Project Management Institute

Case Studies in Project Management

Springfield Interchange Improvement Project

Edited by:

Frank T. Anbari, PhD, PMP

The George Washington University

Springfield Interchange Improvement Project

By:

Young Hoon Kwak, PhD

Jerry Doherty, MSPM

Antonia Mambelli, MSPM

Amin Mourad, MSPM, PMP

LCDR Joe Speranzo, USN, MSPM

Edited by:

Frank T. Anbari, PhD, PMP

The George Washington University

This case study was originally prepared as part of Project Management Applications, the capstone course of the Master of Science in Project Management at The George Washington University, by the graduating students listed above with the supervision of Professor Kwak, during the Fall 2002 semester.

This case study was adapted to make it a learning resource and might not reflect all historical facts related to this project.

Case Study

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Introduction

It is no secret that the number of megaprojects being undertaken in the United States is on the rise. A quick Internet search using Google.com and the words "mega" and "project" returned more than 40,000 results. Part of the reason is the rising cost of technology and inflation; however, a renewed awareness of the interconnectedness of people, technology, and environment is increasingly driving the complexity of projects. A look at the U.S. Department of Transportation Priority Project List (U.S. Department of Transportation, 2004) confirms this notion, with several projects being listed as groupings of smaller related projects, or critical junctures between different technologies and the environment. Addressing only one aspect of a complex system could throw the rest of the system off balance and may create new problems, but not completely solve the old ones. Addressing all or most of the relevant aspects of a troubled system often requires larger, more complex solutions that, in turn, require larger and more complex projects.

With the stakes high and challenges common, it seems intuitive that good project management principles would be employed in megaprojects as a matter of course. However, this may not always be the case. Unfortunately, along with the increased number of megaprojects, the number of challenges among megaprojects is also rising. The same Google.com search with the additional word "failure" returned more than 3,000 results. Many are aware of the spectacular challenges that faced major projects, but dozens of less challenged projects are available as examples of the need for sound project management practices (Hull, 1992).

This case study analyzes the project management practices employed on the Springfield Interchange Improvement Project (SIIP), a US$700 million transportation megaproject in the part of the Washington, DC metropolitan area located in Northern Virginia. The analysis considers the apparent project success as recognized by public stakeholders.

The case study demonstrates that modern project management practices are being used on the SIIP, causing it to be largely successful. However, these efforts may have been initially affected by the limited use of these practices within the parent organization, the Virginia Department of Transportation (VDOT). In an interesting turn of events, the parent organization underwent significant organizational change during the project. This provided the project team with the unique opportunity to enforce project management practices within VDOT, which willingly recognized past mistakes and responded with organizational and policy changes to improve the future management of megaprojects.

The case study covers various Project Management Knowledge Areas (Project Management Institute, 2004) within four project phases: inception, development, implementation, and closeout. Within each project phase, the activities, accomplishments, and shortcomings of performance in the processes of initiating, planning, executing, monitoring and controlling, and closing are discussed. The case study is structured to allow an evaluation of the appropriate processes of various Project Management Knowledge Areas at the end of each phase. The reader can conduct an overall assessment of performance, resulting in a numeric evaluation of the

management of this project, including areas of strength, opportunities for improvement, and lessons learned.

In the inception phase, the discussion focuses on the historical background of the project, its overall objectives, problem definition, concerns, political climate, and the selected solution. In the development phase, the discussion addresses the overall planning, feasibility studies, funding, and conceptual design. In the implementation phase, the discussion addresses detailed design, construction, and commissioning. Finally, in the closeout phase, the discussion reflects on overall performance, project status, and project evaluation.

The Inception Phase

The Springfield Interchange is one of the most complex and dangerous interchanges in the United States (Sipress & Reid, 1999). Situated fifteen miles south of Washington, DC, where the Capital Beltway intersects Interstate Highways I-95 and I-395, the interchange is aptly nicknamed the "Mixing Bowl," as four of the region's heaviest streams of traffic rush together in a fury of bobbing and weaving and last-second lane changing in an effort to negotiate the outdated traffic patterns. As many as 375,000 vehicles commute via this route every day, in addition to the constant traffic of I-95, the primary East Coast commercial corridor. The interchange held the distinction of having more accidents than any section of the Beltway or any other area of road in Virginia. Although delays and driver confusion continually reinforced the need to improve the interchange, it was traffic safety issues that finally moved the project off the wish list and onto the drawing board (Behr, 1999).

Although overriding safety concerns drove the project, not everyone was excited about the prospects of a multiyear construction project in the middle of the busiest area of the Washington, DC Beltway. Local businesses were worried about losing customers because drivers would want to avoid the area. Commercial carriers were concerned about the impact the delays would have on their costs. Local residents were distressed that fixing the Mixing Bowl would solve only part of the problem, leaving bottlenecks at the feeder points just outside the interchange. And the VDOT was very concerned about how to execute a cost-effective megaproject at a site that provided little or no "lay-down" area while keeping the traffic flowing (Sipress, 1999).

To address the community concerns, VDOT held a series of public hearings that helped define the scope of the project. These hearings led to the formulation of a comprehensive Congestion Management Plan (CMP), which set guidelines on how to move regular daily traffic through the construction zone without causing undue stress and delay for motorists. The 12 initial design options were narrowed to one, with the new interchange having separate roadways for express, local and carpool traffic, and the project was divided into eight major stages, each of which could be independently contracted:

1. Add a lane on I-95 South and an off-ramp on I-95 North to ease traffic flow during construction.
2. Rebuild the I-95/Route 644 Interchange.
3. Widen the access road and overpass bridges to accommodate higher feeder traffic flow.
4. Provide a direct overpass for I-495 westbound traffic to southbound I-95.
5. Enlarge the ramp from I-395 South to westbound I-495.
6. Complete the I-95 northbound and local ramps.

7. Complete the I-395 southbound and high occupancy vehicles (HOV) roadway.
8. Improve the Capital Beltway (I-495) from the American Legion Bridge (Virginia-Maryland Line) to the Springfield Interchange (I-95/I-395). This stage was later removed from the SIIP and incorporated into the nearby Wilson Bridge Replacement Project, taking place at the same time but under different management.

During the inception phase, more things in scope planning were done right than were done wrong. The SIIP is one of the largest construction projects in the United States. Many citizens and officials had the right idea of what needed to be done to fix the traffic problems with the Springfield Interchange. Public interest groups and government committees knew that it would be a large, long-term, and costly construction project. However, the problems with the Springfield Interchange had existed for many years and were often deadly. Too many small-scale fixes were attempted while politicians argued over funding and other priorities. While debating, many motorists were killed in accidents related to the Springfield Interchange problems. According to a federal study, a crash from a vehicle trying to maneuver through this complicated Mixing Bowl resulted in death approximately once every three weeks. That is a large part of the reason Virginia finally decided to undertake this project (Sipress, 1999).

The SIIP performed rather poorly in terms of cost in the early stages of the project. This is primarily due to extreme challenges in cost estimating. VDOT had no previous experience with such large-scale projects and used obviously flawed techniques in compiling its estimates (Shear & Shaver, 2002). Prior to the SIIP (and other megaprojects, such as the Wilson Bridge Project and Hampton Roads Third Crossing), VDOT had executed only projects under US$50 million.

Another problem was that VDOT started allowing construction projects to get under way before all the funding was approved. A transportation bill passed by the U.S. Congress increased federal money for Virginia, but that meant the state had to spend its own matching money first. This started a spending frenzy. Department officials responsible for giving approval to contractors had no idea whether there was enough money to pay them. Reports would later reveal that VDOT exerted almost no control over cost (Shear, 2002).

This posed serious scheduling challenges to SIIP in the beginning of the project. The state of Virginia waited too long to authorize and fund the official start of the project while motorists battled congestion and dodged treacherous traffic situations.

The project planners performed well in contract inception for the basic reason that they realized, despite misconceptions in other areas, that the magnitude of this endeavor would require more expertise and experience than they had available internally. The decision was made to outsource the heavy construction and much of the management consulting to large professional firms.

Risk management planning was not conducted in the early stages of the project. In fact, VDOT policy does not even consider risk management in the planning phases of a project. Despite the best efforts of project personnel, the early stages of the project were rife with political issues, particularly with respect to scope, schedule, and cost, which affected the overall quality of the project inception.

The project performed somewhat poorly in terms of teamwork during inception, due to problems between government officials, appointed committee members, and VDOT staff personnel. To be fair, the problem was much greater than just this project. VDOT is staffed with good people, but politics, leadership, and other issues resulted in delayed projects and large cost overruns. The politicians may be at least equally to blame for much of the mess. The record indicates that VDOT staff professionals provided sound advice about this project and others, but the politicians ignored that advice because adopting those policies was not politically expedient (Goolrick, 2002).

During the inception phase, VDOT had to contend with many political difficulties. Despite antiquated computer and information technologies, VDOT seems to have done an excellent job of communicating with all stakeholders of the SIIP during this phase. The transportation department made a concerted effort to get all parties involved in the process early, with the express purpose of identifying and avoiding difficulties later in the project. Public hearings, neighborhood committees, and an aggressive public awareness and community relations campaign were very successful parts of this project.

Assessment and Analysis

1. Please complete your evaluation of project management during this phase, using the following grid:

Rating Scale: 5–Excellent, 4–Very Good, 3–Good, 2–Poor, 1–Very Poor

Project Management Area	**Inception Phase**
Scope Management	
Time Management	
Cost Management	
Quality Management	
Human Resource Management	
Communications Management	
Risk Management	
Procurement Management	
Integration Management	

2. Please highlight the major areas of strength in the management of this phase of the project:

3. Please highlight the major opportunities for improvement in the management of this phase of the project:

The Development Phase

Once the SIIP was commissioned, many public hearings were held to gather information on the concerns and needs of the community. Transportation committees were designated and studies were conducted to determine the appropriate scope of the project. These measures helped the project team effectively forecast an adequate, yet realistic scope for the project. To keep traffic moving during construction, the VDOT planning committee decided to include many creative and aggressive programs as part of the overall project scope, including a Congestion Management Program (CMP), a public Information Center (IC), and equipment and financial support to local law enforcement and rescue agencies. The CMP provided programs that were developed to enhance commuter options during construction, including improving alternate routes, additional park-and-ride lots, and increased public transit services. The SIIP IC is the central location for the project's extensive public awareness program, and was developed to meet the needs of motorists, residents, and business owners concerned about the impact of the project. Although not initially included in the inception plan and original estimates, these initiatives allowed the project to perform well in this area (VDOT Springfield Interchange Improvement Project, [2003a]).

When officials tried to model the project costs based on historical information, estimates were way off because of the lack of data on large-scale projects within Virginia. There were many aspects that were grossly underestimated and others that were not even included. Projected overhead rates were especially inadequate because VDOT's method for calculating overhead was flawed. VDOT policy also precluded incorporating inflation into the estimate. Even the internal VDOT tax rate on the project had to be recalculated.

In 1992, VDOT planners said the project would cost US$220 million. The 1994 plan estimated the total cost at US$350 million; however, VDOT officials emphasized that only 40% of the design work was completed at that point. These were not realistic cost estimates, but politically motivated announcements that hampered management of the project (Jones, 2002, March 13).

In spite of the late authorization to proceed with the project, project managers recognized the value of involving the public in the detailed planning and development of the project. The parallel development of stages 2 through 8 while stage 1 was being completed was a smart tactic to speed implementation without compromising development.

The transportation department performed well in the contracting area during the development phase, particularly in view of VDOT's inexperience in large projects. Although VDOT is to be commended for using contracting incentives to motivate the construction companies, there were problems with the way such incentives were written into contracts for the individual stages. VDOT had the right idea to limit the impact of construction on the citizens and merchants who work and live in the area, but the incentives were poorly planned, especially in stage 1, and did not always produce the desired effects.

Whereas there were no formal VDOT procedures in place for risk management, informal procedures were at least considered at the project level. However, without support from the organization, risk mitigation strategies, such as incorporating inflation into the cost estimates, were not recognized as valuable approaches and were disallowed.

Astoundingly, the SIIP was not developed with any kind of a formal quality assurance program. Were it not for internal programs used by design contractors, the project would have had serious challenges in this area.

The project also had its challenges in teamwork development for various political reasons. VDOT professionals had anticipated the transportation needs for the congested areas of Northern Virginia far in advance, but development stalled because of those reasons. Construction under way at the Springfield Interchange could have been done a dozen or more years earlier, but the politicians were not willing to make decisions because of the risk of public controversy (Goolrick, 2002).

VDOT continued its excellent campaign of information exchange with the community and public officials during the development phase. Input was collected and evaluated for consideration in the project and a significant amount of money was set aside specifically to address community concerns. However, as the SIIP project team was taking formal shape, VDOT made a tactical error in the project organization and set up the project with multiple managers, unrelated organizationally, each with responsibility in different areas, such as design, construction, congestion management, and information operations. This organization, though perhaps effective for smaller projects, hampered effective communications during the development phase of this megaproject, and was responsible for several developmental mistakes.

As noted earlier, several policy and organizational issues within VDOT wreaked havoc on this project in the early phases. Until the subsequent organizational changes, VDOT did not advocate formal project management techniques, or offer project management training or guidance.

Assessment and Analysis

1. Please complete your evaluation of project management during this phase, using the following grid:

   Rating Scale: 5–Excellent, 4–Very Good, 3–Good, 2–Poor, 1–Very Poor

Project Management Area	**Development Phase**
Scope Management	
Time Management	
Cost Management	
Quality Management	
Human Resource Management	
Communications Management	
Risk Management	
Procurement Management	
Integration Management	

2. Please highlight the major areas of strength in the management of this phase of the project:

3. Please highlight the major opportunities for improvement in the management of this phase of the project:

The Implementation Phase

The SIIP continued to move forward with the planned large-scale project approach. The project scope has changed little and the management of that change has been exceptional. One example of prudent scope management was the decision to eliminate exit and entrance ramps for carpool lanes due to the uncertainty of the planned expansion of the Washington, DC Beltway, which may not include carpool lanes (Timberg, 2000).

The project performed well in the cost management area, despite the early mistakes, primarily because VDOT was willing to listen to the project management team and change its procedures to accommodate megaprojects. Two areas of mistaken cost estimates that became especially evident in the implementation phase were the increased expenditures for raw materials and skilled labor. This was due to the lack of inflationary factors in the original estimates. Project planners had a good idea of initial costs; however, due to the size and length of the schedule, estimates did not reflect actual costs for labor, raw materials, and other commodities. In addition, people who own land that VDOT needed to acquire for right-of-way have disagreed with the state on its value, resulting in court cases and attorneys' fees. By the middle of 1998, VDOT's estimate for SIIP had risen to US$394 million. However, this figure was still based on inaccurate and incomplete forecasting. With a change in administration at VDOT, the project management team incorporated lessons learned from the previous mistakes and recalculated the cost estimate for the entire project. The new estimates considered inflation, a more complete understanding of the VDOT overhead, and the latest changes in scope. These estimates predicted the project to cost about US$700 million, which appears to accurately reflect the project management team estimate for the first time (Shear, 2002).

Although there have been several scope changes that have impacted the schedule, time management has generally been excellent. The project schedule was well planned for such a large undertaking and has generally progressed as intended (VDOT Springfield Interchange Improvement Project, 2003b). One impact to the schedule that should have been foreseen was the interference that arose during the construction of a rail bridge for a busy (60 trains a day) rail corridor. Heavy traffic and stringent safety requirements combined to limit available work hours and cause a significant increase in task duration. This delay and others caused by scope changes increased construction time for two stages by eight months, but with the creative planning of the phased implementation, there were no significant delays in the overall project schedule.

Whereas the contract incentives were a failure in stage 1, they were extremely successful in stages 2 and 3, which were completed six months ahead of schedule. One contracting company received a US$10 million bonus check from VDOT for the early completion of these key stages (Jones, 2002, March 6).

Project performance improved for risk implementation because the new SIIP project team recognized the importance of a formal risk management program and implemented specific procedures at the project level. The SIIP project team recognized quality and safety as important assets that require constant attention. They created a strong quality-assurance program that captured lessons learned for future incorporation into the project. Although the team's implementation was effective, the disconnect between their project system and the VDOT quality index, which admittedly is an inaccurate measure, prevented the project from benefiting

fully from these efforts.

The project performed very well in teamwork implementation, partly because of the hard work and dedication of the project leadership team, but also because of recent significant changes and reforms within VDOT. These included sweeping fiscal changes within VDOT, the implementation of important organizational reforms, new methods for estimating the cost of projects, strict financial controls, and a major reorganization for the management of megaprojects, putting the leadership of the entire project under one individual. This new organizational relationship, though implemented more than two-thirds of the way through the project, has significantly benefited the SIIP's current and planned project stages.

These major organizational changes within VDOT had many positive effects on project communications. In particular, having a single project manager enabled the project team to correct problems initiated in the development phase that were still plaguing stages 6 and 7 of the project. A new computer system installed at VDOT to help monitor the progress of road construction projects has already demonstrated its value on this and other projects (Shear, 2002). The team has also taken advantage of cell phones, e-mail, and official correspondence to communicate, and has kept a vast library of all project correspondence.

The new organization has been moving toward a project management framework and implementing project management processes and best practices. This trend is very positive, well received by the professional staff, and long overdue; indeed, these changes should have been implemented earlier to enhance the likelihood of success for the project.

Assessment and Analysis

1. Please complete your evaluation of project management during this phase, using the following grid:

   Rating Scale: 5–Excellent, 4–Very Good, 3–Good, 2–Poor, 1–Very Poor

Project Management Area	**Implementation Phase**
Scope Management	
Time Management	
Cost Management	
Quality Management	
Human Resource Management	
Communications Management	
Risk Management	
Procurement Management	
Integration Management	

2. Please highlight the major areas of strength in the management of this phase of the project:

3. Please highlight the major opportunities for improvement in the management of this phase of the project:

The Closeout Phase

The project team, as well as VDOT, continued to learn from its past mistakes by incorporating lessons learned from previous stages into subsequent stages.

The project performed well in scope closeout, again because of the team's willingness to incorporate lessons learned from mistakes made in previous phases into the planning for future phases. For example, contractual incentives that were ineffective and caused cost increases in the first stage were changed for stages 2 and 3, resulting in those stages finishing six months ahead of schedule.

The project also performed well in cost closeout, because not only did the team use the mistakes of previous stages of the project to improve cost estimating and forecasts, but it also convinced VDOT to change its estimating procedures in the process. Not only have estimates on future work for the SIIP been more accurate, but also estimates for projects of all sizes throughout the state of Virginia will now reflect actual costs more accurately.

The project performed well in contract closeout because of the team's and VDOT's willingness to learn from past mistakes and incorporate those lessons into plans for the future, as discussed in other areas. In addition, the project team maintained an automated list of closeout requirements, often called a punchlist, which the team used to ensure that even minute details were completed before a contract is declared finished (Jones, 2002, March 6).

The project performed very well in risk closeout, because not only did the team incorporate risk management into future project stages, but they also convinced VDOT of the value of risk management and statewide procedures that have been modified to incorporate risk planning and risk management in the early stages of all projects, not just megaprojects.

The project team applied its efforts to create a quality system that can be used by future stages and projects. Using tools that VDOT already had in place, such as the pre-constructability review of a design before it is released for bids, the project team applied lessons learned to ensure that project stages under review will not be plagued by past mistakes. However, some disconnects between the project system and the VDOT system provided additional challenges in this area.

Although the project team had developed sound plans for maintaining teamwork and positive relationships as current and subsequent project stages come to a close, there have not been sufficient opportunities to demonstrate the effectiveness of these plans since the organizational changes occurred within VDOT. Despite organizational barriers to good communications that were present during most of the first three stages of the project, the team performed well in the closeout phase because of the significant effort put into learning from past mistakes and communicating them to those responsible for developing future stages. The schedule design with several overlapping stages -- and the project correspondence files -- facilitated this process.

The lack of a modern computerized knowledge management system to easily share lessons learned throughout the organization caused challenges to better performance in this area. However, SIIP has successfully utilized lessons learned information from ongoing and previous stages and projects, and has succeeded at getting these practices incorporated into new VDOT

processes. This demonstrates that VDOT is learning well as an organization, which should facilitate further improvements in this and other projects.

Overall, the project has done a fair job of satisfying stakeholders. The delay in initiating the project and the numerous small attempts to "quick fix" the problem cost a lot of goodwill, as well as dozens of lives. However, once the project was initiated, scope was managed extremely well. Commuters and businesses have been quite complimentary of the correlation between what they were told the schedule would be and how the schedule has actually evolved. Nonetheless, an outrageous gap remained between the initial political cost estimate and the actual cost of the project.

Public stakeholders are largely unaware of the overall impact of contracting issues on the project. The blunders in the development of contractual incentives early in the project were remedied later, thereby helping to improve project performance.

Despite the impact the project has had on risk management throughout VDOT, the overall performance for risk management remained weak for the project as a whole, primarily because risk management is most effective if considered in the early stages of project planning. Despite the near-heroic efforts of the project team to institute a quality management program for the project, the lack of VDOT support, particularly in the early stages, resulted in challenges to the project.

There is great potential in VDOT's new organizational responsibility plan for megaprojects. However, the fix was offered so late into this project that it had limited impact on its overall performance. Overall, the project performed well in communications, partly because of the ingenuity and conscientious work of the project team leaders, and partly because of the sweeping organizational changes within VDOT that allowed the team to overcome early deficiencies. Despite serious challenges in the early stages of the project, management of the SIIP improved steadily as the project moved forward through its various stages. Stages 1 through 3 of the SIIP were completed in 2001. Work is in progress on the final stages of the project which is planned for completion by late 2007.

Assessment and Analysis

1. Please complete your evaluation of project management during this phase, using the following grid:

   Rating Scale: 5–Excellent, 4–Very Good, 3–Good, 2–Poor, 1–Very Poor

Project Management Area	Closeout Phase
Scope Management	
Time Management	
Cost Management	
Quality Management	
Human Resource Management	
Communications Management	
Risk Management	
Procurement Management	
Integration Management	

2. Please highlight the major areas of strength in the management of this phase of the project:

3. Please highlight the major opportunities for improvement in the management of this phase of the project:

Summary of Project Assessment and Analysis

1. Please complete your evaluation of project management for this project and calculate the average rating, using the following grid:

   Rating Scale: 5–Excellent, 4–Very Good, 3–Good, 2–Poor, 1–Very Poor

Project Management Area	Inception Phase	Development Phase	Implementation Phase	Closeout Phase	Average
Scope Management					
Time Management					

Cost Management					
Quality Management					
Human Resource Management					
Communications Management					
Risk Management					
Procurement Management					
Integration Management					
Average					

2. Please highlight the major areas of strength in the management of this project:

3. Please highlight the major opportunities for improvement in the management of this project:

4. Please highlight the major project management lessons learned from this project:

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This case study was adapted to make it a learning resource and might not reflect all historical facts related to this project.

Case Study

Springfield Interchange Improvement Project

Teaching Note

This case study is structured to allow the reader to evaluate the project management methods and processes used in this project. It covers a wide range of project management areas within four project phases: inception, development, implementation, and closeout. Discussion is provided within each project phase of specific activities, accomplishments, and performance shortcomings in applicable processes of the five Project Management Process Groups (Initiating, Planning, Executing, Monitoring and Controlling, and Closing). The reader is asked to perform an assessment of performance in terms of the appropriate processes of various Project Management Knowledge Areas at the end of each phase. At the end of the case, the reader is asked to summarize his or her assessments and to provide a list of lessons learned from the case study.

In this teaching note, the following is provided:

1. Assessment of appropriate project management processes in terms of the Project Management Knowledge Areas. Suggested assessments are provided for each phase, and an average is calculated for each Knowledge Area.
2. A discussion of major areas of strength, opportunities for improvement, and lessons learned from the evaluation of the case study.
3. A brief description of project life-cycle phases, project management process groups, and Project Management Knowledge Areas, based on *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*)—Third Edition (Project Management Institute, 2004).

It is expected that the reader will reach somewhat similar conclusions to those provided in this teaching note. However, it is very possible that readers may conduct additional research, develop further insights, and reach other conclusions.

Assessment of Project Management
The following table summarizes the assessment of appropriate project management processes, in terms of the nine Project Management Knowledge Areas, by phase:

Rating Scale: 5–Excellent, 4–Very Good, 3–Good, 2–Poor, 1–Very Poor

Project Management Area	Inception Phase	Development Phase	Implementation Phase	Closeout Phase	Average
Scope Management	3.00	4.00	5.00	3.00	3.75
Time Management	2.00	4.00	4.00	4.00	3.50
Cost Management	1.00	1.00	4.00	5.00	2.75
Quality Management	1.00	1.00	4.00	4.00	2.50
Human Resource Management	2.00	2.00	4.00	3.00	2.75
Communications Management	4.00	4.00	5.00	4.00	4.25
Risk Management	1.00	1.00	3.00	4.00	2.25
Procurement Management	4.00	3.00	4.00	4.00	3.75
Integration Management	2.00	2.00	3.00	4.00	2.75
Average	2.11	2.44	4.00	4.00	**3.14**

Major Areas of Strength, Opportunities for Improvement, and Lessons Learned
As noted in the table, the overall scoring suggests the Springfield Interchange Improvement Project (SIIP) is a modest success, but there is room for improvement in applying modern project management principles. The major strengths in the management of this project are in the areas of communications, scope, and procurement management. The major opportunities for improvement in this project are in risk and quality management.

As the then-governor of Virginia noted on August 2, 2001, when he stood atop the newly constructed overpass at the Springfield Interchange and cut the ribbon, officially opening that section to traffic, "This is one of the great works of the modern world." There is no doubt that the SIIP is indeed a marvel, and one of the largest and most complex highway projects in the United States (Shear, 2002). But is the project successful, and to what extent is the success attributable to modern project management techniques?

Judging by the sentiments of the primary stakeholders, the daily commuters, and the Virginia taxpayers, the project has been extremely successful. However, the summary of the preceding analysis indicates that the SIIP progressed steadily in terms of the application of modern project management practices. The score reflects performance challenges in the early stages of the project on the part of VDOT, which served as both the project sponsor and overall manager. Although the press continually reports that the project costs are skyrocketing and the scope is forever changing, the reality is that the project has remained largely unchanged since inception, and what has changed is the accuracy with which estimates are calculated and reported.

The analysis shows that the early phases of the project generally received lower scores for most of the Project Management Knowledge Areas, and the later phases generally received higher

scores for most Knowledge Areas. This could be explained by the fact that the early phases required a great deal of input and support from VDOT, which served as both the overall manager and project sponsor. (VDOT was clearly having problems during the years in which the early phases of this project were being conducted.) Eventual organizational changes within VDOT improved its ability to manage the project using modern project management principles, and holds promise for further improvements in the future. The biggest successes for the project may be that VDOT would continue to incorporate the lessons learned from the implementation of this megaproject and allow—even require—more modern project management practices to be used throughout the organization.

Overall, the key lessons learned from this project include:

- Recognition by VDOT of existing problems and adoption of appropriate changes allowed the team to work through these problems and improve project management throughout the organization
- The use of modern techniques by the project management team allowed the team to "lead the way" for VDOT, as demonstrated in estimating procedures, calculating overhead, and managing risk
- Application of modern project management tools and techniques allowed drastic improvements to take place, particularly in the areas of Quality Management and Risk Management. These techniques allowed more accurate cost estimates to be calculated and reported
- The SIIP could set the example for the rest of VDOT to follow in incorporating modern project management practices as a normal way of doing business to enhance its overall effectiveness.

Project Life-Cycle Phases, Project Management Process Groups, and Knowledge Areas

Project Life-Cycle Phases

Project managers or the organization can divide projects into phases to provide better management control with appropriate links to the ongoing operations of the performing organization. Collectively, these phases are known as the project life cycle. The project life cycle defines the phases that connect the beginning of a project to its end. Phases are generally sequential and are usually defined by some form of technical information transfer or technical component handoff. Although many project life cycles have similar phase names with similar deliverables, few life cycles are identical. Some can have four or five phases, but others may have nine or more. (Project Management Institute, 2004, pp. 19–22). In this case study, the following phase descriptions are used:

Inception

This phase may also be called initiation, conception, or preparation. It deals with project proposal, selection, and initiation. It considers alignment of the project within the organization's overall strategy, architecture, and priorities. It explores linkages of the project to other projects, initiatives, and operations. It addresses methods of identification of the opportunity or definition of the problem leading to the need for the project, and clarification of the project's general premises and basic assumptions. It considers the project concept, feasibility issues, and possible alternative solutions.

Development

This phase may also be called detailed planning, definition and design, formulation, the formal approach, preliminary engineering, and preliminary design. It covers project organizing, planning, scheduling, estimating, and budgeting. It addresses development of plans for various project parameters, such as risk, quality, resources, and so forth, as well as plan audits (possibly pre-execution). It considers development of a project baseline and establishment of the detailed project work breakdown structure and master plan. It discusses finalizing the project charter and obtaining approval to proceed with the project.

Execution

This phase may also be called implementation, implementing and controlling, adaptive implementation, and deployment. It examines directing, monitoring, forecasting, reporting, and controlling various project parameters, such as scope, time, cost, quality, risk, and resources. It considers appropriate methods for change management and configuration control in evolving conditions. It addresses resource assignment, problem solving, communications, leadership, and conflict resolution. It also looks at documentation, training, and planning for operations.

Closeout

This phase may also be called closing, termination, finish, conversion, cutover, conclusion, results, and final documentation. This last phase advises on finalizing and accepting the project, product, system, or facility. It addresses transferring the responsibility for operations, maintenance, and support to the appropriate organizational unit or individual. With reassignment or release of project resources, this phase considers closing and settling any open project items. It addresses post-project evaluation (audit), and preparation of lessons learned. It covers

documentation of areas of strength and opportunities for improvement. It frames the development of recommendations to support success in future projects.

Project Management Process Groups

Project management is accomplished through processes, using project management knowledge, skills, and tools and techniques that receive inputs and generate outputs. These processes are divided into five groups, defined as the Project Management Process Groups: Initiating Process Group, Planning Process Group, Executing Process Group, Monitoring and Controlling Process Group, and Closing Process Group. Process Groups are seldom either discrete or one-time events; they are overlapping activities that occur at varying levels of intensity throughout the project. The Process Groups are not project phases. Where large or complex projects may be separated into distinct phases or sub-projects, all of the Process Group processes would normally be repeated for each phase or subproject. The project manager and the project team are responsible for determining what processes from the Process Groups will be employed, by whom, and the degree of rigor that will be applied to the execution of those processes to achieve the desired project objective. (Project Management Institute, 2004, pp. 37–67). In this case study, the Project Management Process Group processes are imbedded within each phase, as appropriate.

Project Management Knowledge Areas

The Project Management Knowledge Areas organize the project management processes from the Project Management Process Groups into nine Knowledge Areas. These areas are: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resource Management, Project Communications Management, Project Risk Management, and Project Procurement Management (Project Management Institute, 2004, pp. 9–10). In this case study, the Project Management Knowledge Areas are considered within each phase and are used for performance assessment, as appropriate.