

# Systems and Design Thinking

THE *Open* GROUP

CREATING THE CORPORATE FUTURE  
AN INTERACTIVE PLANNING PROCESS



The Ackoff Centre for  
Systems and Design Thinking  
@ Da Vinci

*daVinci*  
Research · Design · Education

**If you read the newspapers and are still satisfied with the state of the world, put this book down; it is not for you.**

**My objective is not to convert those who are satisfied -- even though I believe they need conversion -- but to give those who are dissatisfied, cause for hope and something to do about it.**

[R. L. Ackoff, in Preface to /Redesigning the Future/]

**London  
1 April 2009**

# Emergence of State Capitalism

**STOP  
WORLD WAR 3  
OVER IRAQ  
NUCLEAR  
HOLOCAUST**

**CAPITALISM ISN'T  
WORKING**

**CURRENCY  
IN INTRY**

**NO BORDERS ANYWHERE!  
ONE**



# The Economist

FEBRUARY 7TH-13TH 2009

www.economist.com

Obama slips up

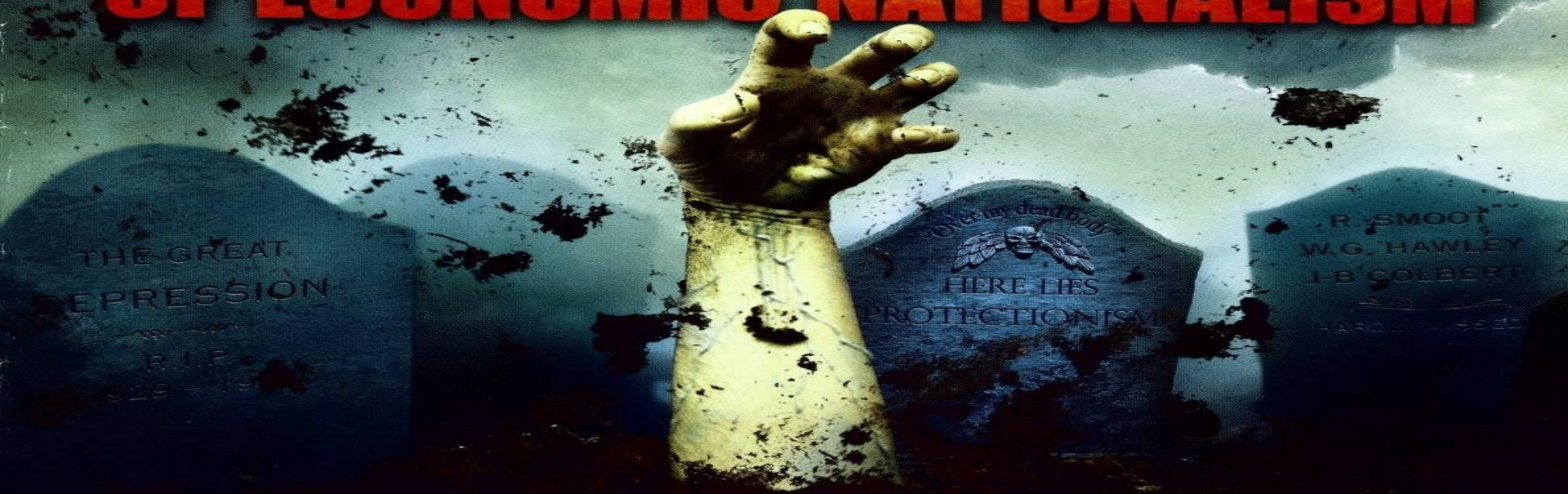
Japan's ailing electronics firms

The dark horse in Israel's election

Charles Darwin, still evolving

Where to get divorced

# THE RETURN OF ECONOMIC NATIONALISM



UK 8637

€5.50

06



Albania..... ALL680	Croatia..... HRK48	France..... €5.50	Ireland..... €5.50	Latvia..... LVL4.25	Nigeria..... Naira 600	Romania..... RON23	South Africa..... R40.00
Austria..... €5.50	Cyprus..... €5.50	Gibraltar..... GIP4.00	Israel..... NIS34.90	Lebanon..... L£9.900	Norway..... Nkr50	Saudi Arabia..... Rials35	Sweden..... SEK55
Bahrain..... Dinar3.50	Czech Rep. .... CZK150	Greece..... €5.50	Italy..... €5.50	Lithuania..... LTL23.10	Poland..... PLN23.5	Serbia..... RSD550	Switzerland..... Sfr.10
Belgium..... €5.50	Denmark..... DKr47	Hungary..... HUF1,490	Kenya..... KShs490	Luxembourg..... €5.50	Portugal cont. .... €5.50	Slovakia(s165.60)€5.50	Turkey..... TRV11.5
Bulgaria..... BGN13	Estonia..... EEK92	Iceland..... IKr500	Kuwait..... Dinar 2.80	Malta..... €5.50	Qatar..... Rials 35	Slovenia..... €5.50	UAE..... Dirhams 35

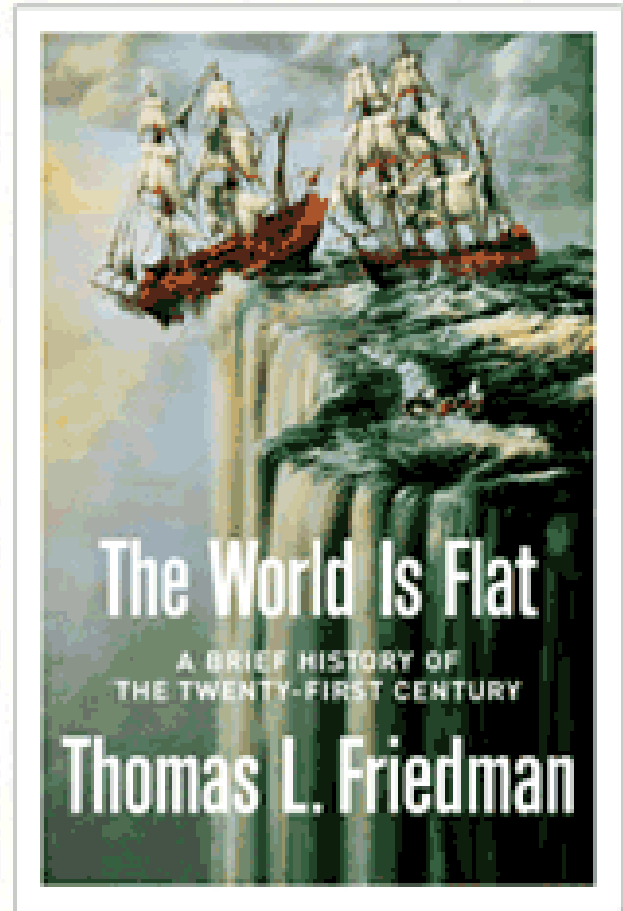
# Systems & Design Thinking vs Conventional Wisdom

- *"Business schools tend to focus on **inductive thinking** (based on directly observable facts) and deductive thinking (logic and analysis, typically based on past evidence), ..."*
- *"Design schools emphasize **abductive thinking—imagining** what could be possible. This new thinking approach helps us challenge assumed constraints and add to ideas, versus discouraging them."*
- **- Procter & Gamble CEO A.G. Lafley**

(From *The Game-Changer: How You Can Drive Revenue and Profit Growth with Innovation*, Business Week 28 July 2008)



*Let's today step out of the normal boundaries of analysis of our economic crisis and ask a radical question: **What if the crisis of 2008 represents something much more fundamental than a deep recession?** What if it's telling us that the whole growth model we created over the last 50 years is simply unsustainable economically and ecologically and that 2008 was when we hit the wall – when Mother Nature and the market both said: 'No more'?*



**Thomas L Friedman**

- **Production factors are diverted** to activities that compensate for the loss of services that were previously provided by nature (eg. sewerage treatment, air purification)
- **Production factors are diverted** from final goods production to exploitation of scarcer, more distant or deeper resources
- **Technologies are invented** to make use of lower-quality, smaller, less valuable resources (because higher-value ones have been exhausted)
- **Capital depreciation exceeds investment**, and maintenance is deferred, so that capital stock (esp. infrastructure) declines
- **Growing demands by the military** for production factors to gain access to, secure and defend resources that are increasingly concentrated in fewer, more remote or hostile regions

**What Does A System Do That Is Under Stress?**

# What does a system do that is under stress?(continued)

- **Investment in human resources (education, health care) is postponed** in order to meet immediate consumption or security needs, or to pay debts
- **Debt constitutes an increasing proportion** of annual output
- **Goals for environmental** health are lowered
- **Increasing number of conflicts**, especially over resources
- **Declining respect for governments** as they are used by the elites to preserve or increase their share of a declining resource base
- **Growing chaos in natural systems**, with natural disasters becoming more frequent and more severe because of less resilience in the environmental system



- Through our filters from the past **we see only the problem that we want to see** and therefore tend to react with **known solutions**, many of which **are no more than quick fixes** to treat symptoms.
- The more we study the major problems of our time, the more we come to realise that **they cannot be understood in isolation**. They are **systemic problems**, which means that they are interconnected and interdependent, **requiring a systems view**.

# We are products of the machine age

- **Renaissance man** – discoverer with a mechanistic view of the world
- **Analysis, reductionism, determinism**, - take apart, understand the parts separately, assemble the understanding of the parts to understand the whole
- **Industrial revolution** – lever, pulley, wheel axle, series of small stages/steps produce a defined outcome,
- **Applied machine logic to human effort** – intelligent machines driven by process defines the workplace
- **Assumes behaviour is deterministic, linear and repeatable – the past is a reflection of the future**
- This forces conformation and “androidism” and assumes those at the top know which levers to pull to keep everyone safe and efficient

- **Does Systems & Design Thinking provide any answers?**

**Pace of Change,  
complexity and THE  
FAILURE OF  
CONVENTIONAL  
WISDOM**

- There is always and **EASY** solution to every problem – neat, plausible and **WRONG** – H L Mencken “The Divine Afflatus” 1917
- "I have no interest in forecasting the future, only in creating it by acting appropriately in the present".  
Russ Ackoff

**Pause for Thought**



- **“We fail more often not because we fail to solve the problem we face but because we fail to face the right problem.” (Ackoff)**
- **“Vision without systems thinking ends up painting lovely pictures of the future with no deep understanding of the forces that must be mastered to move from here to there” (Senge)**

# COMPLEXITY REIGNS

## **A DA VINCI PERSPECTIVE**

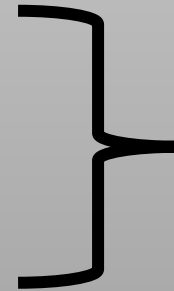
“Some problems are so  
**complex** that you  
have to be highly intelligent and  
well informed  
**just to be undecided** about  
them.”

--Laurence J. Peter

- **Where did it all begin?**
  - **Working for water – Eucalyptus trees**
  - **Bread wrapper – biodegradable**
  - **Traffic Lights in Canada**
  - **The TOYOTA Catastrophe**

- **What really did take place?**

- **Complacency?**
- **Arrogance?**
- **Complexity?**
- **Western style of management?**



**FAILURE TO  
UNDERSTAND  
THE SYSTEM**



**SETTING THE SCENE**  
**THE REALTIES FACING THE**  
**MODERN WORLD**

THE FAILURE OF  
CONVENTIONAL  
WISDOM

It is not  
Clear  
Which  
Activities  
are  
Relevant?

It is not Certain  
How or to What  
Extent these  
Activities are  
Interdependent

The  
Environment  
to a Manager  
Appears to be  
Ill-structured,  
dynamic and  
uncertain

- **There is a subtle but pervasive kind of pain in our organisations.**
- **It is characterized by such frequently heard complaints as:**
  - **“How am I supposed to get my work done with all of these meetings?”**  
**and**
  - **“We always have time to do it over again, but never time to do it right.”**
    - (Jeff Conklin).

# The Reality of NOT Looking at the System as a Whole





- Part of the pain is a misunderstanding of the nature of the problems at hand.
- More precisely, the pain is caused by working on a special class of problems – *wicked problems* – with thinking tools, and methods that are useful only for simpler (“tame”) problems.

Jeff Conklin, Ph.D.

- Why with all the sophisticated forecasting and planning processes did the world not predict the global economic fall out?
- We suggest that the reason for this lies in the planning processes which are based on FORECASTING, AND ANALYSIS.
- THE REALITY IS THAT THE WORLD AS WE NOW UNDERSTAND IT IS AWASH WITH WICKED PROBLEMS AND CONVENTIONAL WISDOM IN MANY CASES EXACERBATES THE PROBLEM

## The Hard Questions?

**Have No  
Stopping  
Rules**

**No Definite  
Formulation**

**Planner Has  
No Right to  
Be Wrong**

**WICKED  
PROBLEMS**

**Solutions Are  
Not True-or-  
False, But Better  
Or Worse**

**You Don't  
Understand The  
Problem Until  
You Have  
Developed A  
Solution**

**Characteristics - Wicked Problems**

- Churchman describes wicked problems as, " a class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing."

## Wicked Problems - Summary



- A wicked problem is a social or cultural problem that is difficult or impossible to solve for as many as four reasons:
  1. Incomplete or contradictory knowledge,
  2. The number of people and opinions involved,
  3. The large economic burden, and
  4. The interconnected nature of these problems with other problems.

[https://www.wickedproblems.com/1\\_wicked\\_problems.php](https://www.wickedproblems.com/1_wicked_problems.php)

- **Consider the following:**
  - **The US Automotive Industry**
  - **The Mining Industry in South Africa**
- **Both are wicked problems which cannot be solved but can be dissolved**
- **From a Systems viewpoint there are some interesting options**

## **Two Wicked Problems**

A black swan *is a large-impact, hard-to-predict, and rare event beyond the realm of normal expectations.*

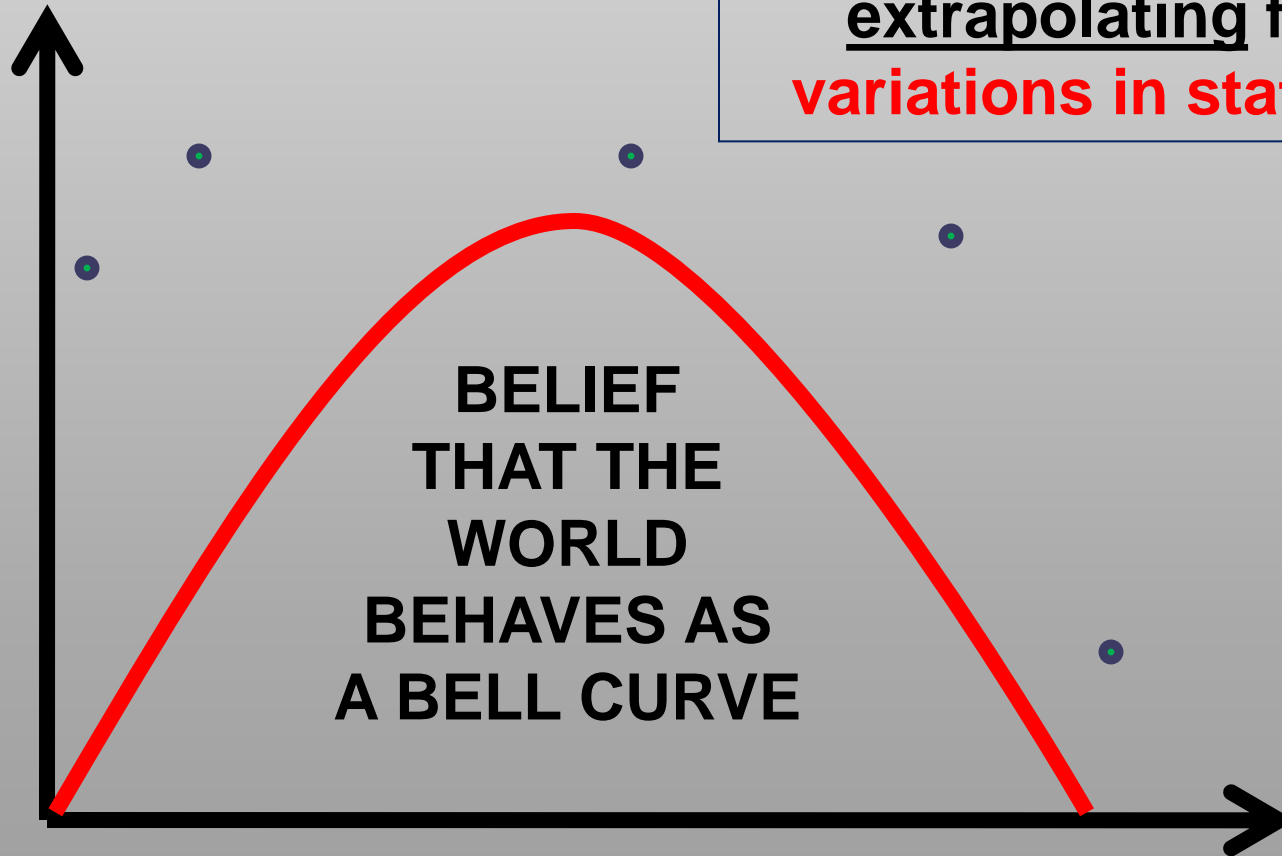
Taleb regards many scientific discoveries as black swans—"undirected" and unpredicted. He gives the rise of the **Internet**, the personal **computer**, the **first world war**, as well as the **September 11 2011 attacks** as examples of Black Swan events. [L](#)



The term *black swan* comes from the ancient **Western** conception that 'All **swans** are **white**'. In that context, a **black swan** was a **metaphor** for something that could not exist.

# The Black Swan

unexpected can be  
predicted by  
extrapolating from  
variations in statistics



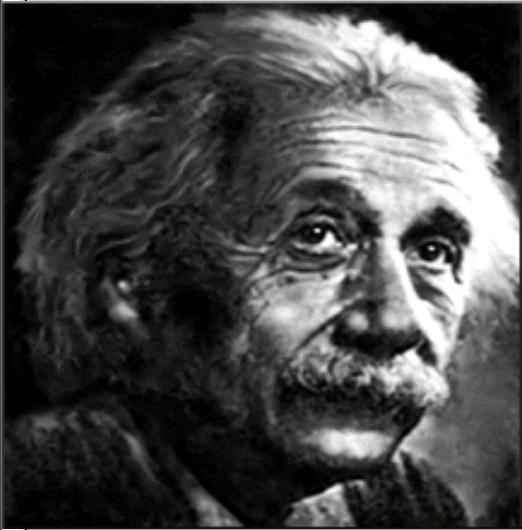
# The Black Swan

- The bottom line is that you cannot **solve** wicked problems – you can only **dissolve** such problems
- Dissolution can only be achieved through **re-designing** the system
- **Re-design** can only be achieved through an understanding of ***SOCIAL SYSTEMS***

**THE GREATEST CHALLENGE  
FACING ANY ORGANISATION  
RE-DESIGN IMPLIES**

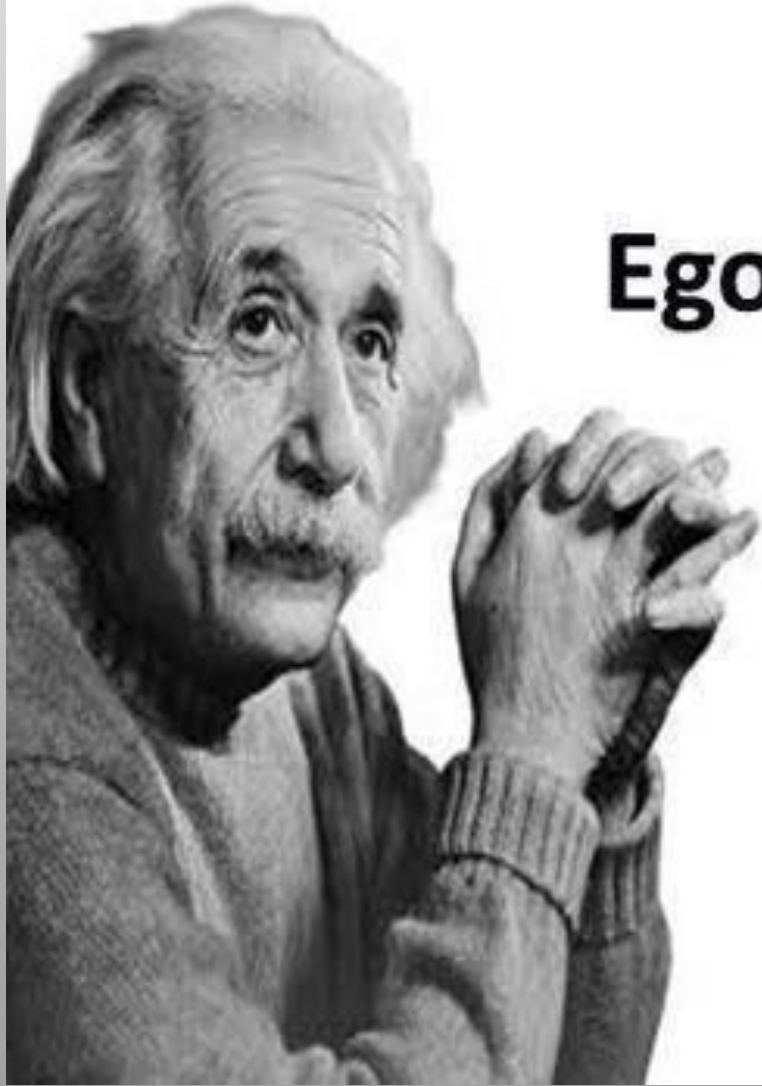
**CHANGING MINDSETS**





- **Without Changing our pattern of thought, we will not be able to solve the problems we created with our current patterns of thought.**

**A Quote From Einstein**



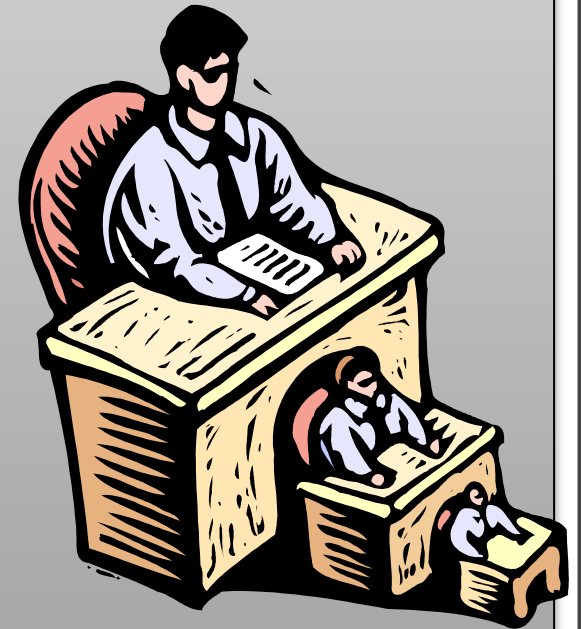
$$\text{Ego} = \frac{1}{\text{Knowledge}}$$

*"More the Knowledge  
Lesser the Ego,  
Lesser the Knowledge  
More the Ego..."*

**-Albert Einstein.**

**The Real Definition of Ego**

- The view that **mindsets can differ and that they can have a powerful impact** on corporate strategies is illustrated well by the case of Kenneth Olsen, founder and then CEO of digital equipment (DEC).



**A Classic Example!**

- **In the mid-1970s, DEC was the world's second-largest computer company and the market leader in the minicomputer segment.**
- **In 1977, Olsen observed that**
- **"there is no reason for any individuals to have a computer in their home."**
- **This was the same year in which Steve Jobs and Steve Wozniak incorporated Apple computer and launched the PC revolution."**



# SYSTEMS THINKING

## **A DA VINCI PERSPECTIVE**

**In the 1970s there were  
many head-on car crashes  
resulting in injuries  
and deaths on the  
George Washington Bridge  
(NY-NJ)**

**Example : Car Crash Problem**





# George Washington Bridge

## Port Authority



## Columbia-Presbyterian Medical Center



Police  
and EMS



**Problem: Reduce Into Parts**

**Focused on the road markings so they regularly repainted the solid yellow lines. They measured their effectiveness by the degree of visibility of the lines by the drivers.**

**But, there was little overall improvement.**

- Solid Yellow Lines



**Focused on driving behavior so they attentively issued fines to drivers who crossed the solid yellow lines or drove over the speed limit. They measured their effectiveness by the number of fines levied.**

**But, there was little overall improvement.**



**Focused on responding to emergencies so they kept themselves and their resources up to date. They measured their effectiveness by response time to the scene, quality of care, and response time to the medical center.**

**But, there was little overall improvement.**





**Focused on advanced medical care so they improved emergency facilities and treatment. They measured their effectiveness by quality of care feedback and survival rate. But, there was little overall improvement.**





Frank and Ernest



**Until...** A Different Model Was Applied

# Think Systemically

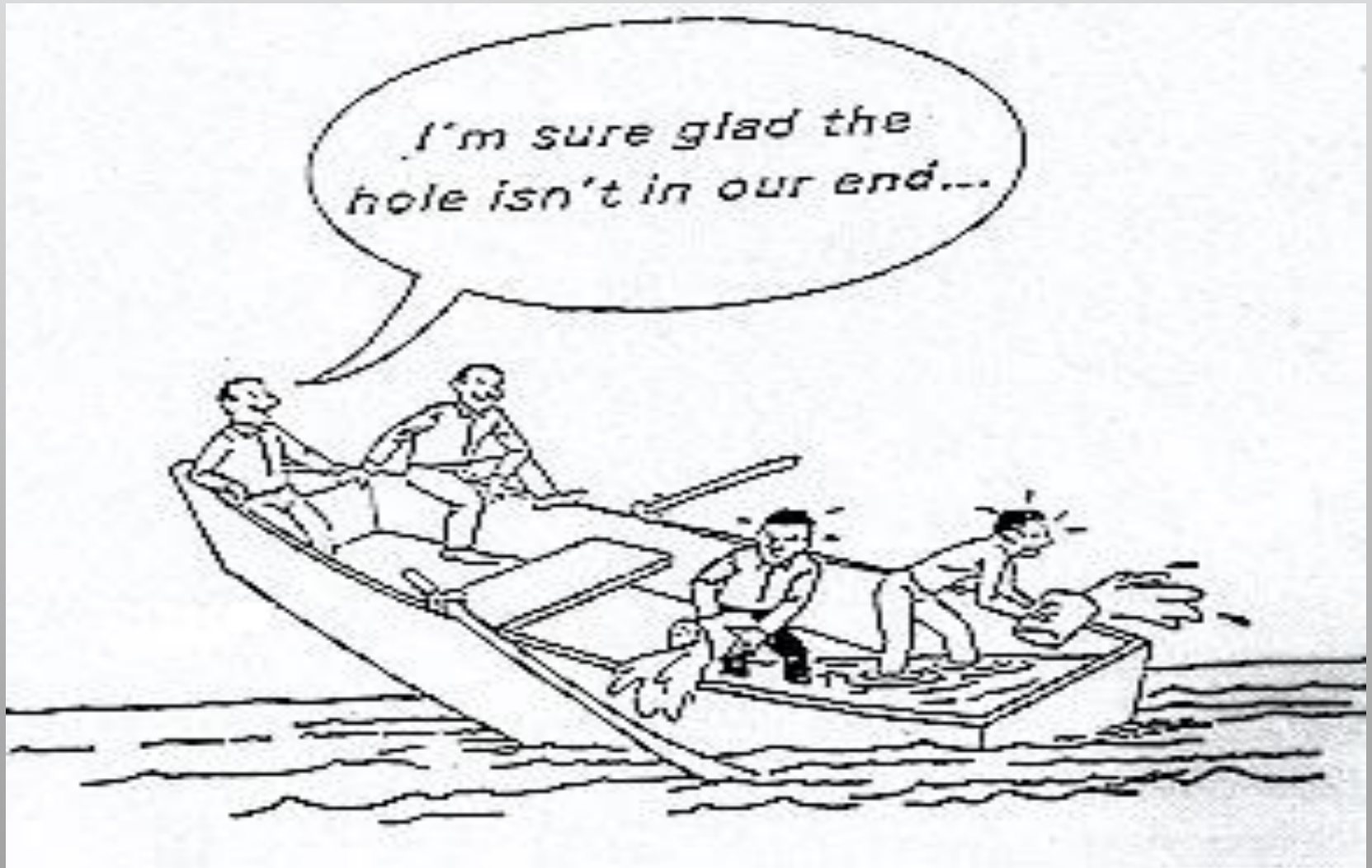
**Thinking Models/Metaphors: Social Systems**



The performance of the whole is **NOT** the sum of the performances of its parts.

**In a system problem  
the performance of the whole  
is derived from the  
interactions of the parts.**

**A system problem cannot be solved by  
focusing on independent parts.**



**Parts Are Inter-connected**

The parts do **NOT** always  
perform in ways  
that are expected.

# **In a social system the “parts” include**

- ▶ **people and groups**
  - ▶ **who are purposeful, have their own interests, intentions, and generate their own goals**
  - ▶ **a key characteristic of the players is that they exhibit choices!**

**Goals are not always shared**



# **In a social system the “parts” are characterised by**

- ▶ **Parts of a social system are constantly interacting.**
- **Because of the interdependency of the parts, changes can- not be made in isolation.**
- **Moreover feedback loops can create unintended consequences that do not follow a simple linear course and commonly include time delays**

**Different methods are  
required to **diagnose,**  
**describe, and understand**  
a systemic problem**

**When these methods were  
applied  
a different question emerged:**

**On the George Washington  
Bridge,  
under what conditions would a  
head-on collision  
be impossible?**

**And THIS produced a  
Systemic Solution:**

**Replace the solid yellow  
painted lines with a  
solid concrete barrier**



Gambino, Raymond. *Beyond Quality Control*. Lab Report, 1990, Vol. 12, No. 5.

# George Washington Bridge

# The A380 Challenge



**AND WHAT ABOUT  
BOEING?**

**Think about the  
realities:**

- Airport facilities
- Passenger acceptance
- The rollout impact – who is controlling whom?
- Impact on South Africa?



# A380 The Rear View



25.06.2005

© AIRBUS 2005





# Taking A Closer Look



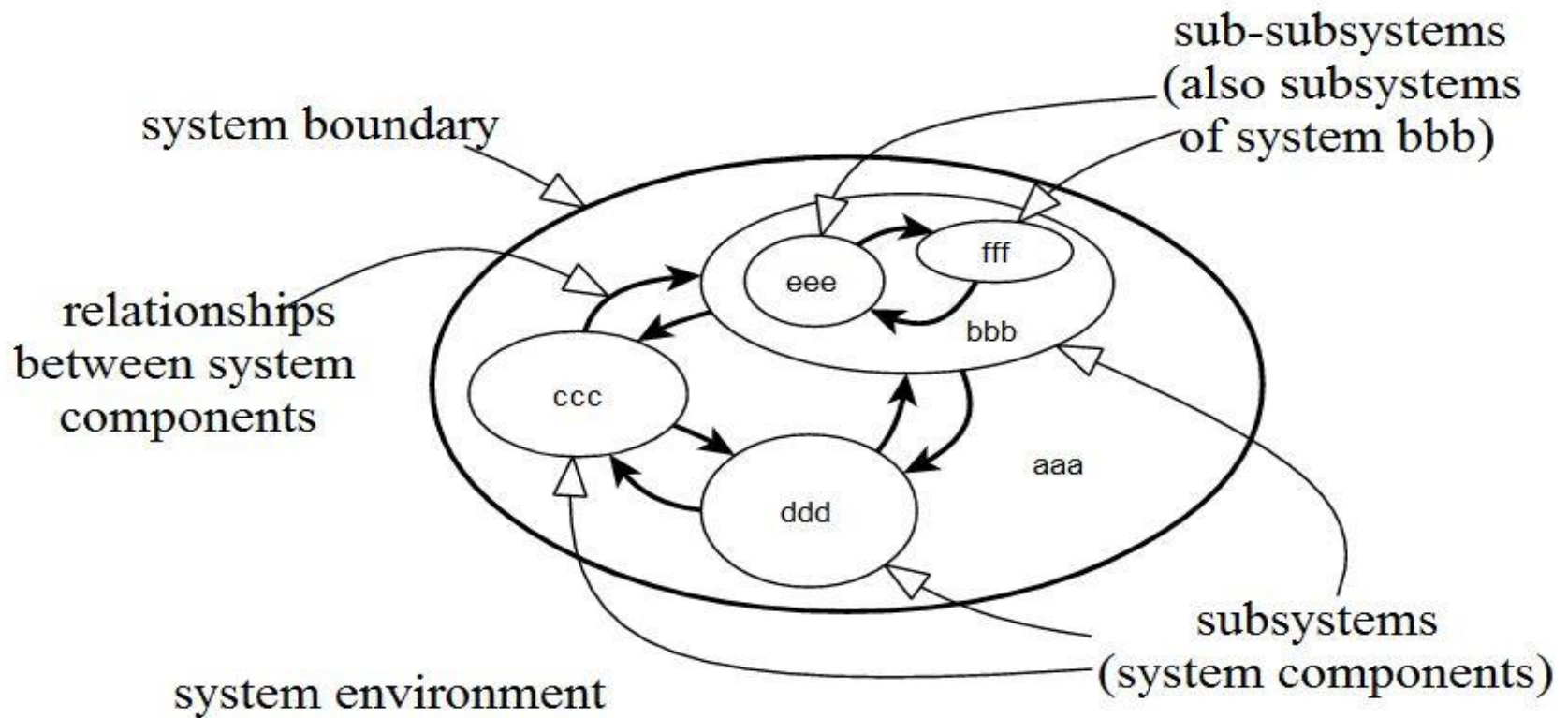
# Hello Runway

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- A system is a **construct** that the designer creates by assembling **interacting** parts of the world ( either concrete or abstract) for the purpose of design. This assemblage must satisfy two conditions :
  - The assemblage must exhibit **emerging** properties that are not exhibited by any of its parts and will somehow be diminished if any of the parts is removed;
  - Each part must be **interacting with** at least one other part.

# What Is A System?



**A Boundary:** that defines the system as separate from its environment

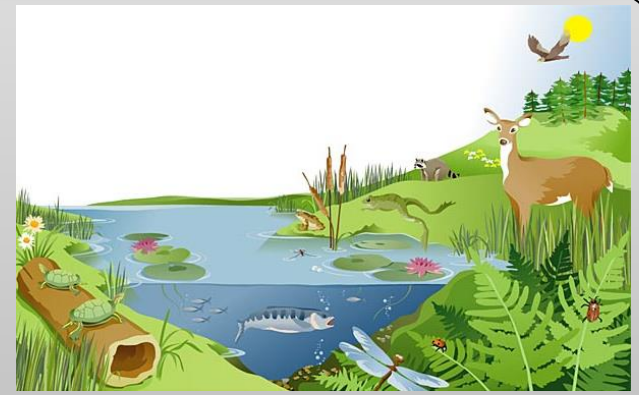
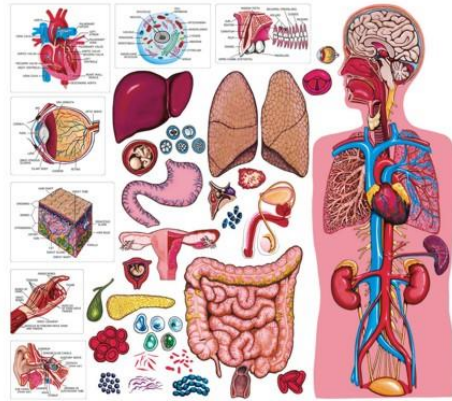
**An Environment :** which influences the system and influenced by it

**Subsystems :** systems within the system

**Has Purpose :** either by design or by attribution

**Demonstrates :** emergence

# The Component Parts



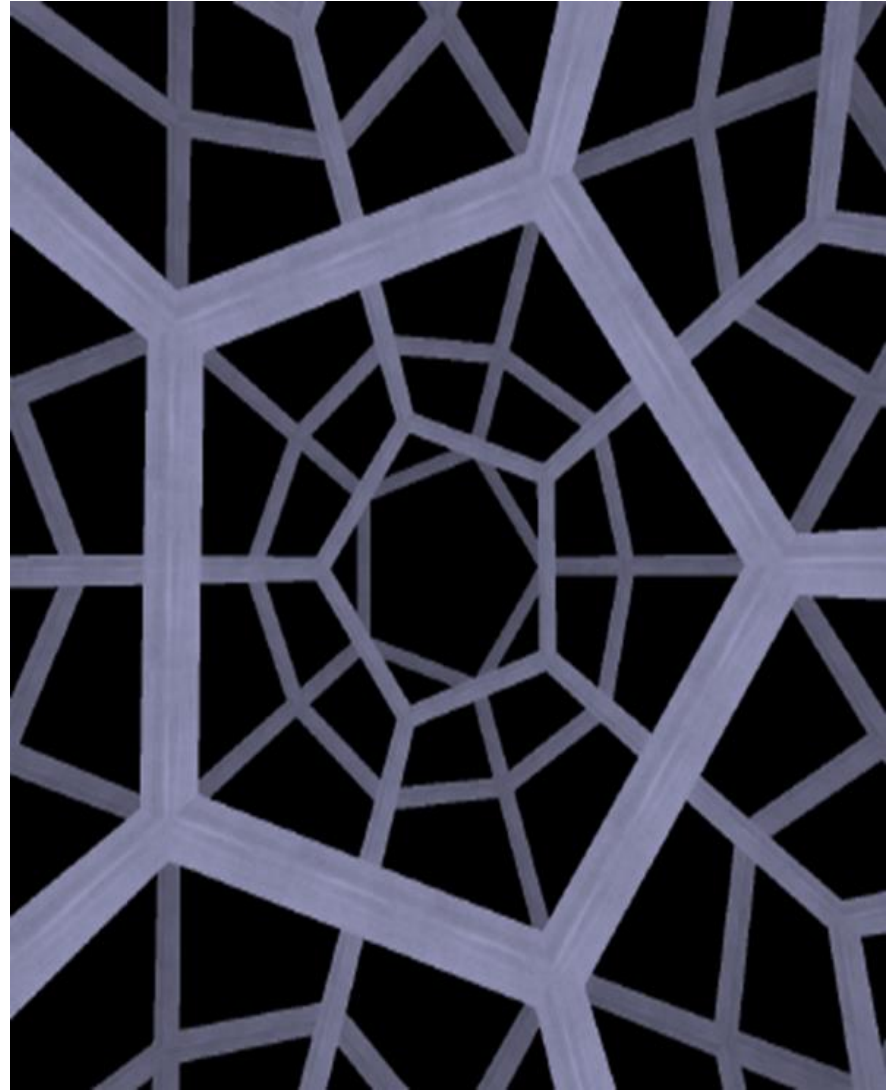
**A system is a group of interacting, interrelated, and interdependent components that form a complex and unified whole**

- **All parts must be present and functioning**
- **All parts must be connected in the proper way**
- **A critical element is the presence of a *FEEDBACK LOOP***

# **The Rules of Engagement**

**“Systems thinking is based on the fundamental shift of perception from the world as a machine to the world as a living system”**  
(Fritjof Capra)

- Focuses on **relationships** and **interrelationships** rather than the parts
- Sees **patterns** not events
- Is about **connectedness**
- Gives a more accurate picture of the **reality**
- Forces awareness of ‘the **unintended consequences**’





# Understanding the real system





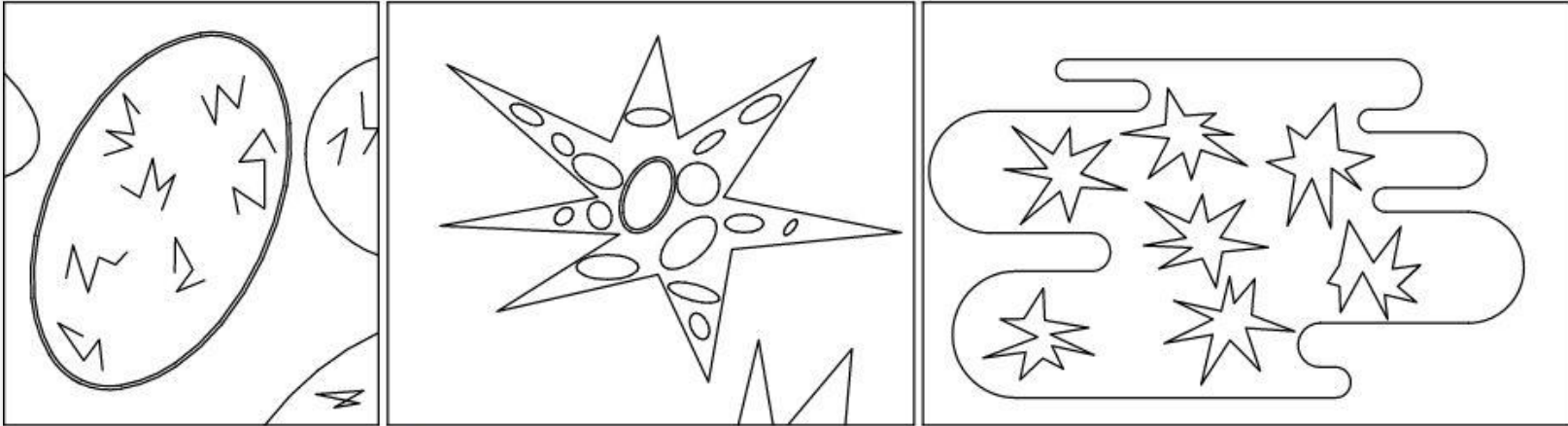
	Holistic Thinking	Reductionist Thinking
<i>Method</i>	Systemic	Analytic
<i>Issue tackled by</i>	Investigating the problem's environment	Reducing the problem into smaller & smaller parts
<i>Approach characterised by</i>	An upward movement	A downward movement
<i>Simplifies by</i>	Taking multiple, partial views	Breaking problem down into simplest parts

It's all about moving from the "either/or" to the "both/and"

## Differences between Holistic and Reductionist thinking (East & West)

reductionist  
thinking

holistic  
thinking



(a)

(b)

(c)

**Reductionist** – zoom in on the star shape in (b) and find it has elliptical components (a) with zig-zag subcomponents

**Holistic** – zoom out to observe context

**Systemic** – move freely between the views

Growing Wings on the Way – Rosalind Armson

**From Reductionist to Holistic**

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# DESIGN THINKING

## **Making sense of Wicked Problems**

- Design thinking is not new; it can be linked to the work of the likes of **John Dewey** and **Edward De Bono**.
- Its ethos is human-centered, integrative, optimistic and collaborative, and warrants serious consideration as a possible creative response to **wicked problems**.
- **For businesses, it is a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity.**

<http://theconversation.edu.au/wicked-problems-and-business-strategy-is-design-thinking-an-answer-6876>

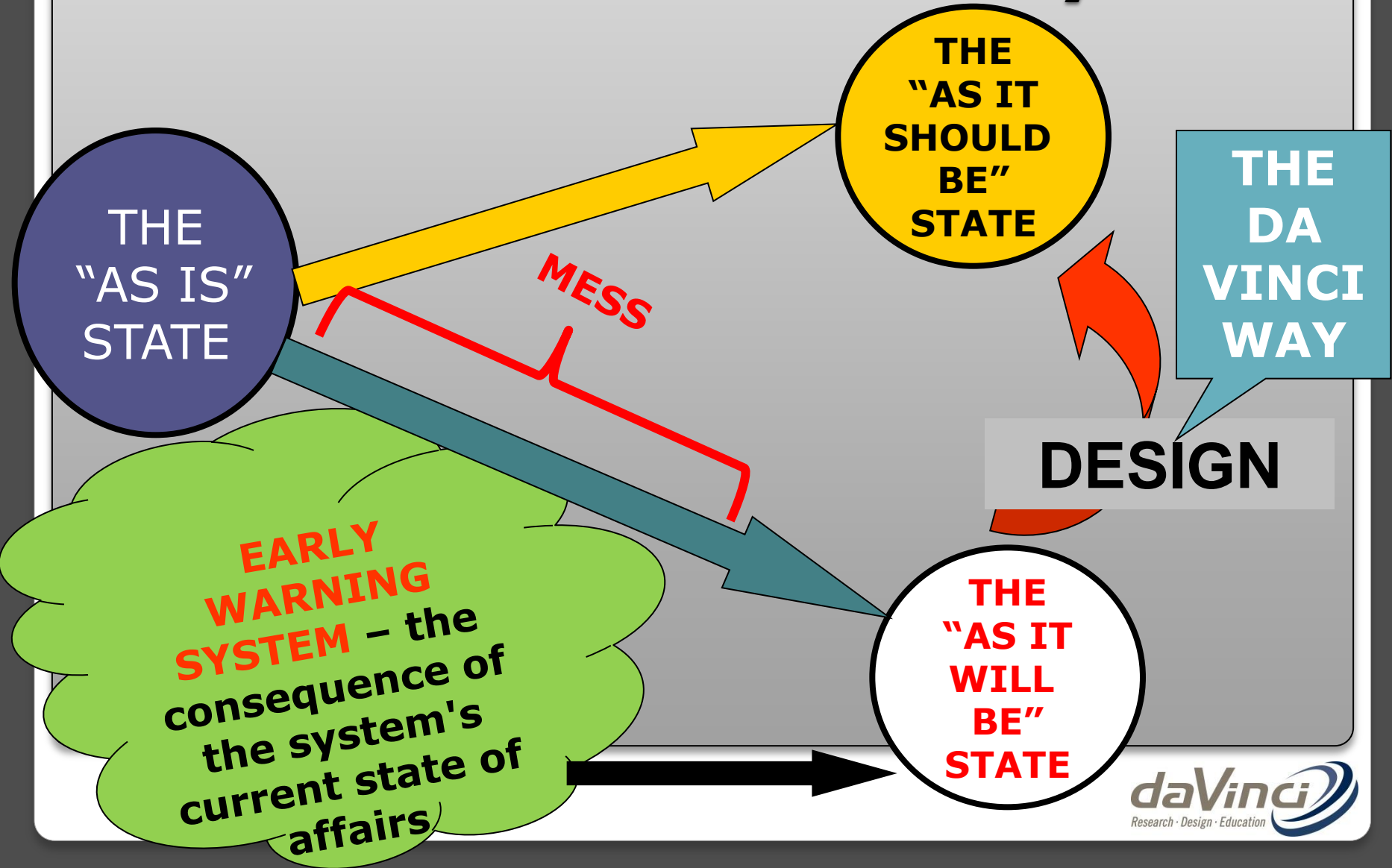
**If you read the newspapers and are still satisfied with the state of the world, put this book down; it is not for you.**

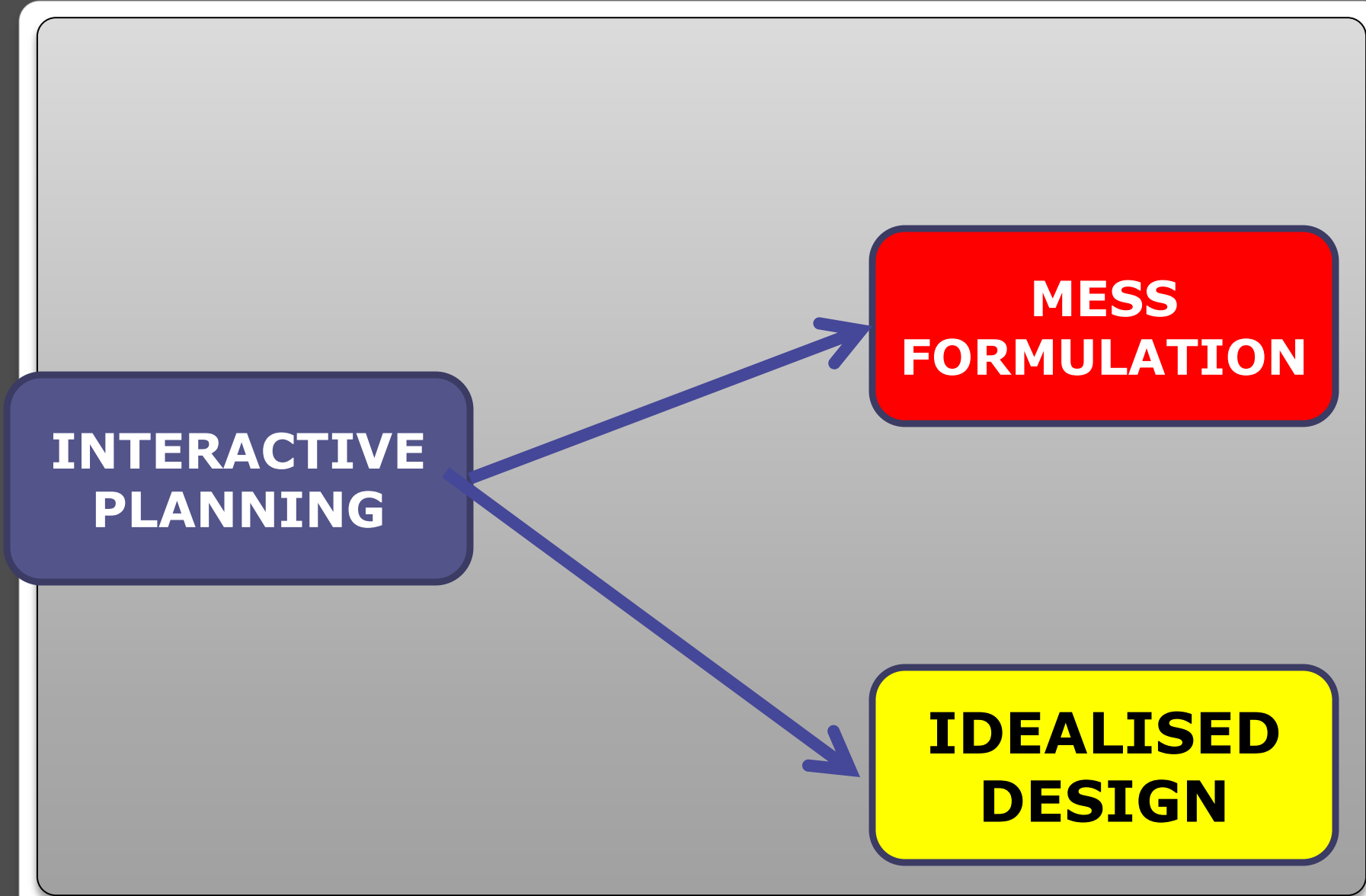
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[R. L. Ackoff, in Preface to /Redesigning the Future/]

**Design Thinking In Context**

# The 3 States Of A System





# Interactive Planning



**Every organisation is faced  
with  
interacting  
threats and opportunities,  
a system of problems  
called a *mess***

**Why a 'MESS' ?**

## The purpose of exercise:

- Determine how the organisation **would eventually destroy itself** if it were to continue behaving as it currently is; that, is if it were to fail to adapt to a changing environment, even one that is perfectly predicted
- Identification of the Achilles' heel – **the seeds of destruction** – provides a focus for the planning that follows by identifying what must be avoided at all costs

1

- **Stakeholder view of the Organisation:**
- Identifying all the internal and external influencers

2

- **Systems & Obstruction Analysis**
- How does the system currently operate?

3

- **Reference Projections**
- An extrapolation of performance from past to future

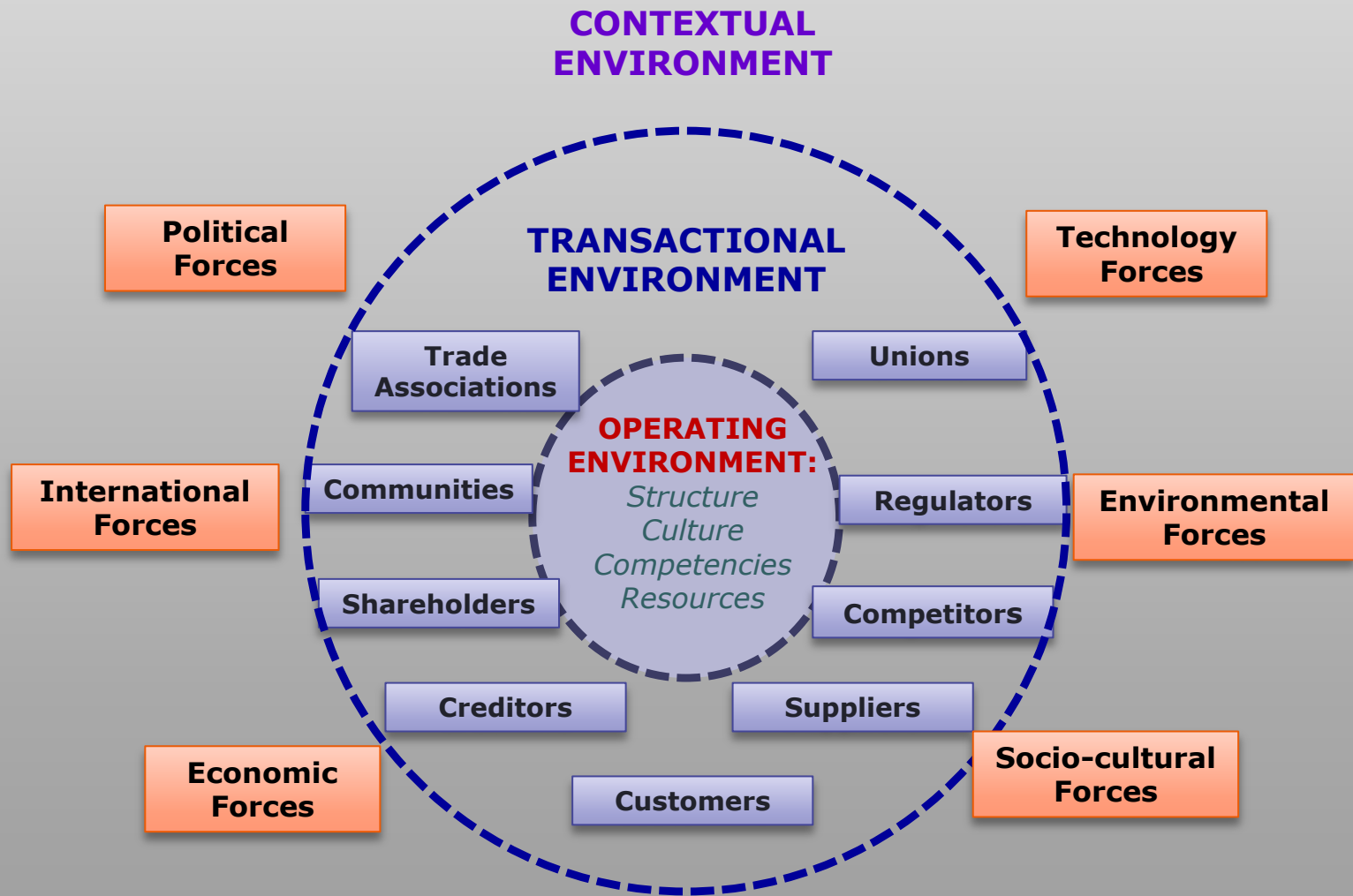
4

- **Reference Scenarios**
- The possible future that the organisation will face

5

- **Telling the Story**
- Presenting the Mess in a compelling and factual manner

# The Mess Formulation Process

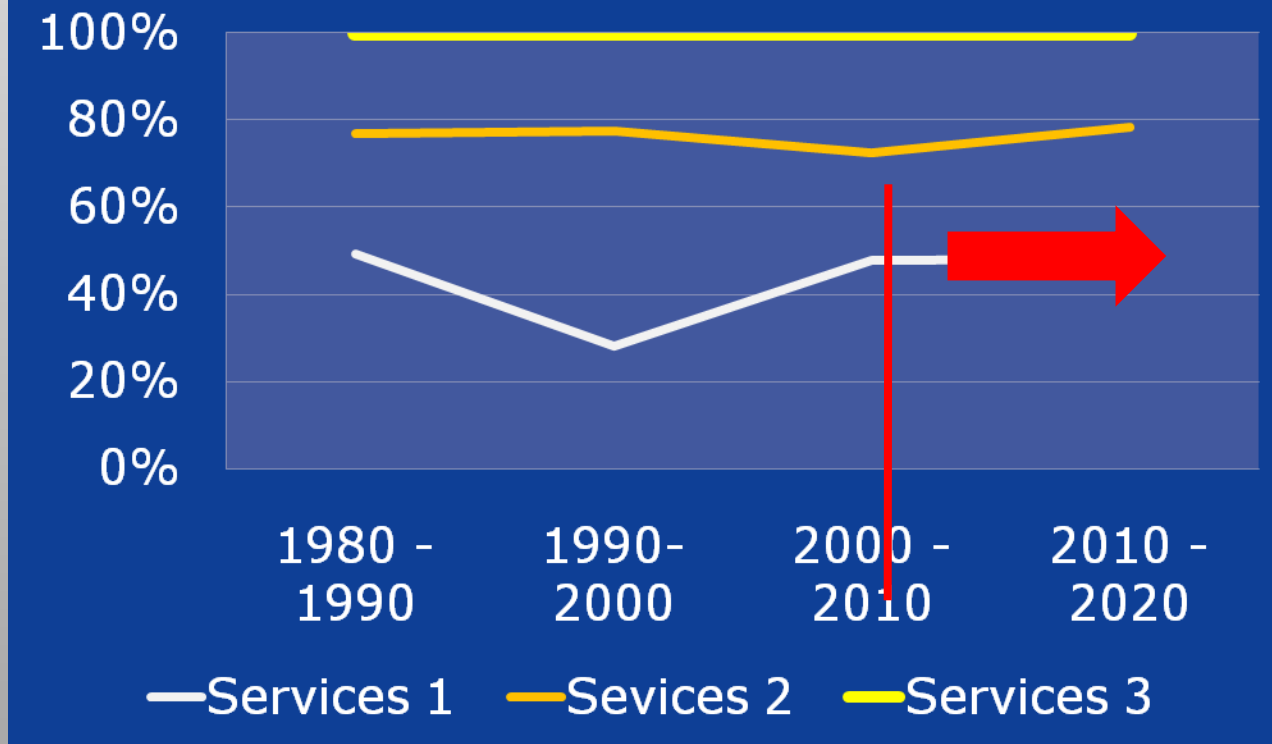


# Stakeholder View of the Organisation

# **Two assumptions are in place when making projections:**

- **No change in the organisation's plans, policies, programmes, etc.**
- **The future environment will be what the organisation expects**

## Group Performance



**Reference Projection: Group Performance**

**The current state of the organisation  
and the reference projections are  
now combined into a **scenario** of the  
possible future the organisation will  
face if it were to make no changes in  
policies and practices, and the  
environment changed only in  
expected ways**

## **Reference Scenarios**

- A **believable and compelling** story that reveals the undesirable future implicit in the current state has to be developed
- Management is usually reluctant to share the mess with other stakeholders. This practice not only defeats the purpose for formulating the mess, but is also counter intuitive

Remember - the world is not run by those who are right - it is run by those who can convince others that they are right!





# BREAKING NEWS

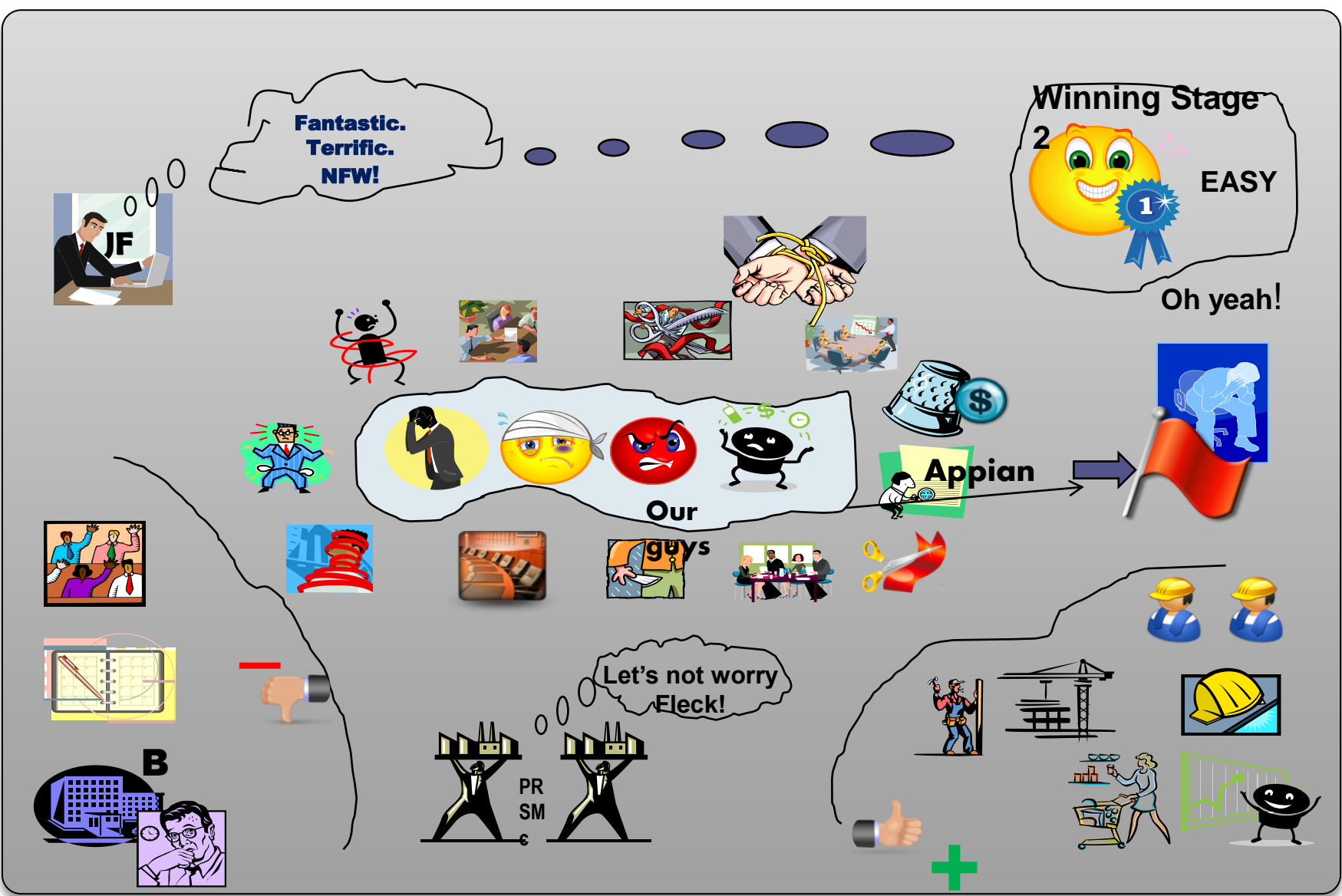
Management Knew of Failing Board Support

In a shock announcement the shareholders of XYZ Pty Ltd have announced the closure of the company with immediate effect.

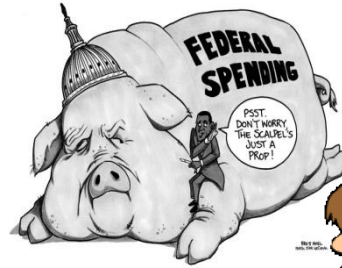
Reasons cited by the board include management's failure to recognise the emergence of new technologies, obsessions with annual bonuses and a loss of key skills due to a neglect in developing retention strategies



## Telling the Story



# Reporting The Mess



CBR003650 [RF] © www.visualphotos.com

www.shutterstock.com - 8473042



27/11/2010 09:32

© Ron Leishman \* www.ClipartOf.com/5839

IFunny.com

# **Idealised Design**

**Begins with the premise that  
the system involved**

**was destroyed last night**

**but its environment remains  
as is**



# **An Idealised Design**

**.....is that design  
you would have right now  
if you could have  
whatever design you wanted**

# AN IDEALISED DESIGN IS SUBJECT TO THE FOLLOWING CONSTRAINTS

It must be  
*Technologically Feasible*  
and  
*Operationally Viable*

**Idealised Design**

**IN ADDITION IT SHOULD BE  
READY, WILLING, AND ABLE  
TO CHANGE ITSELF,  
AND BE CHANGED**

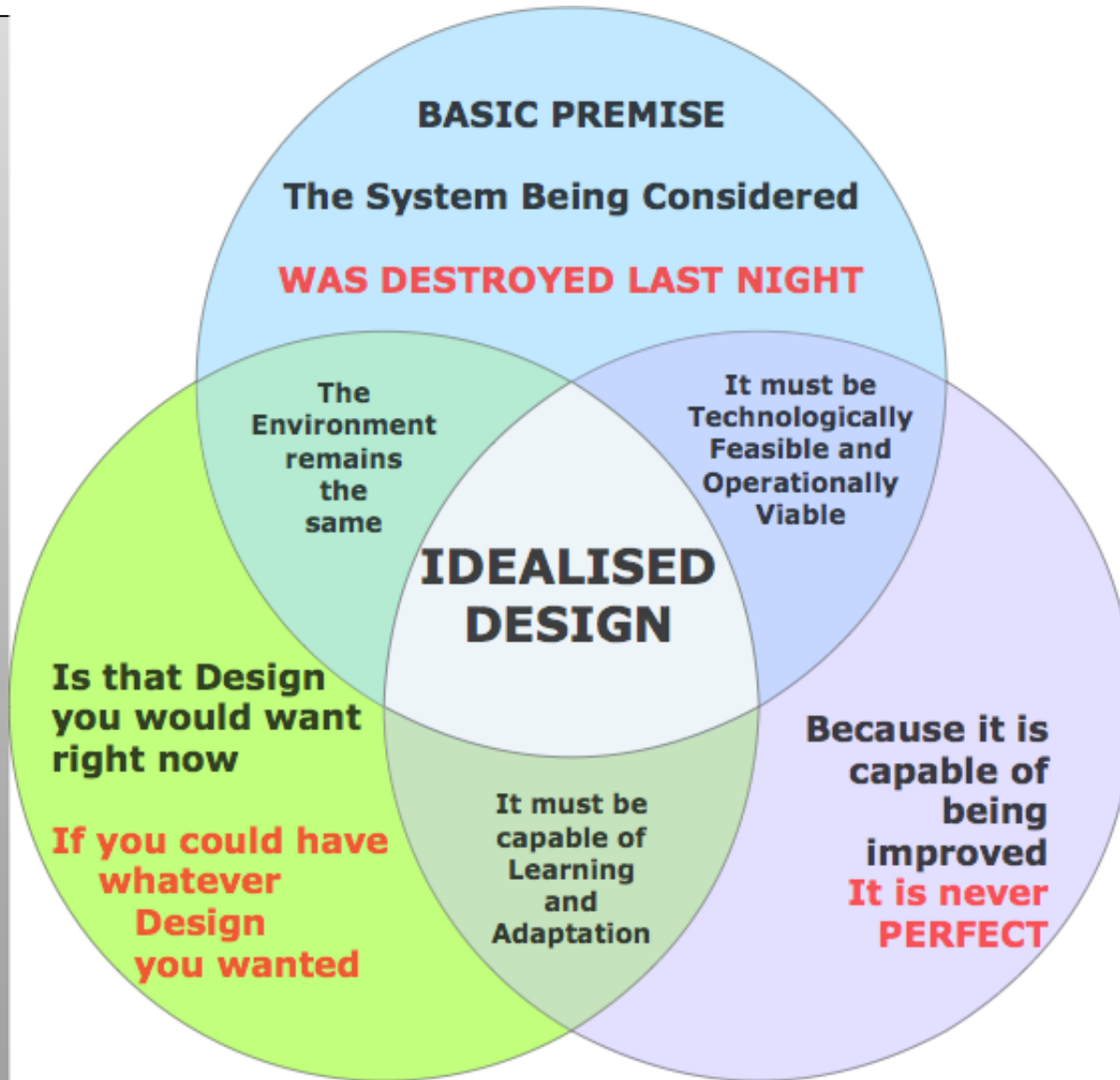
**that is,  
It Must Be Capable Of Learning  
and  
Adaptation**



**THEREFORE,  
THE PRODUCT OF AN IDEALISED  
DESIGN IS NEITHER IDEAL NOR  
UTOPIAN**

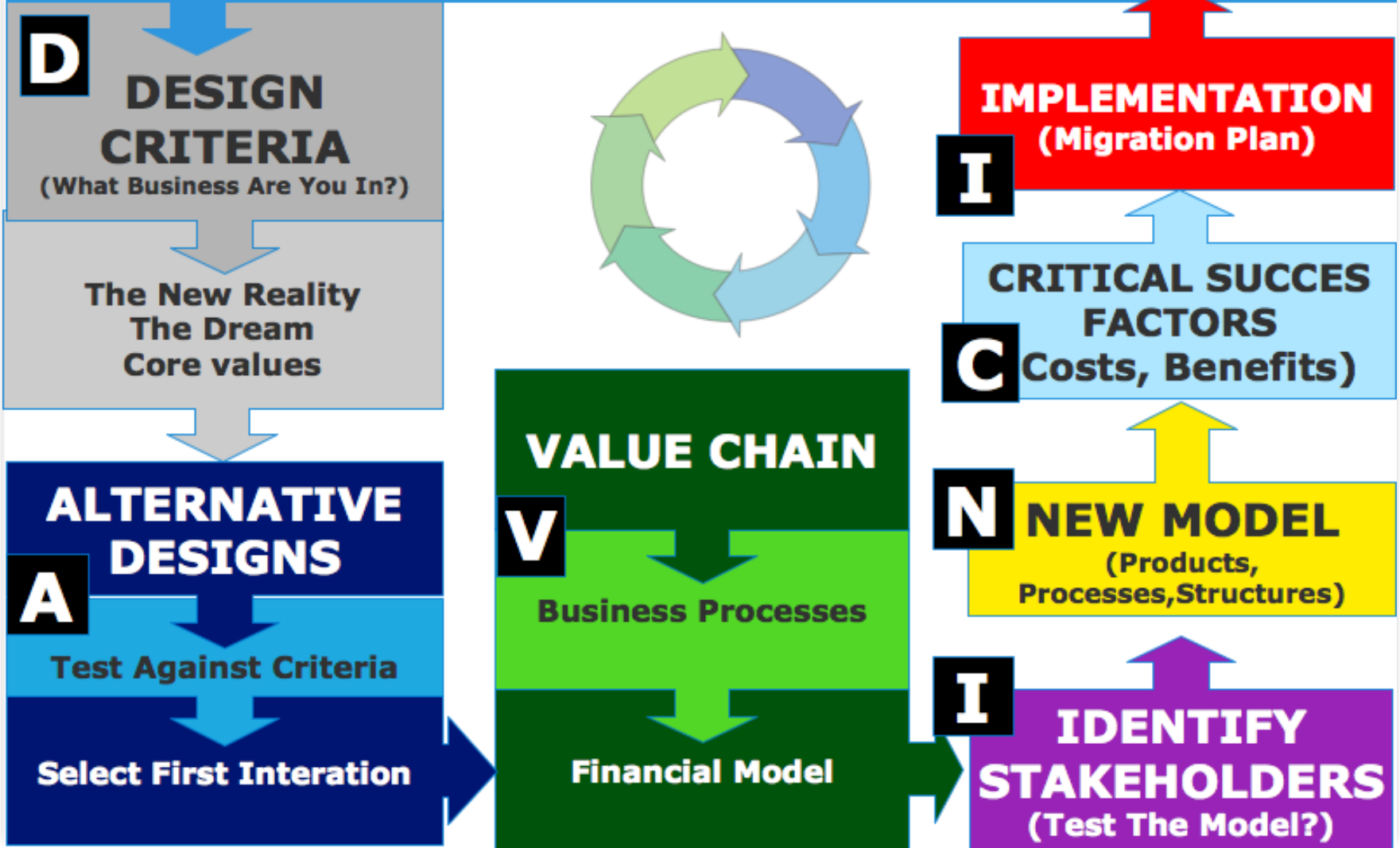
**Because it is capable of being  
improved,**

**IT IS NEVER PERFECT**



# IDEALISED DESIGN

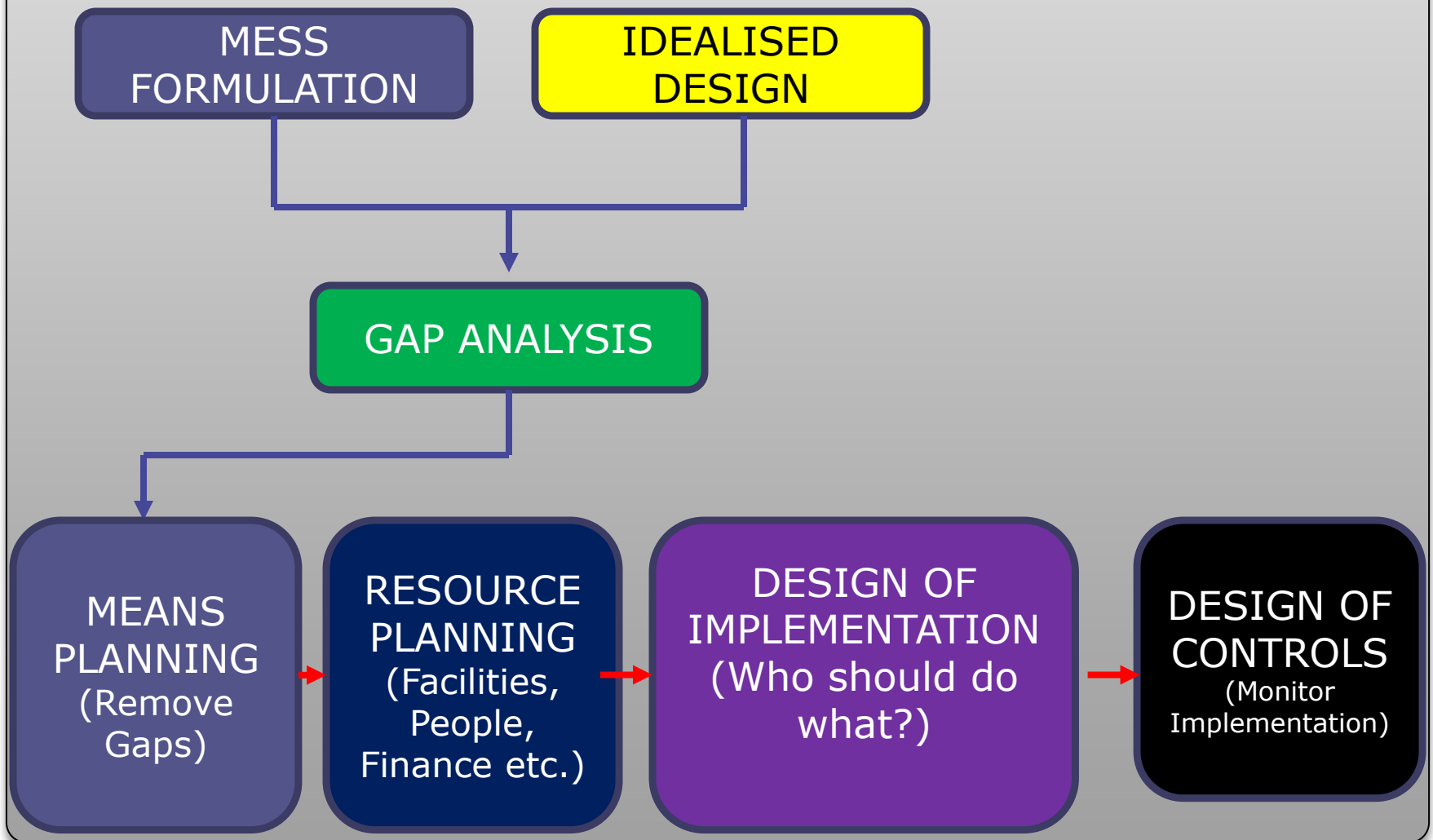
# DA VINCI IDEALISED DESIGN PROCESS



## Idealised Design - Iteration

- **D = Design Criteria** -designing the new future state of the organisation/system – what business are you in?: including values
- **A = Alternative designs** – assess impact
- **V = value chain** – business process – operationalising the dream (partnering, change management, capacity building, subcontract, assemble, despatch, retail outlet)
- **I = identifying stakeholders** – getting their views on the new vision
- **N = new products/processes/structure**
- **C = critical success factors/cost benefit analysis**
- **I = implementation** – the migration plan

# The Design Process

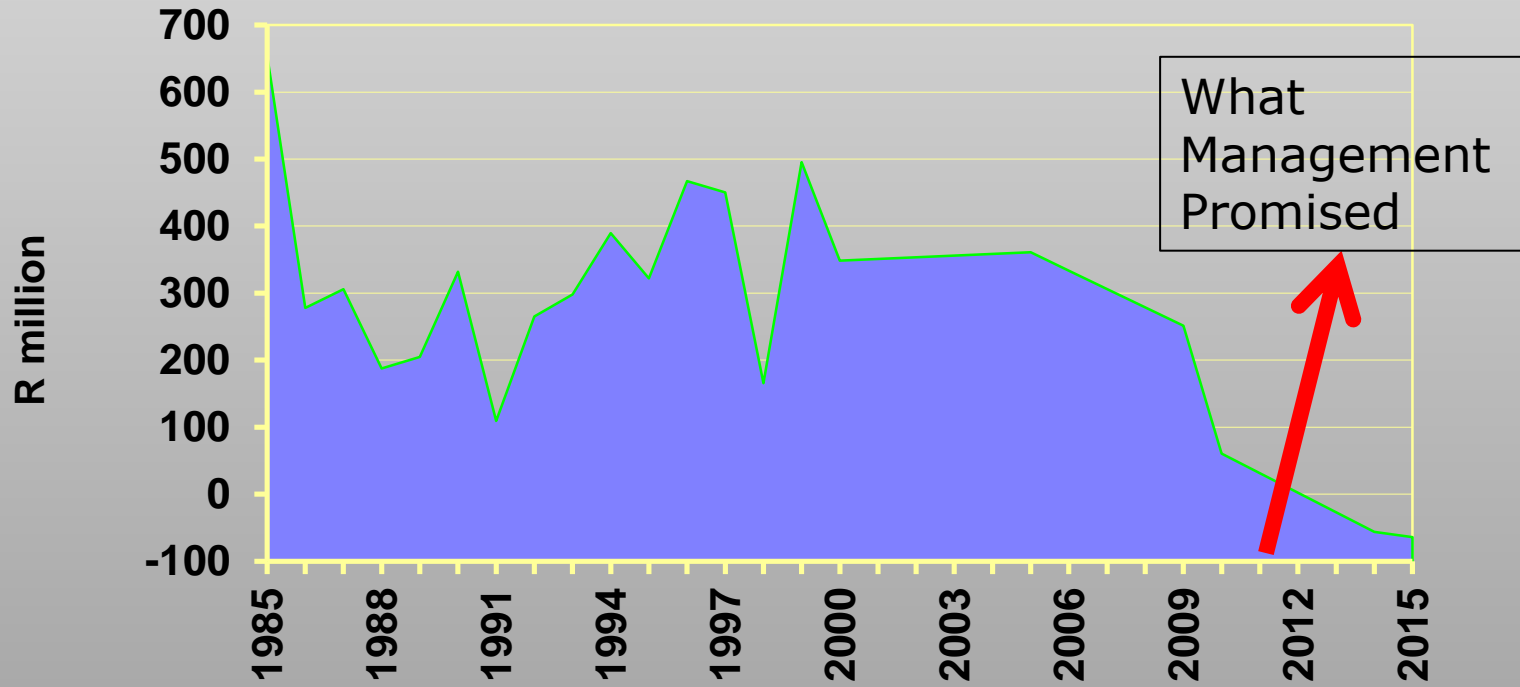


# The Interactive Planning Process

## ■ Major Commercial Electronics Company:(Mess Formulation)

- Has one major customer
- Spate of sporadic resignations
- Mess team finds out that the customer is building an expertise base from the Electronics Company
- The mess team also revealed that the reference projection for a recovery was not feasible.

## Total Pre-tax Income



**Reference Projection: Income**



## ■ Major Commercial Electronics Company: (Ideal Design)

- Design team a number of young researchers and designers
- Their dream was driven by a desire to take all their ideas as well as a cupboard full of abandoned projects and come out with a totally new integrated product
- They are now launching the new product which bypasses their customer and will take on their existing customer's, customers

## ▪ **Opera Company Mess Formulation**

- Declining audiences
- Serious mismatch between the board and the management
- Very old school and dogmatic about following the rigid classical line
- Bleeding financially
- Too reliant on donor funding

**FROM EXCLUSIVITY TO  
INCLUSIVITY WITH A DIFFERENCE**

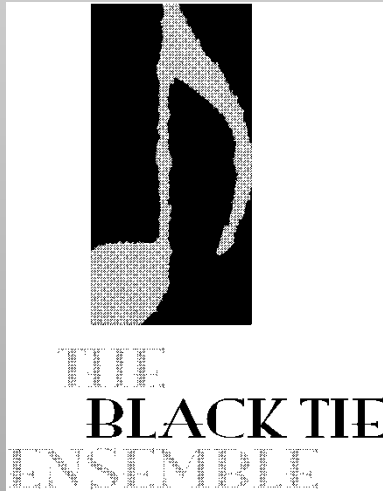


# Reporting The Mess

## ▪ **Opera Company Ideal Design**

- A vocal company which can transcend several genres
- Ability to provide a suite of services from entertainment to function design, to supply of specialist equipment
- Taken the first steps –
  - Board resigned
  - Several singers could make the transition
  - New positioning in the market place

**FROM EXCLUSIVITY TO  
INCLUSIVITY WITH A DIFFERENCE**



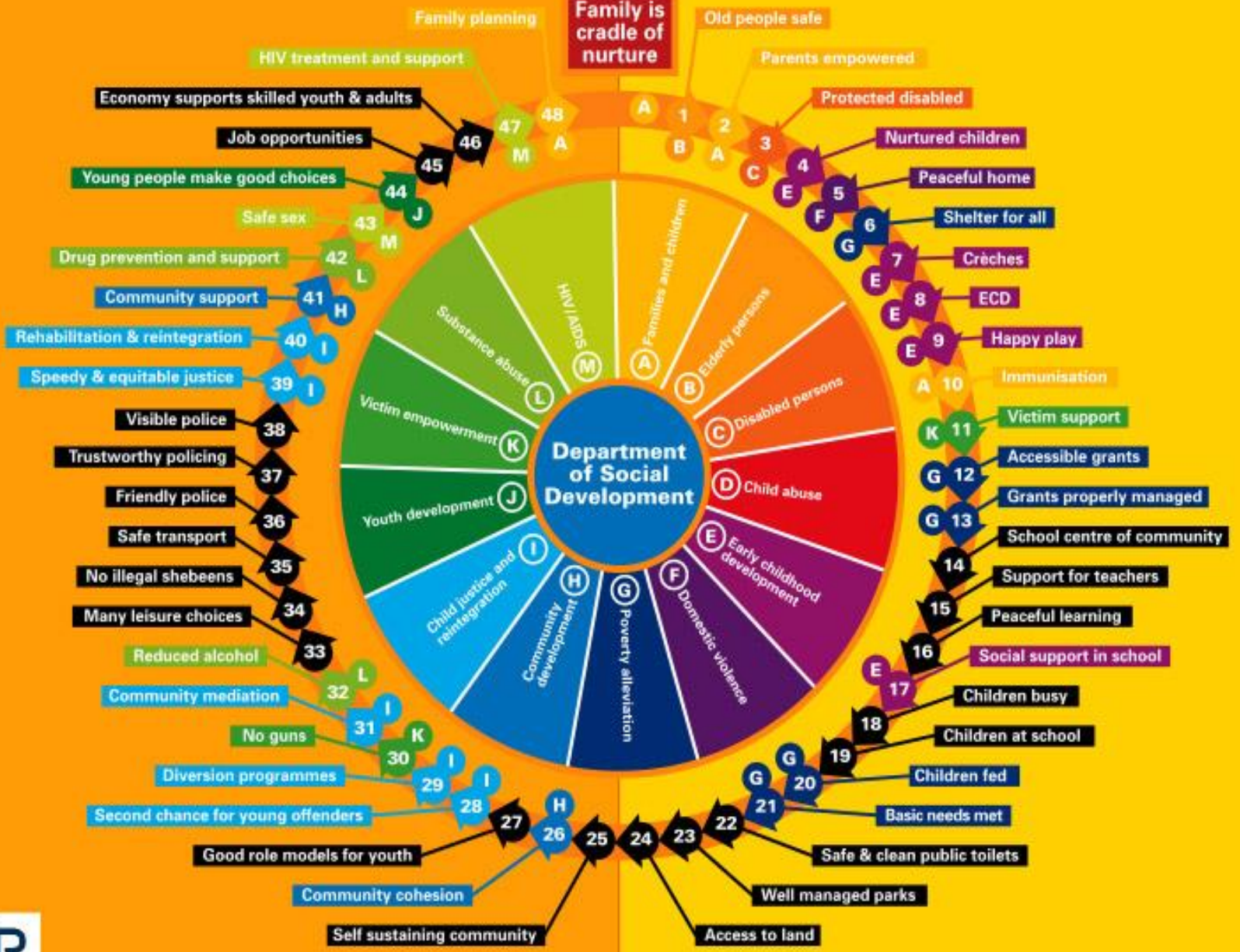
**FROM BTE TO VO1SS**

# CYCLE OF CRIME AND VIOLENCE





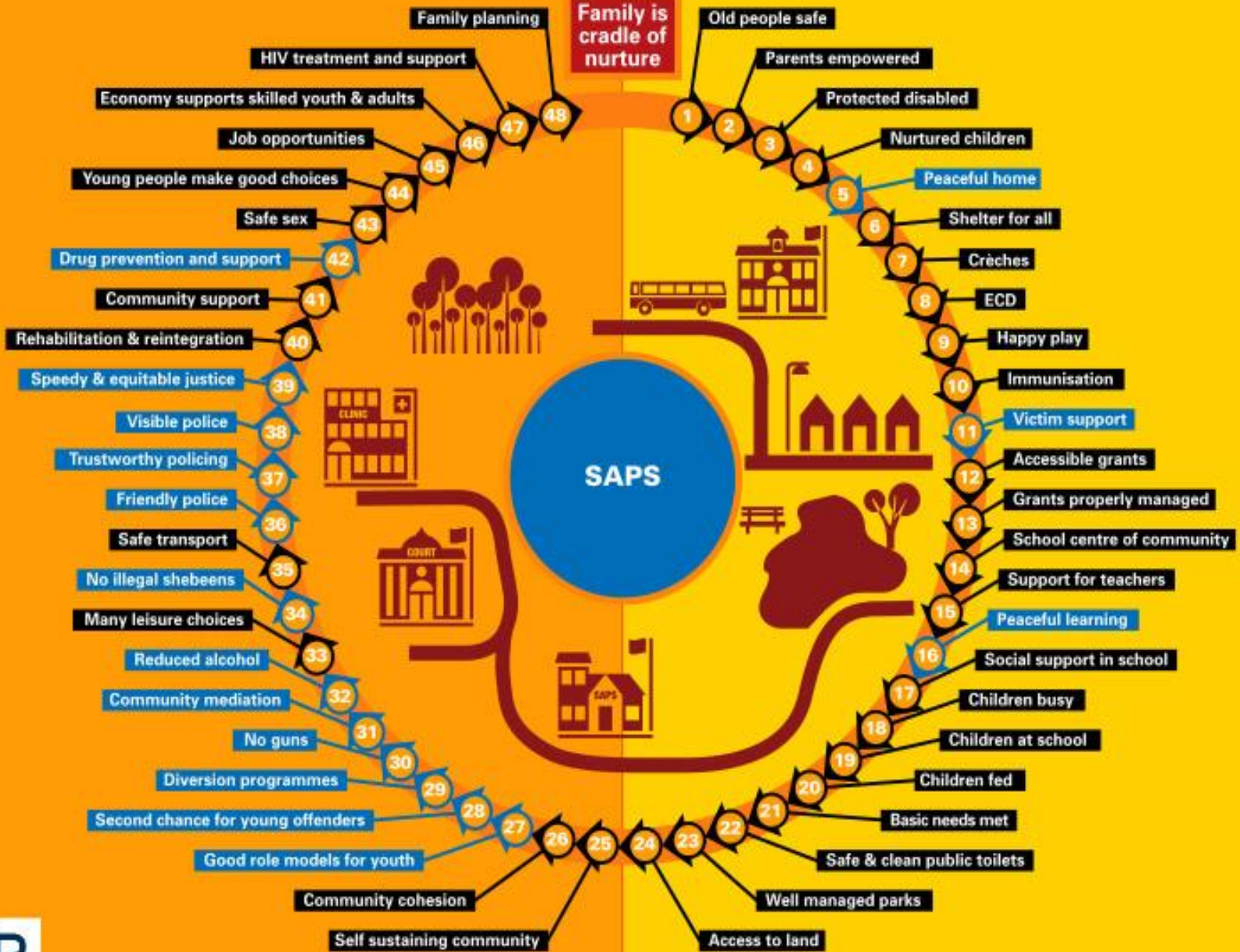
**Family is cradle of nurture**





# Family is cradle of nurture

## SAPS



THANK YOU