

CASE STUDY: WE'LL CROSS THAT BRIDGE WHEN WE COME TO IT (PART II)

This case revisits the situation that was discussed at the end of Chapter 5. The earlier case introduced the actors, the alternatives, and the issues and asked you to identify an evaluation strategy that included selection of criteria and weighting issues. Some additional information has now been gathered, and you can proceed with a more detailed analysis that leads to specific recommendations for constructing a bridge. For your convenience, the material from Chapter 5 is included at the beginning of this expanded case. The case is designed for teams of students who represent the different actors involved in the ongoing debate about which bridge is best.

Situation

Cammitibridge, a prosperous city of a million residents, is located on the north side of the Cammiti River. It is adjacent to and to some extent hemmed in by a state forest to the northeast and a series of steep hills to the northwest (see map at end). The town is named for its historic bridge, first built in 1720 and most recently rebuilt in 1850. The bridge is a narrow, two-lane bridge that spans the river so as to connect Cammitibridge with the main road to the capital, Boslondale, some 100 miles away. The bridge connects to a highly scenic road that winds for several miles toward the west below sandstone cliffs along the edge of the river. Everyone in the city agrees that a new bridge is needed, for various reasons:

- Development in Cammitibridge is increasingly limited by a lack of vacant land close to the city center. On the outskirts of town, people are starting to move up the slopes of the hills, but

there just isn't much room for expansion downtown or along the major roads serving the city.

- There is considerable traffic between Cammitibridge and Boslondale, so that the old bridge is often congested, irritating those who must use it and limiting opportunities for development on the south side of the river.
- The current bridge provides little access to the land available for development south of the river. A new bridge in a new location would open up this land for development.
- The local construction industry supports the construction of a new bridge, because of the opportunity for new activity and profits.
- A consortium of private citizens, led by Canwy Bildem, has even proposed that they will replace and expand the existing bridge at their own expense if they are allowed to charge a toll of no more than \$2; at the end of a 30-year period, they would turn the bridge over to the city.

There are four competing options for the bridge:

- *Bridge 1:* Expand the existing bridge at a cost of \$20 million. The plan would basically build a second two-lane bridge next to the existing bridge. Once the new bridge is operating, the old bridge would be rehabilitated to handle heavier trucks and then reopened.
- *Bridge 2:* Replace the existing bridge with a new four-lane bridge at a cost of \$50 million. The old bridge would be torn down upon completion of the new bridge. An additional \$5 million would be required to modify the roads to match up with the new bridge.

- **Bridge 3:** Build a new four-lane bridge that connects to the developable land to the southeast. Since the river is wider at this location, the cost would be greater. Initial estimates are that the bridge would cost \$75 million if built at the narrowest location, while access roads would cost \$20 million.
- **Bridge 4:** A variation on Bridge 3, this option would change the bridge location slightly to improve access to the city, while requiring a longer bridge to get over the swamps; the costs would be \$90 for the bridge plus \$10 million for access.

The bridge could be financed in several ways:

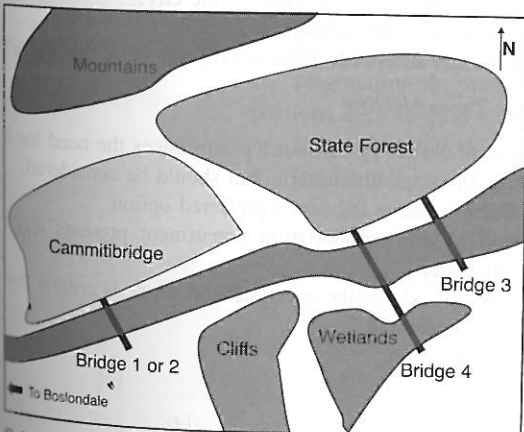
- The city could sell revenue bonds to the public and pay the interest on the bonds out of general tax revenue.
- The city could sell revenue bonds to the public and charge tolls on the bridge sufficiently high to pay the interest on the bonds.
- The city could authorize Mr. Bildem to proceed with his plan to build a toll bridge without using public money.
- The city could probably fund the required connections (but not the bridge) from its ongoing budget for road construction and maintenance.

The economic benefits from construction of the bridge fall into several categories:

- Reductions in travel time for people who currently use the bridge
- Increased opportunities for development south of the river, leading to higher land values, new jobs, and greater real estate taxes for Cammitibridge

Preliminary analysis suggests that

- Expanding or replacing the current bridge will have minor effects on traffic volume or development, since very little open land is suitable for development near the existing routes.
- Building a bridge at the east end of town will provide a spark to development of that region; total traffic across the river is expected to grow quickly if a new bridge is built in that location. Also, some traffic will divert to the new bridge, reducing congestion in the city.



Schematic Diagram of Cammitibridge and Possible Bridge Locations

Table 1 summarizes the expected results from constructing each of the major options. It also shows the costs expected for constructing each bridge and for constructing new access roads. These costs can be assumed to be incurred at a uniform rate over the construction period. The travel time benefits represent the results of a network model showing the expected impacts on average commuting time for the city in the year 2015. The city normally considers travel time savings in its economic studies, using \$10 per vehicle-hour to represent an average value of time to users. The traffic volumes are also for the year 2015; this year is currently used as a basis for traffic studies in the region (and, to simplify our analysis, we will assume that this year is in fact an average year over a 30-year planning horizon). Adding capacity for growth on the south side of the river is predicted to be helpful in relieving congestion in the city center; adding capacity to the existing bridge will prevent that location from becoming a major bottleneck for the city.

Assignment

The class will be divided into groups of 4 to 8 students. Half of the groups will analyze the choice of bridges from the perspective of the city's transportation department; the other groups will analyze the choice of bridges from the perspective of Mr. Bildem's company. Each group will have two subgroups; one will consider Bridges 1 and 2, the other will examine Bridges 3 and 4. Each subgroup will submit a joint analysis that answers the questions posed below for their bridges (i.e., everyone conducts a full set of analyses on at least one of the bridges; the students within each subgroup then compare and if necessary revise their analyses; each subgroup prepares a joint report on its bridges). The total group will prepare a one-page summary with its recommendations for the mayor and the public and attach four bridge reports as appendices. Group members can collaborate in any way they chose in preparing for their presentation.

Questions for the Public Sector Groups

You work for the city's transportation department. You have been asked to compare the NPV of the bridge options, taking into account the construction costs and the toll revenues over a 30-year period.

- What is the present value of the costs of building each bridge and its access roads using a discount rate of 8% per year (as required by city policy for infrastructure analysis)? To simplify the analysis, assume that all costs are incurred uniformly over the construction period.
- Assume that the city can sell 30-year bonds with an interest rate of 5% to cover all construction costs as well as interest on the bonds during the construction period (for example, at the end of year 2, 5% interest will be due for all of the bonds that had been sold at the end of the previous year). What is the total face value of the bonds that must be sold to cover all construction, access, and interest costs? (This will equal the total amount of outstanding bonds at the time when the bridge is finished).
- Assume that annual costs for toll collection are \$250,000 and maintenance costs are expected to be 5% of the construction cost for the bridge and access roads. For each new bridge, what

Table 1 Expected Costs and Benefits Related to the Bridge (preliminary and subject to change)

| | Bridge 1 | Bridge 2 | Bridge 3 | Bridge 4 |
|---------------------------------------|--|---|---|---|
| | Expand the existing bridge to 4 lanes. | Replace existing bridge with 4-lane bridge. | Build shorter bridge at east end of city. | Build longer, more accessible bridge at east end of city. |
| Bridge cost | \$20 million | \$50 million | \$75 million | \$90 million |
| Access roads | — | \$5 million | \$20 million | \$10 million |
| Construction time | 2 years | 3 years | 4 years | 4 years |
| Travel time savings for current users | 4 minutes | 4 minutes | 5 minutes | 7 minutes |
| Total users, west bridge | 15 million/yr | 15 million/yr | 12 million/yr | 11 million/yr |
| Total users, east bridge | — | — | 5 million/yr | 6 million/yr |
| Maximum toll | \$2 | \$2 | \$2 | \$2 |
| Increase in GRP | \$10 million | \$12 million | \$20 million | \$30 million |
| Population | 1.1 million | 1.1 million | 1.15 million | 1.2 million |

toll would you charge to cover the interest on the bonds plus the costs of toll collections and maintenance, assuming traffic volumes as shown for 2015?

(Note: If Bridge 3 or 4 is built, tolls will not be charged on Bridge 1).

Questions for the Private Sector Groups

You are the financial advisor to Mr. Bildem. You need to determine whether the NPV of future tolls is sufficient to cover the NPV of the construction costs. You also need to consider the possibility of getting financing (first a construction loan that would cover the costs of construction and then, once the bridge opens, a loan with lower interest rates that would be based on toll revenues).

- What is the present value of the cost of building each bridge and its access roads, assuming that you use Mr. Bildem’s discount rate of 15%?
- Assume that Mr. Bildem can get a 10% line of credit for all construction costs for the bridge. Further assume that Mr. Bildem will pay only for the bridge, requiring the city to provide the access roads as its part of the deal. What will the total loan be when the bridge is open for construction? (For simplicity, assume all costs are incurred at the end of the year; the interest costs at the end of year $n + 1$ would equal 10% of the outstanding balance at the end of the prior year).
- You can refinance your loan once the bridge opens. Assume that the bank will let you borrow an amount that can be financed by an annual amount no greater than 50% of the average net toll revenues expected in 2015 (and the total loan cannot be greater than your construction costs).
 - Will the amount of the new loan be sufficient to cover the costs of construction loan?

- If the loan is for 30 years at 8%, what will the annual payments be?
- To cover your loan payments and your share of operating costs (i.e., \$250,000 plus 5% of the construction costs for the bridge), what toll would you have to charge for each bridge? Which bridge do you prefer to build? Why?

Preparation for Town Meeting

Everyone in the class has been appointed to the mayor’s task force to evaluate bridge options from the perspective of the public. The people in the public sector groups are more concerned with overall economic impacts; the people in the private sector groups are more concerned with entrepreneurial opportunities for construction and development. At the meeting, you will hear reports from the head of the transportation department, Mr. Bildem, the mayor, and the head of the local high-tech development support group “Build Up or Shut Up.” The group will then discuss and take a straw poll on three questions posed by the mayor:

1. Which of the bridges is the best for the city?
2. What is your recommendation concerning tolls?
3. Should the city accept Mr. Bildem’s offer to build the bridge?

Agenda for Town Meeting

1. The head of Build Up or Shut Up introduces the need for a bridge and presents the criteria that should be considered.
2. Mr. Bildem presents the firm’s preferred option.
3. The head of the transportation department presents city’s preferred option.
4. The mayor introduces the questions and suggests criteria that should be considered.
5. General discussion.