

Introduction

By

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What economics is

1. Economics or political economy, is the study of those activities which, with or without money, involves exchange transactions among people.
2. Economics is the study of how people choose to use scarce or limited productive resources (land, labor, capital goods such as machinery, technical knowledge) to produce various commodities and distribute them to various members of society for their consumption.

What economics is

3. Economics is the study of people in their ordinary business of life, earning and enjoying a living.
4. Economics is the study of how human beings go about the business of organizing its consumption and productive activities.
5. Economics is the study of wealth.
6. Economics is the study of how to improve society.

Overall definition

- Economics is the study of how people and society end up choosing, with or without the use of money, to employ scarce productive resources that could have alternative uses, to produce various commodities and distribute them for consumption, now or in the future, among various persons and groups in society. It analyzes the costs and benefits of improving patterns of resource allocation.

Points to be noted

- Economics is both science and art, is studied for a variety of reasons, to understand problems facing the citizen and family, to help government in both underdeveloped and advanced nations promote mankind fulfilling growth, while avoiding depression and inflation, to analyze fascinating patterns of social behavior, to alter the inequalities in the distribution of income and opportunity.

Role

- Engineers are planners and builders. They are also problem solvers, managers and decision makers.
- Plans and production must be financed.
- An engineering economist draws upon the accumulated knowledge of engineering and economics to identify alternative uses of limited resources and to select the preferred course of action.

Engineering Decision makers

- General questions
 1. Which one of several competing engineering designs should be selected ?
 2. Should the machine now in use be replaced with a new one ?
 3. With limited capital available, which investment alternative should be funded ?
 4. How many units of production have to be sold before a profit can be made ? This is called as break –even analysis
 5. When many different cash flow patterns are possible, which should be considered ?
 6. Are the benefits expected from a public service project large enough to make its implementation costs acceptable ?

Example





Conventional VS CNC Machining



Economic decision needed – where ?

- Manufacturing plant – major investment is needed to produce new equipment , training procedures or should plant subcontract to an outside vendor (Asian Paints, Infosys,IBM)
- Manually controlled irrigation system with a planned update to an automated system in 3 years or buy more expensive automated control system be immediately (Israel)

Economic decision needed – where ?

- Football stadium – seating capacity of 80000 or should be constructed with 65000 seat with planned end-zone enclosure (Eden Gardens, Calcutta)
- Electric utility – update to an existing minicomputer file servers or should scrap IBM AS/400 minicomputer ?

Engineering and Economics

- Before 1940, engineers were mainly concerned with the design, construction and operation of machines, human and physical that produced final products.
- Now skillful financial analyses of the effects of implementation. (Worker safety, environmental effects, consumer protection, resource conservation)

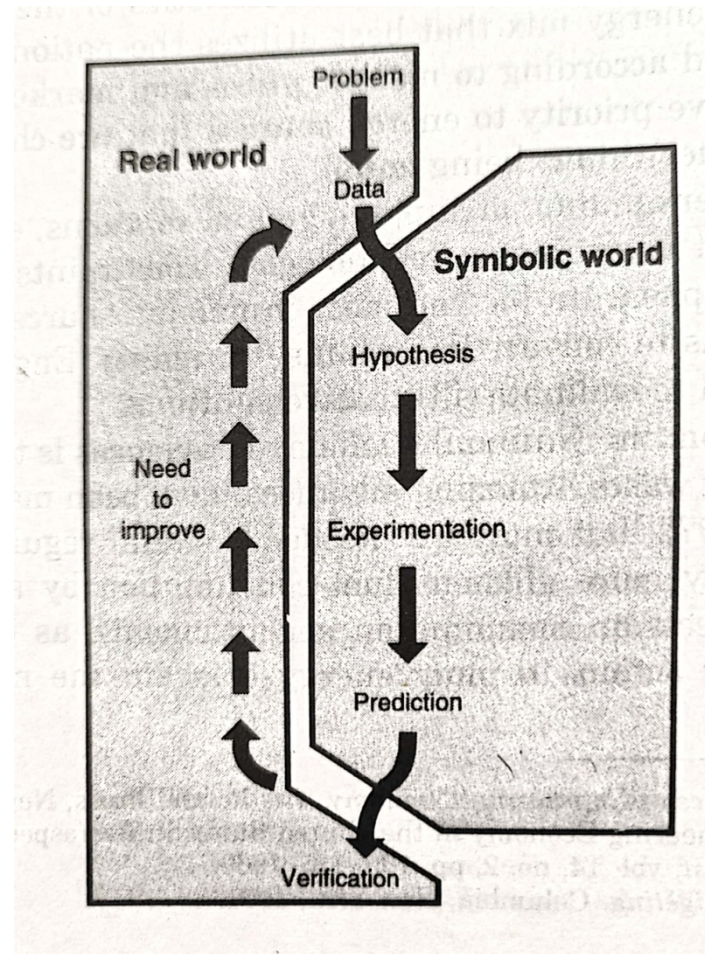
Engineering and Economics

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Problem solving and Decision making

- The fundamental approach to economic problem solving is to elaborate on the time-honored scientific method.
- The method is anchored in two worlds: the real everyday working world and the abstract.
- Refer Figure 1.1

Problem-Solving Process



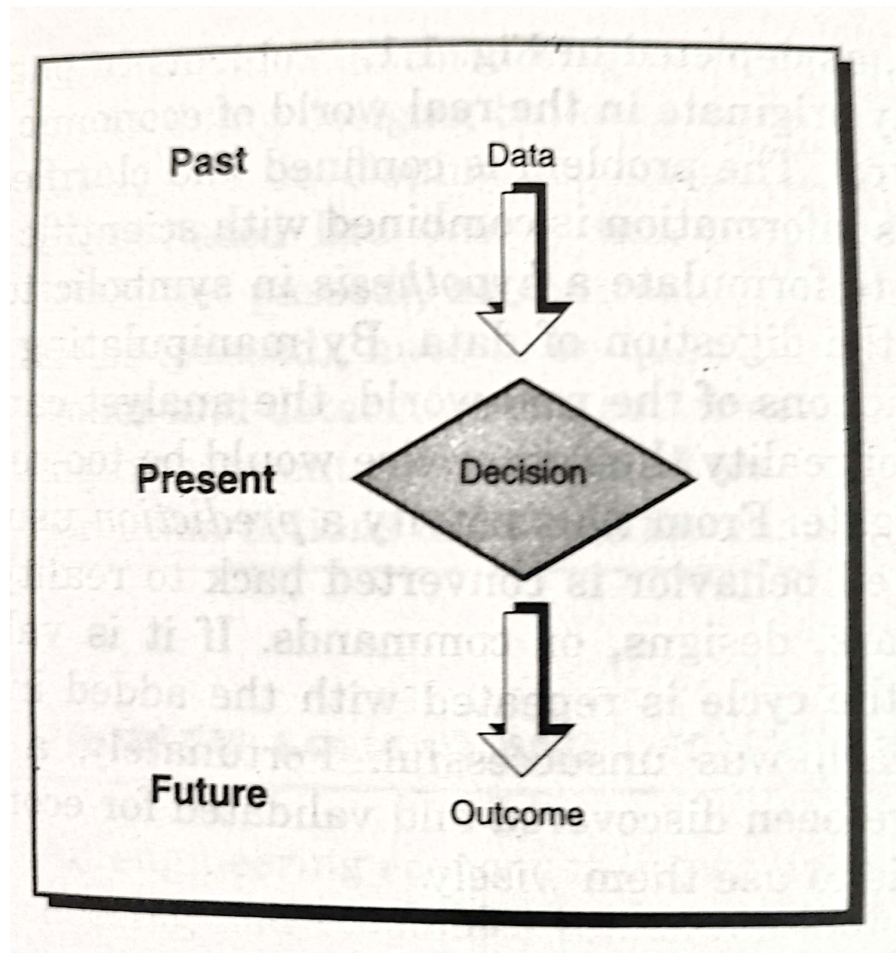
Problem solving and Decision making

- Problems in engineering and managerial economy originate in the real world of economic planning, management and control.
- This information is combined with scientific principles supplied by the analyst to formulate a hypothesis in symbolic terms. The symbolic language aids the digestion of data.
- By manipulating and experimenting with the abstractions of the real world, the analyst can simulate multiple configurations of reality that otherwise would be too costly or too inconvenient to investigate.

Problem solving and Decision making

- From this activity a prediction usually emerges.
- The predicted behavior is converted back to reality for testing in the form of hardware designs or commands.
- If it is valid, the problem is solved.
- If it is not, the cycle is repeated with the added information that the previous approach was unsuccessful.

Decision-making Process



Intuition and Analysis

- Fig 1.2 Decision making process
- Decision made is based on data from past performance and establishes a course of action that will result in some future outcome.
- In economic analyses, SOPs often take the form of worksheets for the justification of investments.
- Most significant problems require both analysis and personal judgement.

Intuition and Analysis

- As the solution procedures progress, factors that are difficult to quantify often arise. These are called intangibles, they represent aspects of a problem that cannot be translated readily to monetary values.
- Intuitive ratings are frequently assigned to intangibles to allow them to be included in the decision process.

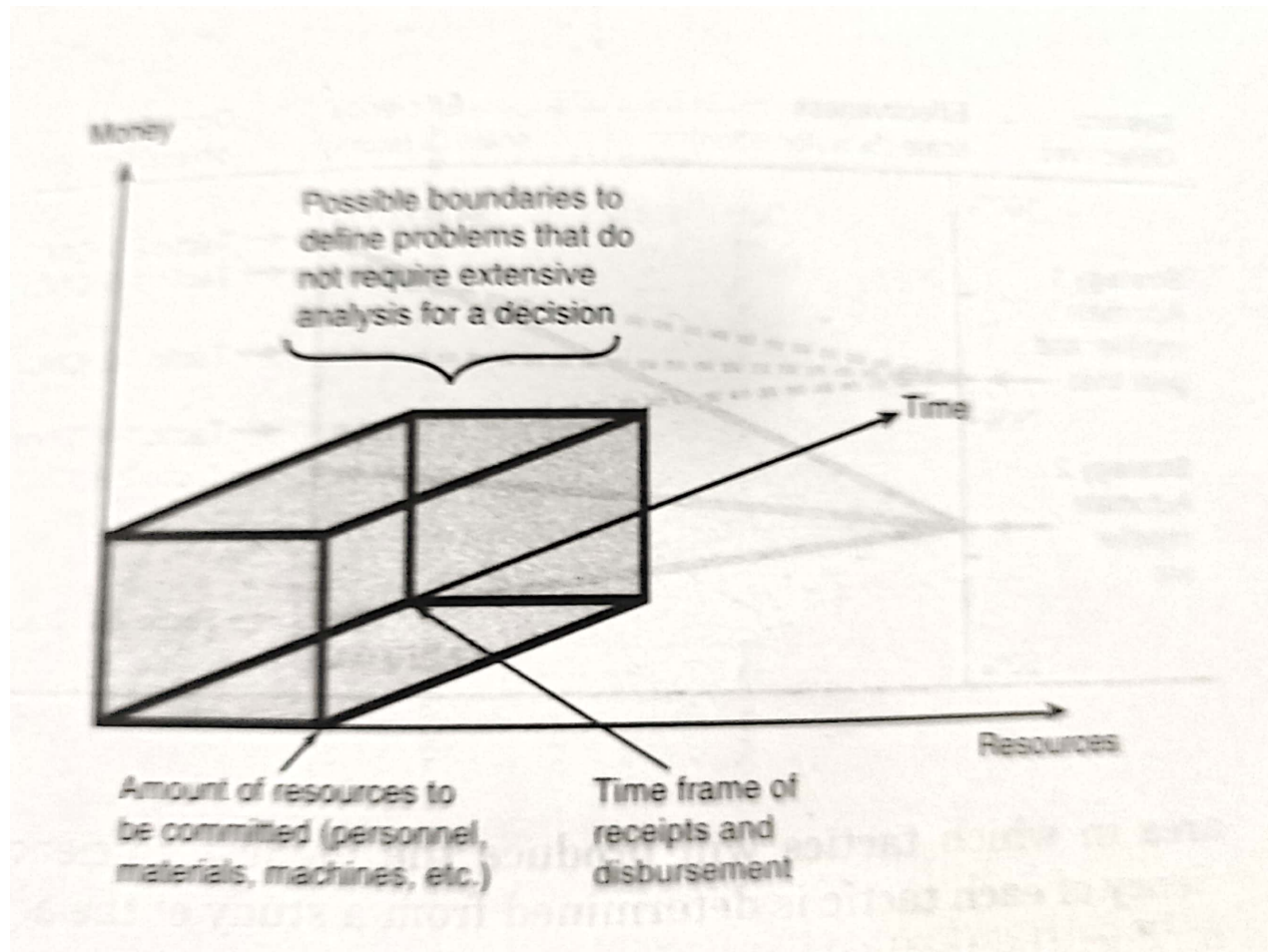
Intuition and Analysis

- Judgment also enters the process in determining whether a solution is well enough founded to be accepted.
- Thus intuition and judgment complement analysis methods by contributing to better decisions.
- Example : Love at first sight, Teacher knows or not ?

To Intuit or to analyze

- Example fig 1.3

Criteria for routine response to an economic problem



Tactics and strategy

- Most frustrating – Wrong decision for an important problem and Right decision for the wrong problem.
- Strategy sets ultimate objectives and associated tactics define the multiple maneuvers required to achieve the objectives.
- Example

A strategic decision is to make use of best resources in the organization in accordance with its long-range objectives.

Tactics and strategy

- In government, strategic method of flood control or development of recreational sites. The measure for strategic alternatives is effectiveness – the degree to which a plan meets economic targets.
- Example flood control – build dams, levees, dredging. The tactical choices are related to efficiency – the degree to which an operation accomplishes a mission within economic expectations.

Tactics and strategy (Levee)

How a River Levee is formed





Tactics and strategy

- The relationship between strategies and tactics offers some constructive insights.
- The effectiveness of each strategy is initially estimated from the effect it will have on system objectives.

Example of an aerospace manufacturing (impeller image)

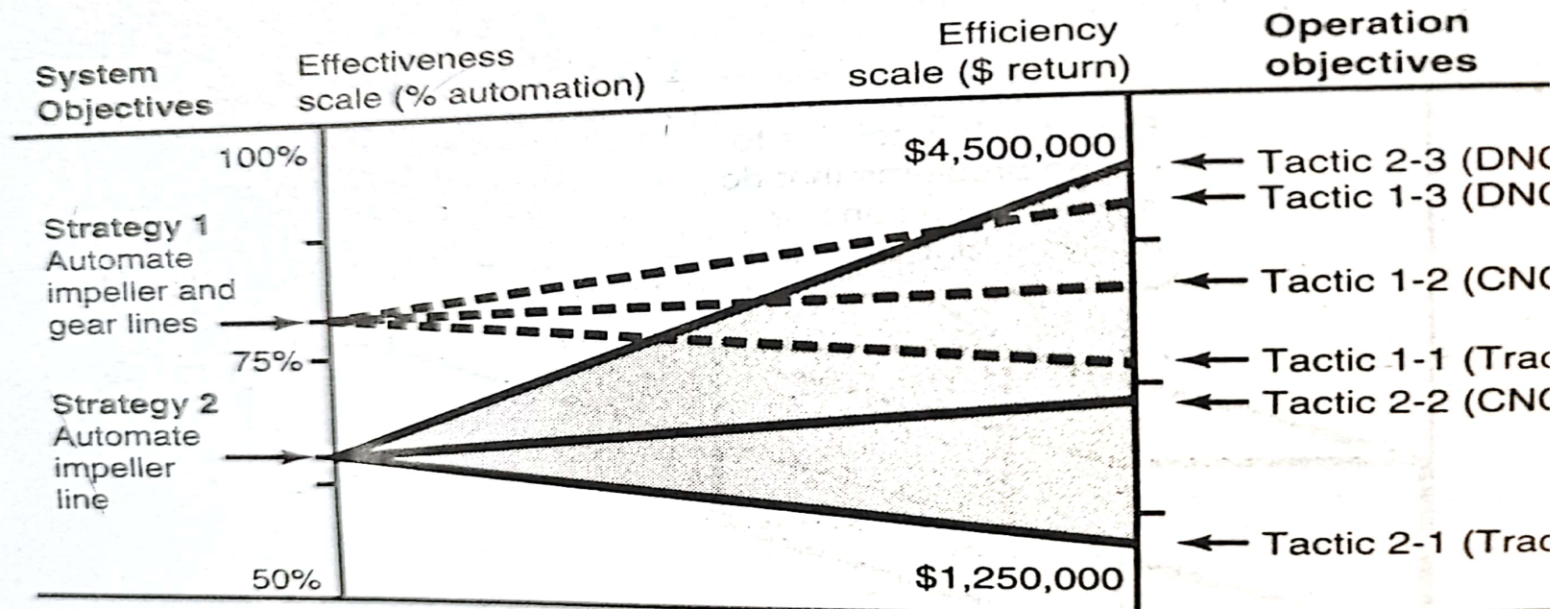


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Example of an aerospace manufacturing (landing gear image)



Relation of strategies and real-world tactics



area in which tactics

Tactics and strategy

- Example

Refer fig 1.4

An aerospace engine manufacturer is considering job shop automation. Two strategies are worked out.

1. Automate impeller and gear lines
2. Automate impeller line

First one make 80% automation and second one 65% automation.

DNC refers to centralized, integrated direct numerical control by computer.

CNC refers to local computer numerical control for each machine

Trace refers to template tracing and duplication for multiple-part setups.

Tactics and strategy

- The efficiency is measured in each approach
 1. The dollar benefits from installing the new equipment, but best dollar return is not realized by the most effective strategy.
 2. Possibly cost of automating the gear line is relatively higher than for the impeller portion of the shop.

Finally the selection of a tactic policy must be evaluated in relation to the strategic objectives and the resources required for implementation.

THANK YOU