1.011 Project Evaluation

Public vs. Private Projects

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Project Evaluation in the Private Sector

- Analysis focuses on financial issues
  - NPV based upon incremental costs and benefits and the (usually rather high) corporate discount rate
  - Costs are generally well understood for any kind of an expansion to an existing system (but new technology may require analysis)
    - Construction, equipment, operations, and maintenance
  - Demand may or may not be well understood
    - Carriers will respond to very clear trends
    - Carriers may panic if growth stops or if traffic declines
    - Carriers tend to be very leery of demand models that go beyond trends that are already evident and understood (which implies a tendency to be conservative in expanding services)
- Strategic plans play an important role
- Availability of funds is not necessarily tied to particular projects

Project Evaluation in the Public Sector

- Public sector projects are much more complex (unless there is an independent agency that operates much like a private company). For many public transport projects:
  - Cash flows from the project will be insufficient to justify the investment
  - A high portion of the direct benefits will be in the form of reduced travel time or increased travel volumes
  - Impacts on development and employment may be major goals of the project, not merely indirect benefits
  - Decision-makers are elected officials who respond directly to public concerns about externalities
  - Equity, aesthetics, etc. are important public concerns
- Public sector transportation projects compete with housing, education, defense, and other public concerns - much broader competition for funds than in a private company

Public vs. Private Projects

Based upon "Engineering Economy", Table 11.3

	Private	Public
Purpose	Financial	Social
Funding	Debt & Equity Markets	Taxes, Tax Free Bonds, Low Interest Loans
Multi-Purpose	Some	Most
Project Life	Shorter	Longer
Benefits	Financial	Financial, Social, Economic, Aesthetic, ...
Conflict	Moderate	Common & High
Politics	Little-Moderate	High
Measure of Efficiency	NPV,IRR,ROI	Very Difficult

Water Resource Project

Based upon "Engineering Economy", Section 11.4

- Dam Benefits
  - Assist in flood control
  - Provide water for irrigation
  - Generate electric power
  - Provide recreational facilities
  - Provide drinking water
- Disbenefits
  - Loss of farmland
  - Loss of wild river
  - Loss of fertile sediment on lower farmland
  - Negative ecological effects of obstructing river flow

Water Resource Project (Cont.)

Based upon "Engineering Economy", Section 11.4

- Inherent Problems
  - Allocating costs to specific purposes
  - Conflicts of interest among users
  - Political Sensitivity

Allocation of costs and pricing of public services from multi-use projects can be arbitrary

Logic for Benefit/Cost Analysis

- The total benefits must exceed the total costs for federally funded projects (Flood Control Act of 1936)
- All benefits can be considered - and the benefits must be monetarized

Benefit/cost calculations can be very difficult when non-financial factors are dominant!

No Simple Rule for Discount Rates for Public Projects!

- Possible discount rates
  - Actual interest rate for funds borrowed for a specific project
  - Opportunity cost of capital to government
    - Possibly return required for risk-free investments
  - Opportunity cost of capital to tax-payers
  - Reasonable discount rate to reflect general practice in private investments
    - "7% interest rate should be used in economic evaluation for a wide range of projects" - Office of Management & Budget, 1992
    - This corresponds to about a 10% before-tax return in private sector

Comparing Benefits, Disbenefits, and Costs

- Attempt to quantify as much as possible
  - Limits or ranges can be useful
- Involve people with all of the relevant viewpoints
  - Get best understanding of costs, benefits, and disbenefits
  - Try to understand how to reduce costs and disbenefits while improving benefits
- The decision will be political; the presentation of data should be fair!

Limits of Benefit/Cost Method?

- Analysis may be skewed toward politically active interests (but bias is always a problem!)
- Equity may be an issue
  - Who benefits vs. who pays?
  - Generational equity?
  - But: if B>C, then losers in principle can be compensated
- Non-financial benefits may be slighted, but:
  - We can look at incremental benefit per incremental cost for any measurable benefit
  - Quite ingenious ways can be developed to quantify and monetarize benefits

Weighting Schemes

- Commonly used, and potentially helpful if:
  - Scheme can easily be identified
  - Weighting scheme can be agreed upon
- Commonly MISused as well!
  - Choice of weights can determine the outcome
  - Choice of measures can determine the outcome
  - Better to debate the importance of specific attributes than to pretend that the weighting scheme is "objective"
  - Choice of weights is NEVER objective!

Examples of Public Projects: Highways & Other Transport Investments

- Justification for Public Involvement
  - Need for land & rights-of-ways (public power of "emminent domain")
  - Need for efficient service (limit duplication of expensive facilities)
  - Need for effective service (make sure public needs are met)
  - Link to development of region
  - Importance of construction to local economy
  - Important issues related to equity, coverage, capacity, service, ...

Some Typical Transportation Projects: Increasing Levels of Complexity

- Investment in equipment and facilities to serve a new customer
  - Can we negotiate a contract to reduce risks?
- Expanding the capacity of a link or a terminal
  - Can we justify adding capacity to improve performance for predicted demand for this facility?
- Adding a link to an existing network
  - How will changes affect costs and benefits across the network?
- Construction of new infrastructure in environmentally sensitive area in order to promote development

Building a Case for the Project: Estimating the Changes in the Transportation System

- Base Case
  - Current demand and performance (traffic flows, trip times & reliability, capacity, equipment, costs, revenues, etc.)
  - Projected performance
- Project Case(s)
  - Changes to be made in the system
  - Expected changes in demand and performance
  - Estimation of NPV of incremental costs & benefits
    - Pure cash flow analysis
    - Other monetary benefits directly related to the project(e.g. value of time to users)

Building A Case for the Project: Estimating Broader Economic Benefits

- Consider indirect monetary benefits indirectly related to the project
  - Multiplier effect of construction jobs on local economy
  - Development of region where new facilities are constructed
- Safety benefits may be important
  - Reduced frequency or severity of accidents

Building A Case for the Project: Estimating Externalities

- A project will have both positive and negative externalities, but it is the negative externalities that will cause the greatest problems
  - Disruption during construction
  - Effects on air and water quality, noise, and views
  - Short- and long-run effects on land use
- A political process will be necessary to deal with these issues
- The larger and the clearer the transportation benefits, the easier it will be to deal with externalities

Some Standard Techniques: Travel Time and Related Savings

- Savings in travel time to existing users are a clear economic benefit
  - Evaluated using appropriate value of time for each group of users
  - Value of time is a high proportion of average hourly earnings
- New travel resulting from the project indicates that the project provided additional economic benefits
  - Often evaluated with the "rule of one half"
    - People who did not previously travel given the costs of the prior system were willing to travel with the reduced costs of the improved service.
    - On the average, the consumers surplus for these new users can be taken as one half of the reduction in cost (or time)

Some Standard Techniques: Safety Benefits

- Improved safety is both a common public policy goal and a result of improving transportation infrastructure
  - We can compare accidents, injuries, and fatalities per million passenger-miles on various modes and various types of facilities
  - A particular project may result in a quantifiable reduction in expected fatalities
- What value do we use for a reduction in the expected number of fatalities?
  - Ken Small argues that the question is "how much would you pay to reduce your risk of death by 1 chance in a million" which turns out to be $3 to 7$ (equivalent to $5 million/expected fatality)
  - Governments have specified values to use in risk assessment that are typcially $1 to $3 million per expected fatality
- Safety improvements may also be translated into changes in behavior (i.e. drive faster on a better road or in a better car)

Environmental Improvements

(Small, "Project Evaluation", 1999)

- An example: air quality
  - Key question: should efforts be made to quantify these effects?
  - Evidence:
    - Autos cause air pollution that results in costs that are significant compared to the costs of emission controls
    - The costs of emission controls are small relative to the costs of auto travel
    - Links to global warming, loss of biodiversity, etc. are still uncertain
  - Conclusion:
    - It makes sense to require emission controls
    - It does not (yet) make sense to require massive restrictions on autos to protect air quality
    - It is too soon to include effects on global warming, etc. in cost-benefit analysis related to urban transportation

The Political Context Cannot Be Ignored

(Alan Alschuler, Presentation to CTS, September 9, 1997)

- There have been periods when powerful coalitions emerged that supported and funded major infrastructure projects
  - Railroads
  - Airports
  - Highways
- Disruption from infrastructure projects and escalating costs of mega-projects have tended to break up the development coalitions
  - NIMBY (Not in my backyard)
  - "Do no harm" is becoming the rule rather than "Make sure that benefits exceed the costs"
  - Increased concern with environmental issues
- Development will continue, but it will be more focussed (e.g. convention centers, airports, but not large ROW projects)

Politics and Finance

(Dutch Leonard, Presentation to CTS Infrastructure Conference, Dec. 1997)

- Some structures are more trusted
  - Authorities (e.g. Water & Sewer Commission) may be able to raise rates whereas the City Council could not
- Self-funding enterprises (e.g. Port Authority) can be insulated from political pressures and take a longer perspective on projects
- Clear linkages can be established between costs and benefits
  - User fees
  - Earmarked charges or taxes
- Public agencies may have distorted views of different types of expenditures:
  - Capital investments - political monuments; major constituency for building something (and defer payments through financing)
  - Operations - must pay or shut down
  - Maintenance - easy to defer (but may pay more later)

Public/Private Partnerships: Toronto's Highway 407

- 69-km, open-access, fully automated toll road
- Purpose: relieve congestion on main expressways
- Cost: approx. C$1.9 billion
  - Net operating income from tolls in 1999: C$69 million
- Ontario decided to privatize the road:
  - Allow tolls to rise, so long as traffic remains high
  - Require construction of 39-km extension (C$500 million)
- Net Income from tolls expected by 2002: C$235 million
- Sale Price: C$3.1 billion for the existing road(60% greater than expected); C$4 billion total
- Financing mechanism:
  - C$2.3 billion with rated, senior toll revenue debt
  - C$0.15 million with unrated subordinated revenue debt
  - C$1.5 billion equity financing

Seeing Deep into the Future

- Ken Small:
  - "Could anyone in the 1890s have predicted the ramifications of inventing the automobile?"
    - [Presumably he refers to the trend toward suburbanization, the decline of public transport, the decentralization of cities, and the use of so many parks as cheap land for highways.]
- Frederick Law Olmsted:
  - Noted landscape architect in the 1890s and designer of many urban parks, including the Emerald Necklace in Boston
  - Olmsted actually cited the need for auto-like technology as a means of allowing people to live in single family homes on suburban streets within a less crowded, more healthy environment. He actually urged Buffalo, NYC, Boston, and other cities to set aside connected tracts of parkland so as to keep space available for future transportation systems!