

# Cybernetics IS fun!

**School of Business Information**  
**7th December 2004**

**Professor John Beckford**

*“the truths of cybernetics are not conditional on their being derived from some other branch of science”*

**Ross Ashby, 1956**

## Managerial Cybernetics

- What is Managerial Cybernetics?
- How does it work?
- Why do we need it?
- What is the benefit?

# Managerial Cybernetics

- Common conception of cybernetics
  - Dr. Who, Cybermen, Cyberspace (the Internet)
- Plato - 417 – 347 BC
  - Kybernetes, 'steersman', 'steering the ship of state', 'governance'
- Wiener – 1947
  - 'Control and Communication in the Animal and the Machine'
- Beer – 1959
  - 'The Science of Effective Organisation'

## Managerial Cybernetics

‘The branch of Management Science that studies the structural, informational and human aspects of any organisation as an integrated whole’

Beckford & Dudley, 1998

# Managerial Cybernetics

- Provides an alternative way of thinking about organisations in terms of:
  - Purpose
  - Structure
  - Behaviour (people)
  - Interaction
- Offers different insights into:
  - Efficiency (Productivity)
  - Effectiveness (Performance)
  - Sustainability (Viability)
- How those things can be managed

However...

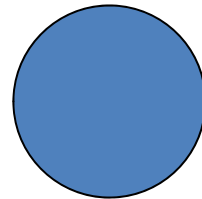
- It is a model – a representation
- A way of thinking about the world
- An abstraction from the full reality of a situation
- It is therefore:

“neither true nor false, it is more or less useful”

Beer, 1985

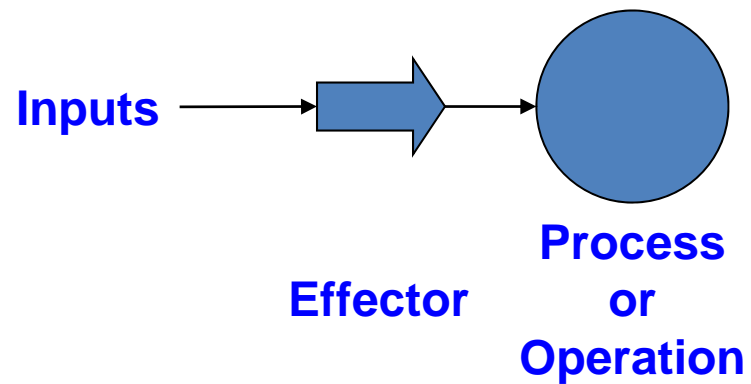
**I find it most useful!**

# The Basic Cybernetic Model



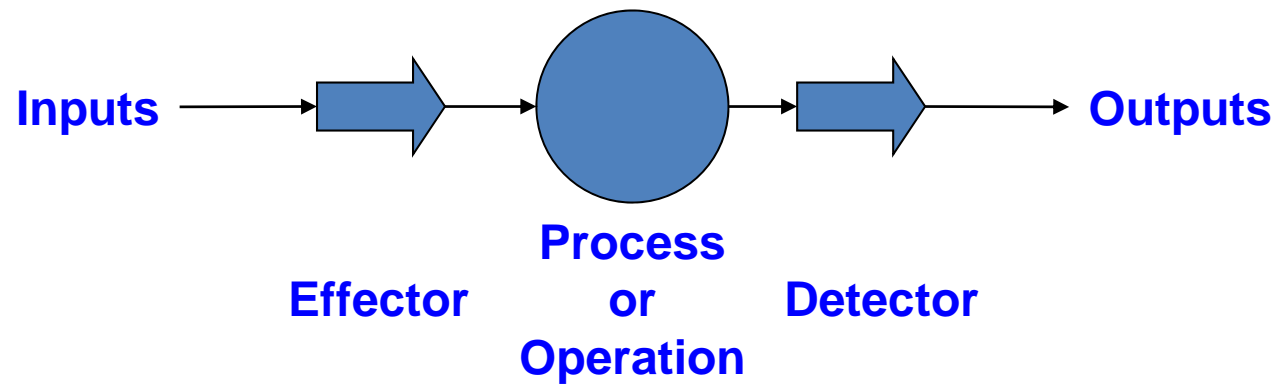
**Process  
or  
Operation**

# The Basic Cybernetic Model

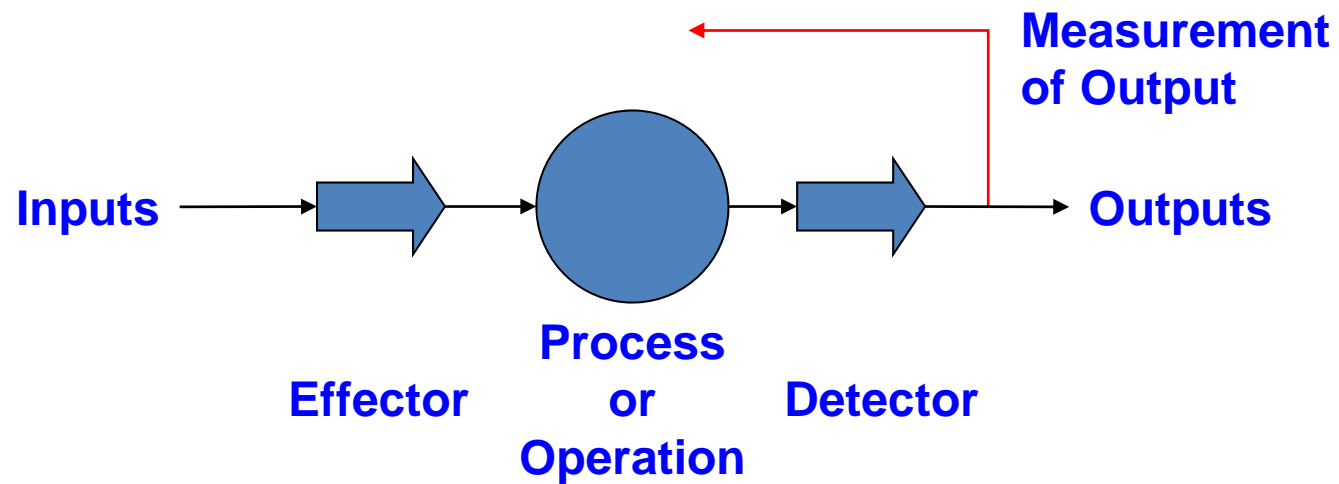




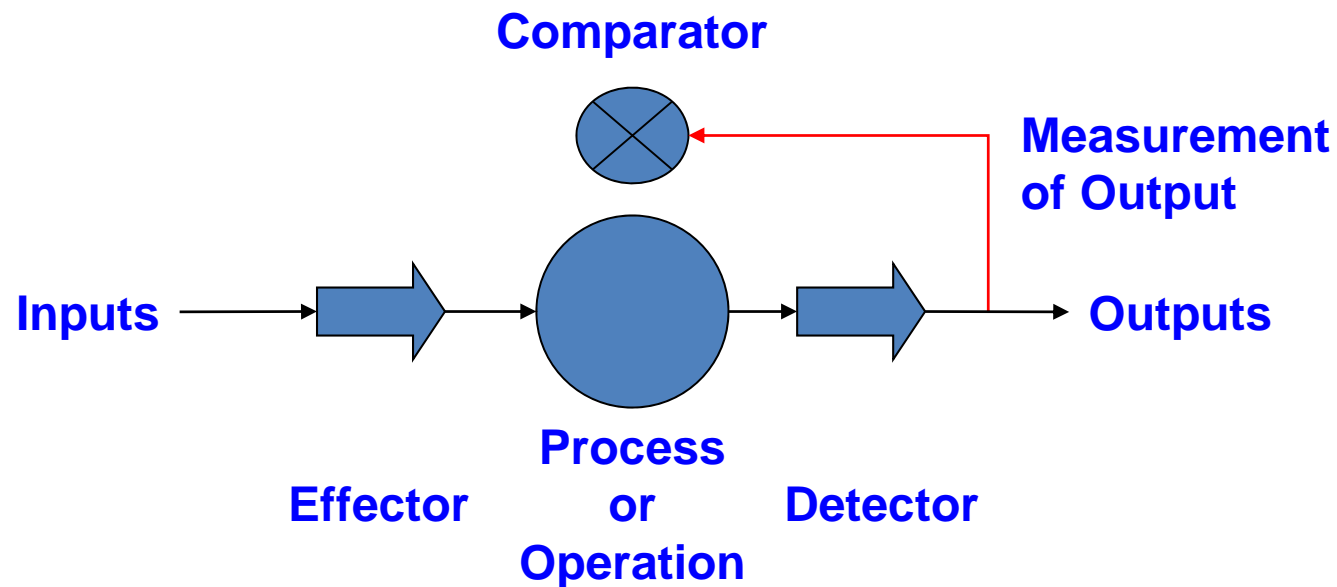
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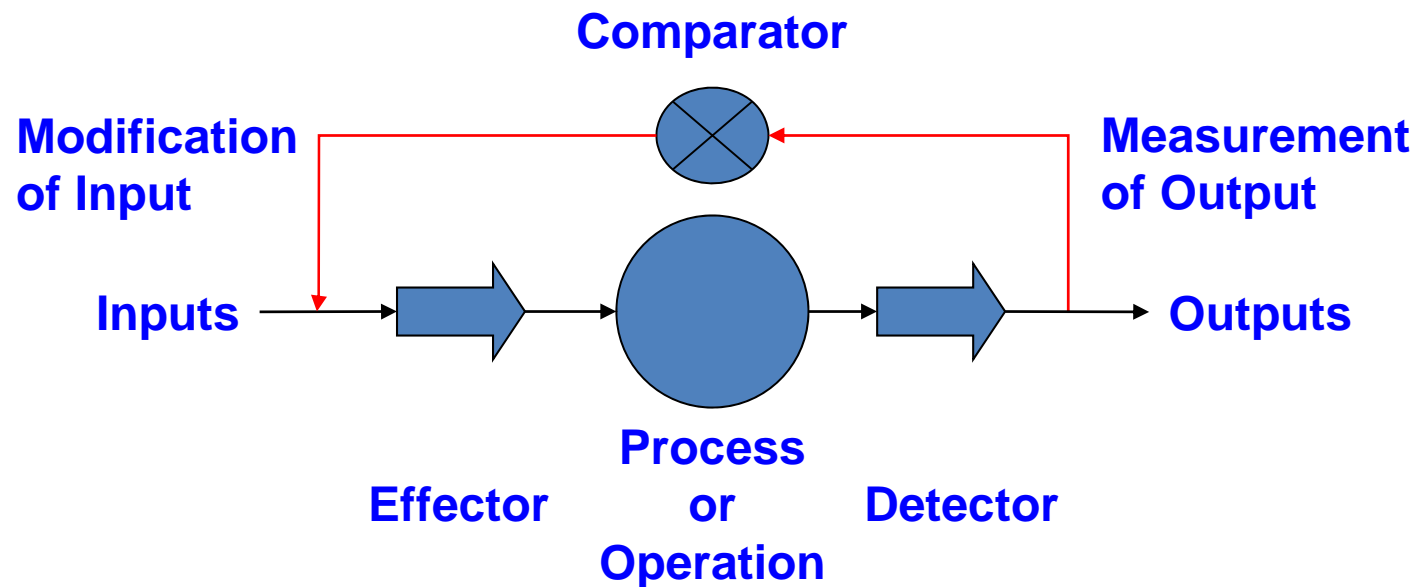
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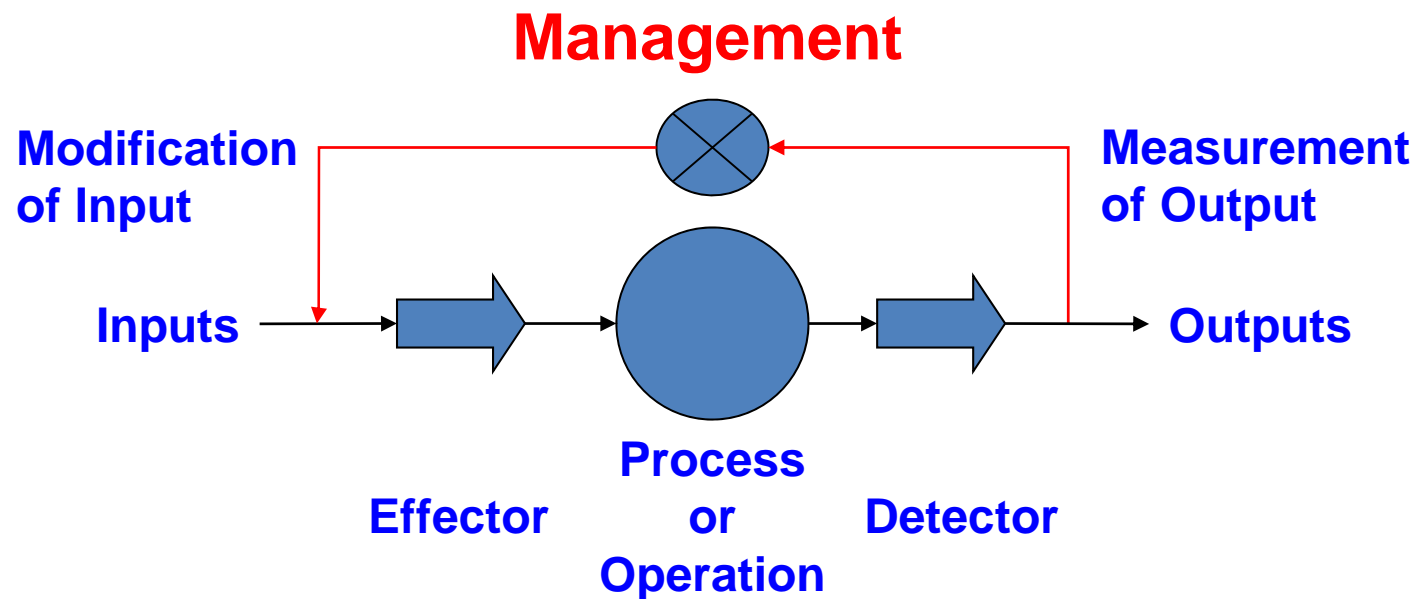
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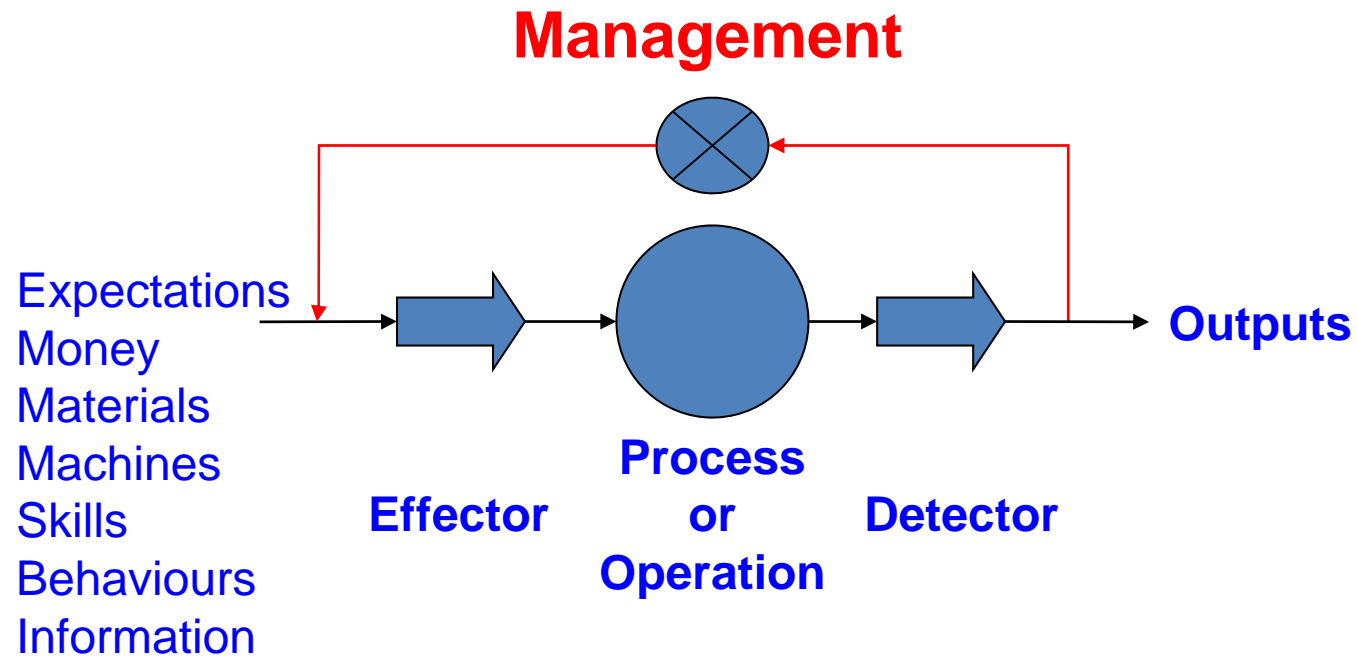
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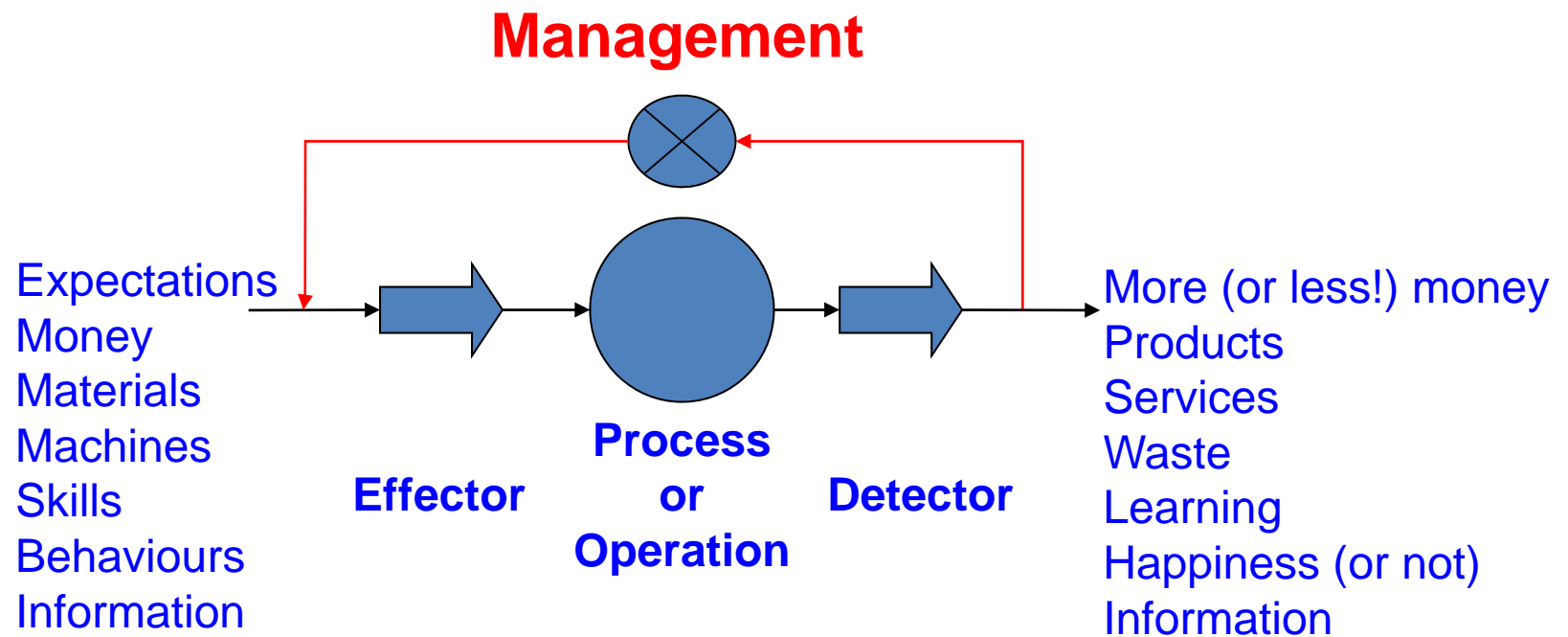
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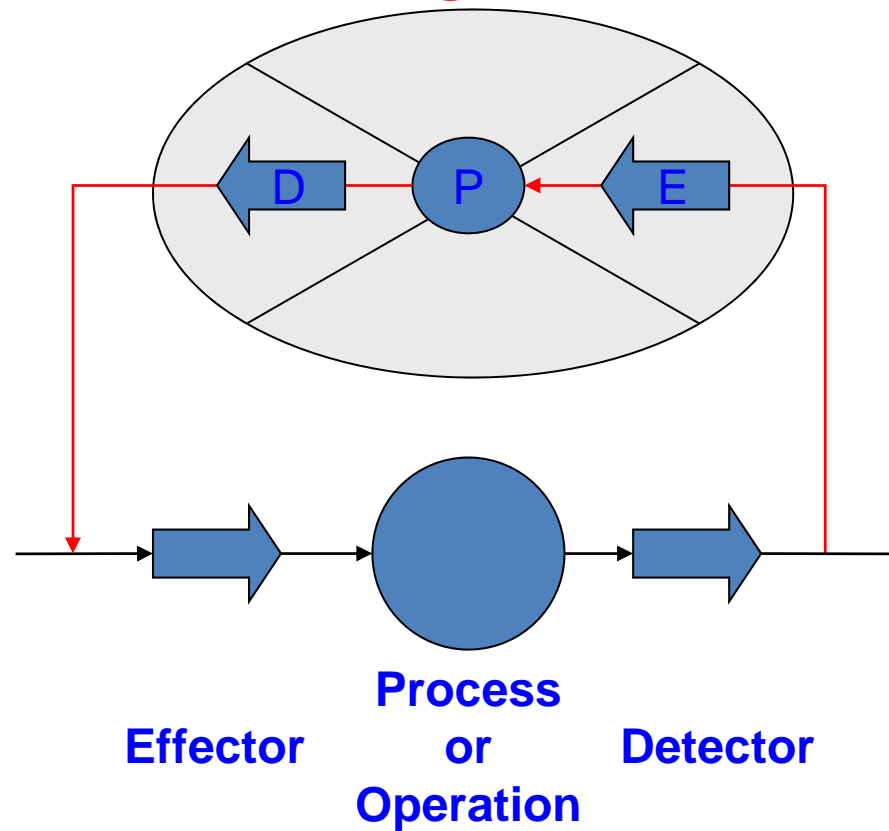


# The Basic Cybernetic Model



# The Basic Cybernetic Model

## Management

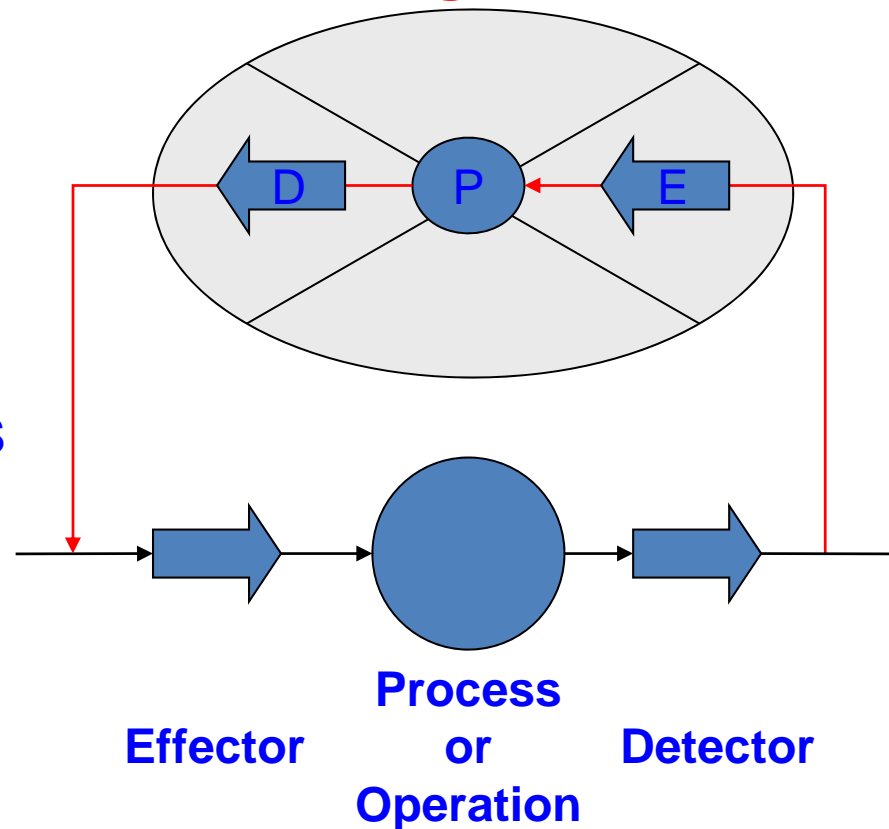




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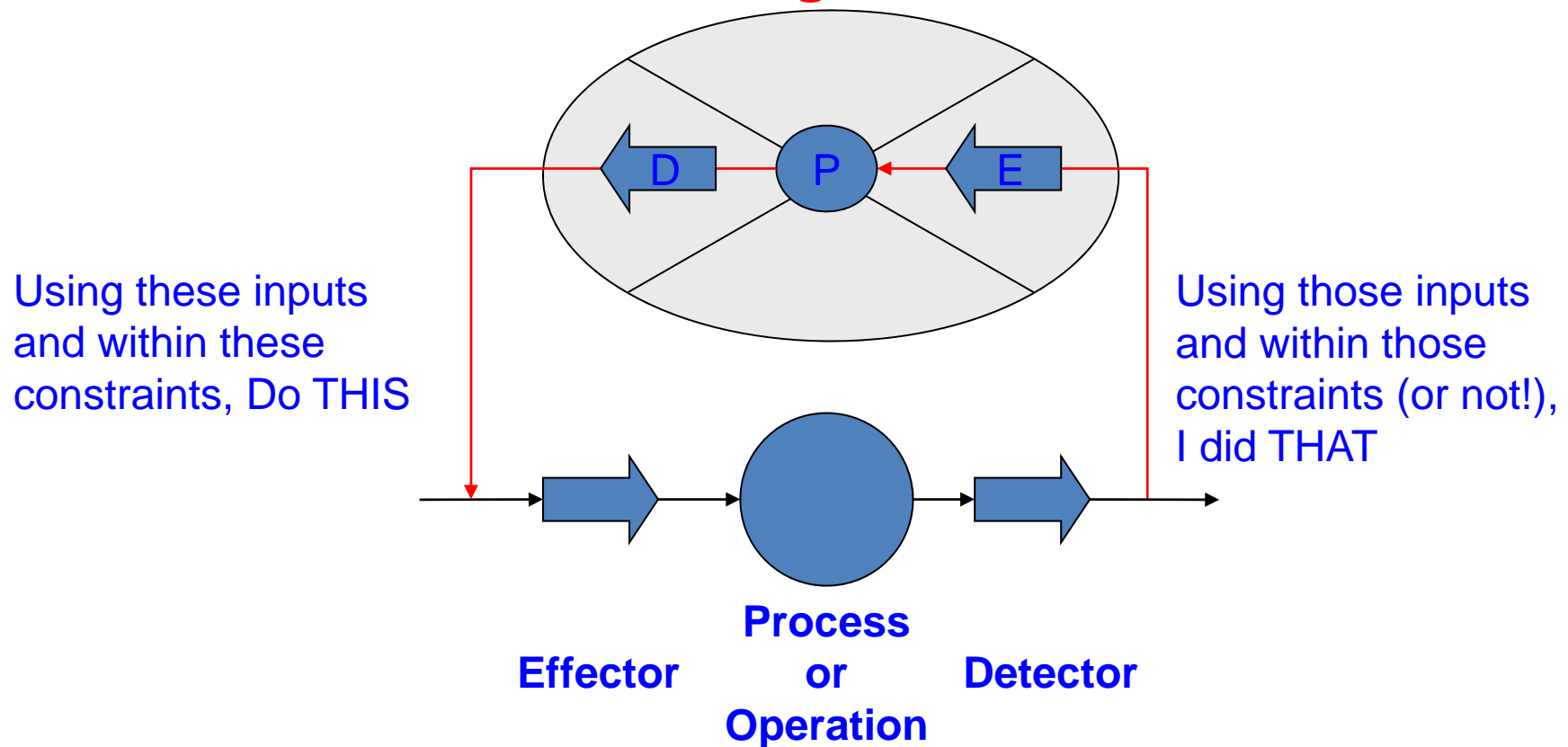
## Management

Using these inputs  
and within these  
constraints, Do THIS



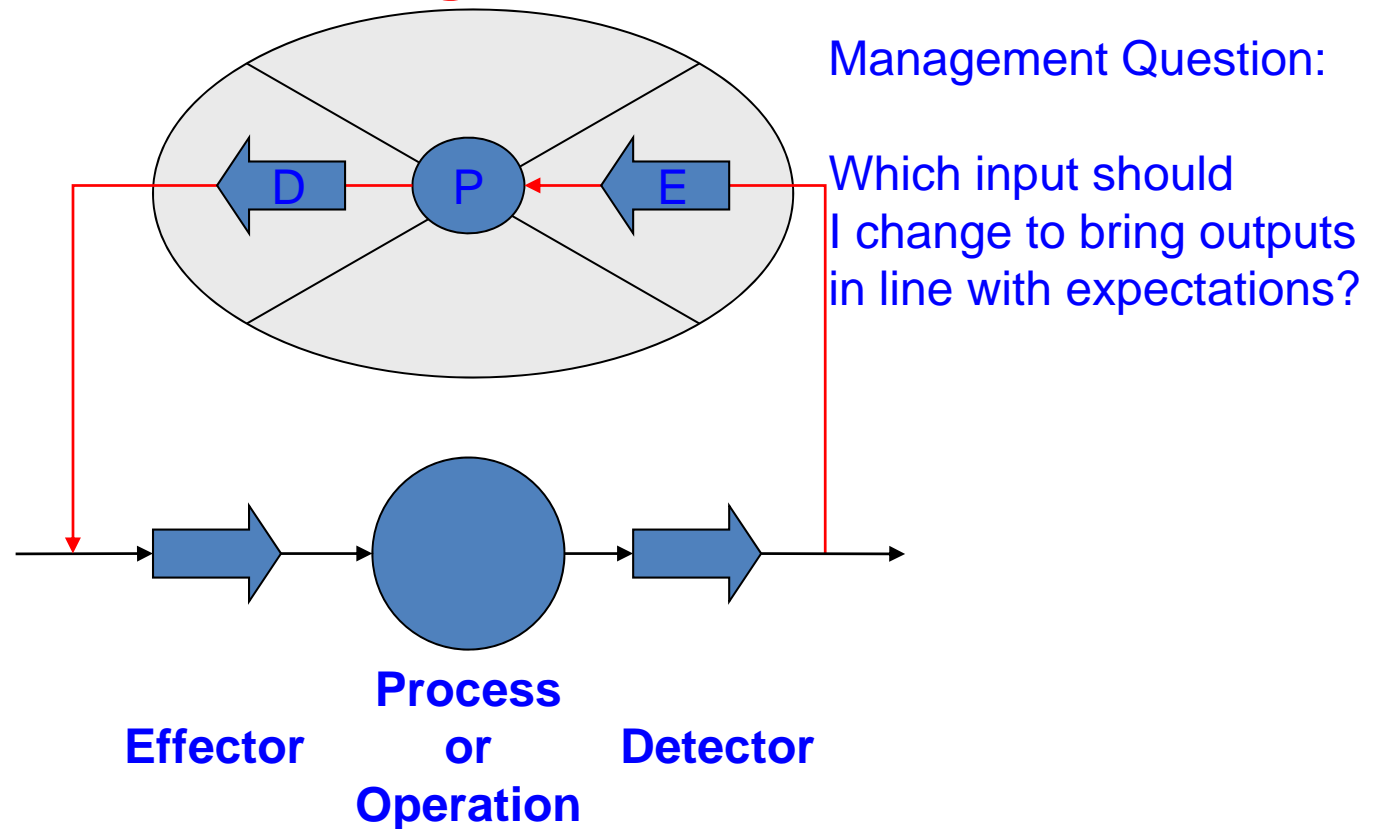
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## Management

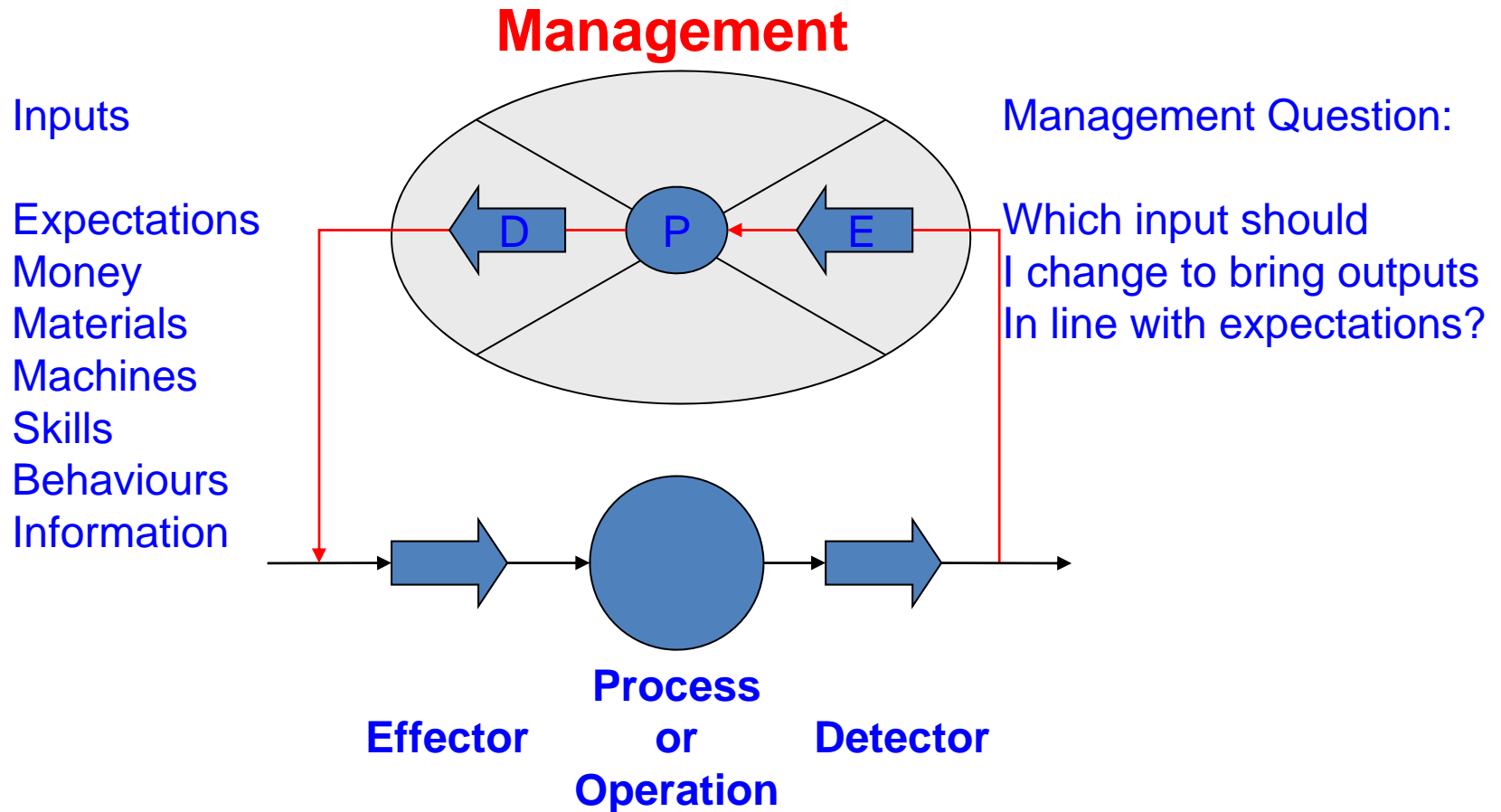


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## Management

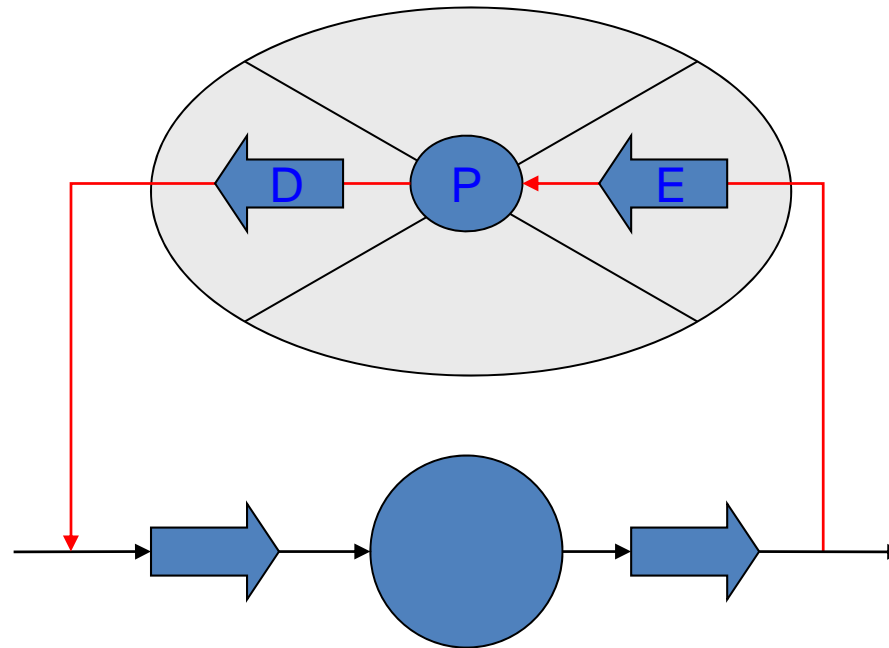


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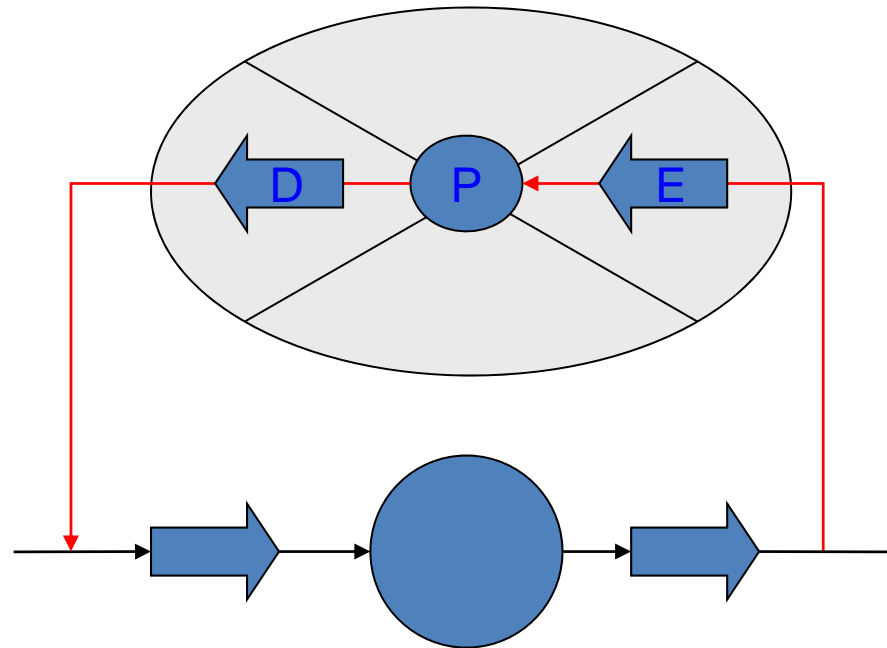
## Management



Are we doing things right?

# The Basic Cybernetic Model

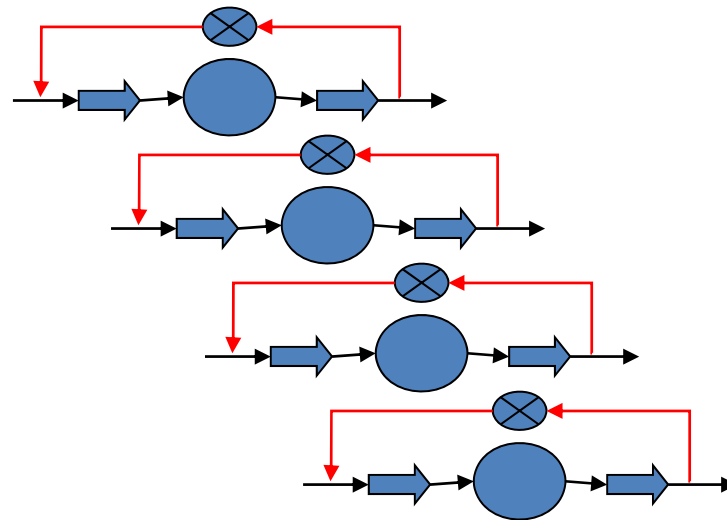
## Management



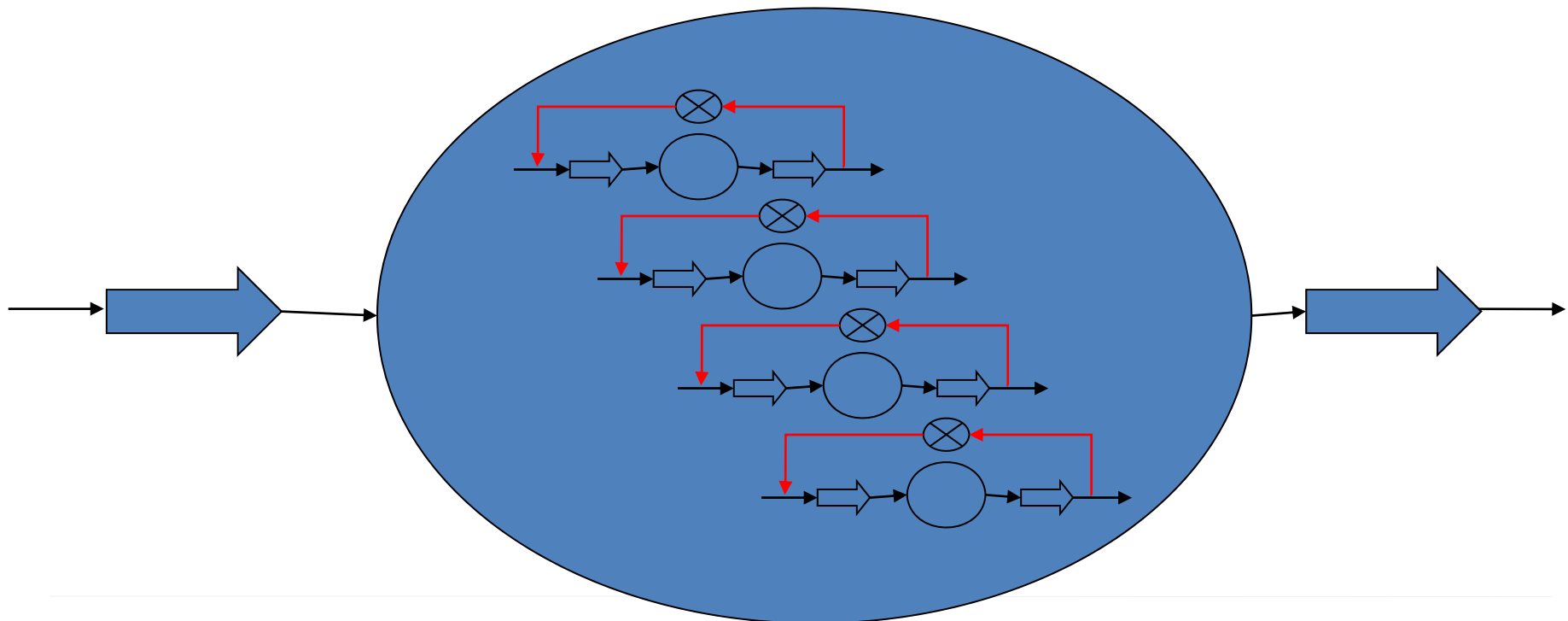
Are we doing things right?

Efficiency, Productivity, Behaviour, Quality, Profitability

# Multi-Process Cybernetic Model



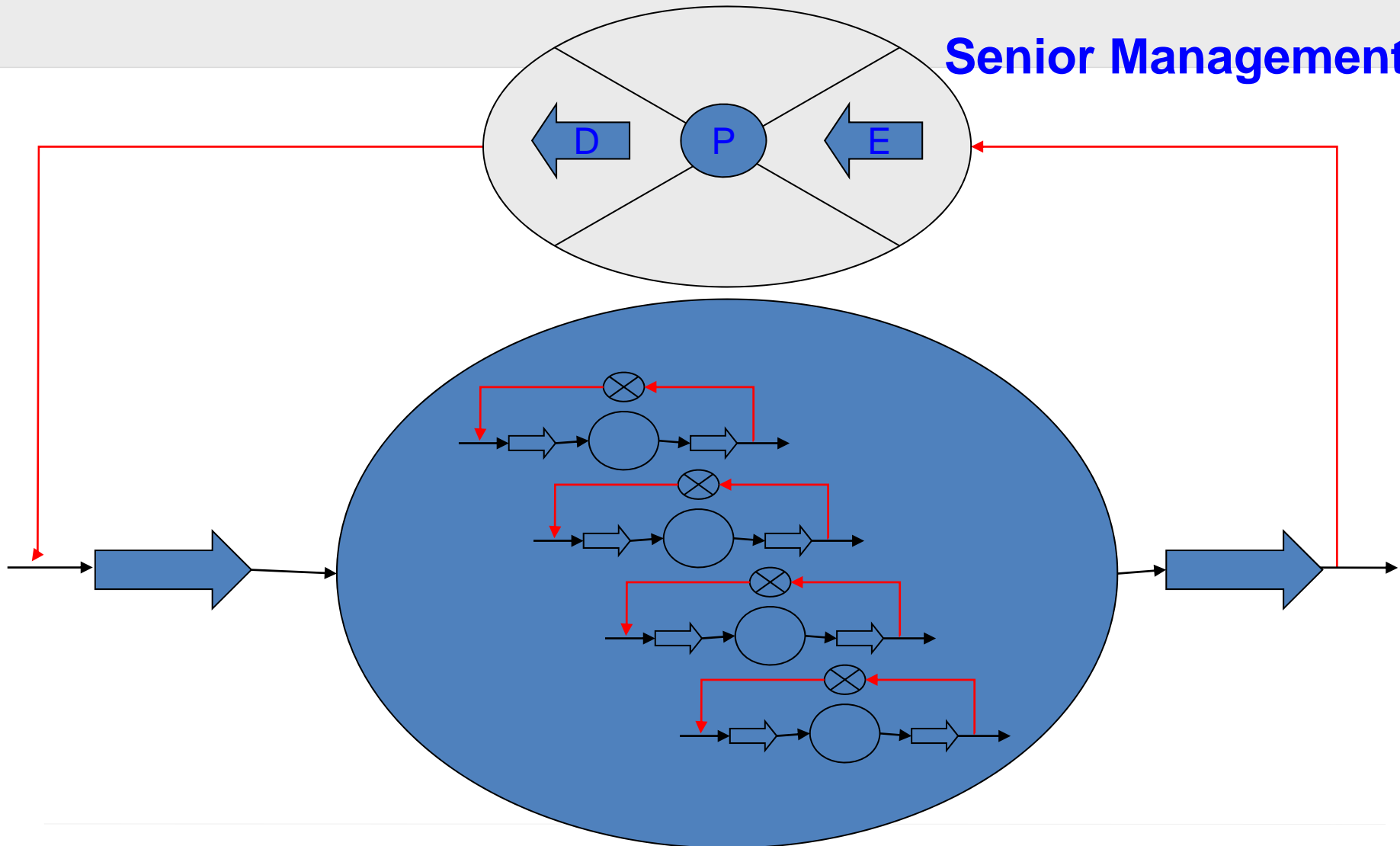
# Multi-Process Cybernetic Model





# Multi-Process Cybernetic Model

Senior Management



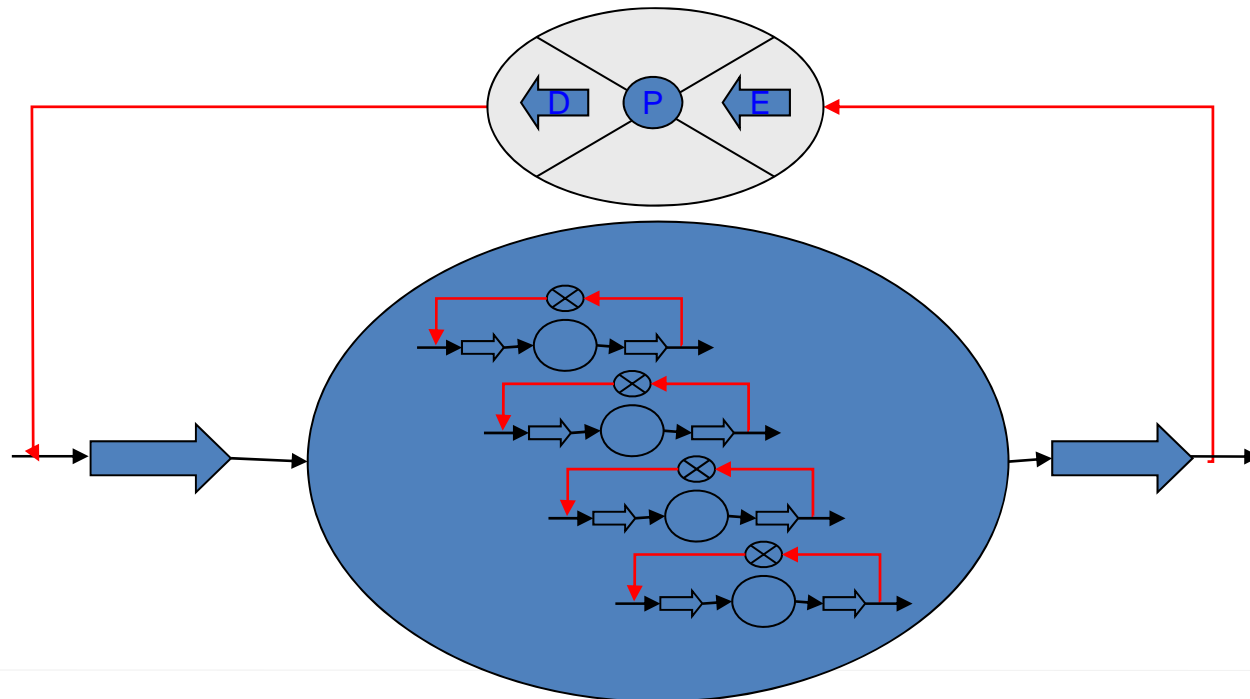
## Multi-Process Cybernetic Model

- Autonomic
- Autopoietic
- Dynamically Stable
- Performance Focused
- Self-Improvement Focused
- Multi-faceted
- Wholly Inadequate!

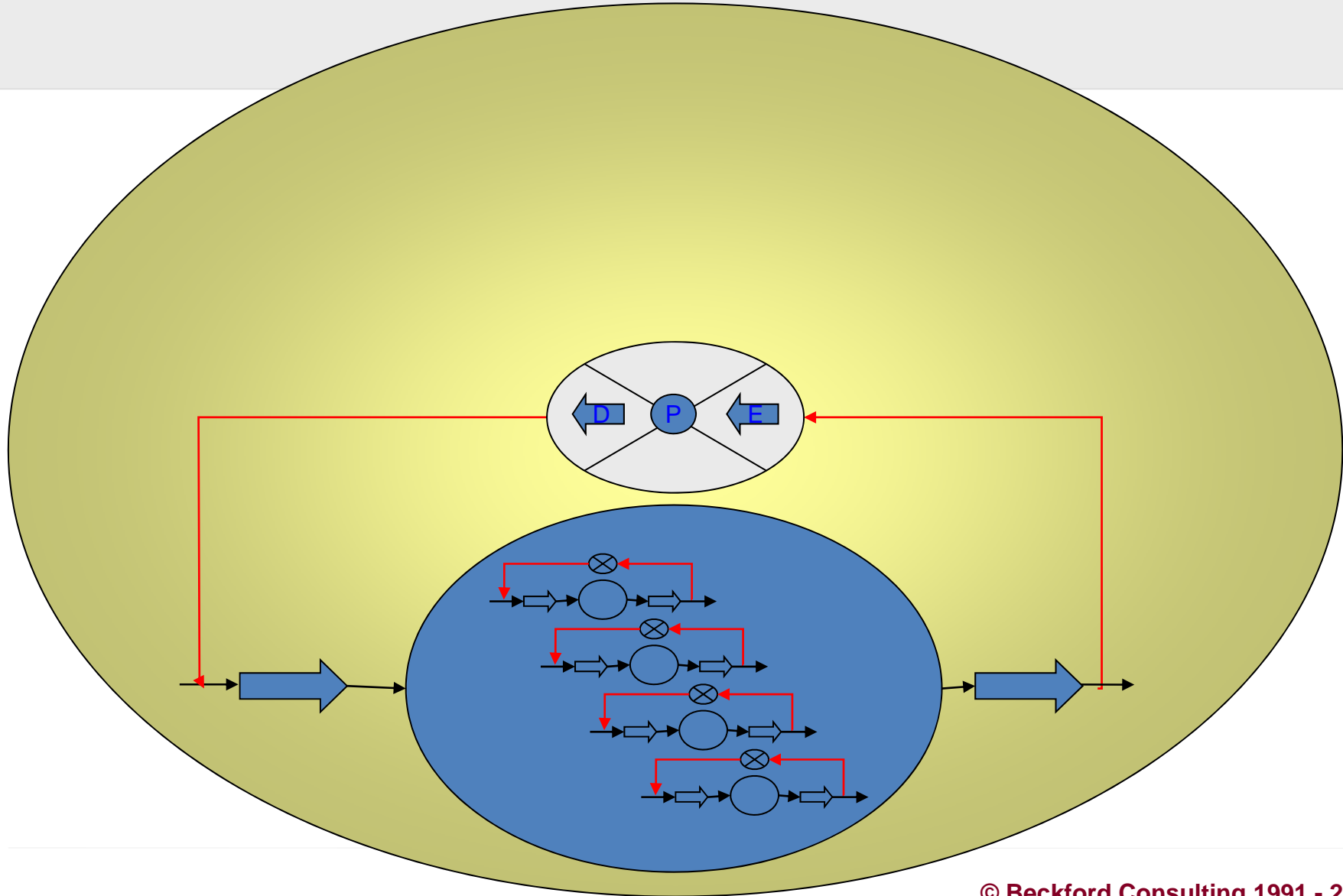
# Multi-Process Cybernetic Model

- Wholly Inadequate! Why?
- Because:
  - Rightness is internally defined
  - Rightness is about NOW
  - Rightness cannot be challenged within that model!
- BUT – most organisations work that way!
- What is needed?
  - A mechanism that enables the ongoing redefinition of rightness!

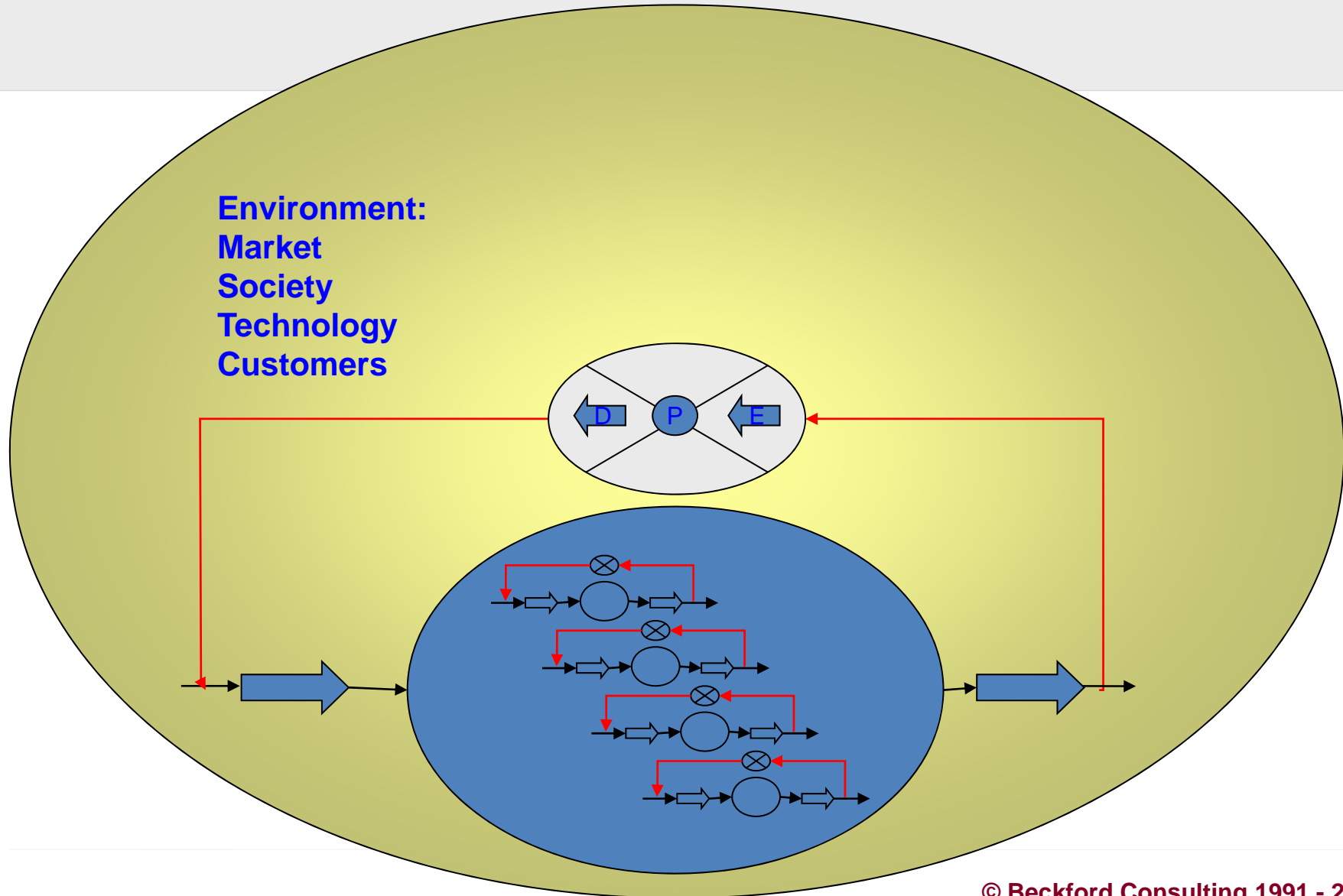
# Complete Cybernetic Model



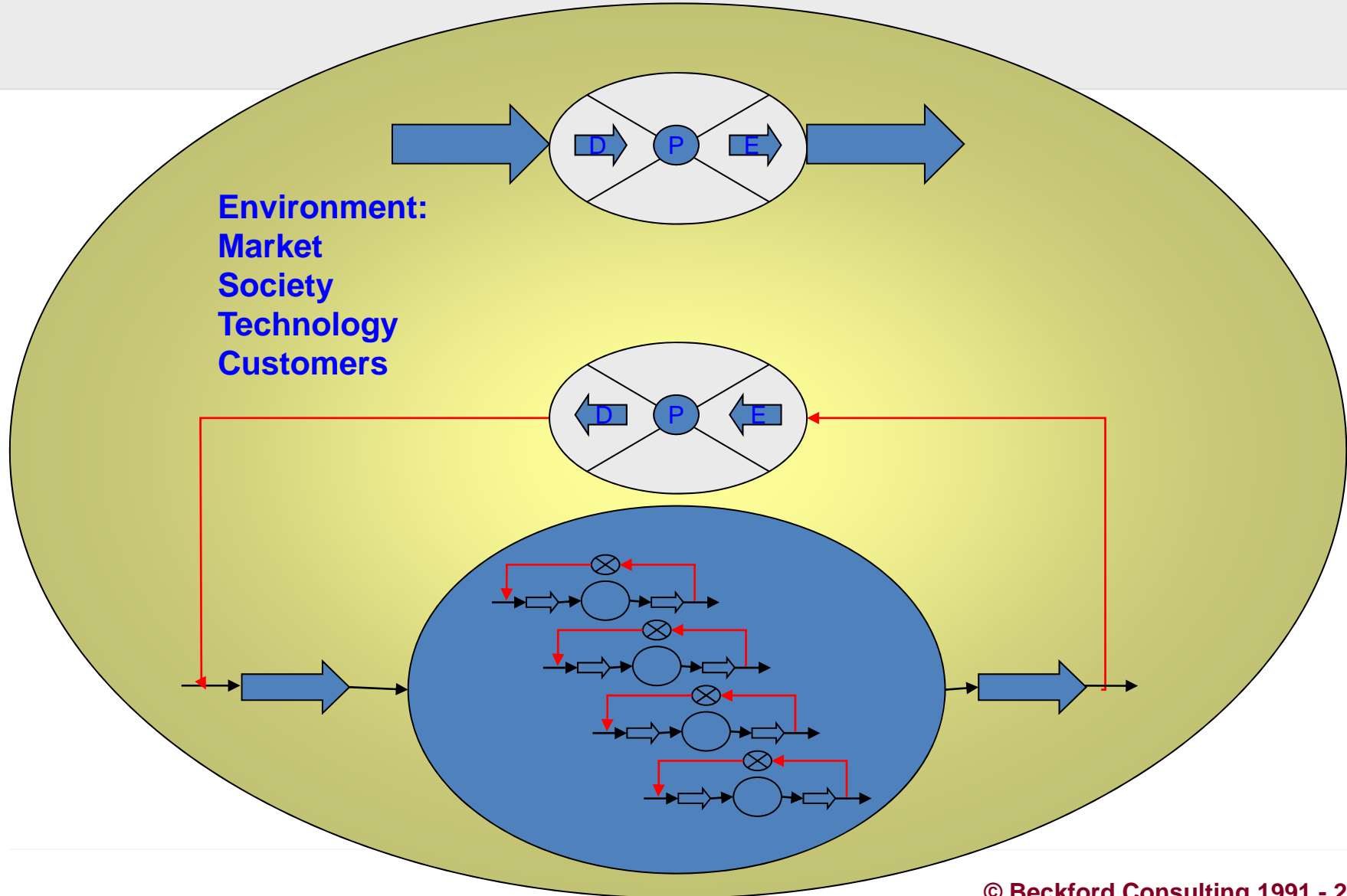
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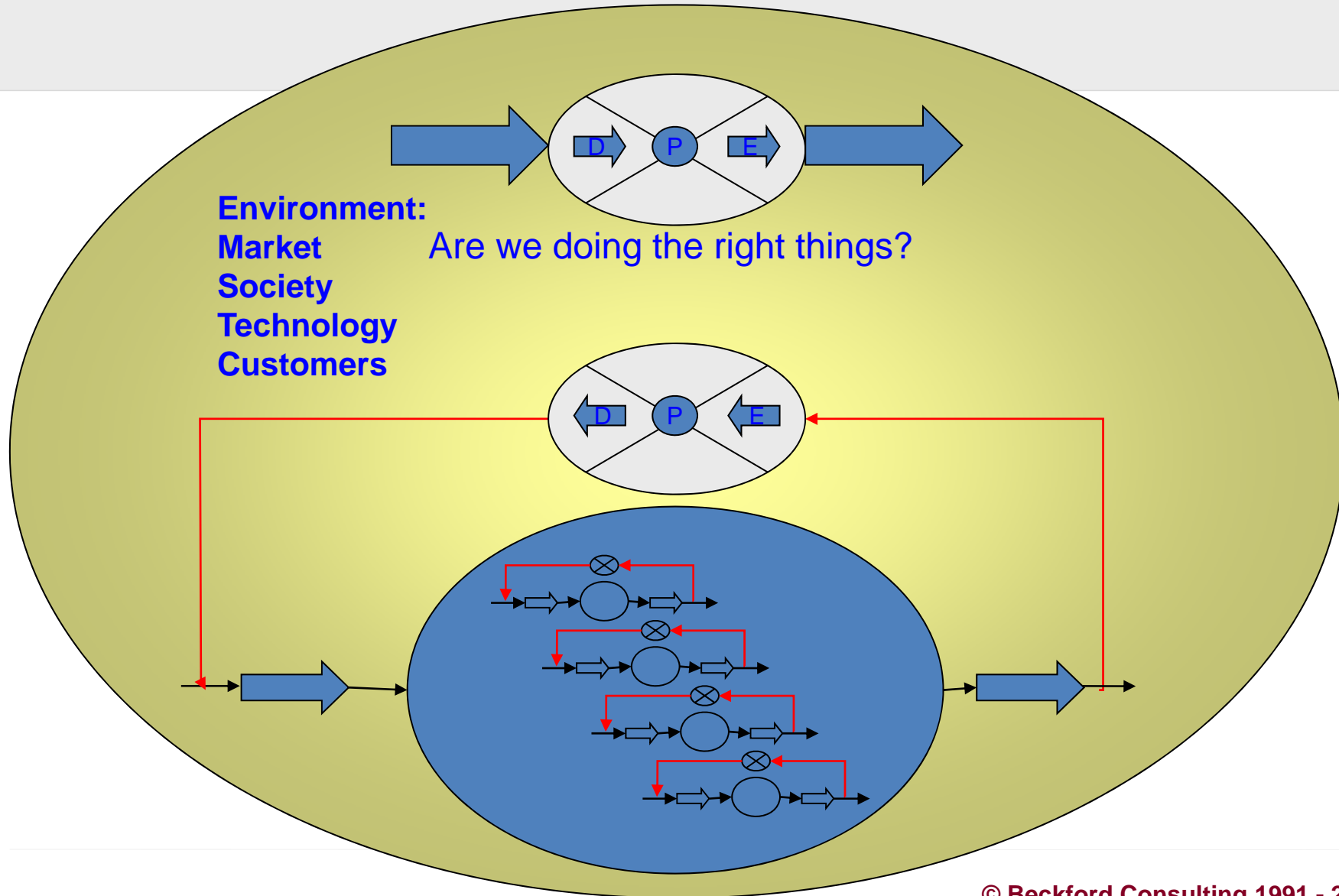
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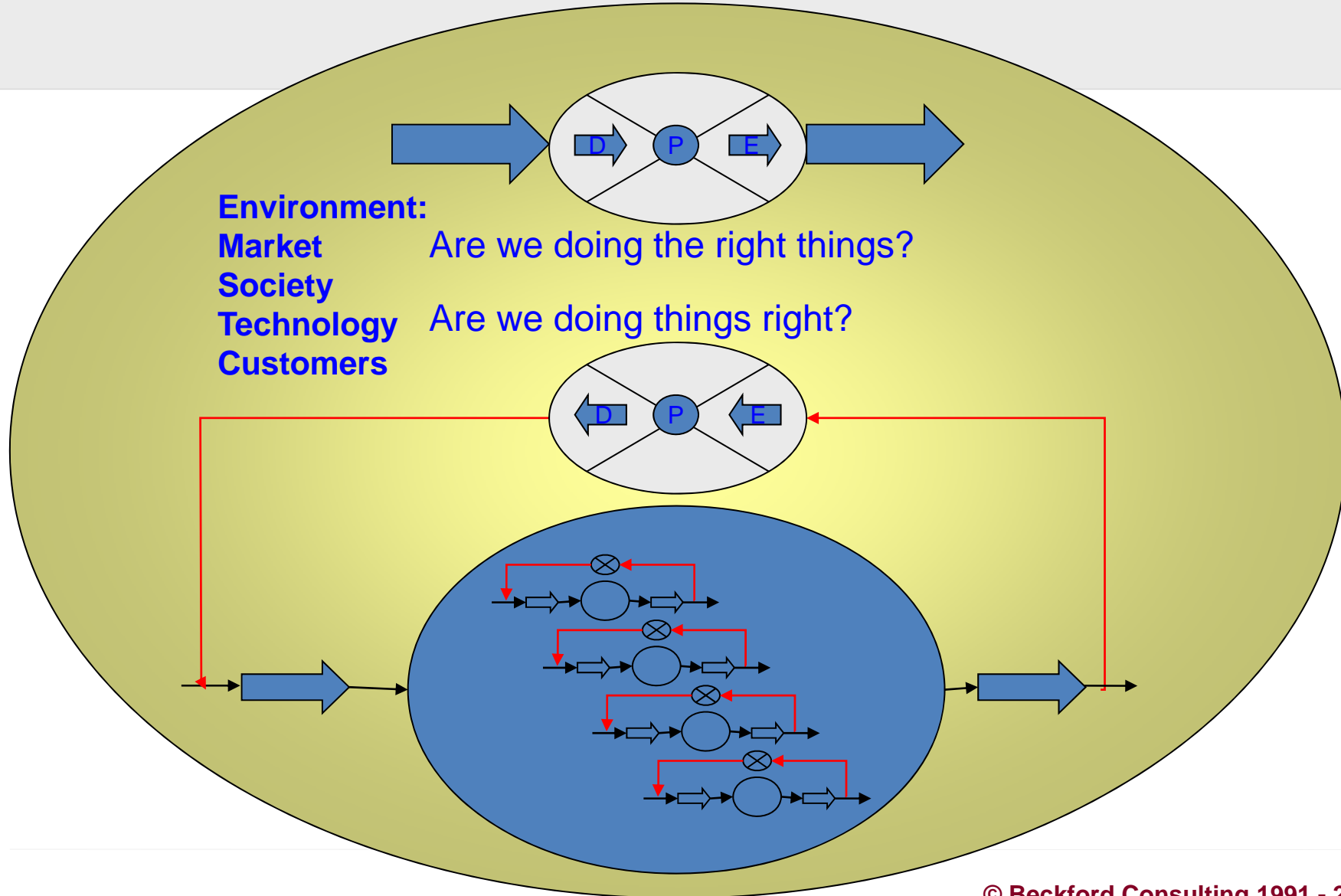


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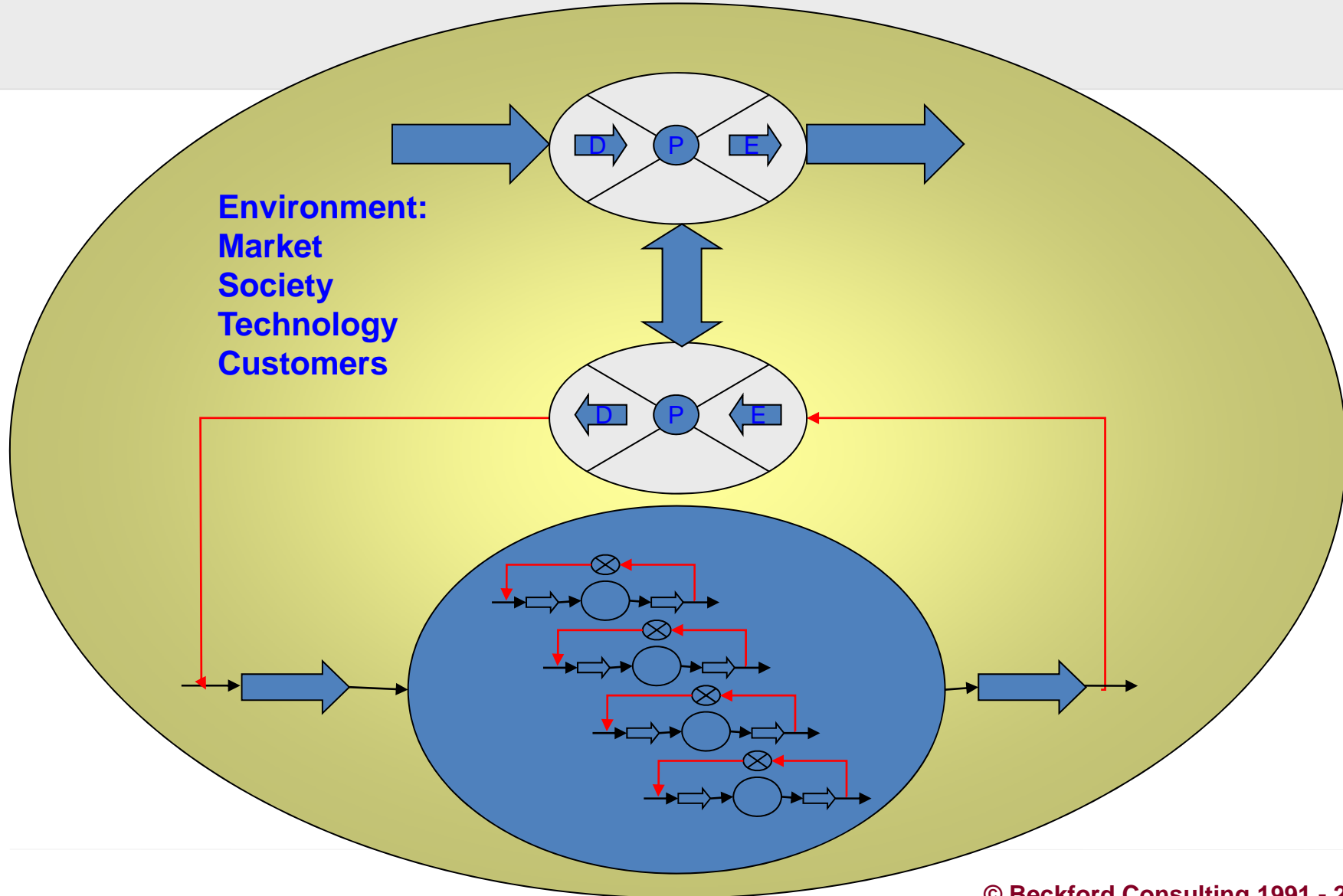




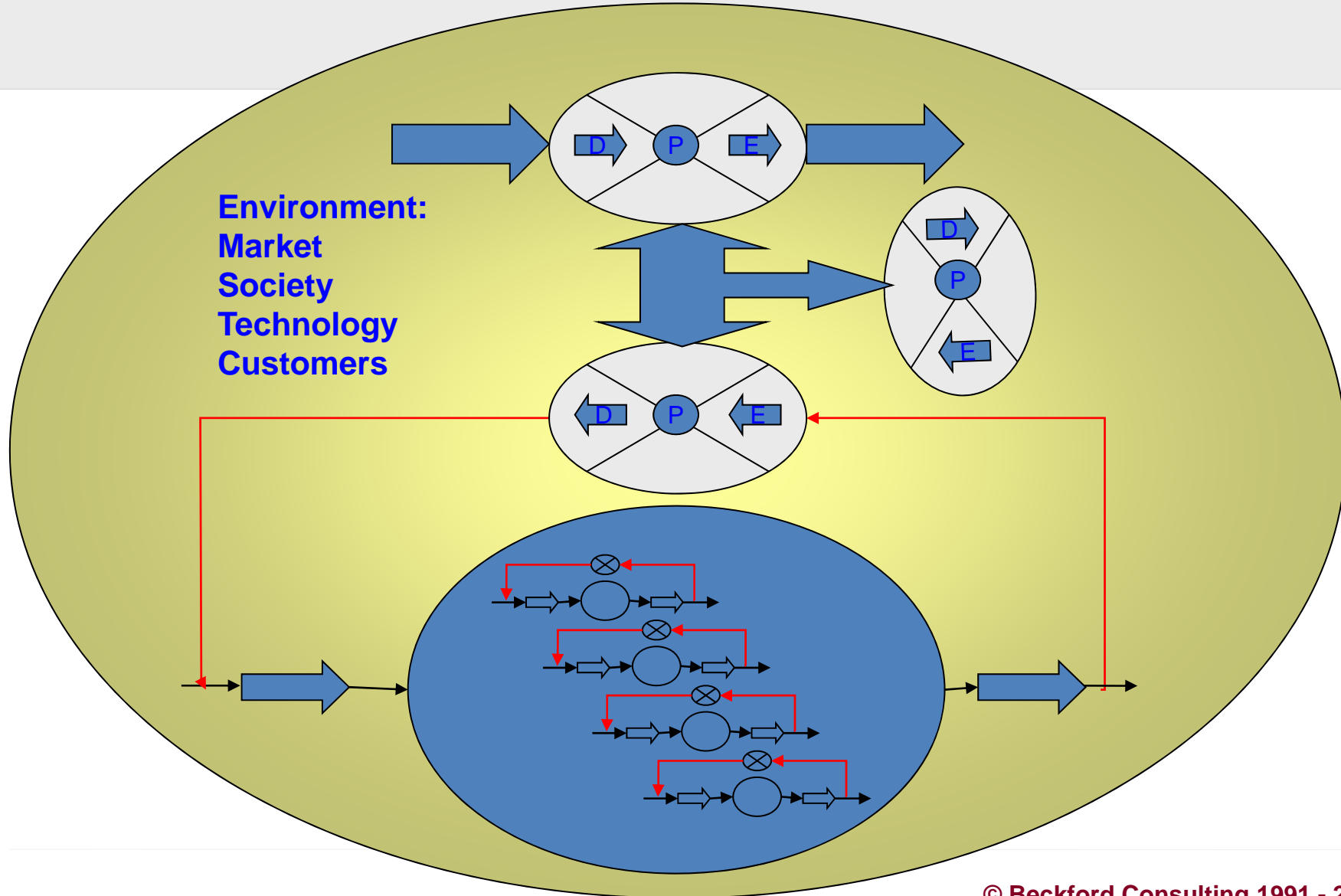
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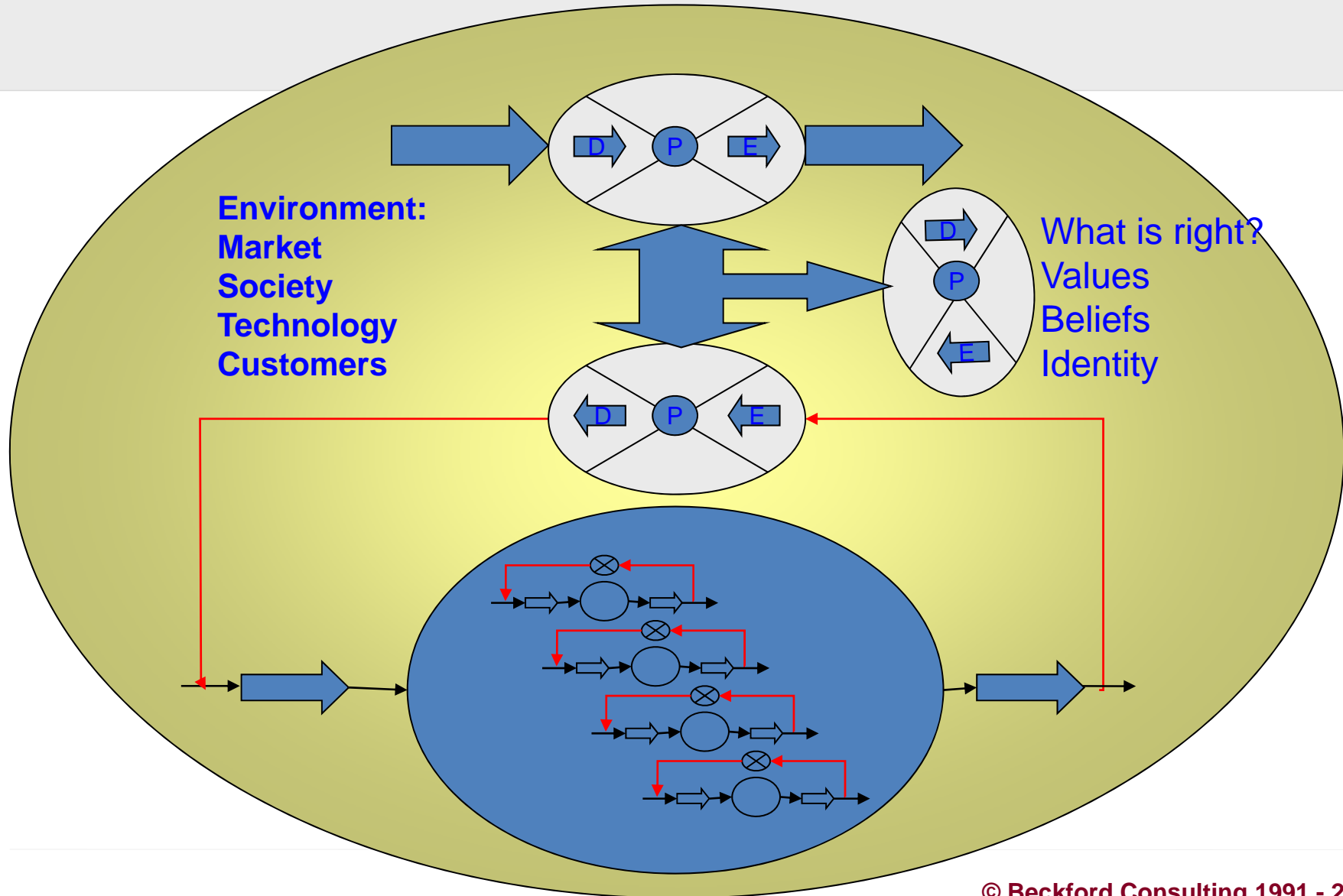
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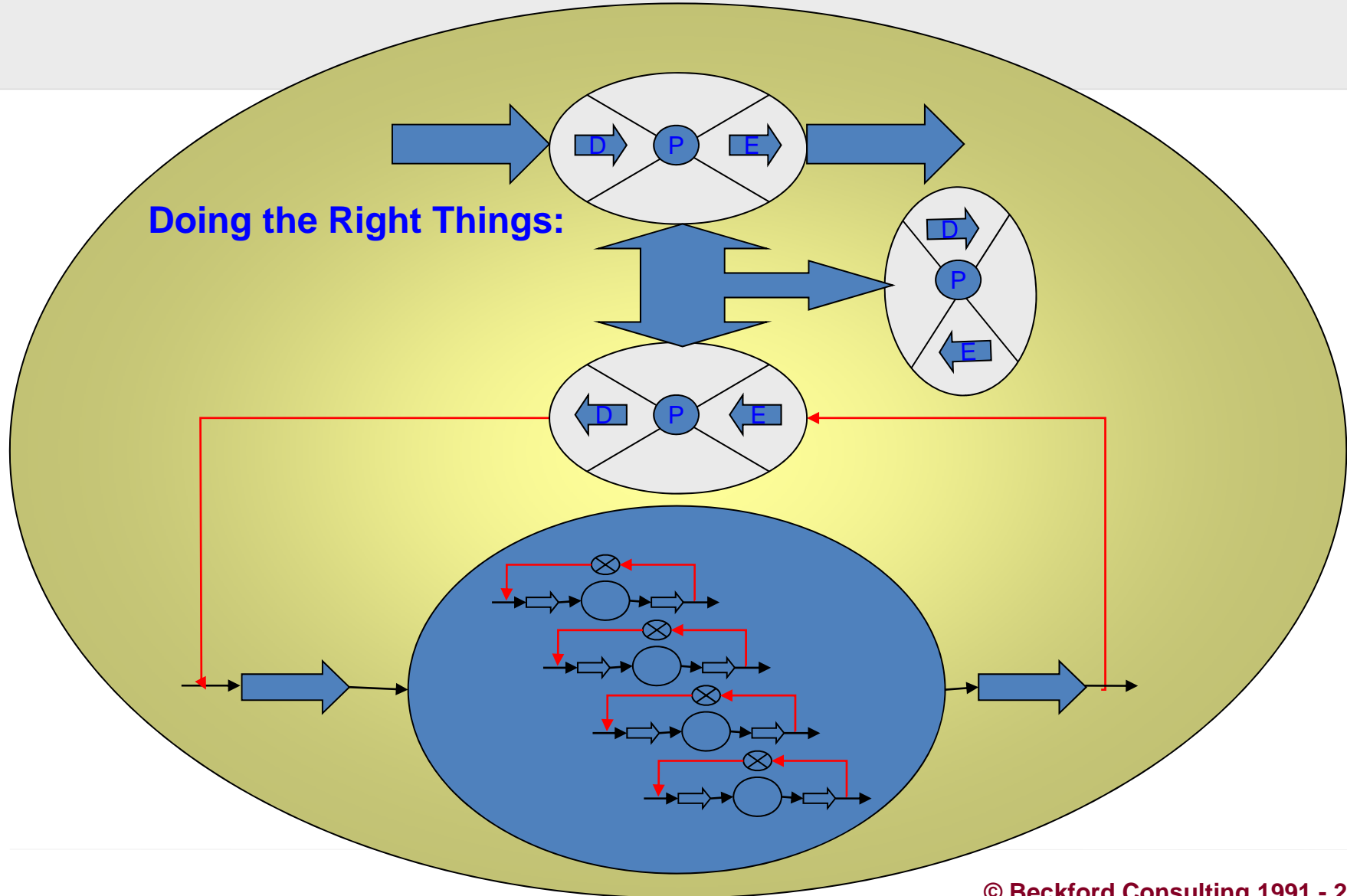
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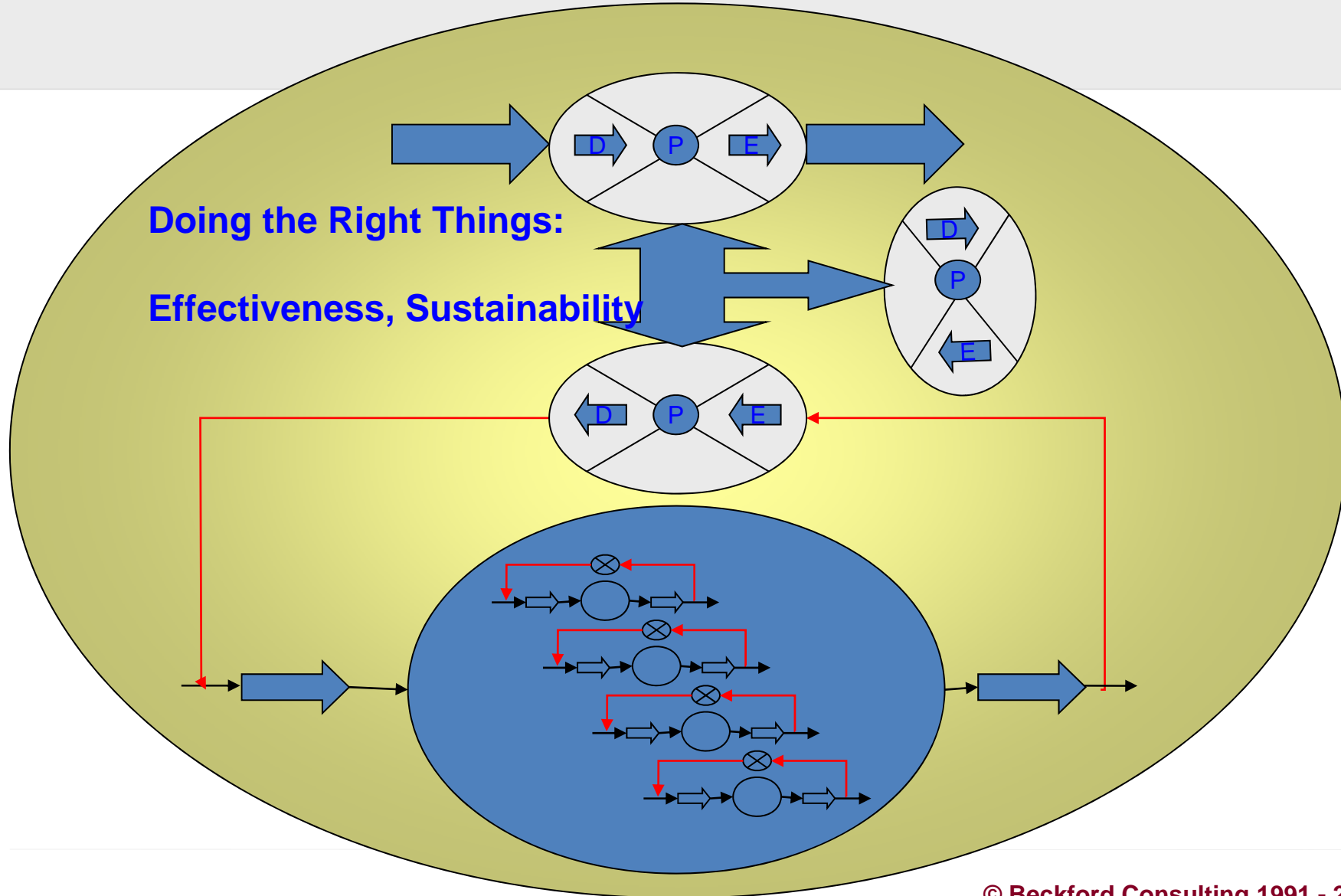
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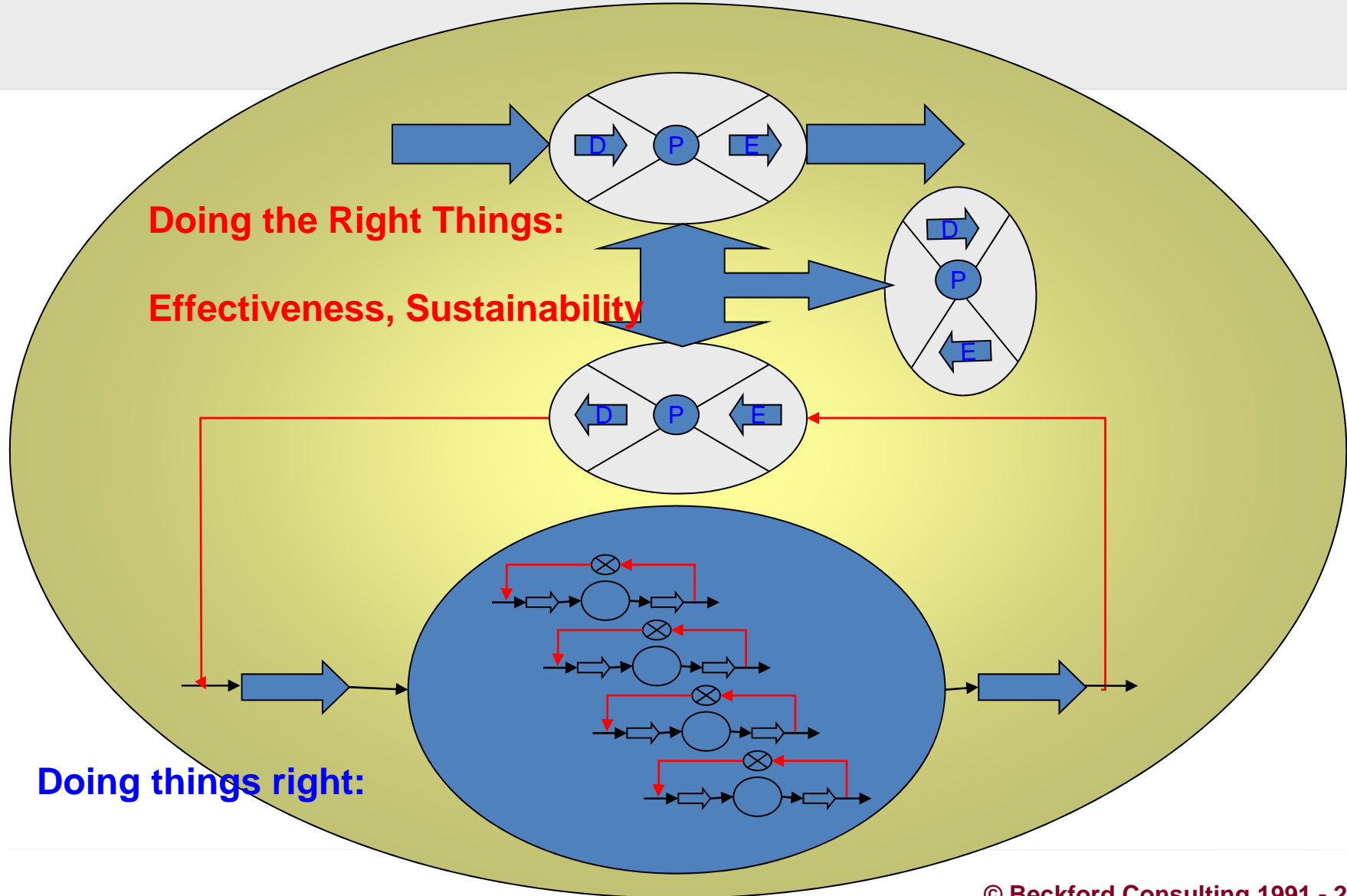
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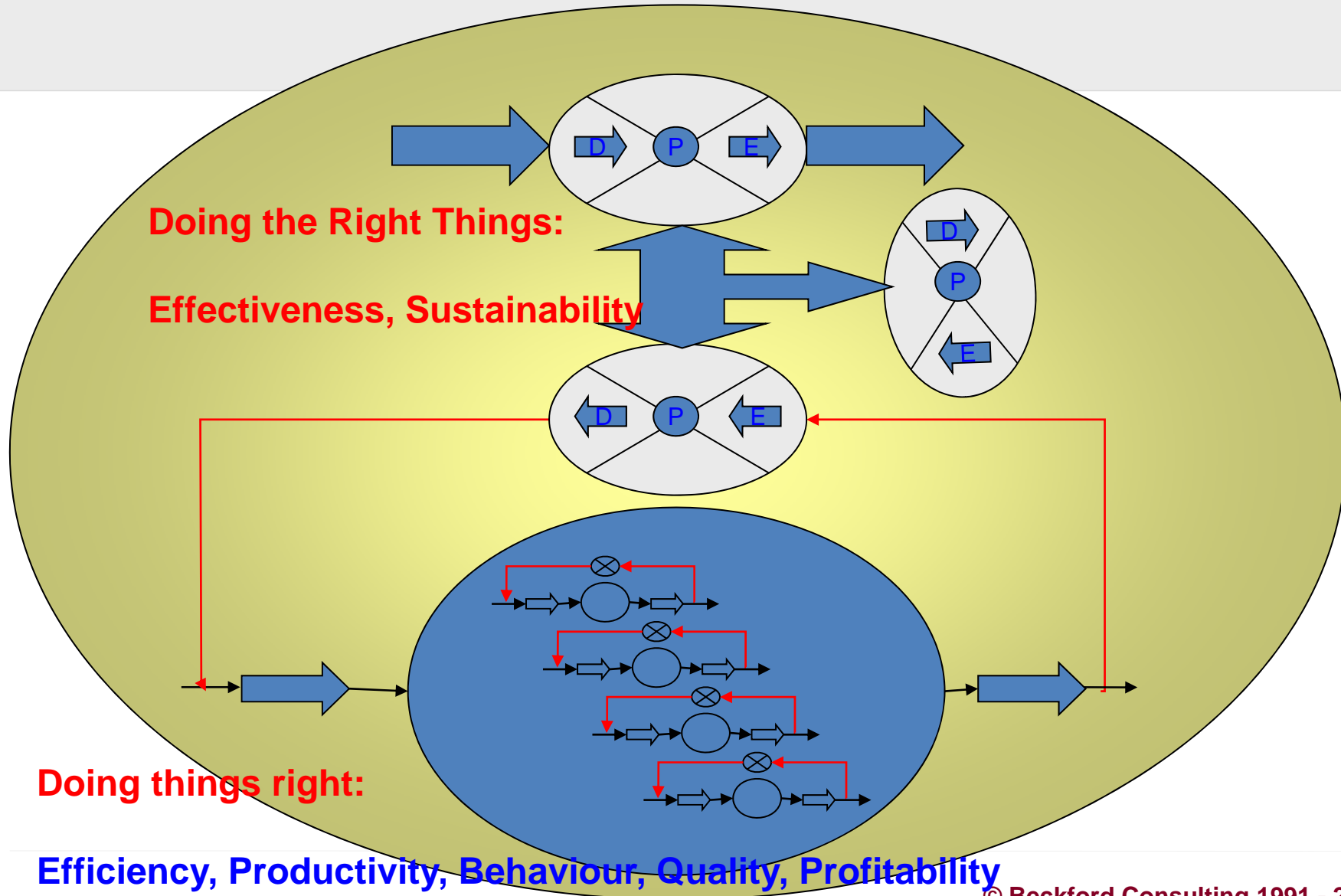
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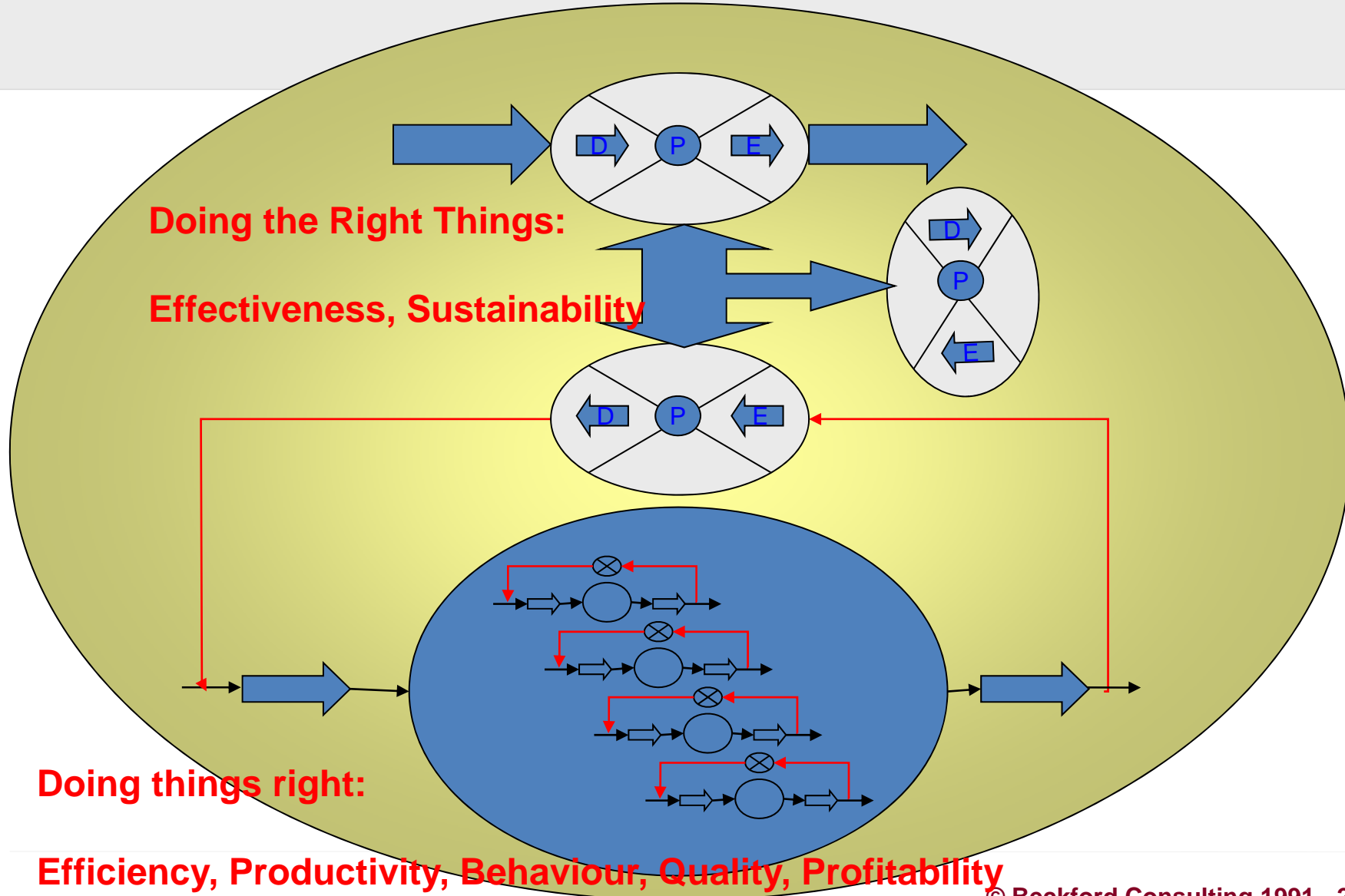


# Complete Cybernetic Model





# Complete Cybernetic Model



## Complete Cybernetic Model

- Autopoietic
- Ultra-Stable
- Customer/Market Focused
- Adaptive
- Learning
- Empowered
- Viable (Sustainable)

## Why do we need it?

- It makes explicit the true role of the manager
- We can use it to model:
  - any process
  - any discipline
  - any 'dimension' of the organisation
- It provides the basis for the design of Information Systems
- It provides a methodology for thinking about organisations which:
  - enables diagnosis
  - enables prognosis
  - enables effective treatment
  - provides the basis for meaningful measurement of performance

## Key Realisation

Problems and issues of contemporary organisations cannot be resolved within the limitations of any one discipline:

They can only be understood and expressed from a supra-disciplinary position which embraces all relevant aspects of the matters under consideration

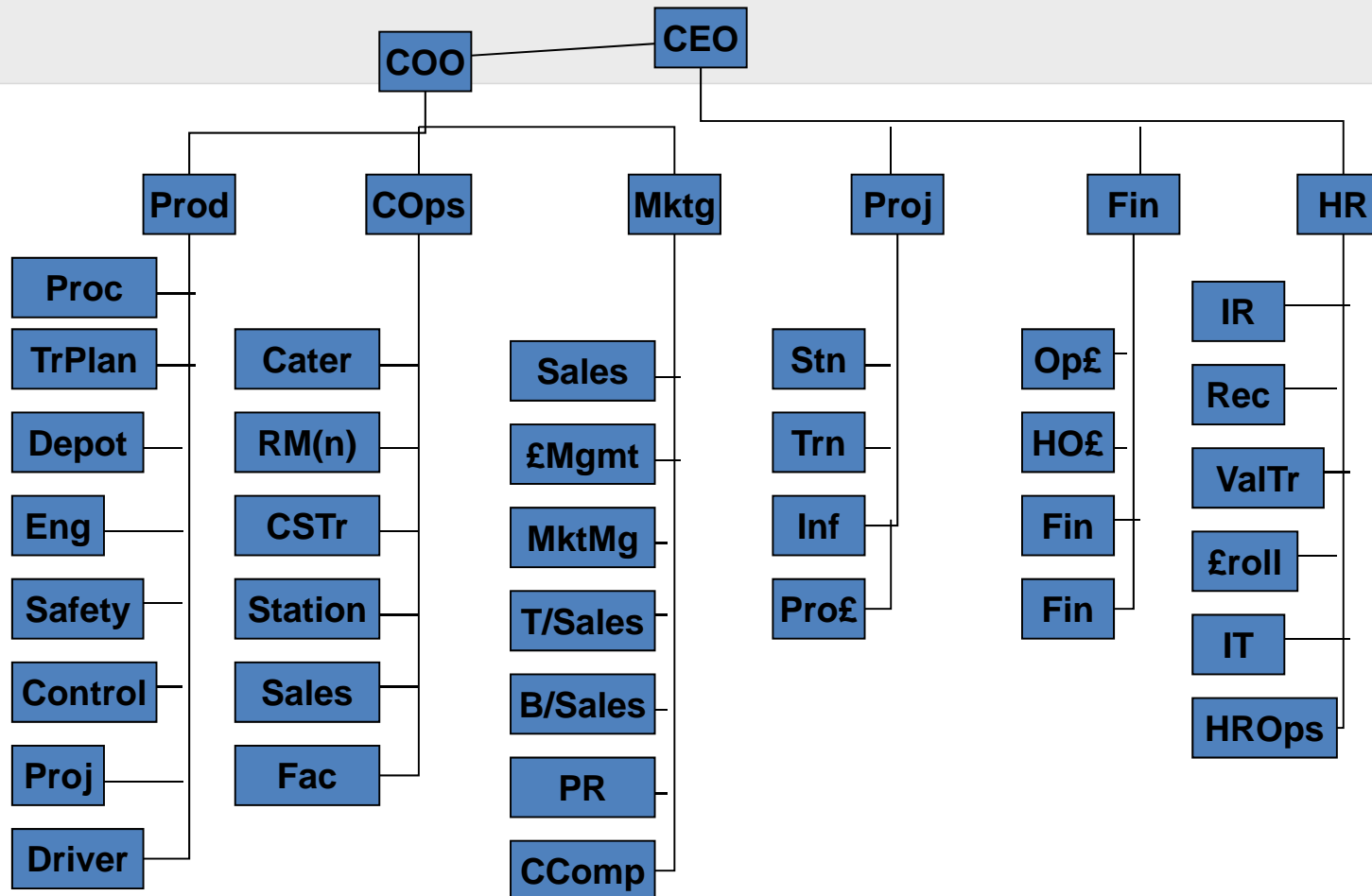
Managerial Cybernetics provides a robust 'tool kit' which attempts to provide this!

## So, why do we need it?

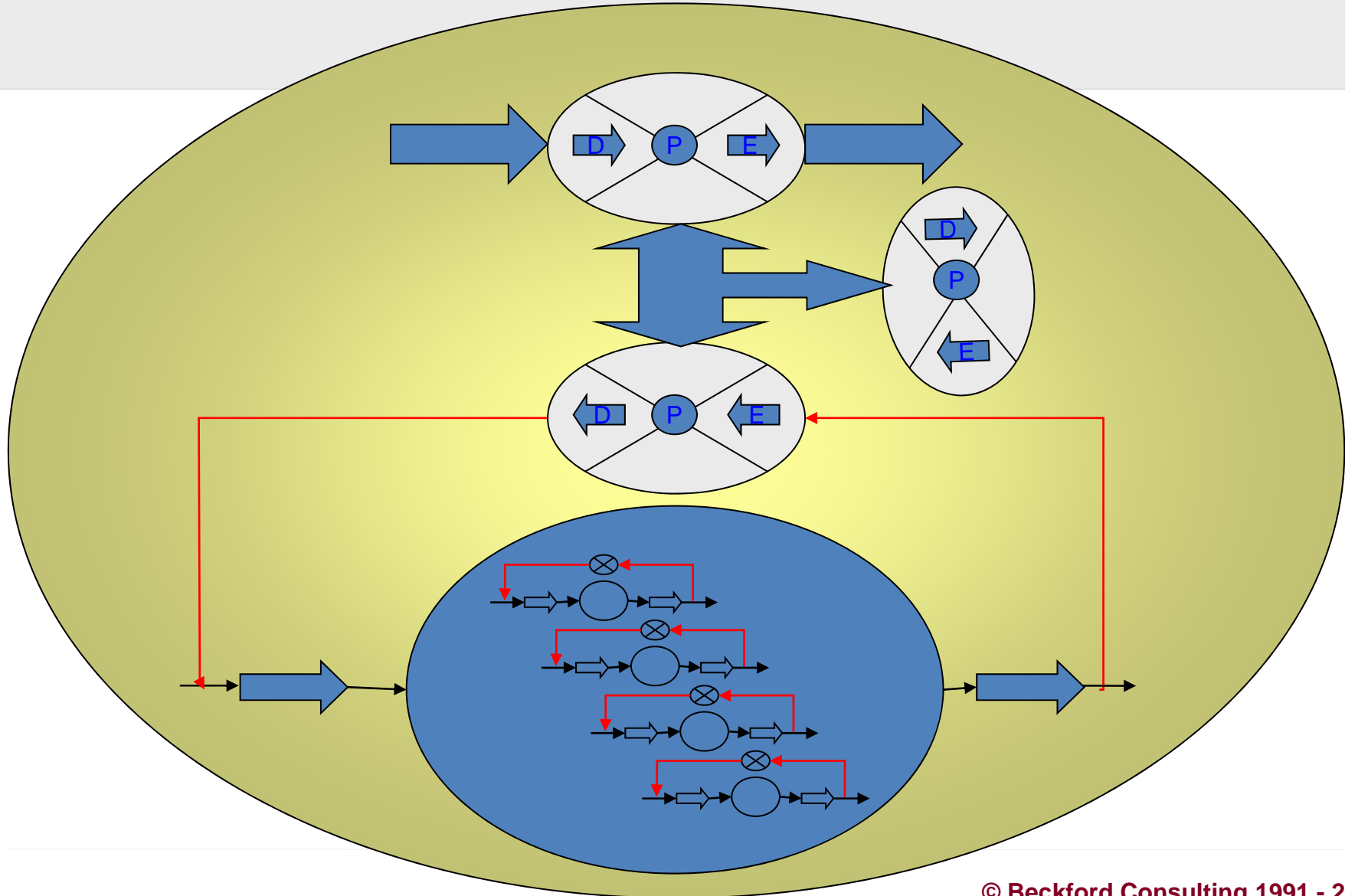
- British Steel
- British Shipbuilders
- Enron
- Parmalat
- Marconi
- Equitable Life
- Railtrack
- The NHS
- JMU?

## So, why do we need it?

- ALL organisations are, to some extent, dysfunctional, most commonly because:
  - They fail to adequately investigate the environment
  - Dealing with today dominates thinking about tomorrow
  - The ‘identity’ of the organisation is not explicit
- The cybernetics of any situation will assert themselves so that ALL organisations necessarily answer to the ‘laws’ of cybernetics
- If we design the cybernetics we can make them work in our favour!

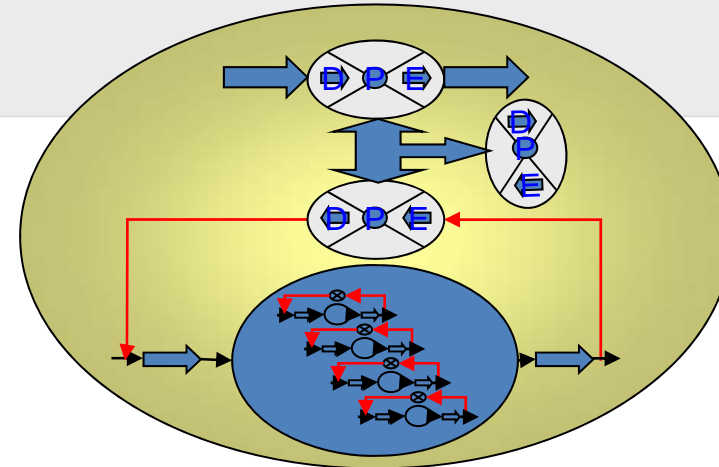
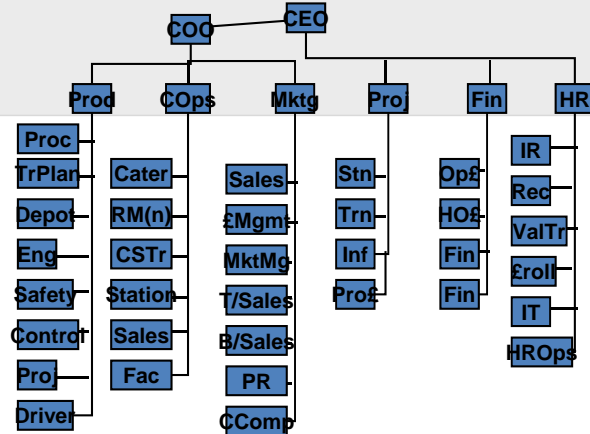


# Complete Cybernetic Model





# Spot the Difference?



How much more does the right hand diagram tell us about the organisation?

The left hand diagram simply tells us who to blame for failure!

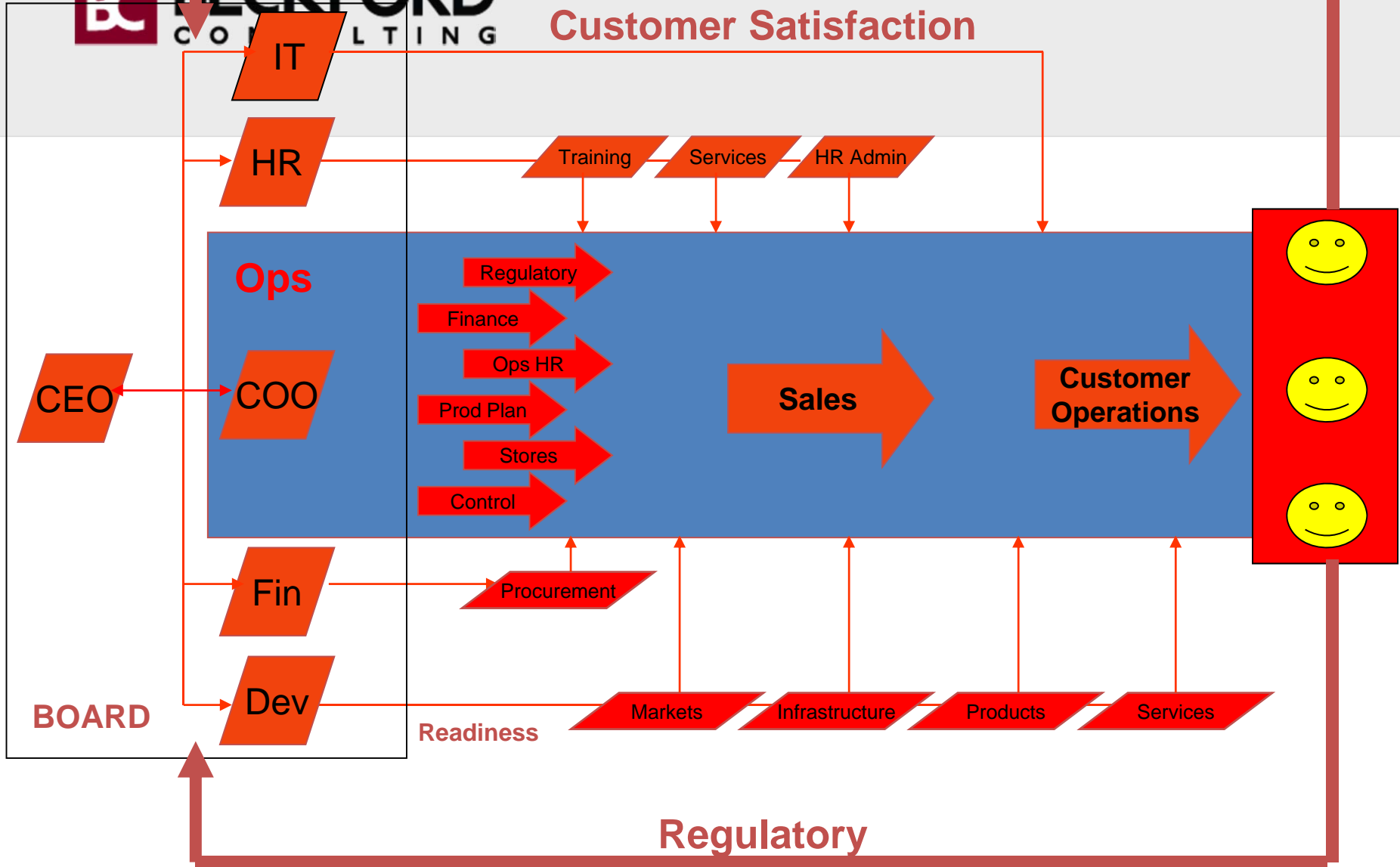
The right hand diagram (and the thinking that underpins it) tells us:

HOW the organisation works  
 WHY it works that way  
 HOW to fix it!

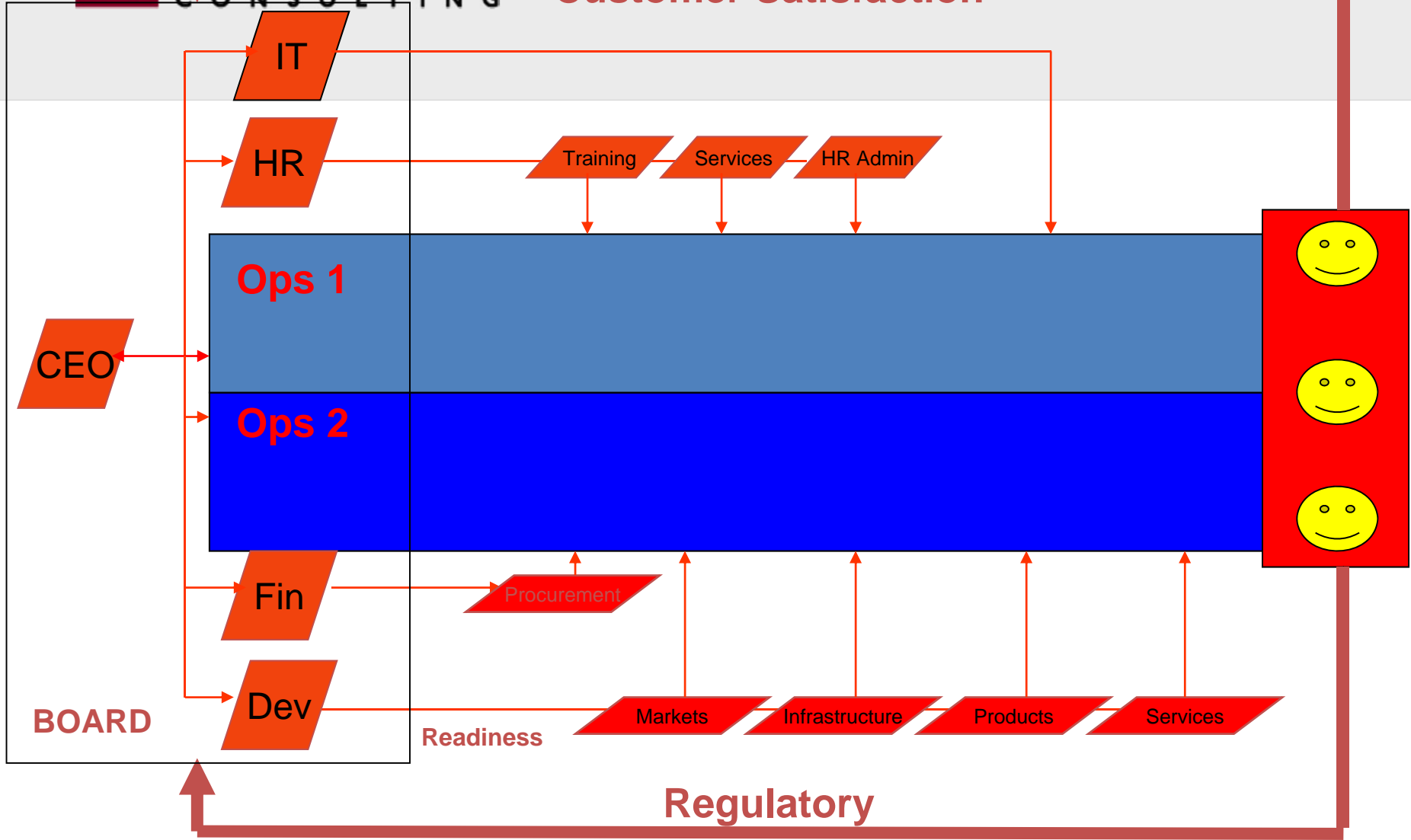


Employee Satisfaction  
Customer Satisfaction

A Real One !

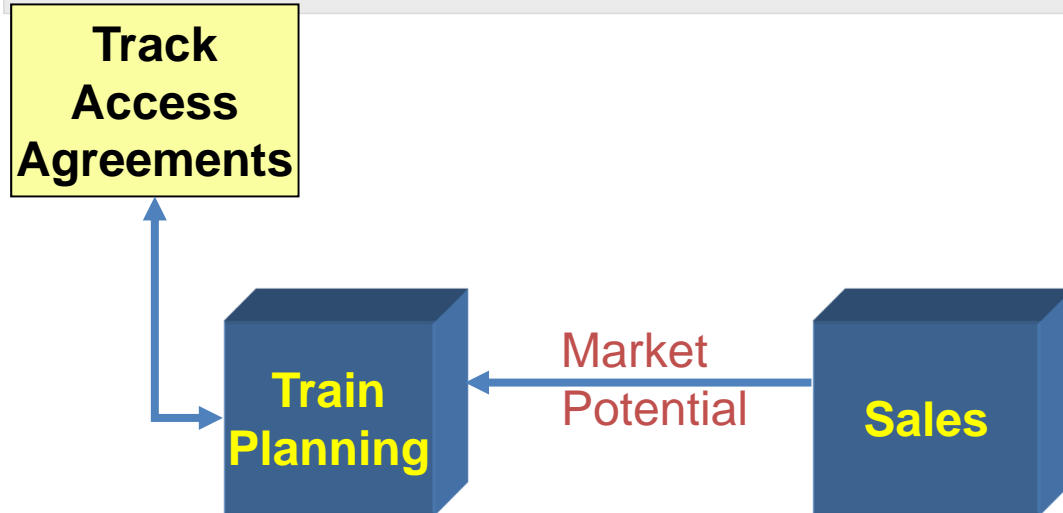


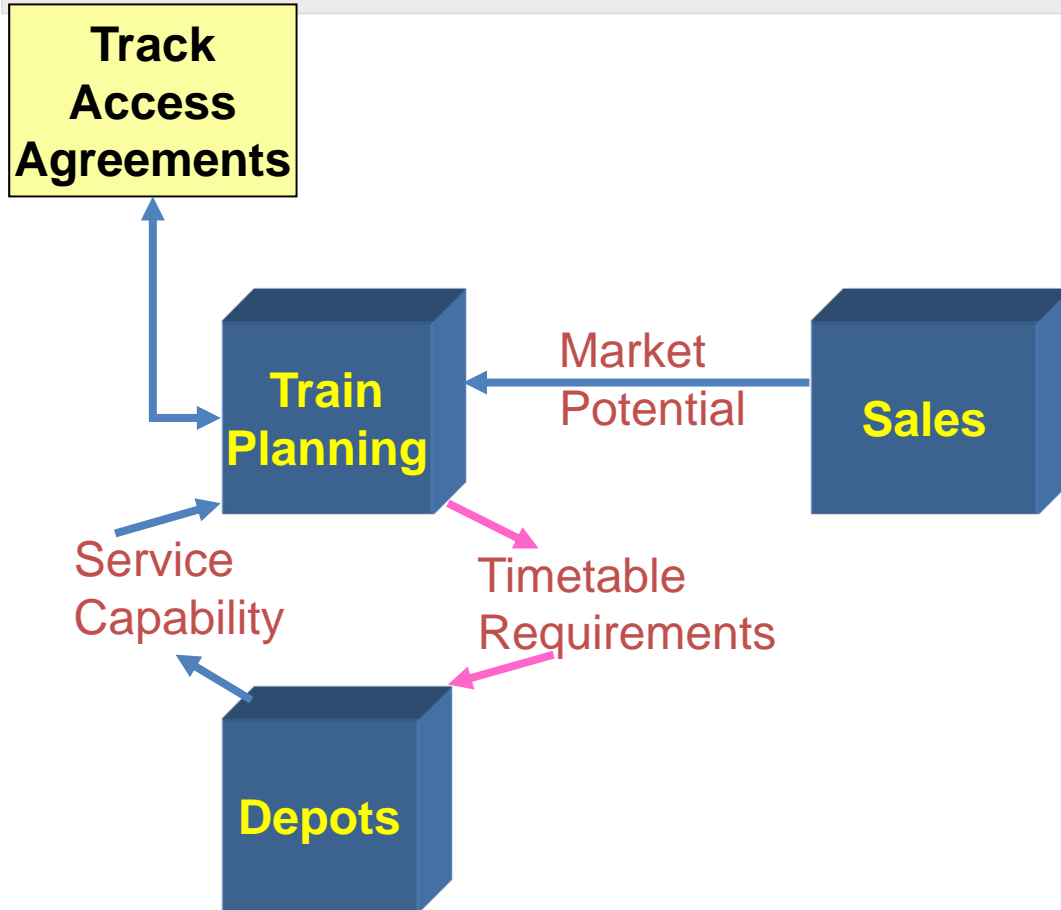
Financial Performance

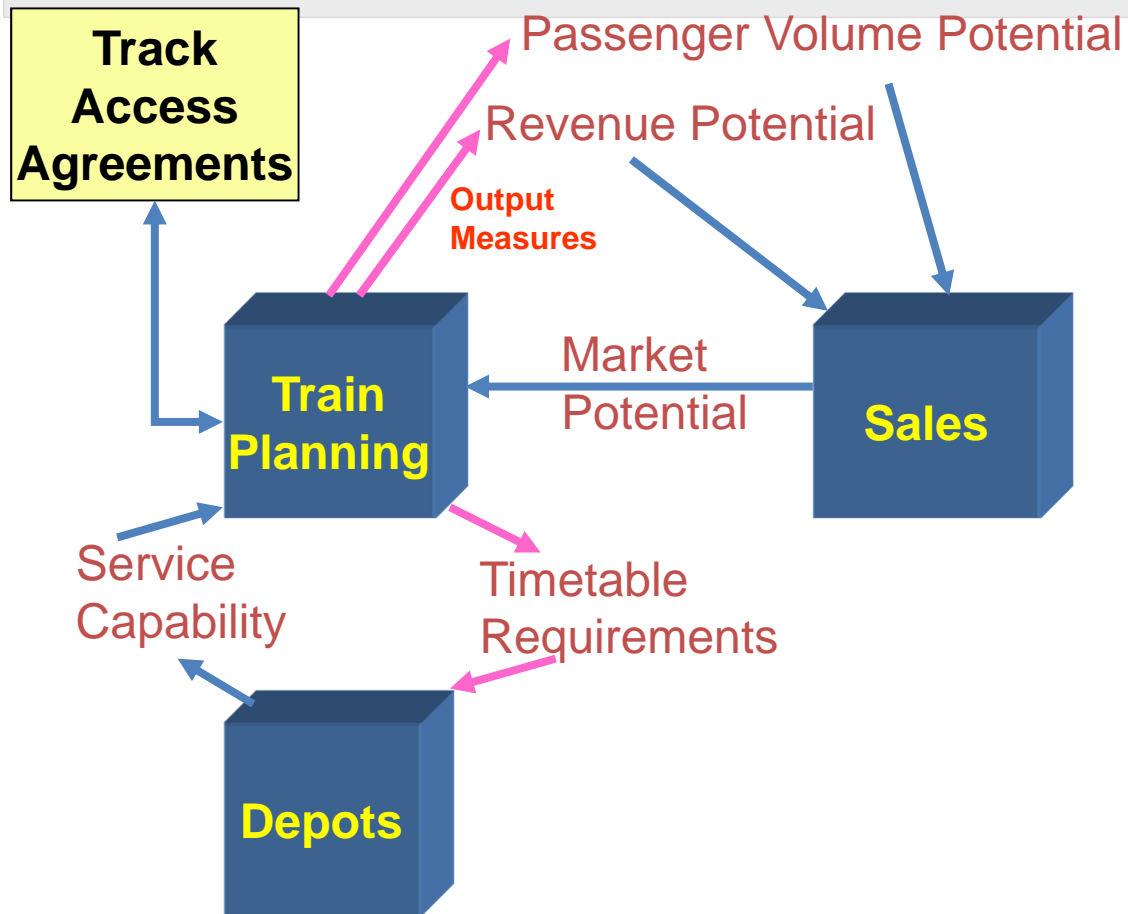


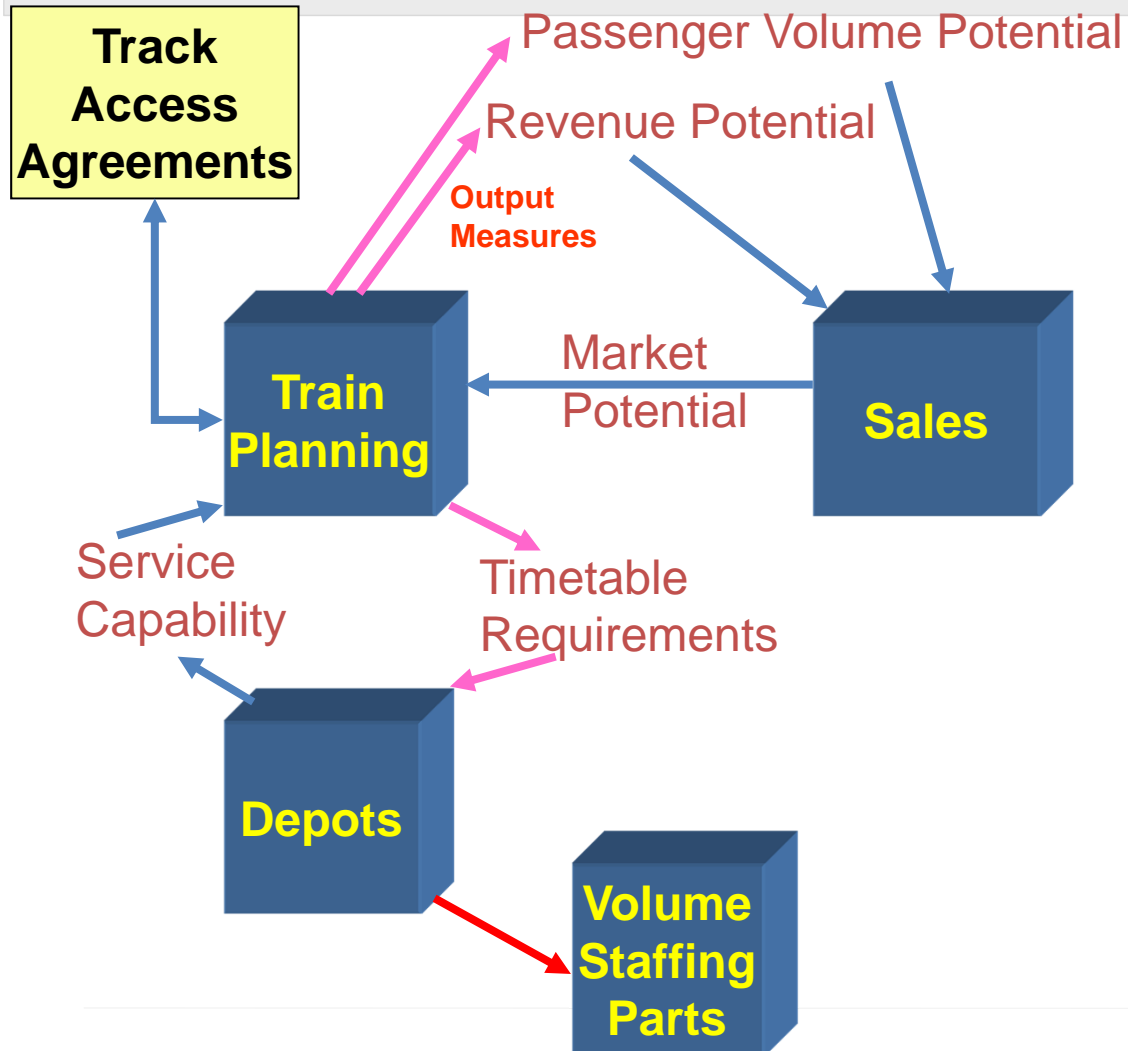
## How does that work







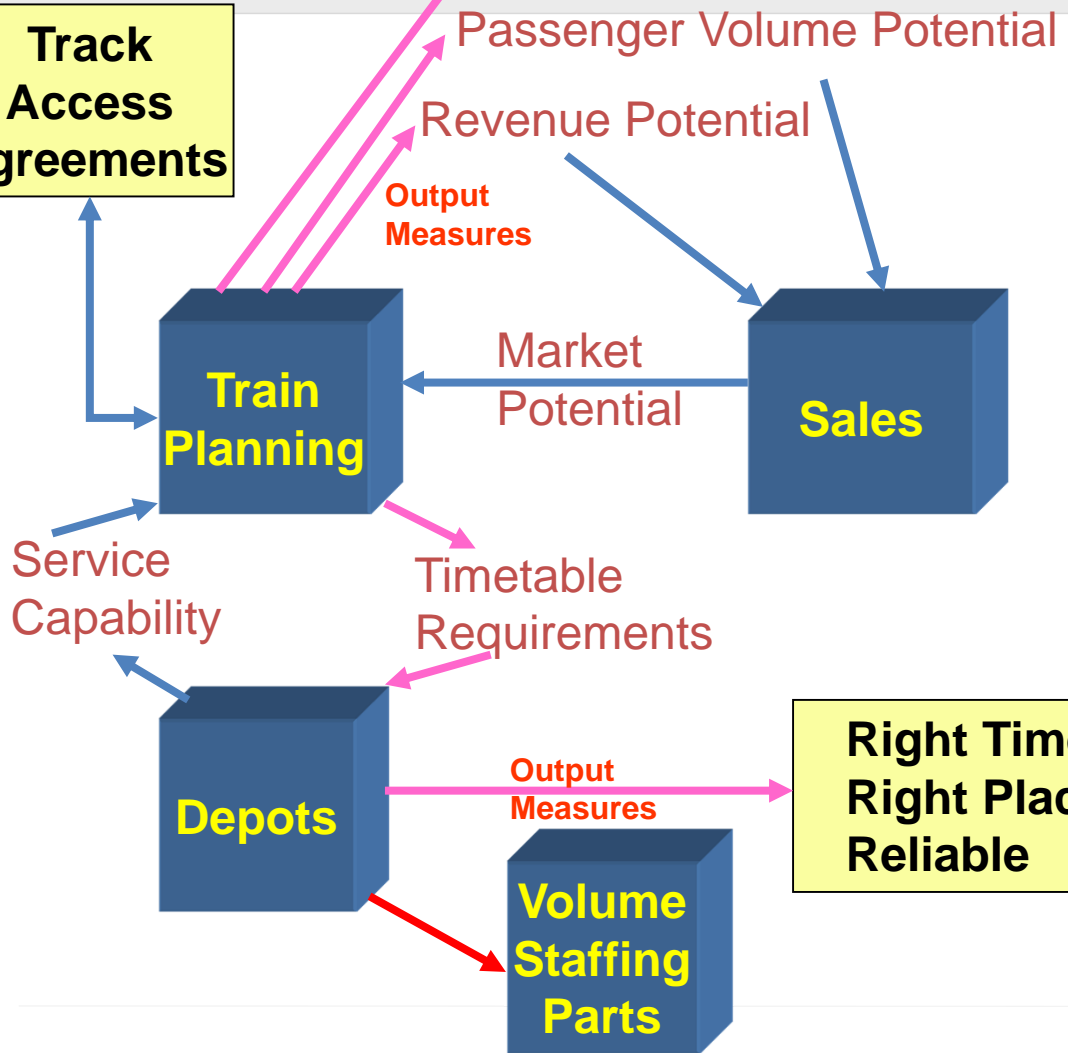








Output  
Measures





**Ops  
HR**

**Right People  
Right Skills  
Right Values**

**Track  
Access  
Agreements**

**Train  
Planning**

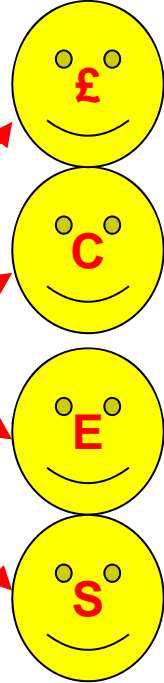
**Sales**

**Delivery**

**Depots**

**Volume  
Staffing  
Parts**

**Right Time  
Right Place  
Reliable**



Output Measures

Performance Constraints

Passenger Volume Potential

Revenue Potential

Output Measures

Performance Constraints

Catering Potential

Performance Constraints

Market Potential

Tickets Sold

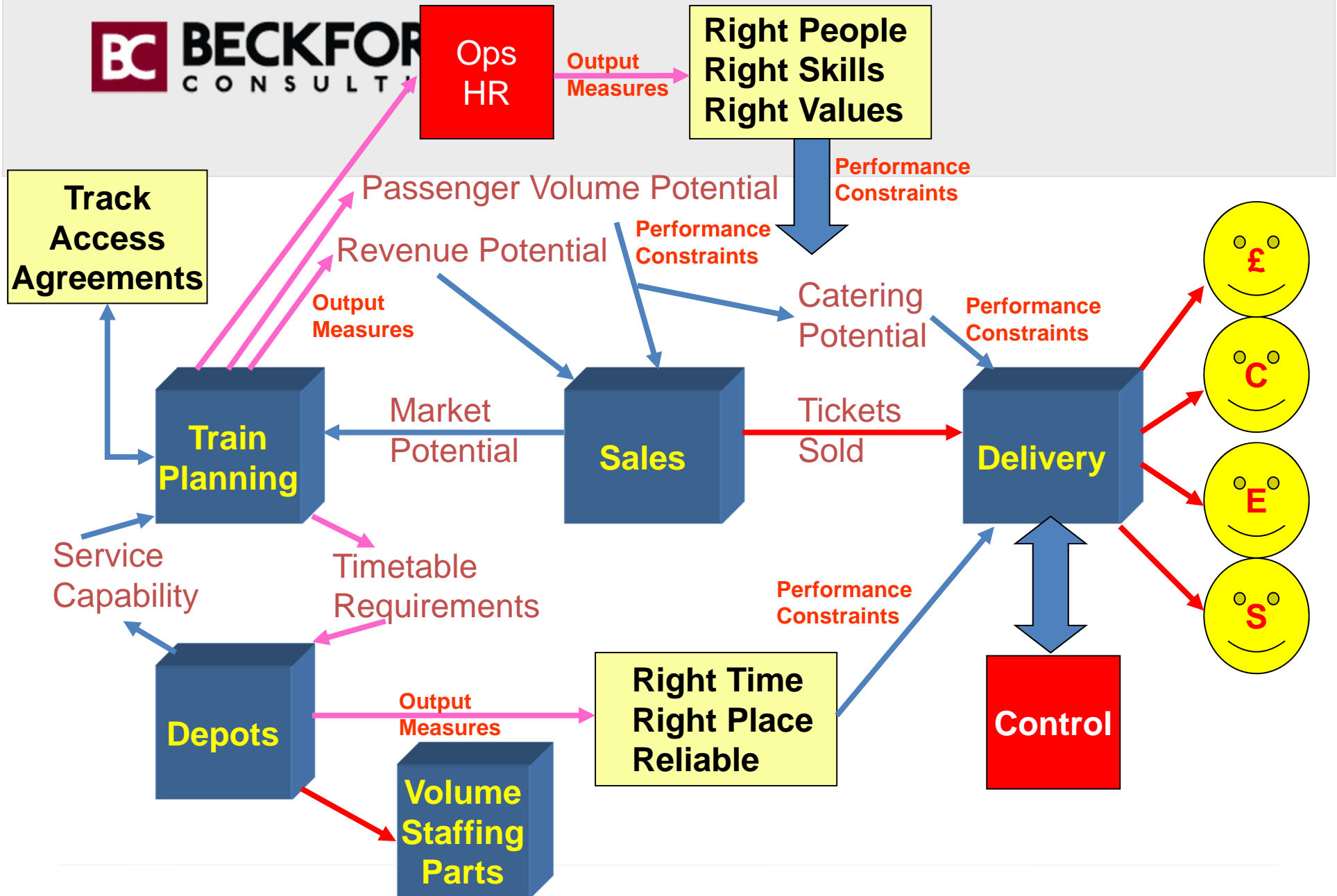
Service Capability

Timetable Requirements

Performance Constraints

Output Measures

Right Time  
Right Place  
Reliable



**Ops  
HR**

**Right People  
Right Skills  
Right Values**

**Track  
Access  
Agreements**

**Train  
Planning**

**Sales**

**Delivery**

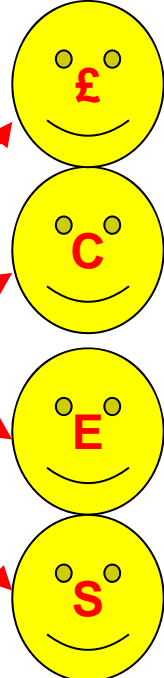
**Depots**

**Volume  
Staffing  
Parts**

**Right Time  
Right Place  
Reliable**

**Control**

**Reg & Comp**



Output Measures

Performance Constraints

Passenger Volume Potential

Performance Constraints

Revenue Potential

Output Measures

Catering Potential

Performance Constraints

Market Potential

Tickets Sold

Service Capability

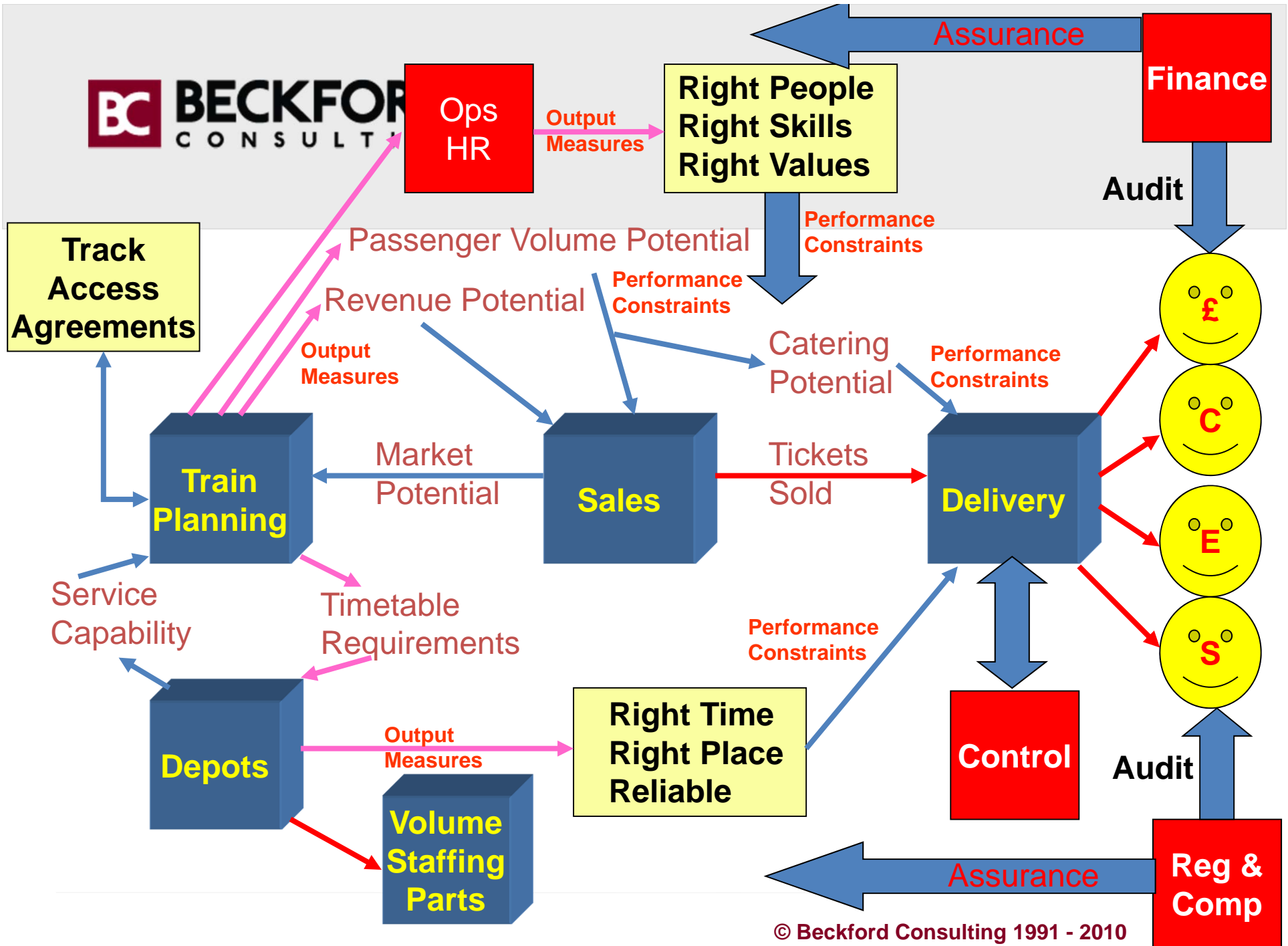
Timetable Requirements

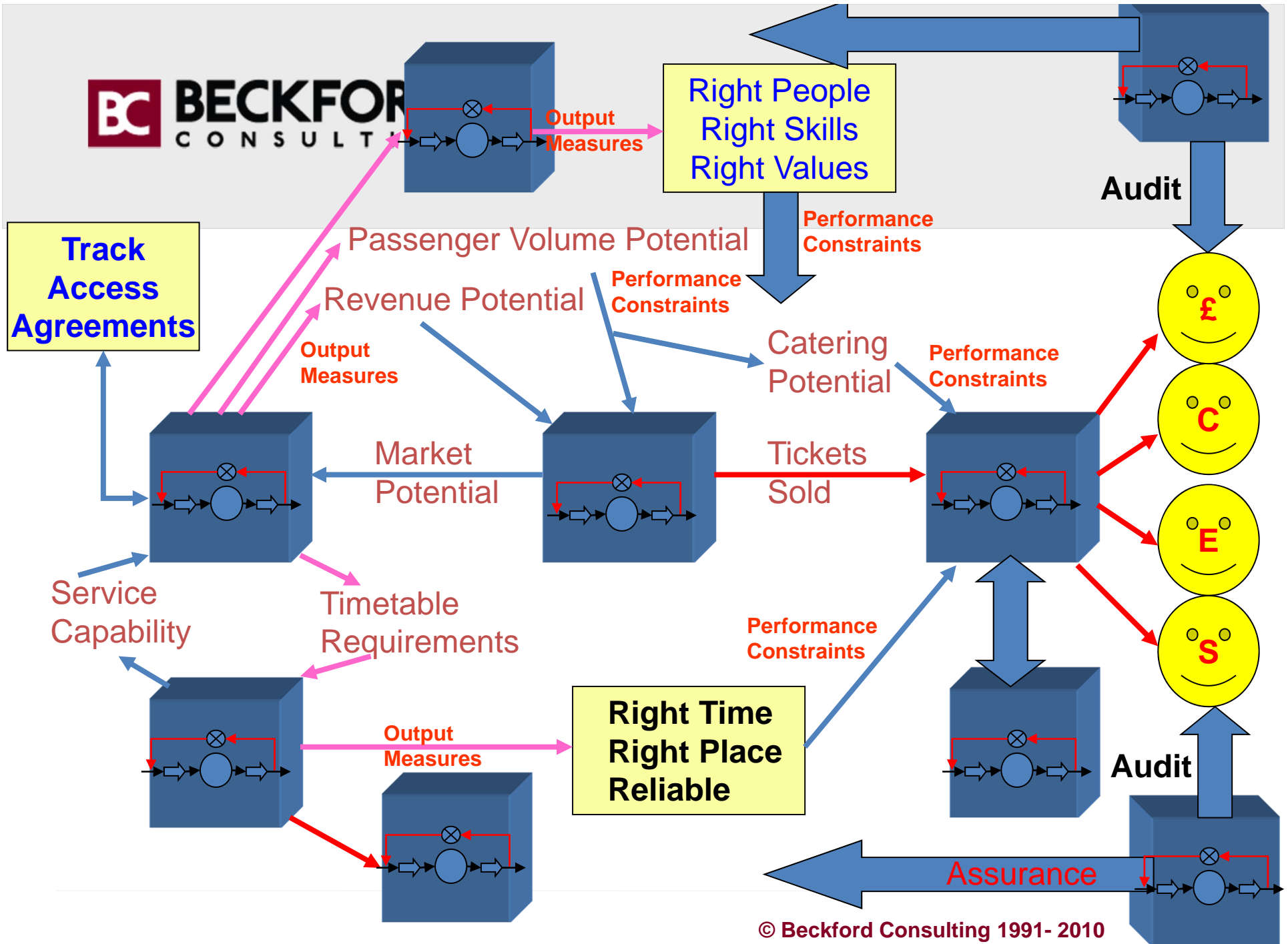
Performance Constraints

Output Measures

Audit

Assurance





## Supra-Disciplinary

- It is in attempting to solve problems of organisations from **WITHIN** the various disciplines that causes many failures because:
  - the languages are incomplete
  - insights generated within a discipline emphasise particular characteristics which may not be perceived as important in another
  - the approach cannot adequately address interactions – the trans-disciplinary issues which can only be seen from a ‘meta’ or ‘supra’ position
- Managerial Cybernetics helps to overcome these limitations



# Performance Measurement

- Managerial Cybernetics provides the basis of meaningful performance measurement because:
  - A statement is made of process capability in multiple dimensions:

## **Inputs**

### **Expectations**

**Money**

**Materials**

**Machines**

**Skills**

**Behaviours**

**Information**

# Performance Measurement

- Managerial Cybernetics provides the basis of meaningful performance measurement because:
  - A formal statement is made of process capability in multiple dimensions
  - Output can be measured against that known capability

**Expectations**

**Money**

**Materials**

**Machines**

**Skills**

**Behaviours**

**Information**

**become**

**More (or less!) money**

**Products**

**Services**

**Waste**

**Learning**

**Happiness (or not)**

**Information**

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**Happiness (or not)**

**Information**

- The impact of increasing (or decreasing) resources or adding and removing constraints can be assessed

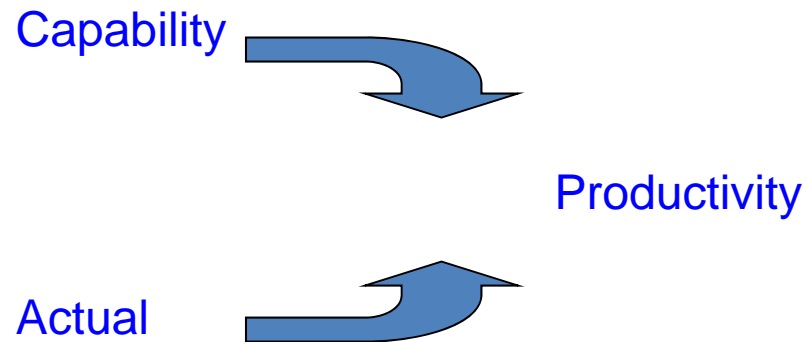
Capability

Expectations  
Money  
Materials  
Machines  
Skills  
Behaviours  
Information

# Performance Measurement

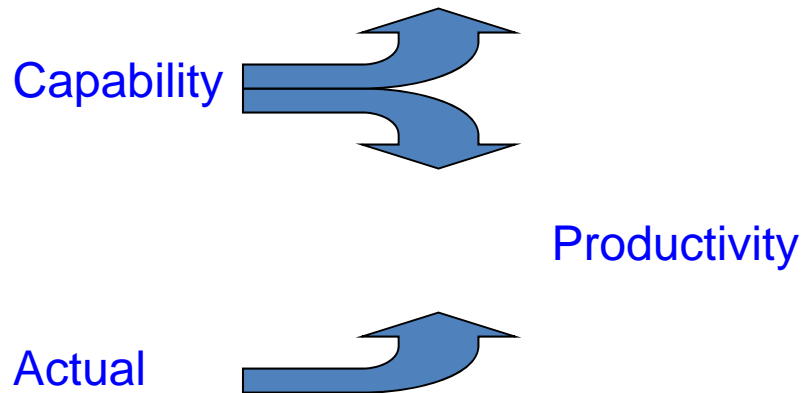


# Performance Measurement

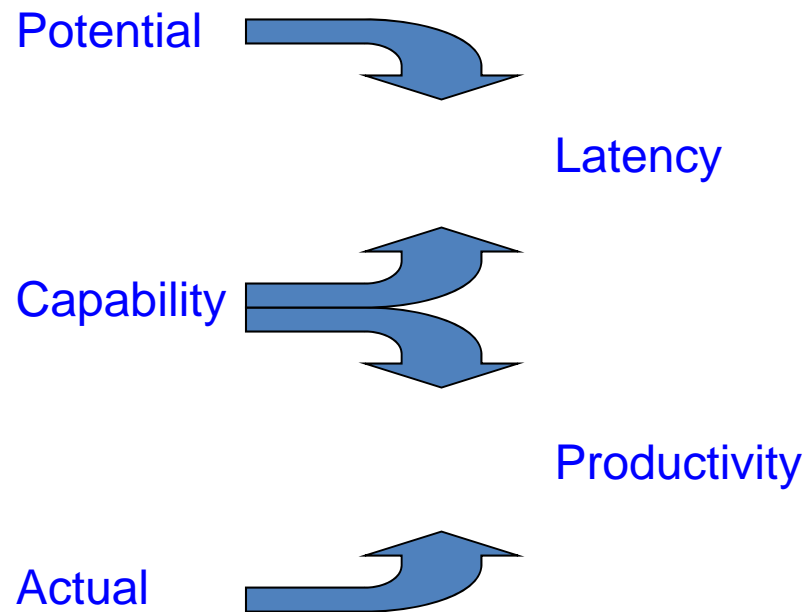


# Performance Measurement

Potential      What could be achieved  
If the resources were changed  
and/or the constraints removed

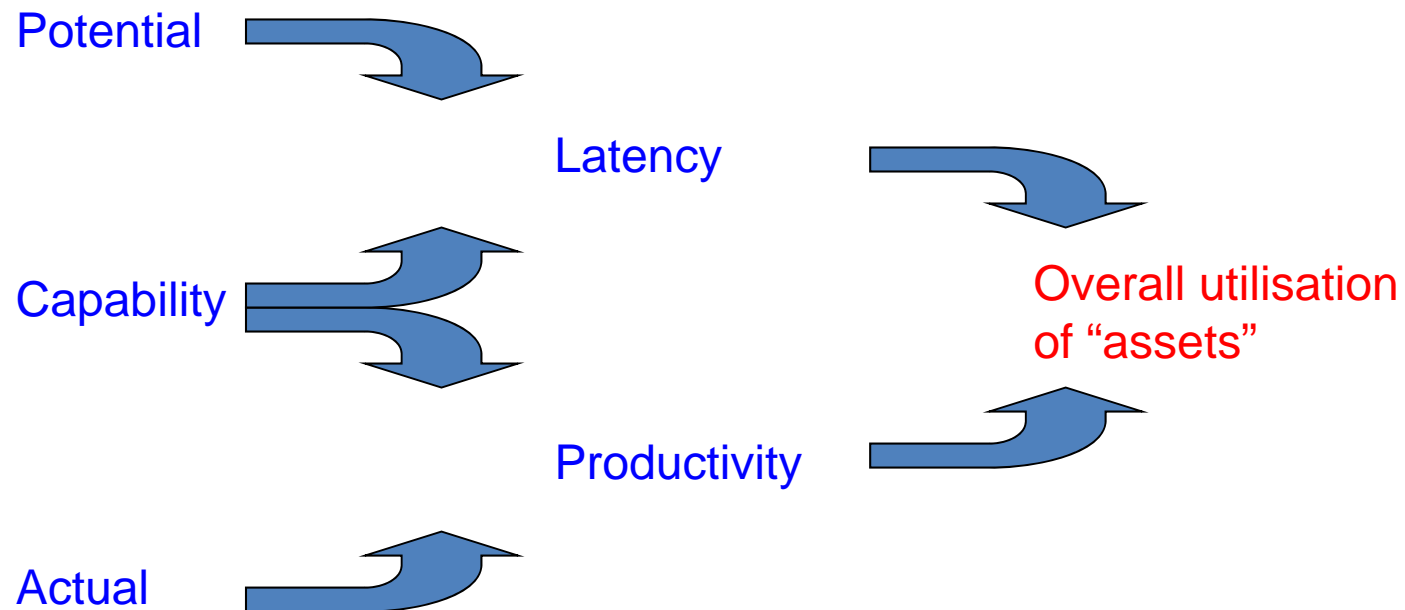


# Performance Measurement

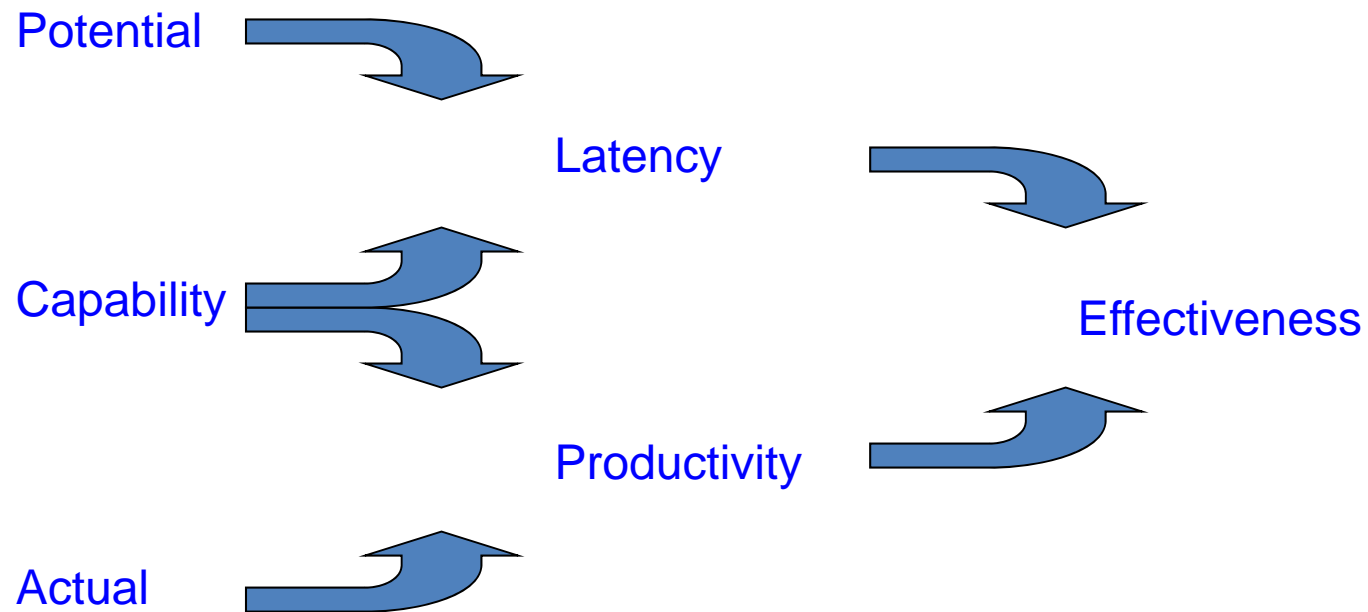




# Performance Measurement



# Performance Measurement



## Where can I use it?

- In any organisation which is:
  - Exceedingly complex
  - Self-regulating
  - Probabilistic in behaviour
- In other words:
  - ANY organisation

## What can I use it for?

- Process Design & Modelling
  - Mushroom Farming, Cake Manufacturing, Steel Production
- Analysis & Design of Organisational Structures
  - Railways, Banks, Factories, Property Companies
- Analysis & Design of Performance Management Systems
  - Logistics, Banking, Dentistry, Healthcare
- Analysis & Design of Information Systems
  - Railways, Pharmaceuticals, Performance Chemicals
- A basis for “Artificial Intelligence”
  - Research Chemistry, HR Selection

- Reduced cost of operation
- Adaptive structure means change is embedded
  - a continuous rather than sporadic process
- Promotes autonomy & empowerment
- Blends local adaptation and global (corporate) coherence
- Ensures easy compliance with regulatory systems
- Promotes organisational learning
- Promotes experimentation and development

- Extended acceptance of the approach
- Refined application & modelling methodology
- Refined Performance Management Systems
- Enhanced Software Tools (*VSSuite*)

- A view of Managerial Cybernetics
- What about it?
  - Robust
  - Rigorous
  - Practical
  - Different!
- In application?
  - Fast
  - Effective
  - It works!

- NHS Sterile Supply Chain Management
- Newsprint Production