

A blue-tinted photograph of a desk. In the center is a glass coffee cup on a saucer with a spoon. To the right is a computer keyboard. In the foreground, there are several documents, including one with the heading "MANAGED FUNDS" and a pen resting on it. The overall scene suggests a professional or academic workspace.

Cost Benefit Analysis for Budgeting Offices

Based on a Collaborative Paper by:

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A blue-tinted photograph of a desk. In the center, there is a white coffee cup on a saucer with a spoon. To the right, a portion of a white computer keyboard is visible. In the foreground, there are several papers, one of which has the word 'MANAGEMENT' visible. A pen is lying on the papers. The overall scene is dimly lit, creating a professional and focused atmosphere.

Agenda

- Research Overview
- What is a Cost Benefit Analysis (CBA)?
- CBA vs. Cost Effectiveness
- Nuts and Bolts of a CBA
- Typical Errors
- Performance Measurement

A Cost-Benefit Analysis of Transit Options in the Northeast Transit Corridor of the City of Charlotte, North Carolina

This cost benefit analysis was conducted to evaluate existing and proposed public transit options in the Northeast corridor of the City of Charlotte in North Carolina. **The proposed Lynx Blue Line Light Rail Extension is compared with the current bus system along the northeast transit corridor.** Based on our findings, we recommend that CATS undertake the LRT project in the Northeast corridor. **We find that the light rail project will increase overall social welfare by creating positive externalities and transfers such as environmental, land-use, and economic growth.** Further recommendations for enhancing the assessment of the proposed light rail project include improvements in data collection, creation of a performance measurement system, and routine evaluation of funding sources for the project.

What is a Cost Benefit Analysis?

“CBA is a policy assessment method that quantifies in monetary terms the value of all consequences of a policy to all members of society... The aggregate value of a policy is measured by its net social benefits... The net social benefits, NSB, equal the social benefits, B minus the social costs, C:

$$NSB = B - C$$

Cost Benefit Analysis: Concepts and Practice

Anthony E. Boardman et. al

p. 2

General Major Steps

1. Specify the set of alternative projects
2. Decide whose benefits and costs count
3. Catalogue the impacts and select measurement indicators
4. Predict the impacts quantitatively
5. Monetize all impacts
6. Discount benefits and costs to obtain present values
7. Compute the net present value of each alternative
8. Perform sensitivity analysis
9. Make a recommendation

From~ Cost-Benefit Analysis:
Concepts and Practices

TRB Steps

- Recognizes the need for explaining non-monetized or non-quantifiable impacts.

All TYPES OF IMPACTS on all PEOPLE at all TIMES

COSTS and
BENEFITS

SHORT RUN and
LONG RUN

HOUSEHOLDS BUSINESSES GOVERNMENTS
as
CONSUMERS and PRODUCERS

In the
AGGREGATE
(SOCIETY)

By GROUP
(Distributional
Impacts: EQUITY)

Source: ECONorthwest.

Figure 2-1. A full-cost framework for evaluating the impacts of public policies and investments.

CBA vs. Cost Effectiveness

- Cost Effectiveness Analysis (CEA) is used best when analysts are limited to only costs measures.
- CEA is best for assessing the efficiency of a project/program.
- Ex: “Alternative highway safety programs may each involve different costs and number of lives saved. The cost-effectiveness ratios of the programs would be expressed as dollars per life saved, and the program that costs the least per life saved would be assessed as the most efficient” ~ **Cost Benefit Analysis: Concepts and Practice, Anthony Boardman et. al pg. 463**

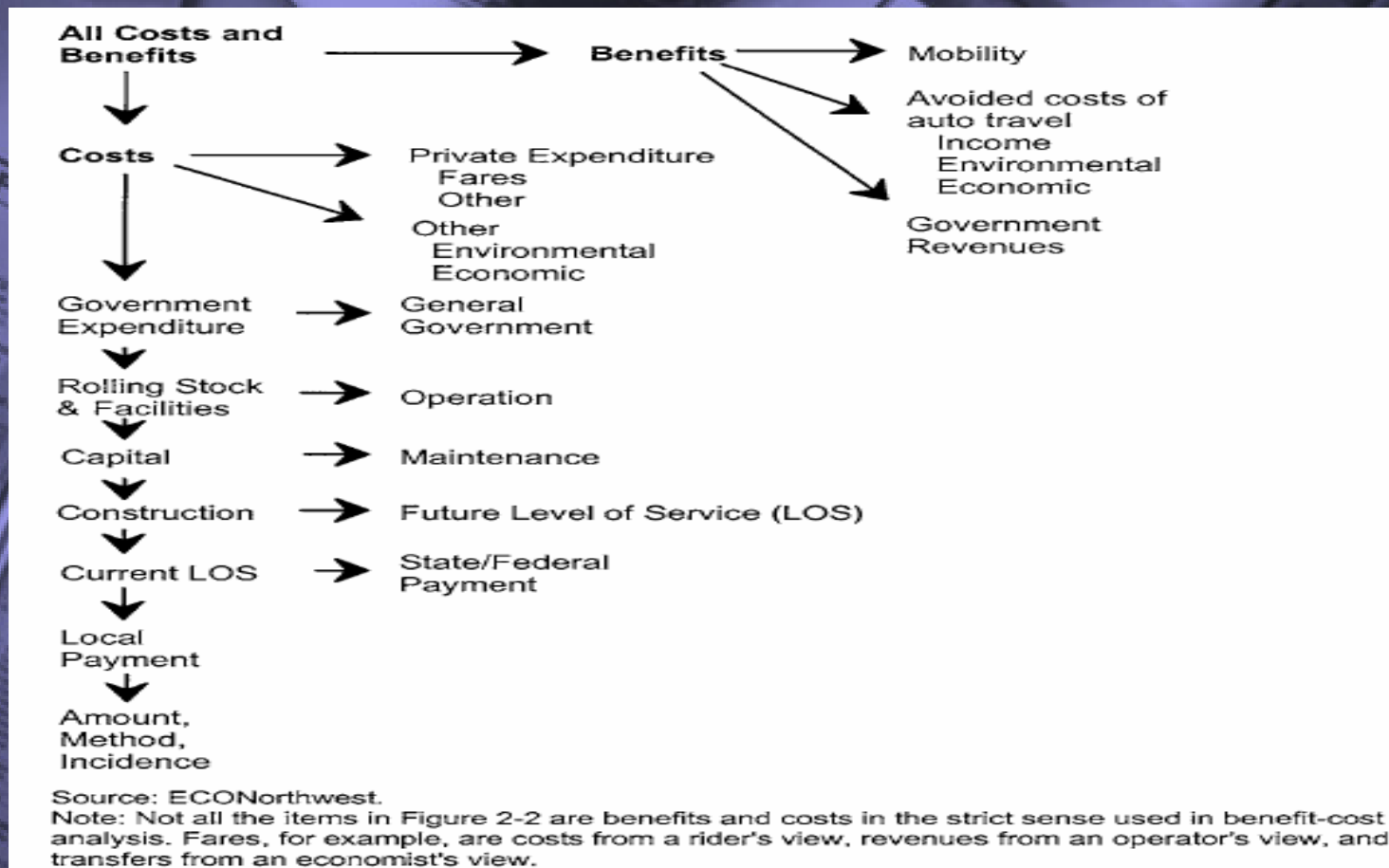
Nuts and Bolts for Transportation Projects


- Standing
- Assumptions and Criteria
- Primary Impacts
- Secondary Impacts
- Costs and Revenues
- Land Use and Economic Development Impacts
- Discounting Benefits and Costs
- Net Present Value
- Non-Quantifiable Impacts
- Sensitivity Analysis

Paper Assumptions

- Quantified services only in Northeast Corridor.
- Only primary impacts are quantified.
- Marginal cost of bus feeder routes and elasticity of demand during peak hours is zero.
- 7% expansion rate; 2.85% inflation rate; 4.67 % discount rate; 20 yr. project horizon
- Capital/construction costs remain constant until project completion date.

Transportation Impacts



A blue-tinted photograph of a desk. In the foreground, there is a computer keyboard on the right side. In the center, a pair of glasses is resting on a piece of paper. To the left, there is a pen and another piece of paper with some text, including the word "MANAGER". The background shows a wooden desk surface.

Paper Transportation Impacts

- Capital/Construction Costs
- Operations
- Maintenance
- Safety and Revenue

Typical User Costs

TABLE 3-15 Summary of user cost analysis

Data Assembly Steps	Parameters to Measure	Guidebook Resources
Step 1: Determine time values	Value of walk, wait, in-vehicle and transfer time	Tables 3-1, 3-2
Step 2: Determine units of travel measurement	Corridor vs. link Pass.-mile vs. veh.-mile	"Selecting the Unit of Travel Measurement"
Step 3: Measure transit user costs, before and after the improvement	Travel time Accident costs (if changed from status quo) Fares and other out-of-pocket costs	Tables 3-3 through 3-8, Figure 3-1
Step 4: Measure auto/truck user costs, before and after improvement	Travel time Accident costs (if changed from status quo) Vehicle ownership costs Vehicle operating costs and tolls	Tables 3-9 through 3-13, Figure 3-2
Step 5: Measure bicycle and walk user costs, before and after improvement	Travel time Vehicle ownership costs Vehicle operating costs	Table 3-14

Source: ECONorthwest.



Brief Note on Revenues

Key Point: While revenue sources are almost always of interest to policymakers, in the context of benefit-cost analysis they are transfers, not benefits, and should not be added to other benefits.

Non-Quantifiable Analysis

Type of Impact/ Evaluation Criteria	Direction of Impact	Comments
Environmental	+	Aggregate LRT usage will decrease air pollutants, due to less congestion on highways. However, LRT causes increased amounts of coal pollutants.
Costs	+	Costs are high but yield a positive net present value.
Land Use	+	New rail transit facilities and rail transit extensions have moderate land use elasticity. These transportation investments are likely to increase land valued and development density.
Economic	+	Employees have more accessibility and travel options to reach their workplaces in the university, but could produce other externalities that may provide counter effects to development, such as pollution, and congestion.
Equity	+	Depending on which income group
Time Savings	0 to +	Added city congestion may offset decreased highway congestion. LRT has decreased travel time due to increased speeds, allowing riders to spend less time on transportation, thus yielding a higher wage. Transfers between various corridors are difficult though, implying a need for coordinated services.
Accessibility	+	Measures have been taken to provide handicap accessibility on the LRT. Additionally, the proposed location of LRT stations provides different points of access.

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Sensitivity Analysis

- How do changes in assumptions affect results for each alternative specified?
- Considers the validity of our analysis and provides different scenarios in an ever-changing economy.

Paper Sensitivity Analysis

Scenario (Assumptions)	NPV/BC Ratio	Alternatives	
		Light Rail	Bus
I. Expansion Rate = 7%; Inflation Rate = 2.85%; Nominal Discount Rate = 4.67%; No Expansion for Construction costs assumed	Net Present Value Benefit-cost ratio	\$547,385,454 3.84	\$428,590,659 2.40
II. Expansion Rate = 7%; Inflation Rate = 2.5%; Nominal Discount Rate = 4.67%; No Expansion for Construction costs assumed	Net Present Value Benefit-cost ratio	\$335,721,160 3.91	\$306,741,080 3.20
III. Expansion Rate = 5%; Inflation Rate = 2.85%; Nominal Discount Rate = 4.67%; No Expansion for Construction costs assumed	Net Present Value Benefit-cost ratio	\$343,725,332 4.20	\$312,408,482 3.34
IV. Expansion Rate = 7%; Inflation Rate = 2.85%; Nominal Discount Rate = 8%; No Expansion for Construction costs assumed	Net Present Value Benefit-cost ratio	\$420,935,109 4.34	\$322,663,687 2.46
V. Expansion Rate = 5%; Inflation Rate = 2.5%; Nominal Discount Rate = 8%; No Expansion for Construction costs assumed	Net Present Value Benefit-cost ratio	\$280,625,207 4.85	\$251,263,752 3.54

Paper Recommendations

- Review and enhance the collection of data before and after implementation.
- Create a performance measurement system for the five corridors in Charlotte and Mecklenburg County using reliable and valid data.
- Survey LRT users currently riding the South Corridor LRT line.
- Conduct a land-use analysis of the corridor before and after implementation to determine the direction of impact of the LRT.
- **VERY IMPORTANT:** Foster investment in transit-oriented development adjacent to the proposed Northeast Corridor LRT stations.
- Promote transit ridership to Charlotte residents by creating disincentives to vehicle transportation.
- CATS should continue to evaluate LRT funding sources, possibly incorporating more private financing.
- Study the possibility of creating a regional transportation fund.

Typical Errors/Problems

- Omissions
- Forecasting Differences
- Valuation Differences
- Estimation/Measurement Differences
- Time Limitations
- Limited Data Availability

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Performance Measurement

- Need to incorporate CBA projections into a performance measurement system in order to track success....or areas of improvement in project.



Sources

- Cost-Benefit Analysis: Concepts and Practice- Boardman, Greenberg, Vining, and Weimer
- Estimating the Benefits and Costs of Public Transit Projects: A Guidebook for Practitioners- Transportation Research Board, TCRP Report 78

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Thank You!!

Any Questions?

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