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DEPARTMENT OF EDUCATION

Applied Economics

SENIOR HIGH SCHOOL

Minimizing and Maximizing Business's Impact: Application of Cost-benefit Analysis

Self-Learning Module
17

Quarter 4

DIVISION OF PASIG CITY
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Applied Economics

SENIOR HIGH SCHOOL

Self-Learning Module 17

Quarter 4

Minimizing and Maximizing Business's Impact: Application of Cost-benefit Analysis

Introductory Message

For the facilitator:

Welcome to the Senior High School – Applied Economics Self Learning Module on Minimizing and Maximizing Business's Impact: Application of Cost-benefit Analysis!

This Self-Learning Module was collaboratively designed, developed and reviewed by educators from the Schools Division Office of Pasig City headed by its Officer-in-Charge Schools Division Superintendent, Ma. Evalou Concepcion A. Agustin, in partnership with the City Government of Pasig through its mayor, Honorable Victor Ma. Regis N. Sotto. The writers utilized the standards set by the K to 12 Curriculum using the Most Essential Learning Competencies (MELC) in developing this instructional resource.

This learning material hopes to engage the learners in guided and independent learning activities at their own pace and time. Further, this also aims to help learners acquire the needed 21st century skills especially the 5 Cs, namely: Communication, Collaboration, Creativity, Critical Thinking, and Character while taking into consideration their needs and circumstances.

In addition to the material in the main text, you will also see this box in the body of the module:

Notes to the Teacher

This contains helpful tips or strategies that will help you in guiding the learners.

As a facilitator you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their own learning. Moreover, you are expected to encourage and assist the learners as they do the tasks included in the module.

For the learner:

Welcome to the Applied Economics Self Learning Module on Minimizing and Maximizing Business's Impact: Application of Cost-benefit Analysis!

This module was designed to provide you with fun and meaningful opportunities for guided and independent learning at your own pace and time. You will be enabled to process the contents of the learning material while being an active learner.

This module has the following parts and corresponding icons:

Expectations - This points to the set of knowledge and skills that you will learn after completing the module.

Pretest - This measures your prior knowledge about the lesson at hand.

Recap - This part of the module provides a review of concepts and skills that you already know about a previous lesson.

Lesson - This section discusses the topic in the module.

Activities - This is a set of activities that you need to perform.

Wrap-Up - This section summarizes the concepts and application of the lesson.

Valuing - This part integrates a desirable moral value in the lesson.

Posttest - This measures how much you have learned from the entire module.

EXPECTATIONS

After going through this module, you are expected to apply the cost-benefit analysis in the real-world scenario.

PRETEST

Directions: Read each statement carefully. Write **T** if the statement is correct, otherwise write **F**.

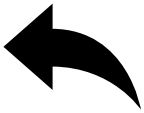
_____1. The best cost-benefit analysis takes a broad view of costs and benefits, including indirect and longer-term effects, reflecting the interests of all stakeholders who will be affected by the program.

_____2. Cost-benefit analysis is traditionally based on conventional welfare economics, which provides a utilitarian account of value that relies on individual self-interest.

_____3. All information on costs, benefits, and risks are rarely known with uncertainty, especially when one looks to the future.

_____4. A cost-benefit analysis should not normally be undertaken for any project which involves policy development, capital expenditure, use of assets, or set of standards.

_____5. It is important to ensure the analysis is as comprehensive as possible.



RECAP

Directions: Discuss what you have learned about cost-benefits analysis in three (3) sentences. Write your answer in the space provided below.

1. _____.

2. _____.

3. _____.

LESSON

Application of Cost-benefit Analysis

To illustrate how cost-benefit analysis might be applied to a project, let us take an example of highway improvement such as the extension of Highway 54 in Metro Manila. The local four-lane highway which carried the freeway and commuter traffic in Metro Manila did not have a median divider and its inordinate number of fatal head-on collisions led to the name "Killer Road." The improvement of the highway would lead to more capacity which produces time-saving and lowers the risk. But inevitably there will be more traffic than was carried by the old highway.

The following is a highly condensed analysis using hypothetical data.

Traffic Data	No Extension, "Killer Road" Only	Highway 54 Extension and "Killer Road"
Rush Hours		
Passenger Trips (per hour)	3,000	4,000
Trip Time (minutes)	50	30
Value of Time (₱/minute)	0.10	0.10
Non rush Hours		
Passenger Trips (per hour)	500	555.55
Trip Time (minutes)	35	25
Value of Time (₱/minute)	0.08	0.08
Traffic Fatalities (per year)	12	6

The data indicates that for rush-hour trips the time cost of a trip is ₱5 (50x0.10) without the project and ₱3 (30x0.10) with it. It is assumed that the operating cost for a vehicle is unaffected by the project and is ₱4. The project lowers the cost of a trip and the public responds by increasing the number of trips taken. There is an increase in consumer surplus both for the trips which would have been taken without the project and for the trips which are stimulated by the project.

For trips that would have been taken anyway, the benefit of the project equals the value of the time saved multiply by the number of trips. For the rush-hour trip, the project saves ₱3 and for the non rush-hour trip, it saves ₱2. For the trips generated by the project the benefit is equal to one half of the value of the time saved times the increase in the number of trips.

The benefits per hour are:

Type	Trips Which Would Be Taken Anyway	Trips Generated by the Project	Total
Rush Hour	6,000	1,000	7,000
Nonrush Hour	400	22.22	422.22

To convert the benefits to an annual basis one multiplies the hourly benefits of each type of trip times the number of hours per year for that type of trip. There are 260 week days per year and at six rush hours per weekday there are 1,560 rush hours per year. This leaves 7,200 nonrush hours per year. With these figures the annual benefits are:

Type	Trips Which Would Be Taken Anyway	Trips Generated By the Project	Total
Rush Hour	₱9,360,000	₱1,560,000	₱10,020,000
Nonrush Hour	₱2,880,000	₱160,000	₱3,040,000
Total	₱12,240,000	₱1,720,000	₱13,960,000

The value of the reduced fatalities may be computed in terms of the equivalent economic value people place upon their lives when making choices concerning risk and money. If the labor market has wages for occupations of different risks such that people accept an increase in the risk of death of 1/1,000 per year in return for an increase in income of ₱400 per year then a project that reduces the risk of death in a year by 1/1000 gives a benefit to each person affected by it of ₱400 per year. The implicit valuation of a life in this case is ₱400,000.

Thus the benefit of the reduced risk project is the expected number of lives saved times the implicit value of life. For the highway project, this is 6x₱400,000= ₱2,400,000 annually.

The annual benefits of the project are thus:

TYPE OF BENEFIT	VALUE OF BENEFITS PER YEAR
Time-Saving	₱13,960,000
Reduced Risk	₱2,400,000

Let us assume that this level of benefits continues at a constant rate over a thirty-year lifetime of the project. The cost of the highway consists of the costs for its right-of-way, its construction, and its maintenance. The cost of the right-of-way is the cost of the land and any structures upon it which must be purchased before the construction of the highway can begin.

For purposes of this example, the cost of the right-of-way is taken to be ₱100 million and it must be paid before any construction can begin. At least part of the right-of-way cost for a highway can be recovered at the end of the lifetime of the highway if it is not rebuilt.

For example, it is assumed that all of the right-of-way cost is recoverable at the end of the thirty-year lifetime of the project. The construction cost is ₱200 million spread evenly over four years. The maintenance cost is ₱1 million per year once the highway is completed.

The schedule of benefits and costs for the project are as follows:

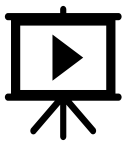
TIME (Year)	BENEFITS (In Million Pesos)	RIGHT-OF-WAY (In Million Pesos)	CONSTRUCTION COSTS (In Million Pesos)	MAINTENANCE (In Million Pesos)
0	0	100	0	0
1-4	0	0	50	0
5-29	16.36	0	0	1
30	16.36	-100	0	1

The benefits and costs are in constant value pesos; i.e., there was no price increase included in the analysis. Therefore the discount rate used must be the real interest rate. If the interest rate on long term bonds is 8% and the rate of inflation is 6% then the real rate of interest is 2%. The present value of the streams of benefits and costs discounted at a 2% back to time zero are as follows:

	PRESENT VALUE (In Million Pesos)
Benefits	304.11
Costs:	
Right-of-Way	44.79
Construction	190.39
Maintenance	18.59
Total Costs	253.77
Net Benefits	50.35

The positive net present value of ₱50.35 million and benefit/cost ratio of 1.2 indicate that the project is worthwhile if the cost of capital is 2%. When a discount rate of 3% is the benefit/cost ratio is slightly under 1.0. This means that the internal rate of return is just under 3%. When the cost of capital is 3% the project is not worthwhile.

It should be noted that the market value of the right-of-way understates the opportunity cost of having the land devoted to the highway. The land has a value of ₱100 million because of its income after property taxes. The economy is paying more for its alternate use but some of the payment is diverted for taxes. The discounted presented value of the payments for the alternate use might be more like ₱150 million instead of ₱100 million. Another way of making this point is that one of the costs of the highway is that the local governments lose the property tax on the land used.



ACTIVITIES

Activity: Think-Pair-Share

Directions: Choose a partner and discuss the proposed CBA projects. From these proposed projects, you need to come up with one (1) cost-benefit analysis, including the data and computations. Present your CBA in tabular form.

WRAP-UP

To summarize what you have learned in the lesson, answer the following questions:

1. What is the importance of cost-benefit analysis in doing a project?
2. What are the factors you need to consider in conducting a cost-benefit analysis?

VALUING

Reflect on this!

"That is, while we believe that cost-benefit analysis is an important tool to inform agency decision making, the results of the cost-benefit analysis do not trump existing law."

— Fred Thompson

POSTTEST

Directions: Read each statement carefully. Write **T** if the statement is correct, otherwise write **F**.

_____1. The forecasts used in CBA might include future revenue or sales, alternative rates of return, expected costs, and expected future cash flows.

_____2. The project needs to earn at least less than the rate of return that could be earned elsewhere or the discount rate.

_____3. An analyst or project manager should apply a monetary measurement to all of the items on the cost-benefit list, taking special care not to underestimate costs or overestimate benefits.

_____4. The results of the aggregate costs and benefits should be compared quantitatively to determine if the benefits outweigh the costs.

_____5. It is important to ensure the analysis is as comprehensive as possible.

KEY TO CORRECTION

POSTTEST:	PRETEST
1. T	1. T
2. F	2. T
3. T	3. F
4. T	4. F
5. T	5. T

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