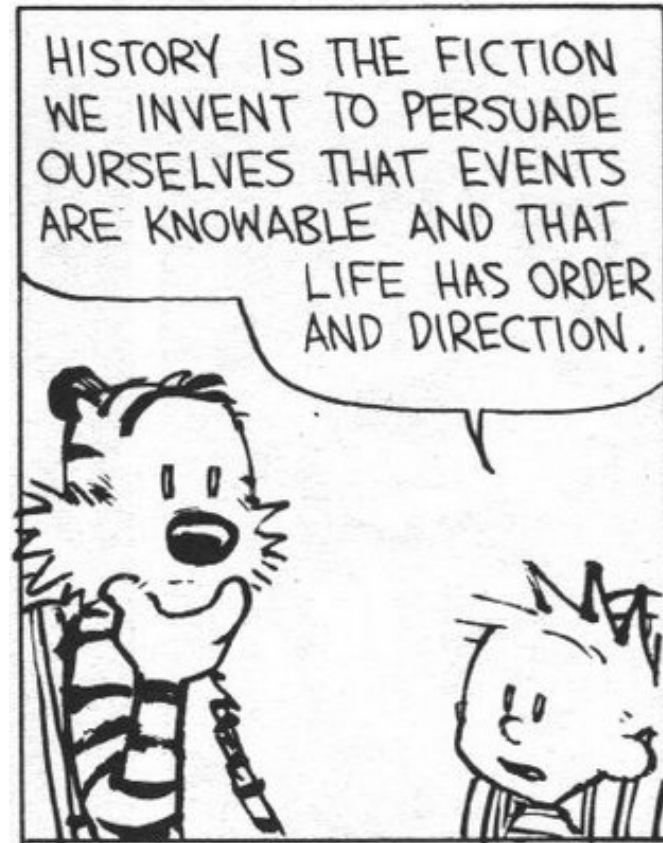


# Why Forecasting?

The formulation of Strategy & Policy

Karel Mulder

January 4, 2010



<http://i14.photobucket.com/albums/a321/Mattpmx/CalvinHobbesHistory.jpg>

# R&D Strategy

## The emergence of large industry

Bayer

Dye industry

Du Pont

Nylon History

General Electric

Westinghouse

Philips



*The miracles of science™*

[www.wackypackages.org](http://www.wackypackages.org)

[Westinghouse.com](http://Westinghouse.com)

[Bayer.com](http://Bayer.com)

# R&D Strategy in Companies

## Development

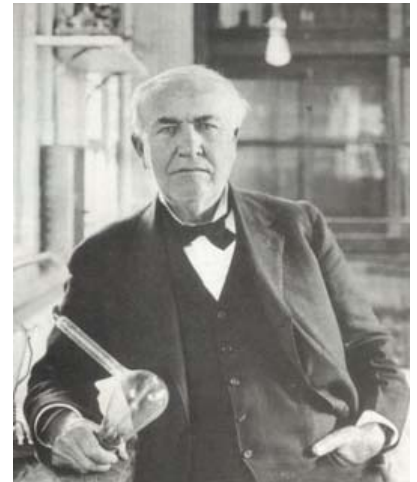
1880: emergence of large industrial corporations, Industrial Research e.g Thomas Edison, General Electric, Bayer

1910-1930: Science based Industry, e.g General Electric, Du Pont, ICI, IG Farben, Philips, Rhone Poulenc, Car industry

Merging science and technology: Academic scientists entered industry

e.g Academics in US industry:

8000 in 1920, 17000 in 1927, 42000 in 1938



[www.nndb.com](http://www.nndb.com)

# R&D Strategy

- Future studies (Energy, transport)
- Scenario analysis

## •Portfolio analysis (Example: bankruptcy Fokker Aircraft)

Growth	Promise	→	Star
Decline	?	←	Cash Cow
	Low Profits/Deficit		High Profits

# R&D Strategy in Companies

Charles M.A. Stine, 1936

*“**Fundamental research** assists one to **predict** the course of development of chemical industry.*

*Pioneering **applied research** enables one to achieve certain **objectives** indicated by fundamental research.*

*Therefore, the **continued growth** (as distinct from mere expansion) of chemical industry **is dependent upon fundamental research.***

*That is the basic philosophy of fundamental research.”*



<http://heritage.dupont.com>

# R&D Strategy in Companies

## Development

First Generation: distinct from corporation

(‘Bright scientists always come up with something new, don’t disturb them’)

Second Generation: R&D Marketing Interface

(For R&D, making Lead from Gold is just as challenging as Gold from Lead, for us only the second conversion is of interest”

Third Generation: R&D integrated in Corporate Strategy

(How to implement real technological change?)

# R&D Strategy in Companies

## Issues

Follower or Leader?

Industry or University?

Make or buy?

Cooperation or not?

Publish or not?

Patent or not?

Centralized or Decentralized?

Business or Corporate organization?

Functional or Disciplinary organization?

# Technology Forecasting for policy

- Military, Cold War
  - scenario's, gaming
- Government R&D:
  - priority setting
- Alternatives courses, strategic planning
  - energy infrastructure



# Technology Forecasting

Mainly after WW II

1950: technological optimism  
energy to cheap to meter,  
squander Dutch natural gas,  
flying cars



[http://i3.iofferphoto.com/img/1158562800/\\_i/14188158/1.jpg](http://i3.iofferphoto.com/img/1158562800/_i/14188158/1.jpg)



[http://novaminds.net/images/science\\_images/skycar.jpg](http://novaminds.net/images/science_images/skycar.jpg)

# Forecasting

## Dilemma's

Technocracy?: Is forecasting leading to technocratic planning?

Dilemma of control:

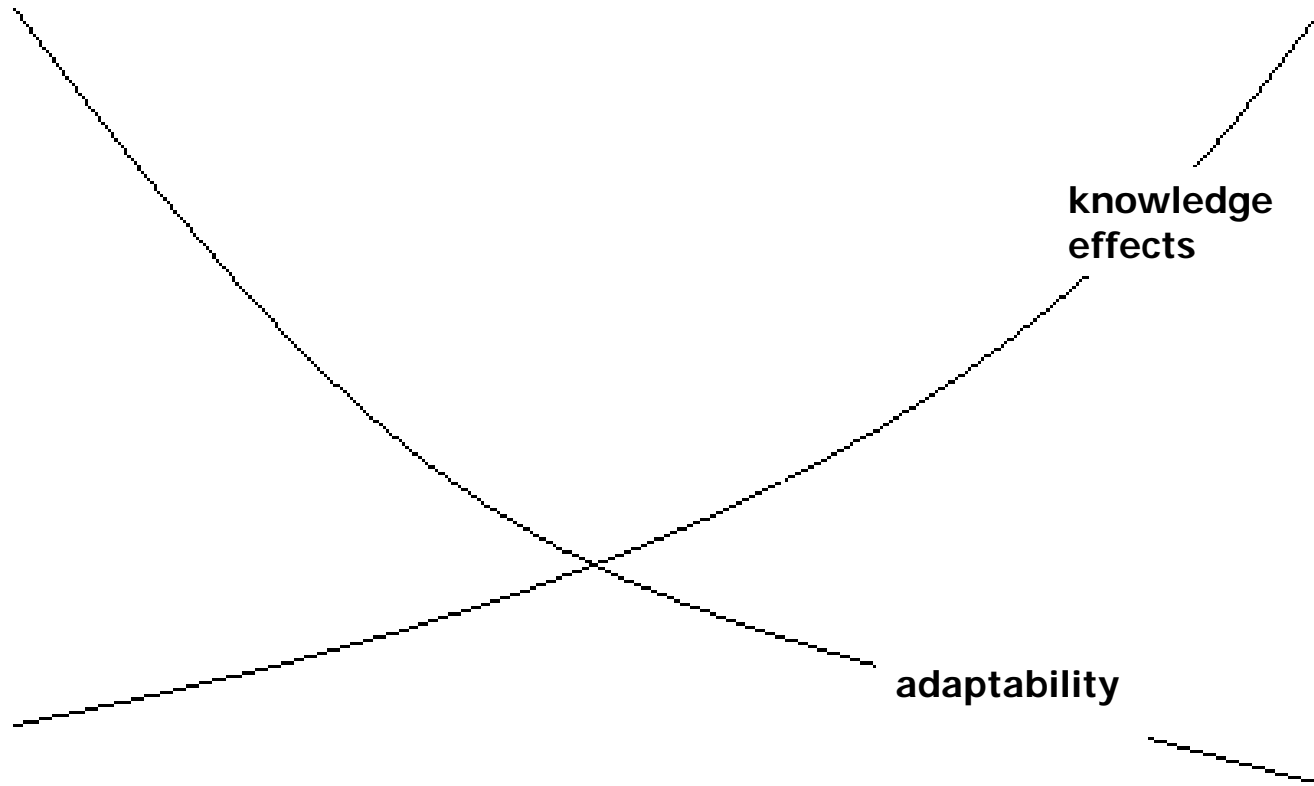
the earlier a debate takes place, the more options there are to control and steering development → entrenchment

Forecasting improves quality of debating?

Enables discussion on alternatives?

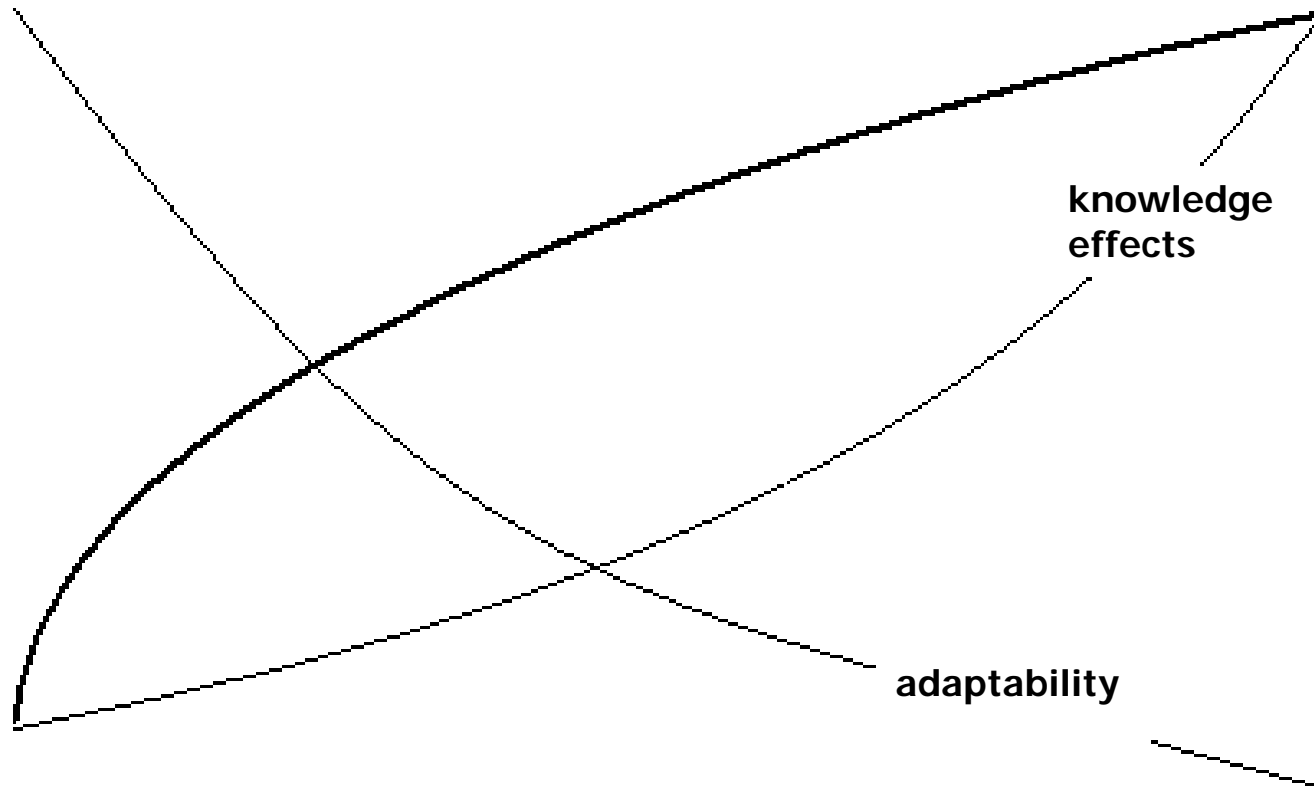
# Forecasting

Collingridge dilemma, (trilemma)



# Forecasting

## Control dilemma with forecasting of impacts



# Forecasting possible?

- Problem of Induction
- Fundamental problem: non-linearities
- Historic empirical correlations insufficient for causal relations

# Forecasting

## Recognising Fundamental Dilemmas

Non-linear relationships

The 'butterfly'

Positive feedback

Problems of induction

Historical empiric correlations insufficient without causal connections

## From forecasting to foresight

# Forecasting

## Did not all forecast fail?

Club of Rome (1970: run into resource catastrophe by 2000)

Demographics (very large increases)

Glass recycling (1975: no chance)

Electricity consumption (early 70s, necessity of 1000 KV grid discussed)

Yes, but everybody always makes forecasts: we should try to make them some better

# Forecasting

## When do companies set up forecasts?

Informal regular forecasting

Explicit forecasts:

- New technological competencies

- New markets (new regions as well as new social groups)



# Forecasting

## When do governments make technological forecasts?

Generic technologies for the economy (ICT, Nano, Bio, Materials)

Potential dilemma's (medical biotech, growth-pollution, privacy)

Under-performing regions and the role of technology

technology for government functions like military, public works, etc