Project Management Institute

Case Studies in Project Management

Using the Geographic Positioning System in the World Trade Center Cleanup Project

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This case study was originally prepared as part of Project Management Applications, the capstone course of the Master of Science in Project Management in the Department of Management Science at The George Washington University, by the graduating students listed above with the supervision of Professor Cioffi, during the Spring 2003 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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Table of Contents

Case Study

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Introduction

On September 11, 2001, two airplanes struck each of the 110-story World Trade Center (WTC) towers in New York City. Within hours, both towers collapsed, claiming thousands of lives and leaving behind the world's largest unplanned demolition site. Nothing approaching the scope of this cleanup had ever been previously required. Major contractors were immediately mobilized to participate in this huge cleanup effort.

It quickly became obvious to officials that the removal of material from "Ground Zero" to dump sites up to 20 to 30 miles away would need to be managed differently than any previous project to ensure efficiency and speed. Officials were faced with the major task of monitoring multiple fleets of vehicles that transferred the ruble and hazardous materials from Ground Zero to evaluation and disposal sites (Emigh, 2002). The trucking operation composed of 200 vehicles was responsible for removing close to 1.8 million tons of material from the site. The operation involved cranes removing debris and loading it into dump trucks and trailers, which trucked the waste away. A fence was erected around Ground Zero and all out-going vehicles had to be washed and covered to ensure that asbestos dust did not escape into neighborhoods where the trucks drove. Four contracting companies handled staging and directing the dump trucks into and out of the loading zones. Occasionally, work stopped during recovery of human remains, which created shortages and surpluses of trucks at various sites while wreaking havoc on nearby traffic. As the work progressed, the fenced area around Ground Zero was reduced and the area surrounding the site returned to normal, creating more of a traffic problem for the trucks. Tracking the vehicles was accomplished by issuing multicopy manifests (paperwork), while police and others teamed to monitor truck movement on the routes and within Ground Zero.

Officials of New York City (NYC), the Department of Design and Construction (DDC) for New York City, the Federal Emergency Management Agency (FEMA), the Port Authority of New York and New Jersey, and others realized quickly that they needed a system to manage this effort. The system needed to be implemented immediately, while facilitating around-the-clock work. Removal of debris is usually included in construction or demolition projects, but not to the magnitude witnessed at the WTC site. Improving efficiency was the most important objective, but having a method to ensure security of the trucks' loads during transit was also needed to avoid possible misconduct, such as selling debris, stealing recyclables, etc. Experts suggested that these objectives could be achieved by employing Geographic Positioning System (GPS) technology. Officials were originally skeptical about the idea of using GPS to assist in the cleanup effort. However, the DDC identified possible suppliers, invited firms to submit bids to assist with the tracking of vehicles in the cleanup contract, and issued a request for quotation (RFQ) that concisely identified their exact needs (Menard & Knieff, 2002). FEMA and DDC required a cost-effective solution that would be portable and applicable elsewhere, after completion of the WTC cleanup project. The solution had to be economical to acquire, easy to install, and efficient to operate. The GPS appeared to be suitable for providing the necessary cost efficiencies.

This case study addresses a project that evolved from a crisis—not from traditional project planning methods where a product or service need is identified, alternatives are considered, and a high-level analysis is completed to determine what next steps are appropriate. The case study focuses on the project management practices exercised by the contractor during the project to employ the GPS to increase the efficiency of the cleanup efforts, and considers the impact of the GPS subproject on the overall cleanup project. The project team performed very well in some project management areas and had challenges in others. However, this project was completed successfully, resulting in numerous benefits and efficiencies.

The case study covers various Project Management Knowledge Areas (Project Management Institute, 2004) and is presented in four project phases: inception, development, implementation, and closeout. Within each project phase, the activities, accomplishments, and performance shortcomings in the Initiating, Planning, Executing, Monitoring and Controlling, and Closing Process Groups' processes 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. An overall assessment of performance is then conducted, resulting in a numeric evaluation of the management of this project, including areas of strength, opportunities for improvement, and lessons learned.

The Inception Phase

Upon receiving the RFQ, the team of contractors that was subsequently awarded the contract determined that the solution needed to provide: (1) documentation for truck loads; (2) reliable 24 hours/day and 7 days/week (24/7) support; (3) system ruggedness to work in a demanding environment; (4) ability to monitor truck locations within zones to ensure security and enable full utilization of trucks; (5) accessibility of tracking information by numerous agencies; and (6) ability to implement the system as soon as possible. The team put together a proposal to submit to the DDC, detailing what the team intended to provide in general terms. Specifics, such as trucking routes and an exact number of vehicles in which to have the GPS devices installed, were not specified. This was due to the extremely short time constraints that were imposed on the bidders. The DDC wanted the systems installed immediately. The contractors specified that they would install portable vehicle location devices (VLD) in each of the trucks, as well as deploy software to enable the documentation and security needs of the DDC to be met through the monitoring of a 24/7 call center under their supervision. Although quickly assembled under great pressure, the proposal submitted by the contractors identified the scope in general terms of what was to be provided under contract.

The DDC was faced with many barriers to speeding up the cleanup project, and using all available means to speed the cleanup process meant taking some chances. Improving the efficiency of existing processes was the main option within their control. Because of these factors, there was only one objective that the officials wanted to meet—get the job done as soon as possible.

The team of contractors was among the first to respond to queries for the GPS. They had the required technology platform and demonstrated the solution on-site within 48 hours of the initial call. The contractors incurred travel costs to be active at the site and had to properly qualify to be in good standing for the RFQ. The contractors demonstrated their agility and properly qualified for the RFQ (Sleeper, 2002).

For a complete system, the contractors introduced several partners and subcontractors. Each VLD was equipped with a GPS receiver and a modem made by another company. Other subcontractors provided on-site installation services, satellite telecommunications services, and call-center services. Contractors had to identify the key subcontractors for necessary components of the VLDs, and negotiate the protocol for cost splits and payments that subcontractors would receive once the contractors were selected. Despite the complexity of subcontract issues and their potential impact on schedule, risk, and cost, the contract provided the simplicity of fixed pricing.

According to the procurement process when doing business with NYC agencies, the award goes to the lowest responsive, responsible bidder, per their Competitive Sealed Bidding rules (Procurement Policy Board Rules for NYC). A formal RFQ was issued in accordance with the NYC process, which included a questionnaire for potential vendors. Submissions were made by the deadline and evaluated on technical and business parameters. Officials took just two weeks to select the system presented by the contractors (Sleeper, 2002). While completing negotiation of terms and conditions, the technical experts of the team were already preparing the solution.

The contractors solicited input from project team members and from DDC officials to identify the internal and external risks of the project. As the contractors were planning the project, there was high concern that the GPS would not solve the traffic problems. The contractors created a simple risk identification sheet for the team members to identify the potential risks for this project. Six major categories of risk were identified, and a preliminary kickoff meeting for team members was conducted to identify potential risks within those categories. The categories were: technical, installation, financial, coverage, operation, and customer risks.

An important goal of the project was to alleviate the bottlenecks and chaotic traffic patterns on and around the site created by the hundreds of trucks hauling debris to dump sites. However, during this phase, there was high concern for ensuring that technology the contractors planned to employ would actually work, and less concern for how to actually measure if the traffic problem was reduced. To test the quality of the GPS technology and ensure it would work in the city environment, the team demonstrated the system in Manhattan, driving trucks between tall buildings to prove that it would work even within the “urban canyon” that sometimes threatens GPS performance (Sleeper, 2002). Further, several measures were identified in an attempt to determine how to monitor system performance, including the number of trucks on-site and the number of loads per truck per day.

Teamwork was exemplified throughout the WTC cleanup project. The extraordinary efforts by all resources involved in this project helped realize successful results. The team rapidly pulled together complementary resources to ensure the success of their work. Existing business relationships with these resources helped in this effort, and technology provided the solution. The communications plan included the RFQ and the product demonstration, but did not specify formal means by which the client, contractors, and subcontractors would be able to communicate project changes and other project information.

Project management practices evolved from the success of application development efforts and a number of moderately sized projects. A project management office (PMO) provided the project team with templates, standards, guidance on best practices, and a process by which projects should be implemented. Some of the templates and example documents included service level agreements, hardware RFQ’s, risk assessments, governance agreements, software development guidelines, and project proposal guidelines.

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

After submitting the proposal to the DDC, the contractors continued the scope planning for the project. The team examined the areas in which the DDC was experiencing problems, further developed the scope and broke it down into smaller details. The team planned to install VLDs on every dump truck assigned to the cleanup activity and set up "geofenced zones" around Ground Zero and the dump sites, along with "geofenced corridors" running between Ground Zero and the dump sites (Menard & Knieff, 2002). This would allow the movement of trucks into and out of the corridors and zones to be tracked with a software application developed by the team. The software would also allow for an individual record to be kept for every truck trip, and for each truck's location to be followed during its transit to the various zones to alert for any potential security issue. For security purposes, alarms indicating whether a truck had gone out of the zone or corridors would be monitored and addressed through a 24/7 call center that would be set up and operated on-site. The call center would also be responsible for directing the trucks to minimize their wait times in the different zones and corridors.

The contractors did a good job planning what to accomplish. However, no work breakdown structure (WBS) or change control management plan was employed during the development phase. A WBS could have assisted the team in defining the scope, as well as with scheduling and cost estimating details.

The agreement called for the contractors to provide 235 VLDs, as well as software for locating, tracking, monitoring, and operating a call center. The 235 specially equipped VLDs, which cost about US$1,000 each, were purchased by NYC and remain in its possession. The rest of the package provided by the contractors included customization and installation of the VLDs, software application, call center operation, and project management. The cost of the VLDs was about US$235,000. Other costs included installation and airtime for messaging. In the beginning, 200 trucks were used each day. By using GPS to manage and track the flow, the number was reduced to 50 trucks for day and night shifts. Each truck improved from moving four loads per shift to ten per shift. The cost of moving each load of debris was about US$50 dollars, so using the GPS added to big savings for the city (Sleeper, 2002). In the future, the DDC would need to use only the location service provider if it saw fit to use the VLDs again in other applications.

Once the contracts were awarded, the team coordinated their efforts with their business partners to create the customized units and software to support it. However, the team did not develop a detailed schedule for this effort, with clearly identified tasks that had to be undertaken to accomplish the project. The team did not identify important milestones, critical tasks, and a schedule to measure their performance through the implementation phase. Instead, they decided not to invest any resources in scheduling and addressed problems in an ad hoc manner.

The team's solution was a complete system for monitoring, recording, and reporting vehicle activities, based on location data, using GPS and wireless communication. Key elements of the system were:

- In-vehicle portable units: The team customized its VLDs to meet DDC specifications for portability and ruggedness to address dump truck and trailer specifics.
- WTC software application: The team used its technology to develop a unique application. The WTC software application was Web-based and could be universally accessed over the Internet.

- WTC report generator: A report generation tool allowed the DDC to analyze efficiency of the operation, adjust and shift resources, compare vehicle and fleet performance, and measure improvements in real time.
- A call center was provided and operated on-site.
- Installation services were provided and installed by a subcontractor, and supported by technical experts of the team and trucking contractors.
- Equipment was formally tested and performed satisfactorily.

A simple risk identification sheet was used to highlight those risks the team believed would impact the project.

The contractors created a plan to evaluate overall project quality performance on a regular basis. The team's system planned to monitor each of the trucks in real time to provide location, load, and destination information. The system would also track vehicle locations at different times and distance intervals to determine how long vehicles stayed in the different zones (i.e., Ground Zero, on-route, in dump site, on return-route, and off-shift). The plan was to consolidate this tracking information into reports to allow visibility of the impact of the team's system on alleviating the original traffic problems. The customized reports would provide statistics detailing vehicle movements, wait periods, number of loads per shift, and number of loads per dump site. From these reports, the efficiency of the project could be monitored, and resources could be shifted and adjusted to enhance improvements in trip and queuing duration.

Teamwork was supported by the post-attack nature of the work that was being accomplished, and was further bolstered because of existing relationships among the companies. The camaraderie and *esprit de corps* of participants in the cleanup, as well as local and national support, contributed significantly to the teamwork exhibited by project participants at all levels. This, combined with a single-minded focus on the cleanup, virtually assured project team success, despite the absence of a formalized team structure or traditional team-building exercises to improve communications and create alliances within and among teams. There were no formal details regarding the relationships among various teams associated with the project. However, the business partner relationship previously developed between the contractors and subcontractors contributed greatly to teamwork by allowing project participants to immediately address project work without having to overcome usual "group norming" obstacles.

There was no formalized plan to facilitate communications and interactions between the contractors, client, and other project stakeholders and interested parties. For this project, the RFQ, products, and services formed a communications system to increase efficiencies during the cleanup. However, a plan was developed to address the client's specific needs for documentation, security, efficiency, on-going support, accessibility, flexibility, and responsiveness.

The contractors' PMO assigned a project specialist to the project team to provide assistance in the management of software development, change control, project scope control, and vendor management. However, this assistance was not fully utilized. It was taken for granted that support would be provided to navigate the policy and procedures of implementing a new software application, and to accomplish all other activities throughout 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	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 team delivered the products and services promised to the DDC during the development phase of the project in an incredibly short period of time. Within one week of the contract award, 25 customized units were on-site. Within two weeks, 200 customized units were delivered to the site, the first version of the software application was operational, and call center operations started to support the fleet. The system was in use and improvements in workflow and traffic began. In three weeks, all the system elements were in place, trucks were monitored in real time, including dedicated application software to meet documentation and security needs. The DDC started to realize benefits from the valuable feedback provided by the system. The team continued to improve performance with customized reports and executive reports that enabled further efficiency improvements.

The system was fully implemented within only a few weeks of the contract award. The team directed the installation of VLDs on every dump truck assigned to the cleanup activity, and set up the "geofenced zones" and "geofenced corridors." The movement of the trucks into and out of the corridors and zones was tracked as planned with the developed software application (which kept a record of every truck trip, and enabled each truck's location to be tracked during its transit to the various zones to alert for any potential security issue). The alarms indicating whether a truck had gone out of the zone or corridors were monitored and addressed by the 24/7 call center that was set up and operated under the team's supervision. Several cases of vehicles out of the zone were investigated, although none breached security. Despite the lack of a change management plan, the team delivered what it agreed to deliver in a short time span and under trying circumstances.

During this phase, cost is typically monitored, potential cost overruns are watched, and ways to save money are considered. However, the monitoring of spending appeared to be less important in this project. The contract was mainly fixed price. The total cost of the cleanup effort was substantially reduced, due to efficiency improvements and shortening the schedule of the overall operation. This did not necessarily assist the team's bottom line. However, no cost overruns were noted. Without the aid of the GPS, the number of truckloads and tons of debris may not have been quantified and recorded so diligently. The recorded metrics were computer-generated with the aid of GPS and the software tracking and monitoring capabilities.

After repeating a cycle of the work several times, the team helped DDC and FEMA develop a schedule to better manage the cleanup workflow. Alarms designed into the systems helped to track and closely monitor delays and deviations from the tasks; such alarms would go off if a truck drove beyond a predetermined zone, and response teams would be deployed to take action and restore other activities. Thus, the schedule of operations evolved during implementation, and no baseline schedule for the team's activities was established. However, real-time management of operational activities was implemented.

The system helped foil would-be looters or drivers who might have considered selling remnants from the disaster. Routes were carefully mapped, so no trucks could divert or be diverted (Sleeper, 2002). There were no faulty devices, power failures, or down time. The equipment provided assurance and reliability beyond its intended use.

During the development phase, contractors created a risk identification sheet, but did not develop and formalize a risk management plan, or make efforts to determine the risk response strategy for identified risks. During the implementation phase, the risk identification sheet was not used to monitor risk. However, the team had internal procedures that were followed in mitigating various risks. It should be noted that temperatures ranged from 800 to 1,300 degrees Fahrenheit. So, it was fortunate that the GPS technology was not contingent upon temperature, unlike most technologies that require a cooler working environment.

The plan that the team devised to track quality during the development phase of the project was implemented. The recorded metrics were computer-generated with the aid of the GPS, using the software tracking and monitoring capabilities. Reports provided the average time in different zones with identification of route delays. An executive report was also generated to provide a top-level view of overall efficiency. The team's system monitored each of the trucks in real time to provide location, load, destination, and to generally track vehicles for location time and distance intervals to determine how long they stayed in the different zones. This tracking information was consolidated into reports to provide validation of the impact the system had on alleviating the original traffic problems. The customized reports provided statistics detailing vehicle movements, wait periods, number of loads per shift, and number of loads per dump site. From these reports, the efficiency of the project was monitored, and resources were shifted and adjusted to enhance improvements in trip and queuing duration, as well as number of trips per shift.

Cleaning up Ground Zero included the coordination of many public and private resource groups. This phase is marked more by the coordination and results that the project bore, rather than the efforts that went into monitoring and controlling a formal approach to the development of teamwork itself. The team structure that evolved and the entities involved included: the supply of VLDs by the contractors; trucks and drivers supplied by the various contractors; installation of VLDs into the trucks by a subcontractor; call center operation by another subcontractor; database supplied and reports generated by the team; and oversight and control of the trucks and information derived from the data by officials from FEMA and the DDC. The key factors to success resulted from the events that led to the need for the cleanup project. The destruction of the WTC itself created team commitment to the effort, and a source of encouragement to the team to beat cleanup duration estimates. Coordination and cooperation were the hallmarks of this cleanup effort.

Aside from the potential communication failures that one would expect to occur in implementing a project without a communications plan, this phase was still successful from a communications perspective. Contributing to this success is the service that the system provided to the DDC and FEMA in the form of meaningful truck fleet data. The process of collecting and collating the data into meaningful reports greatly reduced the inefficiencies associated with manual tracking.

Among the initial challenges faced by the team was the need to provide a solution that would facilitate accessibility, flexibility, and responsiveness (Sleeper, 2002). The nature of the database design and the platform used to post reports allowed for Web access and review. Report creation and changes were accomplished in a speedy manner once received. However, the absence of a communications plan itself may raise questions about the amount of time used to transmit requests for changes and Web updates. Numerous alarms were built into the system to alert officials to problems with the trucks while in operation. Distribution inefficiencies were found, solved, and documented. However, there was no documented plan to address these alerts, a process for communicating issues to project stakeholders, and various escalation procedures to determine an official's next action. Technology helped avert and mitigate various situations, and the software can be easily confused with the communications plan itself. Despite absence of a communication plan, the success of the project must be recognized.

During the implementation phase, the role of the team's PMO became less significant due to the nature of this project and the fact that the team had other ongoing projects that needed more help and assistance.

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

During the closeout phase of the project, the team could have looked for causes of variances, examined the reasoning behind corrective action taken, and documented lessons learned from scope change management to ensure that this information became part of the historical database for future projects. Due to the fast-paced nature of the project and the absence of a documented scope management plan, there was not a great deal that was documented for input into an historical database. However, lessons were learned from this project, consolidated, and planned to be incorporated into future projects.

One of the main concerns of the project manager during the closeout phase is completing the project and satisfying the customer. After that has been done, the numbers might tell a different story. This project has been identified as the largest and costliest cleanup project in the history of the United States (Catanoso, 2002). As a direct result of GPS, it was realized that about two-thirds of the trucks previously used in the recovery were unnecessary. Taking those trucks out of service saved money and time by creating more space on the streets for the remaining vehicles (*The Roaring News*, 2002).

From the very first day of operation of the new system, DDC staff noted on-scene routing improvements, which were identified from analysis of the vehicle tracking system. The changes in the system had a high return on investment. The system cost was already known from the fixed-price contract. There were no casualties to add to the liabilities that could have been incurred and further increased the total cost. Technology and team cohesiveness proved to be efficient and reliable, and helped in overall cost savings.

Although time was a major factor in this project, the team did not even consider developing a detailed schedule. The team simply acknowledged time as the overriding objective. However, the contractors did successfully solve the problem of their client by providing efficient technology, which helped complete the cleanup project sooner than the completion date anticipated originally. The team did not make any efforts to document the lessons learned with regards to scheduling and did not document any change processes. Despite these issues, it is interesting to note that the project was still successful, having adopted a flexible schedule and efficient technology.

The system provided measurable savings on the trucks used and improvements on the workflow site. The integration of such a system was probably never imagined to aid in such a tragic event. As a result of the rave reviews afforded the GPS and its success, the contracting companies are winning new important contracts.

During the closeout phase, the team could have used a risk factor analysis where actual risk responses are recorded and documented for major risk events that might have occurred, and the project manager could have utilized a risk factor analysis template to document the actual risk occurrences and actual risk responses. The results of the analysis, along with the risk identification sheet, could have been submitted as one of the closeout deliverables to be given to the PMO. However, given the success of the overall project, none of these actions was taken.

All of the trucks' trips were recorded in real time, providing a huge improvement over the original paper-ticket system that did not provide real-time information. There were no security breaches, although several potential breaches were quickly identified and resolved. A reduction in the amount of traffic jams and better monitoring of vehicles increased the control over wasted time, reduced lines at wash stations, dump sites, and loading areas, provided better tracking of delays, and enabled advanced routing of traffic. Queuing times were a major bottleneck in the process. By resolving this problem, increasing the number of loads per truck per shift, and improving efficiency, substantial improvements in the cleanup operations were achieved. This gain in efficiency and quality enabled the number of trucking contractors to be reduced from four to one and the total number of trucks in the fleet to be reduced from 200 to 50, which greatly reduced the earlier estimated expenses.

Teamwork is necessary for the smooth flow of project work among separate entities, but a formal team structure was not documented for this project. However, teamwork was greatly enhanced by the emotions and *esprit de corps* that were evoked by the tragedy itself. It is obvious that an event such as this one creates an atmosphere of teamwork that is rarely found in “normal” projects. The lessons learned during the entire project emphasize the importance of single-purpose or common-thread goal setting. The elements that helped to create the teamwork among participants in the WTC cleanup project might be possible to apply in other projects, although not necessarily at the same emotional level.

There was no formal communications plan in effect during the project and no formal plan for closeout. The closeout phase consisted primarily of dismantling the network and equipment and a general shutdown of the devices. The team prepared a written report summarizing the lessons learned during this project. The contractors attempted to convince NYC to use their technology in sanitation and transportation arenas, especially since the system could be customized and applied to other requirements the customer may have, including those with hazardous material disposal. Utilizing in-vehicle units, software application and a report generator would give customers a complete solution for many possible safety and security situations. Encouraged by the success of the GPS-based management and tracking solution, NYC, FEMA, and other state and federal agencies expressed their intent to incorporate this technology into future recovery efforts (Menard & Knieff, 2002).

The team established a PMO as a strategy to help manage the growth of integrated technologies, provide ownership and accountability for critical projects, assess the impact and risk of change, and provide guidance on promising practices and standards. As a result, project managers would be able to concentrate on the management of their projects, securing budget, verifying authority, handling human resource issues, and acting as liaison to the other project teams. They would be able to focus their efforts on the long-term health of the organization and the relationships with various stakeholders.

Integration of activities in this project strengthened organizational alignment and enhanced the team’s ability to maintain operations, perform rapid planning, and cultivate client relationships. Integration provided the advantages of a role-based organization, including the quick deployment of cross-functional teams, management of risk and impact across organizational boundaries, and promotion of the notion of core competencies.

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:

References

Catanoso, J. (2002, September 9). In depth: How Sept. 11 changed the face of business: WTC cleanup with N.C. ties. *Triangle Business Journal*. Retrieved on September 3, 2005 from http://triangle.bizjournals.com/triangle/stories/2002/09/09/focus5.html

Emigh, J. (2002, July 1). GPS on the job in massive world trade center clean-up. Access Control & Security Systems. Retrieved on September 3, 2005 from http://securitysolutions.com/ar/security_gps_job_massive/

Menard, R. J., & Knieff, J. L. (2002, September). GPS at Ground Zero: Tracking World Trade Center recovery. *GPS World*. Retrieved on September 3, 2005 from http://www.gpsworld.com/gpsworld/article/articleDetail.jsp?id=30686

Procurement Policy Board Rules for NYC, p. 3. Retrieved on September 3, 2005 from http://www.nyc.gov/html/selltonyc/pdf/rules_chapter_1.pdf

Project Management Institute. (2004). *A guide to the project management body of knowledge*, (3rd ed.). Newtown Square, PA: Author.

Sleeper, S. (2002, June 7). Satellites help cut Sept 11 cleanup costs. *Investor's Business Daily*.

The Roaring News. (2002, Fall). Tracking Ground Zero trucks … from Space (2002). *The Roaring News: Richmond Hill Economic Development Quarterly Report*. Retrieved on September 3, 2005 from http://www.richmondhillonline.com/roaringnews/Roar-Fall2002.pdf

The following works, although not cited, were also consulted while preparing this document:

Roberts, M. J. (2001). *Developing a teaching case (Abridged)*. Boston: Harvard Business School Publishing.

Swiercz, P. M. (2003). *SWIF learning: A guide to student written- instructor facilitated case writing*. Unpublished manuscript, Washington, DC: The George Washington University.

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Teaching Note

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Using the Geographic Positioning System in the World Trade Center Cleanup 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*—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	2.00	3.00	3.00	2.75
Time Management	3.00	2.00	3.00	4.00	3.00
Cost Management	3.00	3.00	4.00	5.00	3.75
Quality Management	5.00	5.00	5.00	5.00	5.00
Human Resource Management	3.00	3.00	5.00	3.00	3.50
Communications Management	2.00	2.00	3.00	2.00	2.25
Risk Management	4.00	2.00	2.00	2.00	2.50
Procurement Management	5.00	5.00	5.00	5.00	5.00
Integration Management	4.00	2.00	2.00	3.00	2.75
Average	3.56	2.89	3.56	3.56	**3.39**

Major Areas of Strength and Opportunities for Improvement, and Lessons Learned

As can be seen in the table, the overall scoring suggests the team's project to assist in the tracking of trucks as they loaded and transported debris away from Ground Zero was a huge success, as was the overall WTC cleanup project. There were some inadequacies and shortcomings in the team's project management approach, leaving open the question "How much *more* successful could this project have been if proper project management methodologies and practices had been enacted from the onset?" The major strengths in the management of this project are in the areas of quality, procurement, cost, and human resource management. The major opportunities for improvement in this project are in communications and risk management.

Upon receiving the RFQ, the contractors did a good job of quickly putting together a proposal to submit to the DDC in general terms. During the development phase, the team continued to define the scope of the project, but neglected to employ a WBS, which could have helped them to define the scope and identify deliverables, and could have also assisted with scheduling and cost estimating. No change management plan was documented. In the implementation phase, the contractors delivered what they planned to deliver in a very short time period, but did not follow any change management plan. In the closeout phase of the project, the team documented their lessons learned for implementation in future projects.

The project performed well in cost management, due to the substantial efficiencies and cost savings enabled by the GPS, which was priced out at a fraction of the total cleanup cost. Improved efficiencies were noticed, and time and total cost were reduced. Without the aid of GPS, the timing or recording of the debris, truckloads, and resource utilization may have been only marginally captured. It is unclear if the other bidders' prices were inflated or if the contractor intentionally submitted an aggressively competitive bid. The system worked superbly and the contractor was successful in obtaining other contracts after the success of this project. If the system failed, the contractors' reputation would have suffered, resulting in loss of potential business and a decline in revenue. After completion of the project, the DDC had some outstanding payments and issues to be resolved with other suppliers, although none with the team of contractors.

Although the cleanup project was completed well ahead of the initial expected time, this was not the direct result of using established scheduling techniques. Traditional scheduling techniques were not used because this project established a process. The daily routine was mostly understood from the start and changed little. Some project management processes were developed through the trial-and-error methodology. The new GPS technology became a major advantage that changed the processes of the cleanup project, thereby significantly improving overall cost, time, and quality.

The risk of operating failure could have been detrimental to the contractors' business. So considering the robustness of the system, the team of contractors earned their reputations. The enlisted technology performed beyond its needed purpose. Due to the urgency of the cleanup effort, it was expected that most of the processes would not be in place and that there would be errors, issues, and complaints. Fortunately there were none reported.

During the inception phase, the team identified some metrics to monitor the main goals of the project and tested the technology it proposed to deliver, but did not identify any established quality standards. In the development phase, the team created a plan to evaluate the overall project performance on a regular basis through customized and executive reports, and went on to carry out its plan during implementation. Through its quality monitoring activities, the team significantly reduced traffic jams and lineup times to yield a substantial improvement in the number of loads per truck per shift. Initially, the team thought that quality would receive little attention, as it was obvious that time was of the essence and money was no object. As it turned out, though, the team took quality seriously and devoted a great deal of attention to it, yielding significant benefits.

Teamwork was not identified and instilled to satisfy an element of project management methodology. The extraordinary atmosphere that was created from the tragic events of 9/11 created a teamwork-oriented framework that is rarely seen in projects of any kind. To expect any organization to create this artificially at the same level of commitment and coordination would be unreasonable. Lessons learned from this project and the teamwork that ensued may be more pragmatic than expected, but, ultimately, the reader can decide if teamwork was a result of cognition or just emotion.

An overwhelming success story accompanied this project during the implementation phase, although project management may not have been considered completely successful. The overwhelming results of the cleanup effort cannot be reasonably disparaged. However, a close inspection of the scores by phase—and the reasoning behind these scores—reveals areas for improvement in all phases, with the possible exception of the implementation phase.

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 with 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, it 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, 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 subprojects, 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.