SYNOPSIS

This case explores the possible causes of the suspension of the U.S. $10 billion DOE project involved with the superconducting supercollider (SSC) in October 1993. Over $2 billion U.S. was spent on the project. During the five years that the SSC was under construction, noinsurmountalbe technical barriers surfaced. Also a highly publicized government audit in the summer of 1993 showed the project to be basically on schedule and within budget. The case does not contain technical information and analyses of all of the stakeholders involved in the project.

LEARNING OBJECTIVES -"THE DEMISE OF THE SUPERCONDUCTING SUPERCOLLIDER: STRONG POLITICS OR WEAK MANAGEMENT?"

In discussing this case, participants should gain a better understanding of:

- the mixture of science and management
- the power of stakeholders
- the importance of public relations
- project failure/project success
- mega-projects

Discussion Point

- In all projects there is a possibility of failure.

- Debate any experiences of project failure and discuss the key issues of a project's failure. USE THE EURO-TUNNEL project for such a discussion if read.

The Demise of the Superconducting Supercollider: Strong Politics or Weak Management?

E. Payson Willard, PMP, Willard & Associates, Incorporated

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Synopsis

This case explores the possible causes of the suspension of the U.S. $10 billion Department of Energy (DOE) project involved with the superconducting supercollider (SSC) in October 1993. Over $2 billion (United States' dollars) was spent on the project. During the five years that the SSC was under construction, no insurmountable technical barriers surfaced. Also a highly publicized government audit in the summer of 1993 showed the project to be basically on schedule and within budget. The case does not contain technical information and analyses of all of the stakeholders involved in the project.

Learning Objectives

This case offers the students the opportunity to analyze a failed project and to consider the reasons for its demise. It also helps in the understanding of how politics can affect a project. From the case and the questions listed, the students should gain a better understanding of:

- the mixture of science and management
- the power of stakeholders
- the importance of public relations
- project failure/project success
- mega-projects.

Discussion Questions and Possible Answers

1. The superconducting supercollider (SSC) project did not deliver what was intended. A successful project is one that not only fulfills the constraints of time, cost, and technical performance but fulfills other requirements such as minimal scope change and customer acceptance. Research in Kerzner, *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*, the definition of a project success and identify which factors were not achieved in the SSC endeavor.

   a. On page 6, Kerzner shows that a successful project is one that is completed:
      1. within the allocated time period,
      2. within the cost budget, ...

3. at the specified performance level,
4. with acceptance by the customer/user,
5. with minimum or mutually agreed upon scope changes,
6. without disturbing the primary work of the organization, and
7. without altering the corporate culture.

The project was terminated before its completion. At the time of termination, the project had not followed the cost and schedule control system required. It was incapable, as structured, to properly control the project. However, the Department of Energy (DOE) auditors found the project to be "on schedule and within budget." Thus, it can be said that the project did conform to requirements 1–3 on the list, but did not satisfy 4–7 completely, and thus was not able to be a success. For example:

Requirement 4: The project did not have a clear customer/user and the agencies funding it were not perceived as the customer.

Requirement 5: The case clearly states that the scope was never clear and was changed several times over the life of the project.

Requirement 6: There was a poor relationship with the DOE.

Requirement 7: The special status assigned to the project differed from the typical project framework used by the DOE.

2. Why did this project fail? Was the project's failure inevitable? If not, what could have prevented the failure of the SSC?
   a. This project failed because it did not follow the five key elements of management (motivating, organizing, planning, directing, and controlling), something which probably could have been avoided. If the project's management had achieved a proper hold of the project and, for example, made the scope and objectives of the project clear, set public relations as a priority in the management of the project, and created and used the cost schedule control system and thus pleased their customers, the probability of the success of the project would have greatly increased.
3. The case exposes many factors and reasons for the SSC failure. Which do you think were the real causes and problems not properly addressed by project management?
   a. The project did not handle public relations adequately. Since its funding depended on Congress and was administrated through the DOE, they should have been recognized as important customers/stakeholders.
   b. Management never recognized the possibility that its funding could be cut.
   c. There was not a good balance between the importance of the technical and managerial groups in the project.
   d. There was a lack of scope in the project, in that the objective of the project was not clear and it was not clear what was and what was not a part of the project.
4. If Congress had voted to continue funding on the SSC, what would you have recommended as mandatory changes required to receive this funding?
   a. New experienced management, perhaps from a similar industry such as pharmaceutical or construction, with the power to affect change.
   b. The requirement of using the cost scheduling and control system, despite the adherence to the budget and schedule thus far.
   c. Clear and constant communications with the DOE and Congress, the stakeholders who control the purse strings of the project.

d. Agree on a clear scope of the project and thus minimize changes in the life of the project.

5. Public relations were mismanaged with this project. Is this the fault of the project's management? How could the project have handled the public relations, given the uncertainty of the uses of the SSC?

   a. Public relations are the responsibility of the project management and their importance should be recognized. Positives relating to the project could have been accentuated, such as the boost the SSC provided to the Texas economy and scientific world's knowledge, the jobs it provided, and commercial applications of the scientific findings.

6. Managing a project of this size requires the use of all areas of project management in order to guarantee the desired outcome. If you were in charge of a large project, on which of the nine identified processes of project management, *PMBOK Guide*, section 1.3.2, The Project Management Knowledge Areas, would you concentrate?

   a. Given the generality of the question, covering project management as a whole, all of the areas are equally important. None can be disregarded.

ADDITIONAL DISCUSSION POINTS:

In all projects there is the possibility of failure. The students should research the topic of project failures. The students can then present a failed project and discuss the key issues of that project's failure.

A good reference is *What Made Gertie Gallop: Learning from Project Failures*, O. P. Kharbanda and Jeffrey Pinto.

The Demise of the Superconducting Supercollider: Strong Politics or Weak Management?

E. Payson Willard, PMP, Willard & Associates, Incorporated

PMI Canada *Proceedings*, 1994, pp. 1–7

Introduction

The subject matter of this paper is a $10 plus billion United States (U.S.) Department of Energy (DOE) project called the superconducting supercollider (SSC). The SSC was to have been the world's largest scientific instrument but was terminated by the United States Congress in 1993. When the U.S. government approved the undertaking of this project in the 1980s, many states competed against one another to be the location of this prestigious project.

Locations in six states were selected as finalists before a location near Dallas, Texas, was announced as the winner. The Texas site was chosen mainly because of the subterranean conditions that existed there. During the five years that the SSC was under construction, no insurmountable technical barriers surfaced. Also, a highly publicized government audit in the summer of 1993 showed the project to be basically "on schedule and within budget." Over $2 billion had already been spent on this project, and it had been estimated that four years and $1 billion would be required to "close-down" this project. Despite all of the above, however, the SSC project was formally terminated on October 30, 1993! What caused this important scientific project to be suspended? Was the demise of the SSC due primarily to "strong politics" or to "weak management?" This paper highlights the complexity of the SSC project and addresses the key political and management factors that led to its demise.

What is the SSC?

The SSC is a high-energy subatomic particle accelerator that was to be by far the most powerful particle accelerator in the world. The most powerful particle accelerator in existence at present is located at the Fermi National Accelerator Laboratory near Chicago, Illinois, and the SSC would have been twenty times more powerful than the Fermi accelerator! The SSC would have two beams of protons that would be propelled in opposite directions within two small tubes. These tubes would be located within a series of underground circular tunnels. The tubes would be cooled to –452 degrees Fahrenheit (4.35 Kelvin) by a river of liquid helium to eliminate electrical resistance.

The SSC would draw hydrogen atoms from a small container and remove the electrons, thereby leaving only the protons. These protons initially would be accelerated to successively higher levels of energy in four smaller "booster" rings, then they would be inserted into the main ring. The main ring would have a circumference of 54 miles and be located from 50 feet to 250 feet below ground. There would be perhaps as many as 130 trillion protons continuously circulating within each beam! Carefully synchronized bursts of radio frequency waves would energize the protons. The particles would be guided by 10,600 powerful superconducting magnets encompassing the tubes. After several hundred thousand revolutions around the 54-mile path, the particles within the beams would have velocities approaching the speed of light. Having obtained these velocities, the protons would then be directed to collide head-on with one another in two interaction halls containing enormous detectors. This process is the rationale for the name, superconducting supercollider.

The rate of the proton collisions would be of a magnitude of perhaps 100 million times per second! These collisions would generate a shower of subnuclear particles. The SSC detectors must monitor these many collisions, decide if a particle of interest has been generated, then—if generated—collect data associated with that particular particle! The difficulty of performing this complicated process is magnified by the fact that the life-cycles of these particles are measured in microseconds! The data encompassed by this debris would be recorded and studied by scientists from countries around the world to gain more knowledge about the fundamental nature of matter and energy. The two detectors in which these collisions would take place would weigh in excess of 70 million pounds each!

WHAT ARE THE BENEFITS OF THE SSC?

It is difficult to state what all of the ultimate benefits of the SSC would be because nobody really knows! Even President Clinton depicted this in a June 16, 1993, letter to Congress in which he expressed his support for the SSC and stated: "The most important benefits of the increased understanding gained from the SSC may not be known for a generation. We can, however, be certain that important benefits will result simply from making the effort" (1).

Hazel O'Leary, the U.S. Secretary of Energy, when appearing before Congress in August 1993, stated: "Although one would like to identify specific technological developments and economic returns on the investment that will flow from the SSC, such precision of foresight is not possible. However, if history is any guide, then we can predict with confidence that development of technologies necessary to build the SSC, and the understandings that emerge from experimentation at the facility, will provide major contributions to our economy" (2).

MANAGEMENT HISTORY OF THE SSC

In August 1988, DOE openly solicited proposals via a request for proposal (RFP) for the management of the construction and the subsequent operation of the SSC. The major criteria for the project management selection was expertise in high-energy physics research. Copies of this RFP were requested by

121 interested companies. However, DOE had received only one response by the November 4, 1988, deadline. This single proposal was submitted by the Universities Research Association (URA) team. URA had been formed in 1965 to construct and manage the Fermi National Accelerator Laboratory. Originally, URA was composed of thirty-four research universities but had grown to encompass seventy-eight universities when the SSC proposal was submitted. EG&G, Inc., and Sverdrup Corp. were part of the URA team. EG&G, Inc., was a company that had experience in providing technical services to DOE projects; whereas, Sverdrup Corp. was a small architect and engineering firm. On January 19, 1989, the URA team was selected as the management and operations contractor for the SSC. A professor of physics at Harvard University was designated as the SSC director and would have overall responsibility for all aspects of the project. Within a couple of years, however, Congress became concerned about the SSC management. This led to four congressional hearings on the SSC project management during the 1991–93 time frame!

Magnitude of the SSC Project

To better understand the magnitude of the SSC project management problems, one must first understand the magnitude of the SSC project itself. The SSC was a massive project that was to take in excess of a dozen years to build and eventually be estimated to cost in excess of $10 billion. The SSC and its facilities would require more than 16,700 acres of land. Also, over 2 million square feet of office and laboratory facilities would be constructed. As stated earlier, the main circular underground tunnel would be 54 miles in circumference and would vary from 50 feet to 250 feet below ground. The 10,600 superconducting magnets required to steer the beams of protons would need to be designed and manufactured. Each of the magnets would be 50 feet in length and would weigh 15 tons! The magnets would require the production of 625,000 miles of superconducting cable. Twelve refrigeration plants would be required to cool the magnets and would liquefy 2.4 million liters of helium. Approximately 10 million cubic feet of earth would be excavated. Over 10 million cubic feet of concrete would be required within the tunnel. In contrast to the massive size of the tunnel, the beams of protons would need to be focused into a collision area that would be only 2 ten millionths (2/10,000,000) of a square centimeter in size!

When the SSC was terminated in late 1993, the project was supporting over 7,000 full-time jobs in forty-eight states which were directly involved in the construction of the SSC facilities and equipment. In addition, over 1,000 scientists across the U.S. and another 1,000+ foreign scientists from twenty-two countries around the world were developing experiments for the SSC. Also, when Congress stopped funding for this project, over 12,000 acres of land had been acquired, over 14 miles of underground tunnel had been dug, over 7 million cubic yards of earth had been excavated, over 45,000 procurement contracts had been awarded, and over $2 billion had been spent!

The Demise of the SSC

The SSC had been the focus of much attention since the commencement of the project for several reasons. First, the SSC project was a multibillion-dollar project, Also, as stated earlier in this paper, it is very difficult to identify the benefits of the SSC—much less to quantify the impact of these benefits. Because of the above, the SSC has been the recipient of much ridicule and scrutiny. There are, of course, many factors responsible for the demise of the SSC. Most of these factors, however, either are political in nature or are attributable to the SSC project management.

Political Factors

All large government-funded projects face political problems. Because of the high costs associated with the SSC project, however, this project was especially vulnerable. This vulnerability was magnified since the SSC was a controversial, misunderstood project! Political factors were said to have played a significant role in the termination of the SSC. The following are three key factors that impacted the SSC's demise:

- deficit reduction "feeding frenzy"
- SSC's Texas location
- absence of key pro-SSC Texas politicians.

The phrase "deficit reduction" was a key buzzword during 1993. This phrase was brought to the forefront during the 1992 presidential election. Many of the new congressmen had been elected on deficit reduction platforms. Since the SSC was a high-dollar, highly controversial, and not understood project, it was a good candidate for "reducing the nation's deficit" (3, 4).

Ironically, the two largest science projects in the United States during fiscal year 1993—the SSC and NASA's space station—resided in Texas. To make matters even worse for the SSC, the House voted on June 23, 1993, to continue funding NASA's space station. This was one day before the SSC vote was cast, and the funding passed by a single vote—216 to 215! After the vote on the space station, some House members said the space station's survival may have doomed the SSC since they were running out of big-ticket items to cut (5). Also, Texas elected its second Republican senator shortly before the funding process began for the SSC, making both Texas senators Republicans for the first time in history. Vengeance against Texas was said to have played a role in the demise of the SSC since Congress is controlled by Democrats (6).

Two of Texas' most powerful politicians had been removed from the funding process during the past year—Lloyd Bentsen and George Bush. Senator Bentsen had been chairman of the powerful Senate Finance Committee before his current appointment as Secretary of the Treasury. President Bush was a staunch supporter of the SSC. President Clinton supported the SSC and had included funding for the project in his budget. Bill Clinton didn't, however, threaten to veto any bill that excluded the SSC as George Bush had done the previous year!

The SSC's management had been the focus of heated criticism from General Accounting Office (GAO) reports, congressional committees, and others throughout 1993. GAO (Congress' investigative agency), labeled the SSC project as "over budget and behind schedule." Immediately before the House vote, the Project on Government Oversight, a nonprofit group, released a "leaked" report that had been prepared by government auditors citing numerous inappropriate charges and excessive contractor charges which had been approved by SSC management. Also, many congressmen harshly criticized the SSC management. Representative John Dingell, chairman of the Energy and Water Investigations Subcommittee, stated he had seen many "dodgy" programs in his many years, "but the SSC ranks among the worst in terms of contract mismanagement and failed government oversight" (7).

This harsh criticism was directed at SSC management despite the very impressive accomplishments stated earlier. Successful management of any project must encompass more than simply the achievement of technical milestones. The criticisms had been focused mainly on the cost/schedule areas, but there were also other problem areas. The following deficiencies that hampered the SSC project will be addressed:

- failure to implement effective project management and control systems
- failure to "nail down" the scope of the project from its inception
- failure to promote the project to Congress and to the public
- ineffective DoD/SSC organizational structures.

It was a contractual requirement specified in the 1988 SSC RFP that the SSC must have a fully implemented cost and schedule control system (CSCS). Unfortunately, implementation of this CSCS system did not receive serious SSC management attention until late in fiscal year 1991. Despite repeated directives, no action was taken. In fact, a valid integrated cost/schedule system did not exist even when the project was terminated two years later!

Although many problems were encountered, most of these problems were problems that would be expected for a project of the magnitude and complexity of the SSC. The main reason that this contractual agreement was not met appeared to be a general lack of a strong commitment from project management to implement a valid system. Not only were the cost and schedule systems inadequate, but other project management systems were also incapable of providing management with accurate information in a timely manner. The procurement, inventory, and labor systems were observed by the author to be deficient.

When originally presented to Congress in 1988, the SSC project was to be a $4.4 billion project. In 1989, the projected SSC costs increased to $5.9 billion—then to $8.25 billion in 1991. A seventy-five-member Baseline Validation Committee established by DOE placed the projected costs at $10 billion in June 1993. Another government estimate of the SSC costs was $11 billion. Other unofficial but reputable estimates of the costs were as high as $16 billion! Part of these cost increases can be attributed to a costly design change and to a Clinton-mandated project stretch-out, but many of these increased costs were due to changes in the scope of the SSC project. For example, the SSC originally was to have had only one detector—then two detectors were approved. Since each detector costs $500+ million, why not build

the second detector after the SSC was "up and running?" The scope of the SSC needed to be realistically "nailed down!"

As stated earlier in this paper, it is very difficult to identify the benefits of the SSC, much less quantify the impact of these benefits. It is even more difficult to describe the theoretical high-energy physics involved in the SSC. Although difficult to do, many people felt that the SSC External Affairs Department did a totally inadequate job of promoting the SSC (8). Many congressmen openly admitted that they did not really understand the SSC. Even Hazel O'Leary publicly stated she was "less than passionate" about the SSC shortly after being appointed the Secretary of Energy (9). During a later visit to the SSC site, however, Secretary O'Leary apologized for her earlier remarks. Most scientists and the SSC congressional backers felt that the SSC was an extremely worthwhile endeavor, but the project appeared to be a total mystery to most other outsiders. Since the SSC was totally dependent on congressional funding each year, SSC management should have done a better job of salesmanship!

There have been hundreds of articles written about the SSC and published in various magazines and the major newspapers across the nation. When describing what the SSC would do, it inevitably would be stated that the SSC would provide answers to questions such as:

- How did matter form?
- How did matter acquire mass?
- Is there a force more fundamental than presently known?
- What will eventually happen to the universe?
- What is the most elementary element?

Companies that worked with the SSC are currently exploring various practical applications for the superconducting technology which was developed for the SSC. Accelerated-generated proton beams are currently being used to treat certain types of cancer and other diseases. Superconducting magnet technology, like that developed for the SSC, is being used in prototype trains that levitate above the ground and travel at speeds up to 300 miles per hour. Other applications for the SSC technology are in the areas of computing, electronics, and the environmental sciences. Instead of emphasizing that the SSC would find answers to theoretical questions like those stated above, the impact on practical applications for the SSC technology should have been stressed. For example, the completed applied research associated with the SSC has already reduced the cost of superconducting cable from $100 per foot to $10 per foot, and the price is projected to soon be $1 per foot!

When the SSC project began, DOE decided that the SSC project required a unique oversight and management structure. DOE established a SSC project office near the SSC site in Texas. This office was headed by a DOE manager, who reported directly to the Secretary of Energy. This arrangement apparently was established to streamline and facilitate activities and to provide the Secretary of Energy with direct oversight of the project during the start-up phase. In 1990, the SSC project office was given full delegation of authority for all aspects of the SSC. This combination of delegation of authority, along with the direct reporting relationship to the Secretary of Energy, shielded the SSC from the normal DOE oversight functions. All of the other DOE scientific construction projects were subjected to a series of normal reviews. These reviews, however, were not done for the SSC. Also, many key SSC managers were experimental physicists. Although they were excellent

physicists, some evidently had had little or no project management experience— especially on large-scale projects!

In July 1993, an internal memo written by Joseph Cipriano was mysteriously "leaked" to the press. Cipriano was the associate director of energy research for DOE and responsible for the SSC project. The following is an excerpt from his memo:

> Replacing the lab director now may be the only way to keep the lab from falling apart. Morale is very low, confidence in existing management is practically nonexistent, and cost and schedule trends are worsening at an alarming rate (10).

In his memo, Cipriano recommended that DOE "take a year and fix SSC's management problems before going on." He recommended that the SSC issue no new contracts until the management problems were remedied. He also recommended that the Clinton administration's budget request be cut for fiscal year 1994 from $640 million to $400 million. Although this memo was not signed and apparently was obtained illegally from Cipriano's personal computer files, Cipriano acknowledged authorship!

It was common knowledge around the SSC that URA and the SSC director—Dr. Roy Schwitters—did not have the admiration of DOE and vice versa. According to SSC personnel, the relationship between Schwitters and Cipriano had deteriorated to the point that they communicated only by letter. Even when Cipriano began overseeing the SSC project in mid-1990, he then recommended firing URA because he felt the university group could not manage a massive construction project. In November 1993, the author personally heard Secretary O'Leary express her strong disapproval of the SSC director. Why did the government allow such an unhealthy situation to exist for three plus years—especially on a project as large and visible and important as the SSC?

Fiscal Year 1993—The "Roller Coaster Ride of Death"

The SSC had experienced an intense funding battle with Congress during the 1993 fiscal year funding process. All of the "warning signs" existed that indicated another major funding battle would occur during the 1994 fiscal year funding process. In February 1993, GAO released a report stating that the SSC was millions of dollars over budget and construction was far behind schedule. This bad publicity—be it right or wrong—was released by the Associated Press for nationwide publication and independently reported by reputable newspapers such as *The Wall Street Journal* (11,12). Many members of Congress already felt that the SSC was a "boondoggle—an expensive boondoggle!"—and such adverse publicity was obviously detrimental to the project. In retrospect, the report accusations were probably incorrect.

SSC management, however, had been given ample opportunity to implement effective project controls and to vigorously dispute such erroneous charges in a defensible manner. The sad fact is that apparently nobody really knew the status of the project!

President Clinton asked Congress for $640 million for the SSC when he submitted his fiscal year 1994 budget. On June 18, 1993, the Appropriations Committee of the House of Representatives recommended that the SSC be funded for 1994 but be scaled back to $620 million. On June 24, 1993, however, the House

of Representatives voted by a 280 to 141 margin to permanently cancel the SSC project! Since the Senate would be voting on the SSC several months later, DOE performed an in-depth investigation of the SSC during the summer of 1993 in an attempt to save the project. Over 100 auditors were involved in this investigation. Although numerous improprieties were found, DOE did conclude that the SSC project was basically "on schedule and within budget!" URA management was harshly criticized by DOE, however, for not having demonstrated full commitment to openness and accountability. This government audit produced approximately fifty specific findings and recommendations. The key findings, however, were:

- SSC management had neither implemented an acceptable CSCS system nor established an acceptable "cost baseline."
- SSC/DOE organizations were incapable, as structured, of providing adequate control over the project.

As a result of these findings, Secretary O'Leary corrected the organization flaws stated earlier in this paper and instructed that the SSC project be subjected to the same oversight and programmatic reviews as other DOE projects. At a press conference, Secretary O'Leary told reporters: "We've got to prove to the American people that we can better manage this project. We can, and we will" [13]!

DOE announced in August 1993 that the SSC project management would be restructured. As stated earlier in this paper, URA had initially been given total responsibility for the SSC project. In response to the audit's findings, DOE stated that the URA team would no longer be the prime contractor for the SSC project. Instead, there would be two major contractors having complementary strengths—a "design/operate" contractor and a separate "execute/integrate" contractor. URA was named as the design/operate contractor and would continue to be responsible for the scientific design and research aspects of the SSC, the commissioning of the accelerator and scientific research equipment, and the operations of the facilities as they were completed. A new RFP would be generated to solicit proposals for a new execute/integrate contractor that would bring to the SSC world-class experience in managing large construction projects. The major responsibilities for this new execute/integrate contractor would include implementing the project management and control systems and managing existing major subcontracts. Unfortunately, all of these corrective actions by DOE were coming too late!

After several days of intense Senate hearings, the SSC project was kept alive when the Senate voted on September 30, 1993, to fund the project. The vote was fifty-seven to forty-two. The hearings were broadcast live to TV monitors located throughout the SSC facilities. SSC employees were relieved and jubilant at the conclusion of the voting! The Senate allocated $640M for the SSC project for the fiscal year 1994. Since the House of Representatives had disapproved the SSC and the Senate had approved the SSC, a joint conference committee of Congress was selected to make recommendations.

The joint House/Senate conference subcommittee recommended that the full $640 million be funded for the SSC. The House of Representatives, however, later rebuffed the conference committee's recommendation and again refused to fund the SSC by a vote of 264 to 159 on October 19, 1993. After unsuccessful efforts to save the SSC by powerful SSC supporters, the SSC was officially terminated on October 30, 1993, when President Clinton signed the bill killing the project.

Although it is possible that the SSC might be revived in some future year at its present sight, the present demise of the SSC is very sad and perhaps could have been avoided! Although "strong politics" definitely were involved in the SSC's demise, "weak management" did severely hurt the SSC and made it vulnerable for termination. The following is an excerpt from an article published in *The New York Times*, following the congressional defeat which contains quotes from an interview with Roy Schwitters, the SSC director:

> Schwitters later admitted that perhaps his biggest mistake was that he had "failed to get strong enough, really experienced project management staff on board, who could do these accounting and scheduling things better," and that he had underestimated the importance and magnitude of that job (14).

The SSC project represented the marriage of world-class science and world-class construction. Missing was "world-class" management! Thousands of scientists around the world had devoted many years of their lives to the conceptual development of the SSC, and the results of their efforts were proving successful! No impassable technical barriers had been encountered that threatened the feasibility of the SSC performing successfully after its completion from a scientific standpoint. The SSC was to have been the largest hard rock tunnel in the world. The SSC construction crews digging the underground tunnels epitomized excellence while successfully performing their job. In fact, the construction crews set and reset world "rate of advance" tunneling for 5-meter hard-rock tunnel boring machines in all three categories—best day, best week, and best month (15, 16)!

The SSC was an exciting and prestigious project with which to be associated, and a strong spirit of dedication and excitement from workers throughout the project was observed by the author. SSC employees were totally devastated and expressed much sadness and extreme bitterness when the project was terminated. The employees felt that they had been betrayed by management.

The question as to whether this important scientific endeavor's "death" could have been prevented had there been more effective project management has been raised many times and will continue to be raised again and again.

It is unquestionable, however, that the management deficiencies discussed in this paper did severely hurt the SSC project. Was the "death" of the SSC due solely to its project management? Of course not, but the SSC might perhaps still be "alive and well" today had the SSC project had stronger leadership. While politics played a significant role in the termination of this project, project management (SSC and DOE) must assume the brunt of the responsibility for the SSC's demise because of the reasons stated in this paper.

Had the SSC had a strong project management team to complement its world-class scientific and construction teams, this project might not have been terminated! Perhaps the following excerpt from an editorial by Jim Slattery, the congressman who led the effort to kill the SSC, says it best: "My decision to push for cancellation of the project was not an easy one, because I recognize that the SSC had scientific merit. It was the management—not the science—that betrayed the SSC" (17).

1. Letter from President Bill Clinton to The Honorable William H. Natcher, Chairman of the Committee on Appropriations, United States Congress, June 16, 1993.

2. Statement of Hazel R. O'Leary, Secretary of Energy, before the Committee on Appropriations and Committee on Energy and Natural Resources, United States Congress, August 4, 1993.

3. "Supercollider in Political Spin." 1993. *USA Today*, June 9.

4. "Senate Vote Gives Supercollider Another Chance." 1993. *The New York Times*, Oct. 1.

5. "Intricacies of Budget Politics Exposed in Fight for Supercollider." 1993. *The New York Times*, March 31.

6. "Some Backers See Anti-Texas Bias in Plans to Kill SSC Project." 1993. *Ft. Worth Star Telegram*, Oct. 22.

7. "Superconducting Supercollider: University Consortium Faulted on Management and Accounting." 1993. *Science*, July 9.

8. "SSC's Fall Linked to its Complexity: Backers, Critics Cited Failed Salesmanship." 1993. *The Dallas Morning News*, Oct. 24.

9. "O'Leary: Not Passionate About Supercollider." 1993. *USA Today*, Feb. 5.

10. "Energy Department Official Urges Firing Supercollider Chief." 1993. *The Washington Post*, August 2.

11. "Investigators Say Supercollider is Way Over Budget." 1993. The Associated Press, Feb. 24.

12. "Supercollider Is Said to be Over Budget and Behind Schedule." 1993. *The Wall Street Journal*, Feb. 25.

13. "SCC Management to be Overhauled." 1993. *The Dallas Morning News*, August 5.

14. "The Supercollider: How Big Science Lost Favor and Fell." 1993. *The New York Times*, Oct. 26.

15. "A Boring Record." 1993. *The Houston Post*, Apr. 27.

16. "SCC Sets World Tunnel Records." 1993. *Waxahachie Daily Light*, May 5.

17. "Why I Stopped the Supercollider." 1993. Editorial by Jim Slattery, U.S. House of Representatives. *The Hutchinson News* (Kansas), Nov. 12.

Study Questions

The Demise of the Superconducting Supercollider: Strong Politics or Weak Management?

1. The superconducting supercollider (SSC) project did not deliver what was intended. A successful project is one that not only fulfills the constraints of time, cost, and technical performance, but fulfills other requirements such as minimal scope change and customer acceptance. Research in Kerzner, *Project Management: A Systems Approach to Planning, Scheduling, and Controlling* (1995), the definition of a project success and identify which factors were not achieved in the SSC endeavor.

2. Why did this project fail? Was the project's failure inevitable? If not, what could have prevented the failure of the SSC?

3. The case exposes many factors and reasons for the SSC failure. Which do you think were the real causes and problems not properly addressed by project management?

4. If Congress had voted to continue funding on the SSC, what would you have recommended as mandatory changes required to receive this funding?

5. Public relations were mismanaged with this project. Is this the fault of the project's management? How could the project have handled the public relations, given the uncertainty of the uses of the SSC?

6. Managing a project of this size requires the use of all areas of project management in order to guarantee the desired outcome. If you were in charge of a large project, on which of the nine identified processes of project management, *PMBOK Guide*, section 1.3.2, The Project Management Knowledge Areas, would you concentrate?