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"Those who cannot remember
the past
are fated to repeat it"

George Santayana

"If I have seen further,
it is by standing
on the shoulders of giants"

Isaac Newton

"The question that faces the long range planner is not what we should do tomorrow; it is - what do we have to do today to be ready for an uncertain tomorrow?"

Peter Drucker

SOMETIMES A GREAT NOTION

TECHNOLOGICAL

FORECASTING

What is Technological Forecasting?

The description or prediction,
using a logic that yields relatively consistent results,

of a foreseeable technological innovation,
specific scientific refinement, or likely
scientific discovery,

that promises to serve some useful function,

with some indication of the most probable
time of occurrence.

Uses of Technological forecasting

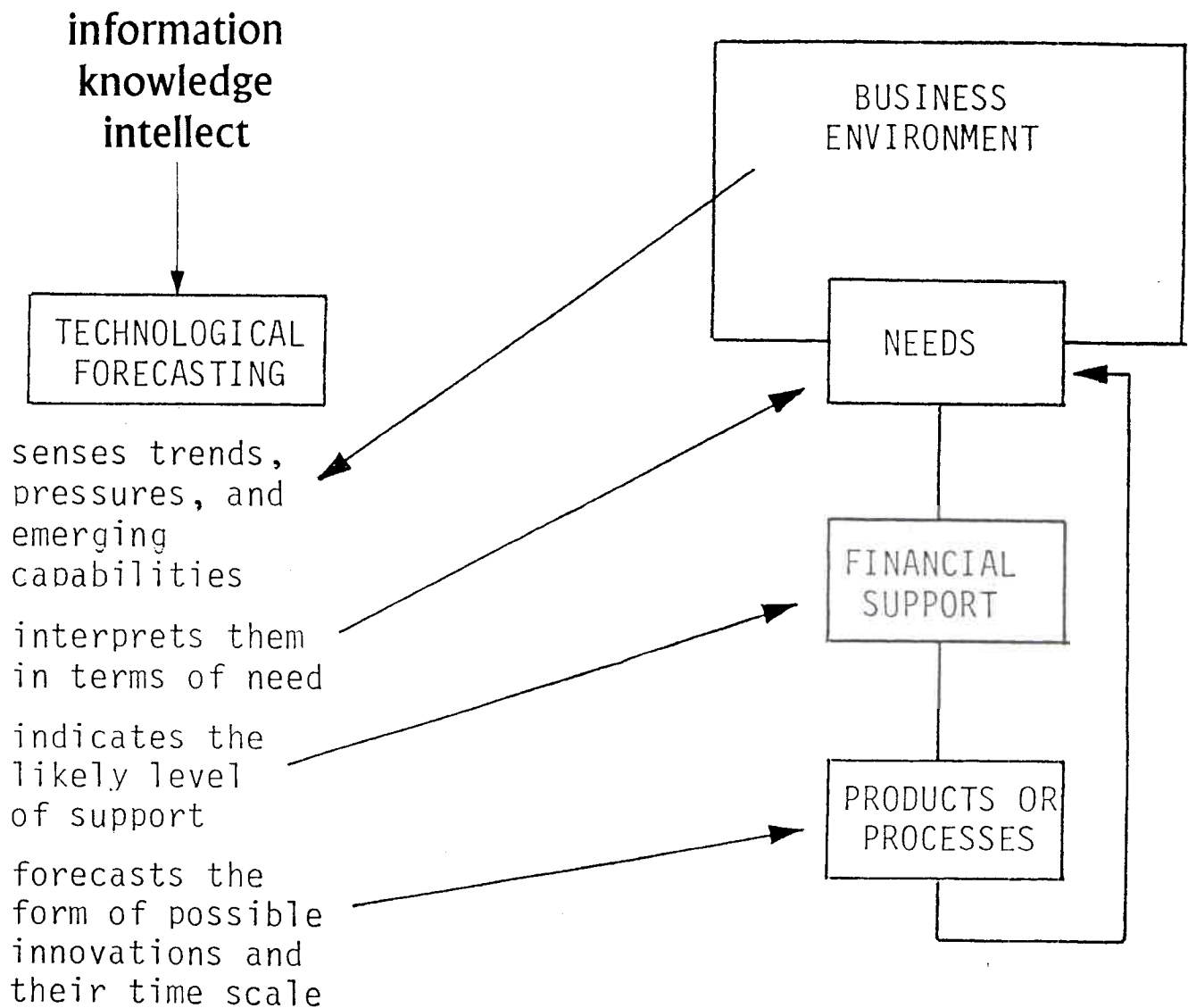
Identify developments

Time scale estimation

Policy reorientation

Operational decision making

Technological Forecasting Context



Usefulness of results determined by:

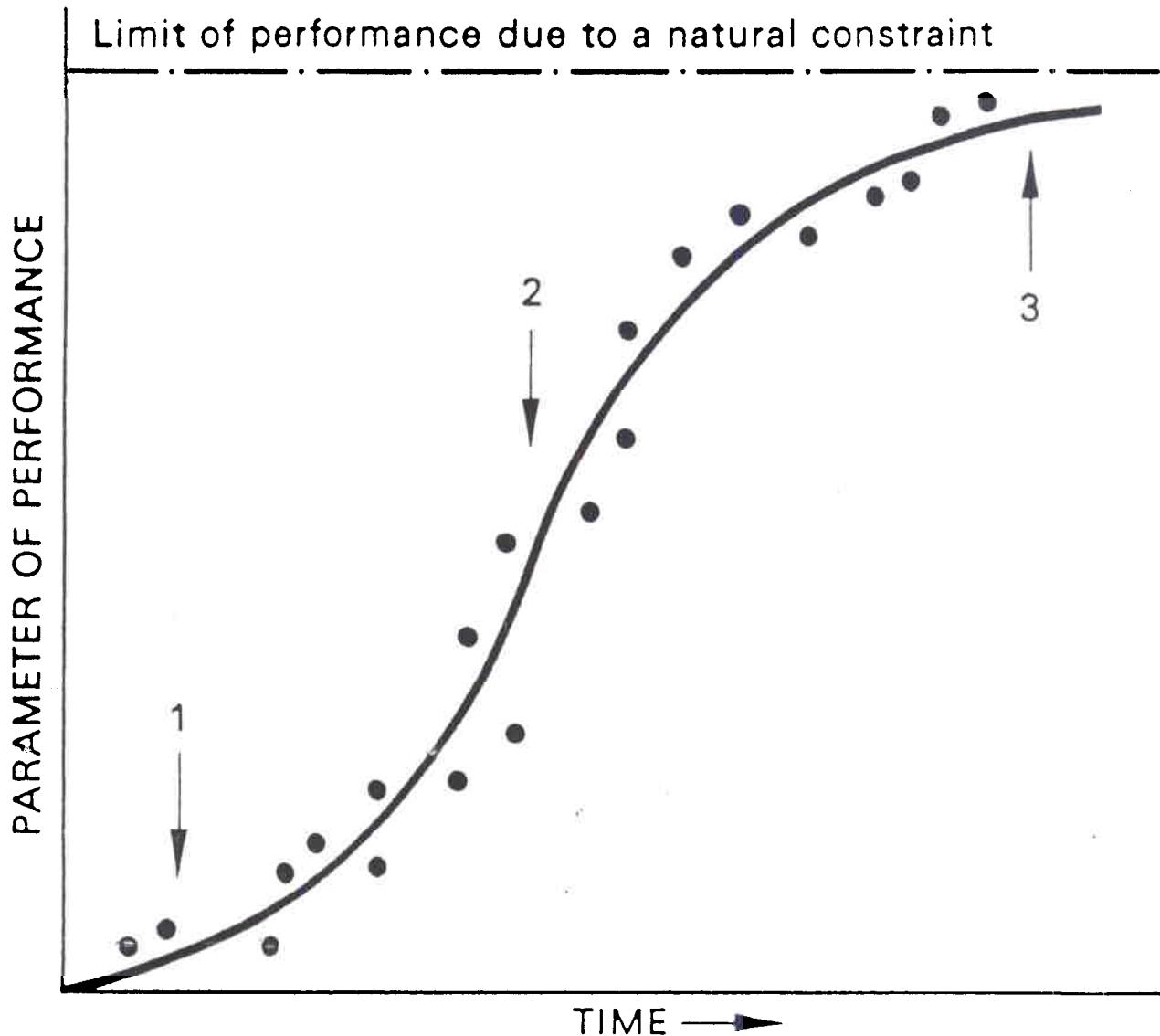
- 1. Quality of the input data*
- 2. Caliber of the minds applied to the task*

Basic Types of Techniques

- **EXPLORATORY**
extend the past
- **NORMATIVE**
start from the future
- **COMBINATION**
usually necessary

Technological Forecasting Methods

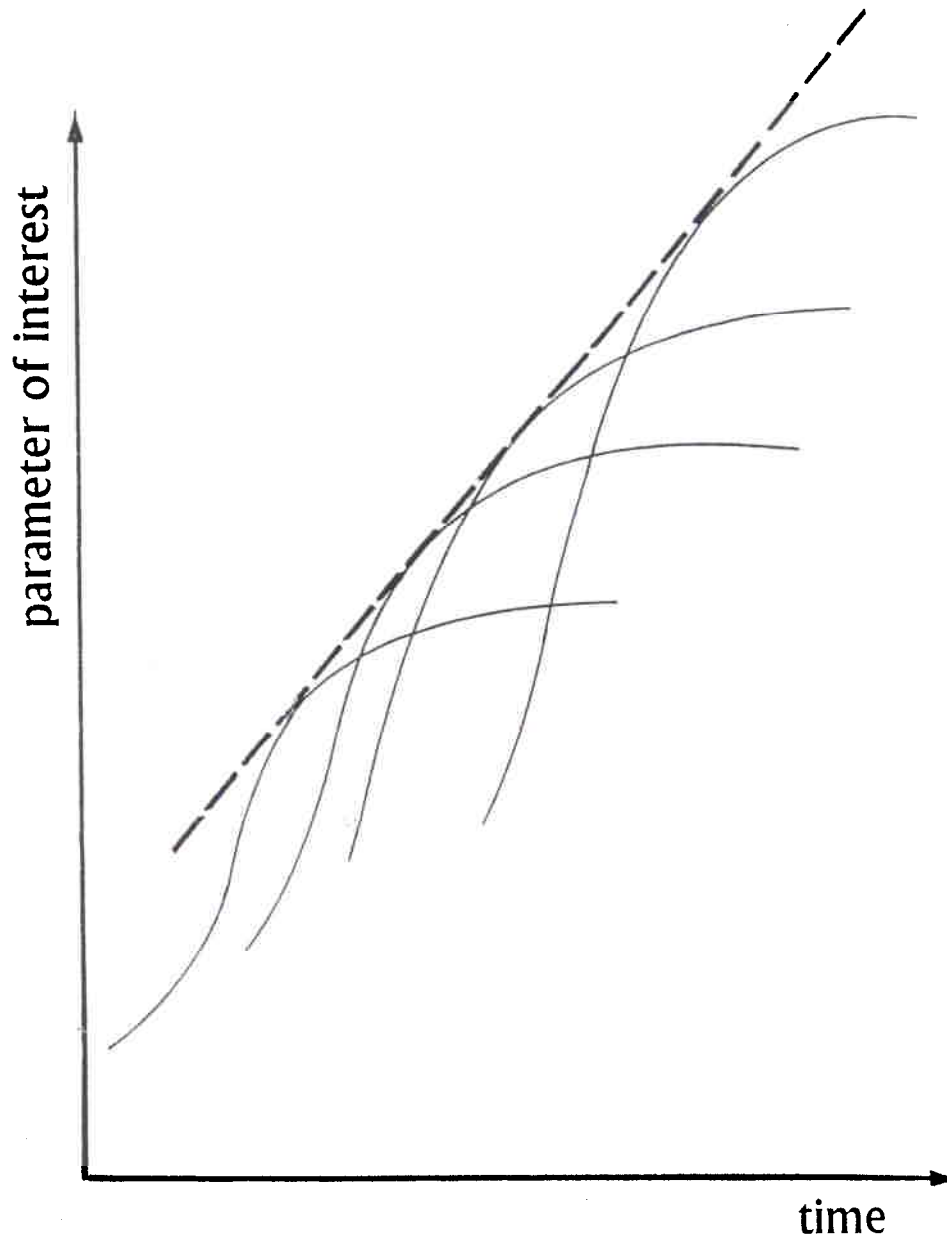
S-Curve



- 1 Period of slow initial growth.
- 2 Rapid exponential growth.
- 3 Growth slows as performance approaches a natural physical limit asymptotically.

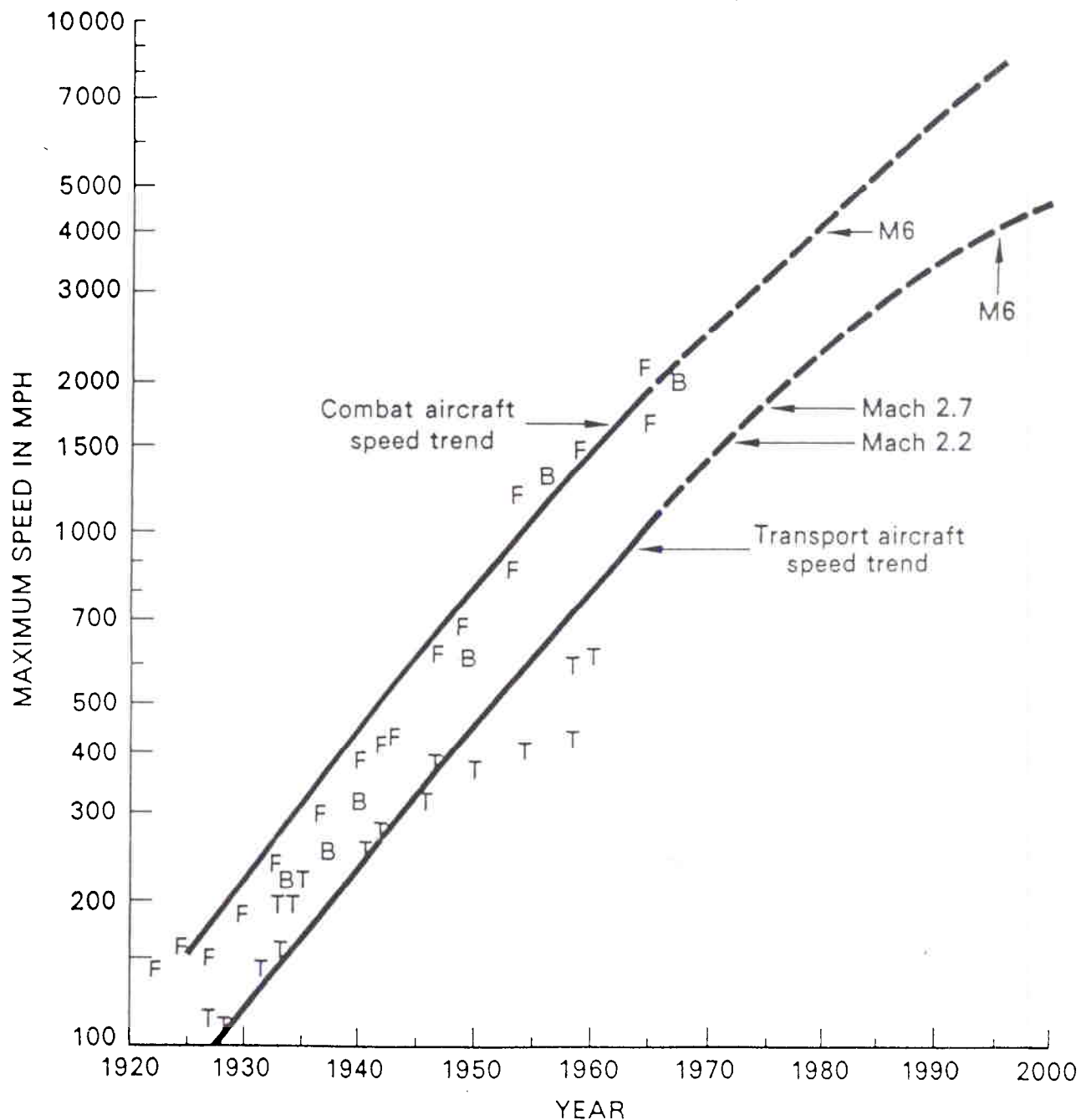
Technological Forecasting Methods

Envelope Curve



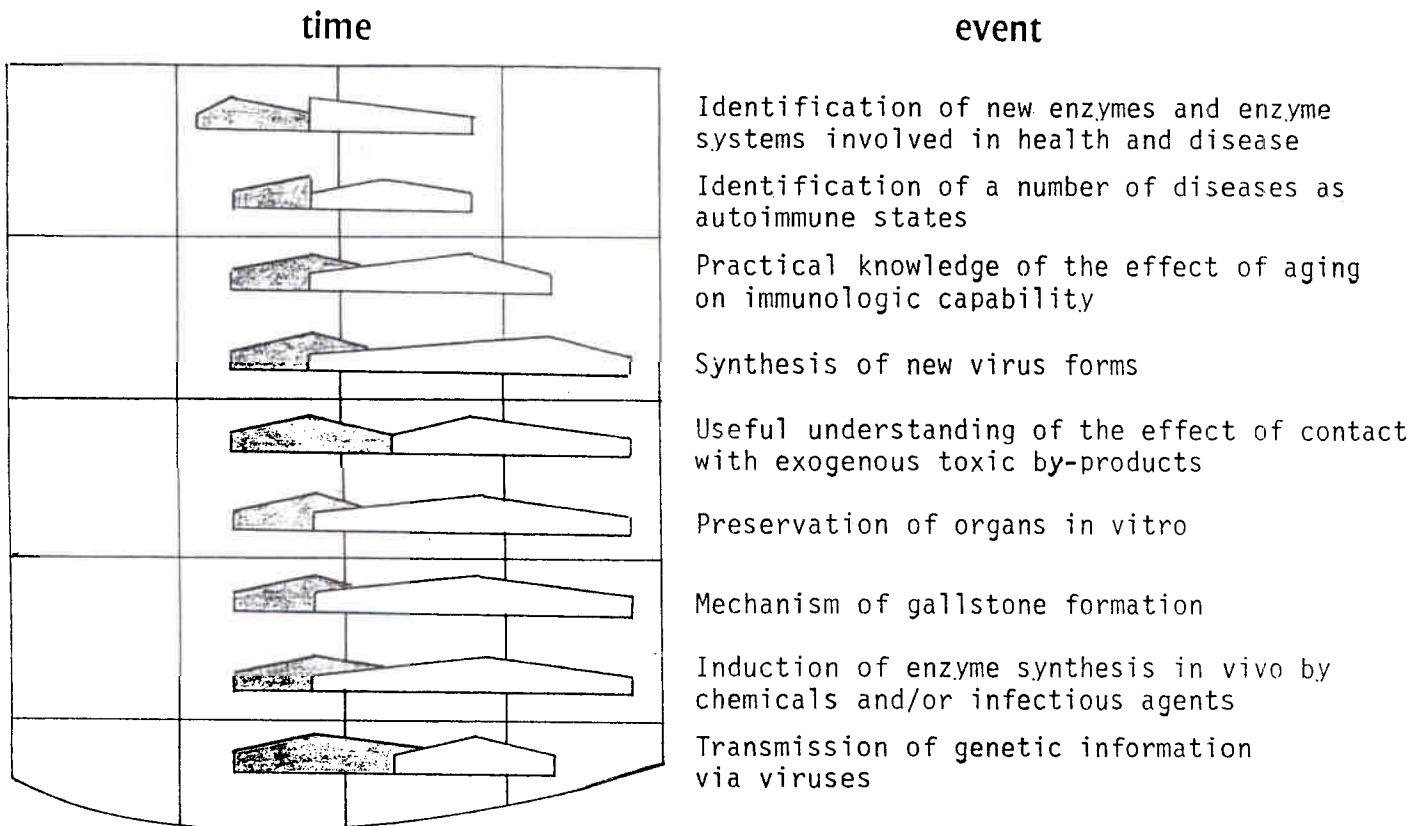
Technological Forecasting Methods

Precursor Trends



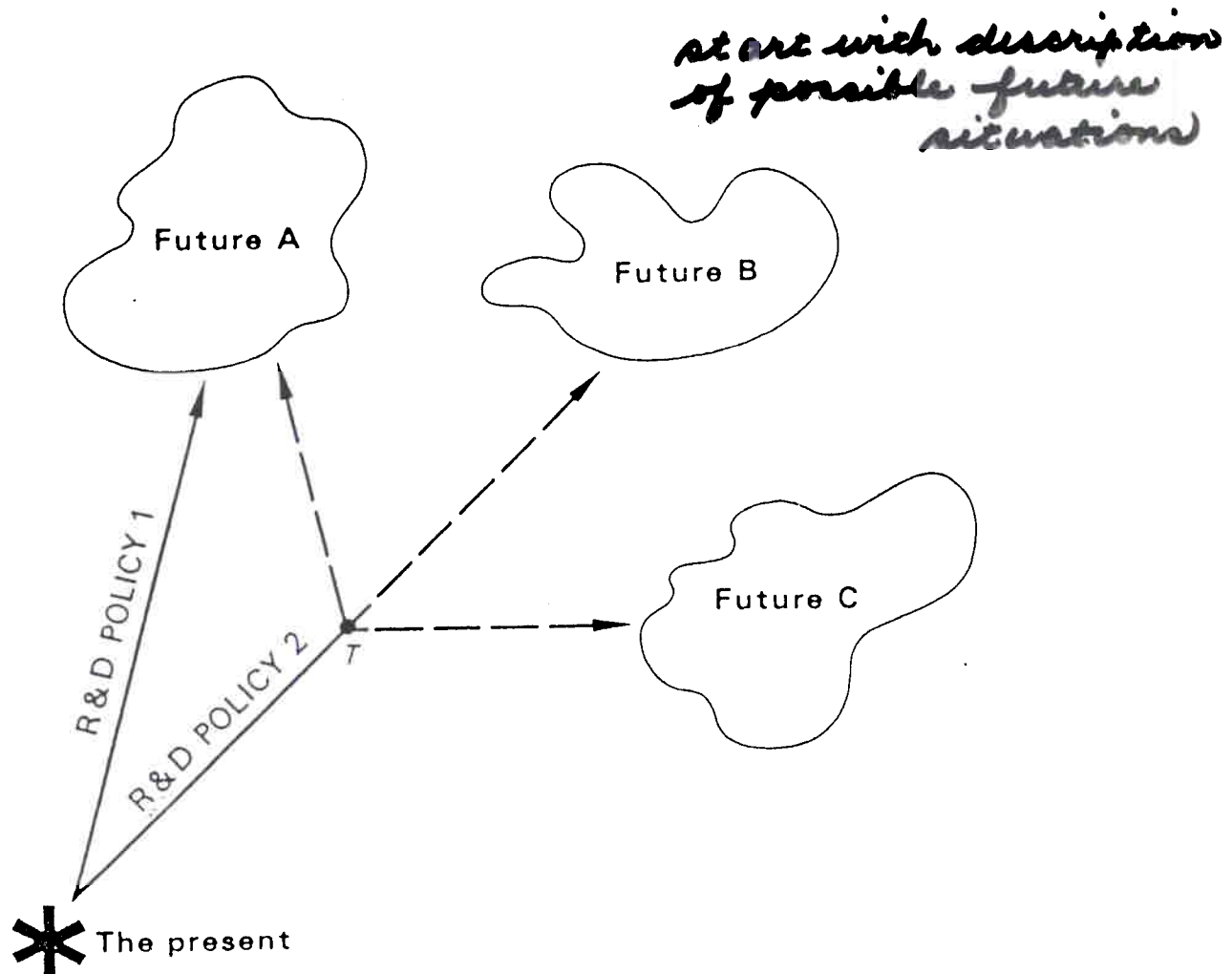
Technological Forecasting Methods

Delphi



Technological Forecasting Methods

Scenarios



Futures A, B and C are three scenarios of alternative futures. The forecast may result in R & D action as follows:

POLICY 1. Future A is considered so probable that decisions are made assuming the forecast is correct.

POLICY 2. A minimum risk policy permitting an advance to *T*, without precluding any of the scenarios. At time *T* a decision cannot be deferred any longer. In this way the decision has been delayed to the latest possible date.

Technological Forecasting Methods

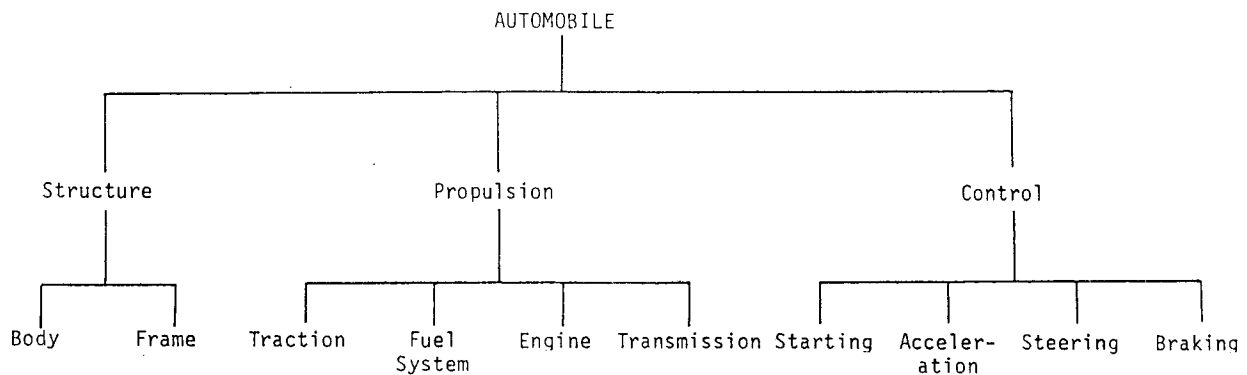
Technology Monitoring

Existence Awareness

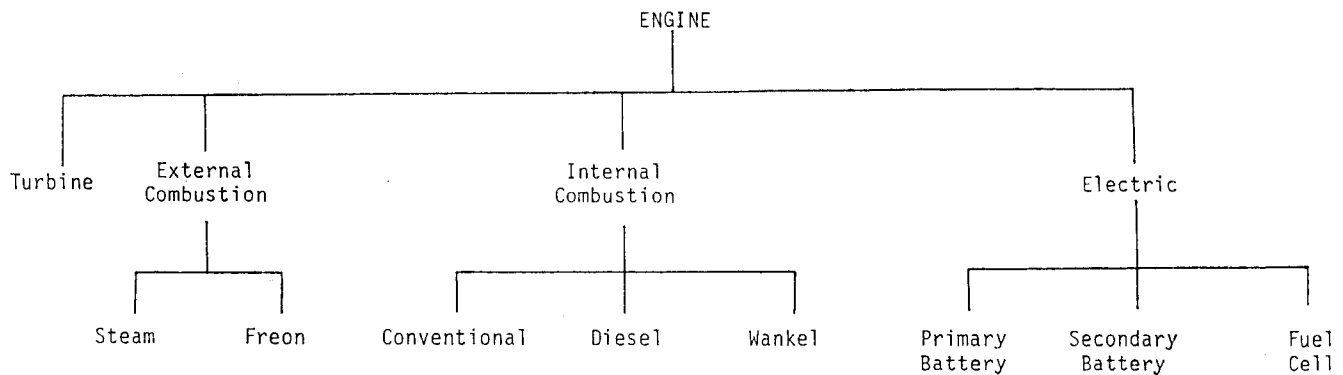
Impact Speculation

Technological Forecasting Methods

Relevance Trees



DESCRIPTIVE TREE



SOLUTION TREE

H-7: Relevance Trees

purpose is to determine and evaluate systematically the alternative paths by which an objective or mission might be achieved.

Technological Forecasting

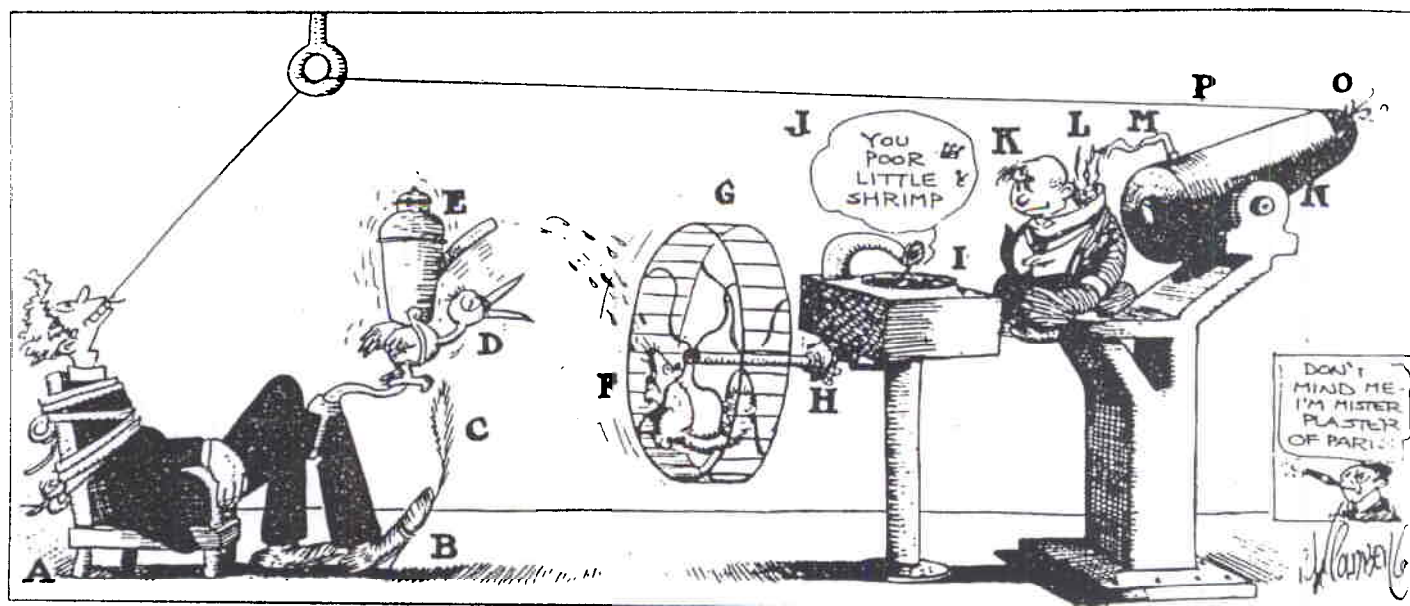
TYPICAL PITFALLS

1. Unexamined assumptions
2. Limited or misplaced expertise
3. Lack of imagination
4. Neglect of constraints
5. Excessive optimism
6. Mechanical extrapolation
7. Overspecification

Technological Forecasting

and

Creative Thought



Rube Goldberg Creative Design

BE YOUR OWN DENTIST !

FIRST TIE YOURSELF SECURELY TO CHAIR (A) AND WIGGLE FOOT (B). FEATHER (C) TICKLES BIRD (D) - AS BIRD SHAKES WITH LAUGHTER, IT MIXES COCKTAIL IN SHAKER (E) - BIRD FALLS FORWARD, SPILLING COCKTAIL, AND SQUIRREL (F) GETS SOUSED - IN HIS DRUNKEN EXCITEMENT, SQUIRREL REVOLVES CAGE (G), WHICH TURNS CRANK (H) AND PLAYS PHONOGRAPH RECORD (I) - SONG (J) GETS DWARF (K) HOT UNDER COLLAR AND FLAMES (L) IGNITE FUSE (M) WHICH SETS OFF CANNON (N), SHOOTING OUT CANNON BALL (O), CAUSING STRING (P) TO PULL TOOTH !

Creative Thought

Attribute Analysis

*Attributes of a concept, product, process, etc.
are systematically examined for potential
alternatives*

????????????????

Adapt ... Modify ... Magnify

... Reduce ... Substitute ...

... Rearrange ... Reverse ...

... Combine ... Other Uses ...

????????????????

Creative Thought

Morphological Analysis

Example.

Subject: Improve a ball-point pen.

Attributes:

Cylindrical Plastic Separate Cap Steel Cartridge, etc.

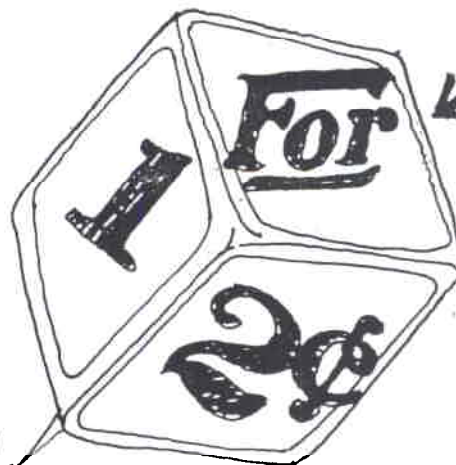
Alternates:

Faceted	Metal	Attached Cap	No Cartridge
<u>Square</u>	Glass	<u>No Cap</u>	Permanent
Beaded	<u>Wood</u>	Retracts	<u>Paper Cartridge</u>
Sculptured	Paper	Cleaning Cap	Cartridge Made of Ink

Invention: A Cube Pen; one corner writes, leaving six faces for ads, calendars, photos, etc.

*Often considered to be
a forecasting technique
due to ability to suggest
future technological
advances*

Dear John



In Closing ...

THE DANGERS OF BEING CUSTOMER-LED

