Project Management Institute
Case Studies in Project Management

The Guri Dam

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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 at The George Washington University, by the graduating students listed above with the supervision of Professor Anbari.

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

Case Study

The Guri Dam

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Introduction

The Caroni River is located in the South of Venezuela in the Guayana region of Bolivar. The river is the second largest in Venezuela with a total length of 522 mi (840 km), a surface of 36,680 mi^2 (95,000 km^2), a perimeter of 1029 mi (1,655 km), a mean annual rainfall of 110 in. (2,800 mm), a mean temperature of 80.8°F (27.1°C), humidity of 76%, and a mean annual evaporation of 76 in. (1,950 mm) (CVG Edelca n.d.). Due to the great hydroelectric power of the Caroni River, the Necuima Canyon, 62 mi (100 km) upstream of the outlet of the Caroni River into the Orinoco River, was chosen to build the structure of the Raul Leoni Hydroelectric Central, now called Simón Bolívar Hidroelectric power station, and commonly called the Guri Dam (Venezuelatuya.com n.d.a). Currently, the Guri Dam is the second largest hydroelectric power generation plant in the world after Itaipu in Brazil (BBC News 2006; The World Bank 2006).

In the 1940's the government of Venezuela started realizing that the country's oil reserves were going to be fundamental for Venezuela's economic development and well being. Therefore, the government decided to switch the country's electric power generation from hydrocarbon to hydroelectric-generated power. This would reduce the expenses of the hydrocarbon machinery and fuel, and would allow selling and exporting more petroleum. With this goal in mind, an international consulting firm was hired in 1949 to develop a national electrification plan. As part of this plan, engineering studies of the potential for the hydroelectric development of the Caroni River were established and performed during 1953 to 1963. Results of these studies and plans for the lower Caroni River were presented to government officials recommending the hydroelectric development of the Caroni River because it offered excellent potential for the desired purposes.

An organization responsible for the development of the Guayana region called Corporacion Venezolana de Guayana (CVG) was created in 1960. Among the main objectives of the CVG was to study, develop, and organize the hydroelectric potential of the Caroni River and to promote the industrial development of the region in both the private and public sectors. In 1961, CVG authorized the preliminary works for the feasibility of construction of the Hydroelectric Central Guri. These economical and technical studies were conducted by a North American company, and were completed in 1962. This case study presents an analysis and evaluation of the performance of the Guri Dam, from a project management perspective.

This 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 performance shortcomings of the processes in the Initiating, Planning, Executing, Monitoring and Controlling, and Closing Process Groups are discussed. This 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 included, resulting in a numeric evaluation of the management of this project, including areas of strength, opportunities for improvement, and lessons learned.

The Inception Phase

Due to the size and implications of the Guri project and the significant funding to the project by the World Bank, the organization Electrificadora del Caroni, C.A. (Edelca) was formally created as a company

of the CVG group in 1963 (CVG Edelca 2003). Edelca then became in charge of the officially named Raul Leoni Dam (still better known as the Guri Dam) project and its subsequent operations.

The mission of the Guri dam project was to build a dam with a reservoir that could store a large volume of water and provide hydroelectric central in stages, which would ensure an efficient electric power supply to Venezuela and provide a significant savings of the country's oil reserves. The Guri project was a major undertaking that established the basis for Edelca's subsequent management and operating style.

The inception phase of the Guri Dam project included well-detailed studies of the hydroelectric potential of the Caroni River and the description of the project extent, which worked as a solid base to get the Venezuelan government's project approval. In order to compensate for the lack of technology in the country, experienced, overseas companies were hired to perform the required studies.

Cost estimation appears to have been well done during the inception phase. It included detailed information of the subprojects to be executed as well as different bids from different consortia, which allowed for comparisons. In addition, in 1963 it may have been difficult to predict that the country was going to go through an economic depression.

During the inception process it was agreed that the first stage of the project needed to be completed by international companies because of a lack of national knowledge in dam construction. In the development stage, the necessity to not be dependent on international services to run the dam was realized and a plan to train national employees on the dam's functioning was created. This plan encouraged transnational companies involved in the project to progressively introduce Venezuelan employees who would be trained and become familiar with the dam operations.

Quality was a priority on the Guri Dam construction. One could consider quality and sustainable development as cornerstones of Edelca's management style today, which is a product of the success of the Guri Dam project. Edelca's mission states: ''To plan, promote and coordinate the integral development, humanistic and sustainable of the Guayana Region, through participation processes that integrate the diverse public and private actors, to generate wealth and well being in the region and the country.'' (CVG 2003a). And its vision specifies: ''To be a successful reference at national and international level of a democratic and sharing model for the promotion and integral, humanistic and sustainable development of the regions.'' (CVG 2003b).

Assessment and Analysis

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

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

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

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

The scope development covered most of the significant elements of the project, and provided a cost estimate, a schedule, contracts requirements, bid policies, payments, regulations, a risk mitigation plan, a quality standards code, administration systems, employees training systems, communications developments, an environment protection plan, a relocation strategy, and other matters. Due to the detail and time put into the scope development of the project, the World Bank approved a significant amount of funding to implement it.

The Guri project was mainly funded by the World Bank and by the Venezuelan government, using World Bank funds (in US dollars) for international currency obligations, and government funding for local currency obligations. Moreover, a significant element that was created to guarantee a project free of corruption was a payment policy, where Edelca was in charge of contracting and supervising the job but it was the bank that submitted the payments to the contractors and the contractors were in charge of paying their employees.

The construction of the Guri Dam took 23 years from 1963 to 1986, divided into two stages referred to as the first stage and the final stage. The most significant dates of the Guri Dam project were (CVG Edelca 1994):

Beginning of the first stage	August 1963
End of the initial phase of the first stage	November 1968
End of the first stage	January 1978
Start of the final stage	August 1978
End of the complete project	November 1986

The companies and consortia used on the Guri project were selected through a bidding process. Edelca was in charge of the bidding process, the selection process, and the contractor's qualifications evaluation. Considering the significance of this project to the nation and the significant amount of investment in the project, the main concern for CVG and Edelca was the quality of the finished product. Specific contractors' requirements were established to select the potential contractors to work on the project. The main requirements were:

- A minimum of five years of operations in the market,
- A verifiable executed work curriculum,

- The company's credit line, to ensure their ability to respond for obligations,
- The company's quality guarantees.

Edelca's risk management plan for the Guri project was based on the grounds of ensuring quality of work, ensuring quality of materials, and recognizing the results of the land and of the Caroni River hydroelectric potential studies. The objective of this risk plan was to reduce risk and other uncertainties. As stated in the project's scope, quality was a significant concern for this project so as to guarantee the investment and provide protection of the environment, high-quality electricity services, and durability of the dam. Therefore, Edelca created the contractors' requirements, and followed up on the work performed making sure that the requirements and specifications were met. As a result, experienced consortia in dam construction and world-leading dam equipment manufacturers were hired. In addition, the project included a Hydro-meteorological Forecast Center in order to generate and disseminate reliable hydrological, meteorological, and climatological forecasts and studies that would help in preventing and/or reacting to any potential natural threat of the dam. Other than the great hydroelectric potential that the Caroni River presented on the preliminary studies, a significant reason for choosing the site of the Guri Dam was a land report which stated that the areas were free of potential earthquakes.

The main teams of the Guri Dam were:

- CVG – Edelca
- Contractors
- Suppliers
- Financiers.

There were over 70 national and transnational organizations that participated in the development of the project, and two major financiers—The Venezuelan Government and the World Bank.

The Guri Dam was built in a remote area which did not have any kind of communications lines installed, such as telephone lines. Therefore, Edelca had to procure its communications services to ensure fast and satisfactory communications between all project team members, which was indispensable for the project's success. A communications service program was integrated into the project, which included voice communications through the installation of a telephone network central, a mobile radio service that connected the project's operations, construction, guards, administration, and hydrologists, and a Guri Lake VHF system to control the lake's navigation.

Assessment and Analysis

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

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

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

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

During the implementation, a major scope change was formally authorized and performed. The change was the expansion of the power units in the first stage from 5 to 10 units. The change was a consequence of the phase one success in functionality in the first stage, and of the fast-growing demand for electric power by the developments in the Guayana Region and of the country. According to a World Bank report on this scope change, the changes were implemented within the time and budget expected (The World Bank 1976).

The scope described in the first stage was designed to have the capacity for generating 2,865 MW with 10 generation units and a reservoir with a maximum elevation of 705 ft (215 m) above sea level. The scope of the final stage included the following tasks:

- Increasing the height of the gravity dam and overflow weir to an elevation of 892 ft (272 m) above sea level;
- Building two gravity dams on both riverbanks;
- Building a second engine-house that would hold 10 units of 730 MW each;
- Digging a second spillway channel;
- Building two earth-fill and rock-fill dams on both riverbanks;
- Building the bulkhead dams.

The volume of the main works of the Guri project was:

Total volume of concrete	10,504,003 yd^3 (8,030,930 m^3)
Amount of cement used	1,651,911 ton (US) (1,498,589 ton (metric))
Total excavation of earth and rock	46 454 332 yd^3 (35,517,078 m^3
Total earth and rock fill	101 741 400 yd^3 (77,787,303 m^3)
Reinforcement structure (steel bars)	120 868 tons (US) (109,649,705 kg)

The actual cost of the Guri Dam project is difficult to calculate because during the project's implementation, Venezuela went through an economical crisis during which the national currency had different exchange values with the dollar. At the project start date in 1963, the exchange rate was 3.33 bolívares (VEB) per dollar until 1973, when it became 4.30 VEB per dollar. Then in 1982, the devaluation exploded and the exchange rate increased daily. An Edelca information brochure about the Guri Dam (CVG Edelca 1994) states that the project's actual costs were:

- First stage—1,388.6 million VEB ($417 million (US))
- Final stage—21,163.6 million VEB

The bolívare is the currency of Venezuela and it is locally abbreviated as Bs. Its ISO (International Organization for Standardization) currency code is VEB (Wikipedia, n.d.) which is used throughout this case study. The cost of the final stage of the Guri Dam is not provided in US dollars in view of the daily increase in the exchange rate during the latter part of the final stage of this project.

The project's first phase (1963–1968) was estimated to cost $185,714,715 (US) (618,430,000 VEB) and its actual cost was $206,662,570 (US) (688,186,360 VEB), which was over budget by 11%. Individuals involved in managing the Guri Dam project estimated that $11,578,000 (US) were left of the unexpected expenses of the budget in the first stage and this money was used to start the final stage earlier than planned. Therefore, it appears that corrective actions were taken to improve cost surplus during the implementation stage. The final stage was financed by CVG using the energy sales produced by the first-stage operation and by the World Bank. This helped CVG and Edelca to compensate for the devaluation problems of the country mainly during the final stage construction.

A general view of the executed schedule of the Guri Dam project follows (CVG Edelca 1994):

Year	Activity
1963	Earth movements, outline of the access roads, and camp construction
1964	Detour of the Caroni River
1965	First concrete flow
1966	Contracts assigned to the construction of the 400 kV transmit line
1967	Rescue and relocation of animal species in danger of drowning, and beginning of environmental conservation plan
1968	Completion of the first phase of the first stage
1969	Beginning of functions of the first stage of transmit line
1975	Beginning of functions of the second stage of transmit line
1976	End of the civil construction of the first stage
1978	Beginning functions of first stage and beginning construction of the final stage
1979	Contracts assigned to the construction of the 800 kV transmit line
1984	Beginning functions of the first phase of the final stage
1986	Completion of the final stage

The procurement plan was realized in the implementation stage because the first stage of the project was done mostly by foreign engineering firms with the inclusion of Venezuelan labor assisted by qualified foreign labor. Later in the first stage, an expansion of the engine-house was performed by the Venezuelan consortium, and, in the final stage, the participation of Venezuelan contractors increased from 30% to 60%.

Quality was a significant goal throughout all phases of the project. Occasionally, project milestones were allowed to be delayed if the quality was going to be affected. Reaching a high-quality level in the Guri Dam was essential to achieve Edelca's mission and vision. Therefore, extra efforts were devoted to the quality of the dam, such as internal and international audits and inspections. In order to maintain the equipment and technologies installed at the dam, recommendation for maintenance and signatures of guarantee were obtained from vendors and contractors at installation time.

Teamwork on the Guri project was well managed. Goals, such as integrating the Venezuelan labor force into the work performed by transnational companies, increasing the participation of Venezuelan organizations in the project, and payments policies, were met. It is also important to note that a common factor in most references in the Guri Dam project to employees' and employers' relationships, was ''respect.''

Assessment and Analysis

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

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

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

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 scope implementation and closeout were closely monitored by Edelca, which ensured that the accomplishments and expenditures complied with the standards and regulations established during the scope development phase. As a result, the Guri Dam was finished 15 days ahead of schedule and within the expected budget.

The project's budget was overrun because of the devaluation problems, but the amount may not have been significant. Individuals involved in managing the Guri project indicated that Edelca considered that the project met the expected budget.

The Guri project was completed on time as it was planned. The final stage was finished 15 days ahead of schedule, which allowed a test of the system before the official inauguration. The main reason for this on-time schedule was the agreed-upon funding contract with the funding institution, in which a severe economical penalty was going to be applied as a result of any breach of the project. This contract agreement forced Edelca to dedicate a great deal of effort to make every step of the project comply with the specifications and requirements, enforcing corrective actions when needed. The project's final stages were not expected to be completed as soon as they were because, when the project was first planned, there were doubts about the funding. However, after the success in performance of the first phase of the first stage, the World Bank and the Venezuelan government decided in the early 1970s to approve the construction of the final stage immediately after the first stage was finished. This allowed enough time for Edelca to improve the schedule and plan for the final stage based on the lessons learned from the first stage, which was under construction at that time. This illustrates how smooth the schedule performance was from inception, to development, to implementation, and through closeout.

During the closeout stage of the project, a maintenance plan was established in order to ensure the success of future dam operations. As a result of that, descriptions of the follow-up maintenance performed at Guri are contained in the 1998 and 1999 annual reports of Edelca (CVG Edelca 1998 and 1999).

During the closeout stage of the project, Edelca organized a recognition ceremony to thank and encourage business loyalty from all of the organizations that participated and contributed to the success of the project. It should be noted that the companies which did not perform as expected do not appear in the Guri history books.

At the closeout stage of Guri and due to the importance of the communications as a project success factor, Edelca made the decision to keep extending the communication system. Today the system includes: data transmission, telex, pager, three more extensions of the mobile radio, a television channel, a radio station, and ''facsimile'' service, providing text and graph transmission through the company's telephone network.

The Guri Dam generates more than 10,000 MW of electrical power, is the second largest operating hydroelectric central in the world, and is the eighth largest reservoir for hydroelectric central in the world to date. It was built over a 23-year period, minimizing the initial investment and allowing the power supply to match the growth in demand on the electrical system (The World Bank 2006; Moxon 1999). The dam has an elevation of 892 ft (272 m) above sea level, a reservoir level of 886 ft (270 m) above sea level, an area of 1513 mi^2 (3,919 km^2), a lake area of 1640 mi^2 (4,250 km^2), and 20 potential power units. For its construction 197,684 acres (80,000 hectares) were flooded.

The Guri dam (and similar major infrastructure projects) is intended to provide service for many years. Understanding its social and environmental impact and the importance of public support for it, are significantly relevant to the funding and success of the project. Having an environmental plan to save and relocate animal life in danger of extinction with the lake flood and a relocation plan for the hamlets in the lake area into two cities, today's biggest cities of the area—Ciudad Bolívar and Puerto Ordaz (Venezuelatuya.com n.d.b; Venezuelatuya.com n.d.c) were important considerations in this project.

The first phase of the Guri dam project raised the water level more than 394 ft (120 m) above that of the original Caroni River. The final stage raised the water level by another 164 ft (50 meters). Floodwaters

turned about a thousand hilltops into islands in one of the largest human-made lakes in South America: Lake Guri. Consequently, a key group of predator animals, such as pumas, jaguars, anacondas, eagles, and armadillos, were not able to persist on these islands. Some animals were relocated, while others swam or flew from the islands or starved to death. This had a huge impact on their prey; and populations of howler monkeys, iguanas, and leaf-cutting ants began multiplying and surged ten to a hundred times more than the animals' density on the nearby mainland. Soon these plant-eaters devoured most of the islands' vegetation and its once pristine forest (Lovgre 2005).

Issues related to sustainable regional development still need to be addressed in a comprehensive manner through cooperation and careful environmental management (Brasil 2004). In recent years, CVG Edelca has invested in local conservation and developed a portfolio of social projects aimed at improving living conditions and seeking to guarantee the long-term water abundance and quality supplied by the well-preserved watersheds. It entered into a landmark inter-institutional agreement to cooperate around the common objectives of preserving biodiversity, ensuring environmental services, and supporting quality of life improvements (The World Bank 2006).

Since the Guri Dam started functioning, there has been only one partial failure of the system, which was solved in less than 3 hours. To date, the Guri Dam has not suffered from any major threat that could identify a failure of the quality of work and/or material used to build the dam (CVG Edelca 2005). Its history of an optimal level of operation and its more than 10,000 MW of power, which is equivalent to 300,000 barrels of oil per day, make the Guri Dam one of the major hydroelectric dams in the world (Venezuelatuya.com n.d.). The Guri Dam has helped Edelca to raise its contribution to the Venezuela national electrical power from 22% in 1963 to 75% in 1999, and has helped with the original goal of replacing thermal electricity with hydroelectric power (CVG Edelca 1999).

In 2003, despite being the world's fifth largest oil exporter, Venezuela faced potential power shortages when water levels at Guri Lake reached record lows because of a 3-year drought. In 2004, abundant rainfall restored water levels close to the maximum at Guri Lake (Ramirez 2004).

By 2006, CVG Edelca was producing 70% of Venezuela's growing energy needs and exporting energy to Brazil (10,000 MW from the Guri dam, which still has the second highest capacity in the world, and 3,080 MW from the 23 de Enero–Macagua dam (The World Bank 2006)). To meet the rising demand for electric power, Edelca constructed the Caruachi hydroelectric over the Caroni River, 59 km downstream from the Guri dam at a cost of about $2.5 billion (US). The Caruachi hydroelectric started to run at full capacity of 2,196 MW from its 12 turbines in March 2006 (El Universal, 2006a and 2006b).

Assessment and Analysis

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

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

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

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:

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					

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

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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Case Study

The Guri Dam

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 key 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	4.00	4.00	5.00	5.00	4.50
Time Management	4.00	4.00	4.00	5.00	4.25
Cost Management	4.00	5.00	4.00	4.00	4.25
Quality Management	5.00	5.00	5.00	5.00	5.00
Human Resource Management	5.00	5.00	4.00	4.00	4.50
Communications Management	4.00	4.00	5.00	5.00	4.50
Risk Management	5.00	5.00	4.00	4.00	4.50
Procurement Management	5.00	5.00	5.00	5.00	5.00
Integration Management	2.00	3.00	3.00	3.00	2.75
Average	4.22	4.44	4.33	4.44	**4.36**

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

As can be seen in the table, the success areas of the Guri Dam project are numerous and easily recognizable. The excellent performance of this project was apparent from its early phases and was reflected in the overall project accomplishments.

In analyzing this project, it is difficult to find evidence of major problems that were encountered or mistakes that were made. It is possible that when preparing the scope of the project, the increase in demand for electric power could have been better predicted. In general, the project was considered to have met the planned budget and schedule, although the extension of the units of the first stage was not first planned and the schedule and budget estimations may have been altered.

It is generally very difficult for projects of the magnitude and size as that of the Guri project (or of any size) to run smoothly and always be on time and within budget. It is also true that taking the time and commitment to the project, especially to its planning, can lead to a reduction of uncertainties and an outcome that is close to the planned project. In the evaluation of the Guri project, we learned the importance of some of the project's lessons learned:

- Quality
- Corruption free
- Environmental plan
- Good planning from the beginning.

Projects such as a dam are built to offer a service intended to last for years. A major factor in increasing the service expectancy of a completed project like this is the use of high-quality materials and processes during the development of the project. The quality standards set for the Guri project were

essential for the project's success and subsequent functionality. The quality carried out throughout the project has increased Edelca's operation and expectation as a prospering organization, and has served as support for the company's code of values.

Unfortunately, Venezuela, like many other countries, has not completely escaped corruption. The area where the Guri Dam is located was very remote, had poor communication access, and the population was relatively small at the time of its construction. The team selected for development of the project was idealistic toward the effort and the government did not want to lose political energies in that area. Therefore, the team was very focused on the project and not on government political issues, which led to clean project management.

The Guri dam (and similar major infrastructure projects) was planned to provide service for many years. Therefore, economic, social, environmental, operational, and management issues are particularly important to its success. Understanding the importance of public support for a project intended to benefit the development of a country and the environmental impact of a project such as a dam are significantly relevant to the project's success and funding. The environmental plan to save and relocate the animal life in danger of extinction with the lake flood, and a relocation plan for the hamlets in the lake area into two cities (today's biggest cities of the area—Ciudad Bolívar and Puerto Ordaz) were instrumental to providing funding and obtaining public support. Most importantly, the plans were met, and today environmental activities are continuing to increase the population and visitors' use of the recreational areas of the lake and Guri Park.

The time and effort devoted to the planning of this project were keys to its success. In general, the planning of the project seems to have converted significant aspects such as risk, quality, and team work, among others, that resulted in a project outcome with high-quality levels and little risk threats.

The phased construction of the Guri Dam project over a 23-year period minimized the initial investment and allowed the power supply to match the growth in demand on the electrical system. Revenues generated from the completed portions of the project were used to partially finance construction of subsequent portions.

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 phases are used: inception, development, execution, and closeout, as defined in the subsequent paragraphs.

Inception

This phase is also 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 a 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 is also called detailed planning, definition and design, formulation, the formal approach, preliminary engineering, and preliminary design. It covers project organizing, planning, scheduling, estimating, and budgeting. This phase 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 is also 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. This phase 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 is also 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. The closeout phase 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.

ISBN 13: 978-1-933890-31-9
ISBN 10: 1-933890-31-2 *U.S. $9.50*