observers recording and interpreting the events. The games provided a rare opportunity to explore strategies. Those Games concerned an advanced communication device called SAMSOM. Examples from those Games will illustrate the scoring technique, to avoid biasing the present games.

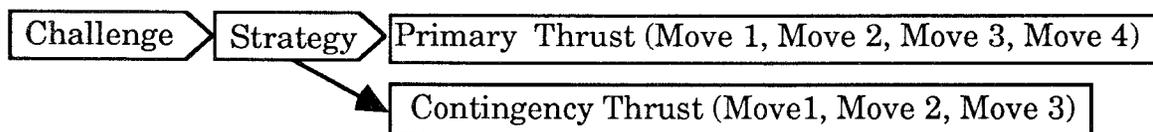
We took an empirical approach. An analogy illustrates the approach: When building a new college, the wise planner will let the students walk where they will for the first year and then capture their traffic patterns as sidewalks for future students. Similarly, we let the players formulate and implement their strategies without any guidance from the game designers so we could capture the patterns of their strategic thinking and planning for future games. This section describes what we learned.

At the start of those Prosperity Games, the players were told to develop strategies for addressing the issues in their Players' Handbook, and to implement them by negotiating deals with other teams. The players were also advised that the robustness of their strategy would be the implicit measure by which their colleagues and competitors would judge each team's results. Therefore, each team's strategies were examined in detail to see what general patterns emerged.

Definitions of Terms

- Challenge:* An issue or opportunity to be addressed. For example, assure a continually improving operating system for SAMSON products.
- Strategy:* An approach for intentionally addressing a challenge. For example, develop a standards-setting, next-generation operating system that is backwardly compatible with the current system, and market it sufficiently for setting the standard for SAMSON products.
- Move:* A negotiated agreement, toolkit option, or summit initiative; e.g., develop an alliance with a university to lay the computer-science foundation for an adaptive intelligent operating system.
- Thrust:* A series of related moves logically joined together sequentially to accomplish a strategy; e.g., (1) develop the scientific foundation for an adaptive, intelligent operating system; (2) concurrently partner with a university, the company, and a national laboratory to engineer a software testbed, and validate the system's reliability; (3) negotiate a cross-licensing agreement with competitors to promote the system as the de facto standard; (4) proceed with a professional standards-setting body to define the system as the standard; and (5) assure early market penetration by negotiating an exclusive field-of-use license for the new software with another organization.
- Penetration:* Quality and quantity of moves that were accomplished within a thrust. Penetration was obtained by negotiating deals that logically built on prior agreements to advance the play.
- Robustness:* How well the implementation of the strategy protected the team from technology or market failure, or from defaulting by another team. Robustness resulted from contingency thrusts and from developing relationships supporting a move.

The following diagram illustrates the relationships among these terms:



The resulting taxonomy of strategies led to a scoring system that is a product of this Prosperity Game. The analysis and scoring proceeded in several steps and generated a diagram of challenges to be addressed, strategies, and thrusts (with the included moves), as illustrated in the following generic diagram; Table 1, the thrusts are implicitly represented by the series of moves and the challenge and strategy are simply repeated for each thrust:

Table 1. Generic Block Diagram of a Team's Play

Key challenges	Strategy	Move 1	Move 2	Move 3	Move 4	Move 5
Challenge 1	Strategy 1-1	XXXXX	XXXXX	XXXXX	XXXXX	
Challenge 1	Strategy 1-2	XXXXX	XXXXX	XXXXX	XXXXX	
Challenge 1	Strategy 1-3	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Challenge 1	Strategy 1-4	XXXXX				
Challenge 1	Strategy 1-4	XXXXX				
Challenge 2	Strategy 2-1					
Challenge 2	Strategy 2-2					
Challenge 2	Strategy 2-3	XXXXX	XXXXX	XXXXX	XXXXX	
Challenge 2	Strategy 2-4	XXXXX	XXXXX	XXXXX		
Challenge 2	Strategy 2-4	XXXXX				
Challenge 2	Strategy 2-5	XXXXX	XXXXX	XXXXX		
Challenge 2	Strategy 2-5	XXXXX	XXXXX			
Challenge 2	Strategy 2-5	XXXXX				
Challenge 3	Strategy 3-1	XXXXX	XXXXX			
Challenge 3	Strategy 3-1	XXXXX	XXXXX			
Challenge 3	Strategy 3-1	XXXXX	XXXXX			

The issues presented to each team in their Players' Handbook were matched to the strategies developed by that team in its planning period. Each move was aligned with the strategy, or strategies it supported. When a move built on a previous move and supported the same strategy, it was diagrammed as part of the same series. In effect, it extended the thrust. The larger the number of moves in a thrust, the more each deal built on the previous successes and the more penetrating was the strategic implementation.

Scoring System

Isolated thrusts, perhaps in response to another team's initiative, received a score of +1 point. If the strategy was primarily composed of such unconnected moves, the strategy was disjunctive, as if the players were motivated to "Seize the day", or **Carpe Diem**, the first level of strategy. The following three moves from the European Government's strategy "Our policy is to ensure European pre-eminence in selected SAMSON technology" illustrate a disjunctive strategy:

- *National lab increases RF data rate by 5x.*
- *Industry-laboratory software family integrates design to delivery process.*
- *Intelligent software increases worker productivity 6%.*

Each stands alone. They are not convincingly connected in the sense that having all three together does not make the case for European preeminence much more compellingly than any of the three alone. The three moves lack a reinforcing relationship that would make the case more compelling.

If the moves have reinforcing connectivity so that multiple moves reinforce each other and build a progressively stronger case, each of those move receives a score of +2 points. If the strategy is primarily composed of moves with reinforcing connectivity, the strategy implies that the players are motivated to build the "Parts for the Whole," or **Partes Pro Toto**, the second level of strategy. For example, three other moves by the European

Government for the same strategy (*Our policy is to ensure European pre-eminence in selected SAMSON technology.*) illustrate a conjunctive strategy:

- *Robotic controllers for precision alignment*
- *0.2 micron precision assembly technology improves yield 30% and lowers cost.*
- *Packaging directly on display reduces costs and weight by 50%.*

The three reinforce each other — in this case from a core competency point of view. If a banker listened to their case for a loan to build a new factory and these three capabilities were presented to build the case for credibility, the case gets noticeably stronger with each capability.

Cross-cutting moves serve more than one strategy. By counting each such move separately — with each strategy it served — extra points per deal are obtained for cross-cutting depth.

Penetration is evident in thrusts with more than one move. Long thrusts project the situation forward in time toward the goal or vision. A strategy that manifests a series of moves, building on the results of previous moves to implement each strategy, has a sense of "It grows as it goes," or **Crescit Eundo**, the third level of strategy. Each move after the first one in a thrust receives the points corresponding to its serial place in the thrust — the Nth move in the thrust gets N points — in recognition of the good use of the intellectual capital accumulated in the previous success. For example, one company implemented their strategy — *Determine interest and benefit to industry and provide competitive/cost advantage to users* — by the following thrust with each move building on the benefits of the previous one to carry the action forward in time towards the goal:

- *Summit Topic: International partners don't dump competitive products in the US.*
- *Mechatronics grants to Infomatics exclusive rights to purchase Robo-APS equipment and all upgrades thereto as applied to all SAMSON class products; Infomatics will pay the greater of \$10M per year or 25% of SAMSON Division's increased profits for years 8 to 20.*
- *Summit Topic: Obtain equal access to foreign markets.*
- *Motorola will purchase \$100M of wafer handling equipment for new plant pending satisfactory installation. Motorola will buy wafer handling equipment for its next 3 plants. Valued at approx. \$400M.*
- *Mechatronics will supply Eurolaser with a turn-key, state-of-the-art display manufacturing facility in Europe for \$180M. Mechatronics will supply Eurolaser with upgrades at the lowest price offered to other purchasers.*

In principle, there should be an even more sophisticated strategy in which the thrusts supporting a strategy combine synergistically with external trends to create wholly new enterprises. For example, strategies that combine the trends within the games with those outside the games to make new industries, would require such a strategy. A Latin descriptor might be **Impetus Futuro**, or "Force for the Future." One enterprise, with its primary and contingency thrusts, would reinforce the effectiveness of another (or of trends) so that the composite would be much stronger than the simple linear sum of the two. This higher degree of strategy should be the most penetrating and successful but was not found in these Prosperity Games — possibly because of the limited amount of time to play.

Some robustness is obtained by a team's having contingency thrusts for a given strategy. When multiple independent thrusts (independent in the sense that a default on a move within one thrust would not directly jeopardize an independent thrust) support a strategy, the overall plan is assessed as less vulnerable to a default or to a failed technology, so the play is assessed to be more robust. Independent thrusts supporting the same strategy are diagrammed on a separate line with the common strategy and each move in the contingency deal received a +1 bonus point to reward the risk management.

If issues are not addressed at all or strategies are not delineated, substantial vulnerabilities are likely and the team is awarded negative points. An uncovered issue gives the team -5 points. An issue that has deals associated with it but is not covered by an announced strategy is interpreted as deficient in intentional planning and the team was given -3 points. Since obtaining financial backing is implicit in the required strategies, neglecting to list that strategy explicitly was forgiven without penalty.

Defaulting on a deal in life has serious consequences. A default on a deal in Prosperity Games also has a penalty. It gives a team -5 points.

In some cases a deal may be only weakly intentional and substantive, e.g. a simple extension for purposes of reassuring loyalty or a simple purchase of a strategy because money was available through the Toolkit option without requiring any interaction with anyone else. Superficial moves will hurt the final assessment by all the players at the end of the game.

Table 2 summarizes the four levels of strategies presented here.

Table 2. Scoring Strategies For Robustness and Penetration

Level	Information Processing (Development of strategies)	Strategy Descriptors	Logic Analogs
I	Declarative: separate unconnected moves	<i>Carpe Diem</i> - Seize the Day	Disjunctive; or-or
II	Cumulative: connect several different moves, none of which is sufficient, but taken together, they make a strong case	<i>Partes Pro Toto</i> - Parts for the Whole	Conjunctive: and-and
III	Serial: construct a line of thought, a chain of linked moves and thrusts	<i>Crescit Eundo</i> - It Grows As It Goes	Serial; if-then
IV	Parallel: construct several serial thrusts with cross-linking to emerging external trends; develop contingency plans	<i>Impetus Futuro</i> - Force for the Future	Parallel; if and only if

This alignment of issues, strategies, and thrusts (defined by the sequences of moves) with sequentially compounded effects allow the team, led by the facilitator/analyst, to diagram the teams' strategies. The facilitator/analyst will work with the team to develop such a matrix and score it as feedback and impetus to the team.

The scoring system is summarized as follows:

Each isolated or disjunctive deal 1 point

Each deal that was conjunctive 2 points

Each deal that built on the previous situation to carry the action further in time towards the announced goal +1 point more than the previous move

The Nth move in the thrust gets N points for the moves 2 through N.

Cross-cutting deals to advance multiple strategies counted as many times as they appeared

Deals that were robust because they developed not only exchanges of money for services but also built relationships +1 bonus point

Each move in the first contingency thrust for a strategy +1 bonus point

An uncovered issue -5 points

A default on a deal -5 points

An issue that had deals associated with it but was not covered by an announced strategy -3 points.

The scoring system rewards substantive planning with its accompanying robustness, penetration, and team cohesiveness. The rationale for this system was drawn from inspection of the various deals. However, the general hierarchy of strategies—(1) disjunctive, (2) conjunctive, (3) serial, and (4) parallel combinations of serial strategies—corresponds to the four logical processes (disjunctive, conjunctive, conditional, and bi-conditional)², to Kohlberg's classification of strategies for making moral judgments³, and to Jaques' classification of information processing in accountability hierarchies⁴. Each study found a similar increase in value as the strategy shifts from disjunctive, conjunctive, conditional, and bi-conditional.

² Seymour Lipschutz, *Set Theory and Related Topics*, Chapter 14, McGraw Hill, New York, 1964

³ L. Kohlberg, *The Philosophy of Moral Development*, Harper and Row, San Francisco, 1981

⁴ Elliott Jaques and Kathryn Cason, *Human Capability*, Cason Hall & Co., Falls Church, VA 1994

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