

Facility Construction Decision Case Study
Benefit-Cost Analysis / Civil Systems Planning
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Overview

In the late 1980s, a large city is considering the construction of a public facility that will benefit its citizens. The facility is expected to last for thirty years, and serve increasing numbers of users over this period. Estimates of costs and benefits over time are presented and a decision needs to be supported on whether it should be built. Further, the assumptions should be seen as open to challenge to see whether alternative scenarios would lead to a different build decision.

Introduction

In 1987, after years of various facility expansions, growth, and approaching obsolescence, a town is faced with the prospect of replacing a major public facility. The original facility was built over 50 years ago, with a significant expansion thirty years ago. However it is now showing its age and compared to facilities available in other cities, it is obsolete.

Aside from obsolescence, the projections by local and national sources suggest that users will continue to grow over the next 30 years. The current facility is barely able to meet current demand, and the number of users has doubled in the last 10 years. With these issues in mind, the city has commissioned the design and specification of Phase 1 of the next generation facility as well as a Phase 2 that could be completed in the future. Table 1 shows a summary comparison of the old and new (proposed) facilities. If built, the facility's various buildings will open and begin operations at the end of 1992. In addition to the facility, total project costs include infrastructure improvements such as highway access.

	Previous Facility	New Phase 1	New Phase 2
Opening Date	Original: 1931 Expansion: 1952	Oct. 1, 1992	N/A
Facility Cost	\$ 33 million	\$ 690 million	N/A
Total Project Cost	N/A	\$ 1 billion	N/A
Facility Size (sq. feet)	836,937	3,170,000	4,065,000
Parking Garage	N/A	1,150,000	1,650,000
Parking Spaces	12,300	17,420	27,410
Users (peak hour)	5,583	7,629	10,091
Users (per year)	17 million	20 million	32 million

Table 1: Comparative Data for Old and New Facilities

The city is not the user of the facility – individuals from the city and visitors from other cities will be the users. The facility over time will support the location and business of several private

companies, who will employ thousands of citizens and also pay the public agency fees for each user. Table 2 shows current and projected users of the facility.

Year	Total Users*
1982	9,986,374
1983	11,885,118
1984	13,414,626
1985	15,058,178
1986	15,989,507
1987	17,457,801
1988	17,632,379
1989	17,808,703
1990	17,986,790
1991	18,166,658
1992	18,348,324
1993	18,807,032
1994	19,277,208
1995	19,759,138
1996	20,253,117
1997	20,759,445
1998	21,278,431
1999	21,810,392
2000	22,355,651
2001	22,914,543
2002	23,487,406

Table 2: Historic and Projected Facility Use, 1982-2002 (* growth rates assumed to increase 1% per year from 1987-1992, and 2.5% per year after 1992)

Operating Budget and Cash Flows

The income and expenses of the facility can be summarized in several categories. The income of the facility (to the public agency) is expected to be \$90 million per year (in \$1992) from 1) concession income and parking fees, 2) rental of space to the private companies, and 3) user fees. The income is expected to be roughly equal across the categories (i.e. 1/3 each). Note that the user fees are specifically set to cover the differences in other categories to ensure income available to pay expenses. All other income and expense categories are long-term in nature.

The operating expenses are expected to be \$80 million per year (in \$1992) come from a variety of sources, about 15% from labor salaries, 15% from utility expenses, 20% from other professional services, and 50% from depreciation and amortization. Of course there is also the expense of paying for the long-term debt from construction.

Investment Details

To pay for the facility and ancillary projects, the city will sell \$930 million worth of revenue bonds at an 8% interest rate. The remaining costs will be paid by federal and state grants. Revenue bonds are a financial instrument where the debt is repaid from project revenue. In terms of cash flows, the revenue bonds are repaid over time such as to pay some of the principal and interest each year (i.e. similar to a loan).

Case Study Questions – Part One

- 1) Develop a cash flow/investment spreadsheet for this public facility construction decision. Be sure to incorporate the following parameters in the model: projected user growth rate, operating income and expenses, financing costs, discount rate. It may help to build separate spreadsheets to track the yearly operating costs and expenses, and the overall cash flow. Should the facility be built given the 'base case' assumptions given above? Are there additional cost or benefit streams that may be relevant to building the facility?
- 2) Perform some sensitivity analysis on the base case. First, consider an appropriate range of alternative parameter assumptions – in percentage or raw value terms. Is your estimate of facility value highly dependent on these assumptions?
- 3) Using all of the most conservative (i.e. worst-case scenario) assumptions, is the facility feasible? Under what conditions? Is there significant project risk based on the assumptions and your sensitivity analysis?