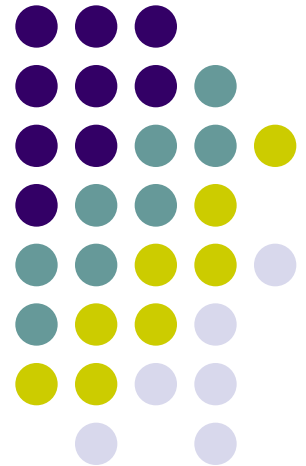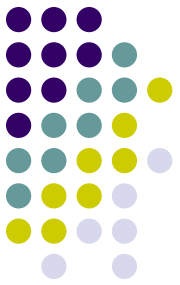# Add-on Unit.

Introduction to
problem solving framework

Dr. Nguyen Manh Tuan

9/2014

AGENDA

Science

Guarantors of the truth

Inquiry/Research Paradigm

Systems Thinking
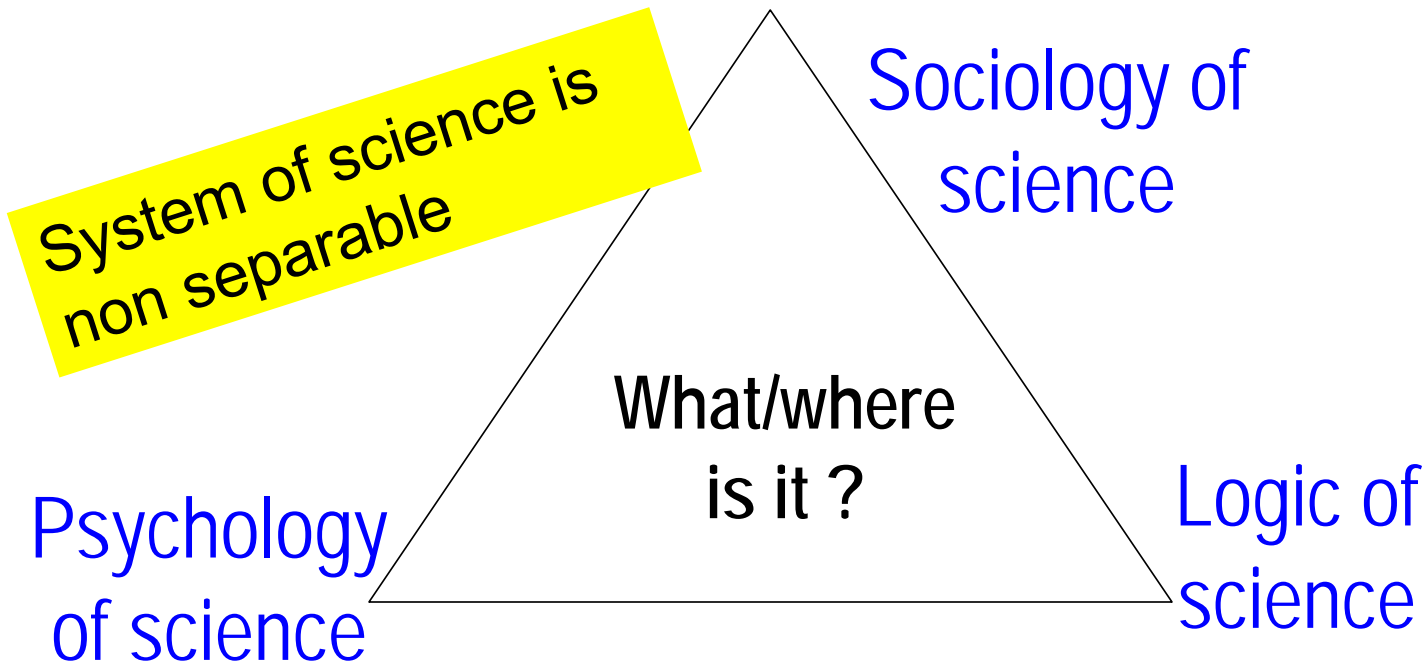
Systems Thinking for Management

Case Study Method for Learning

Science

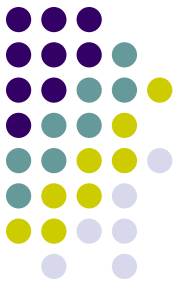Science as a body of knowledge
Science as what scientists do
Science as a social institution

Science as a whole

System of science is non separable

Sociology of science

What/where is it ?

Psychology of science

Logic of science

Adapted from Mitroff (1974)

Science

Categories of science, influenced by Simon's (1969) science of the artificial
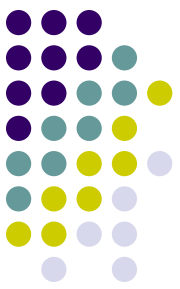
- ❑ natural science vs. science of the artificial (Simon 1969);
- ❑ natural vs. design science (March & Smith 1995);
- ❑ behavioral vs. design science (Hevner et al 2004);
- ❑ scientific vs. engineering discipline (Long & Dowell 1989); or
- ❑ explanatory vs. design sciences (van Aken 2004)

(truth) - building and justification of theories of description, explanation and prediction of real world phenomena

(utility) - design and implementation of artifacts for solving and improving real world problems

Science

Churchman's guarantors of truth

Singer: give all a voice - interdisciplinary

Locke: empirics

Singer Element
Giving All A Voice

Locke Element
Empirics

Leibniz Element
Logic/Algebra

Kant Element
Explanation Why

Hegel Element
Alternatives

Leibnitz: logic

Kant: explanation why - syntheis

Hegel: dialectical alternative

Boundary: Argument is real; scientific knowledge is insufficient; multiple interpretations.
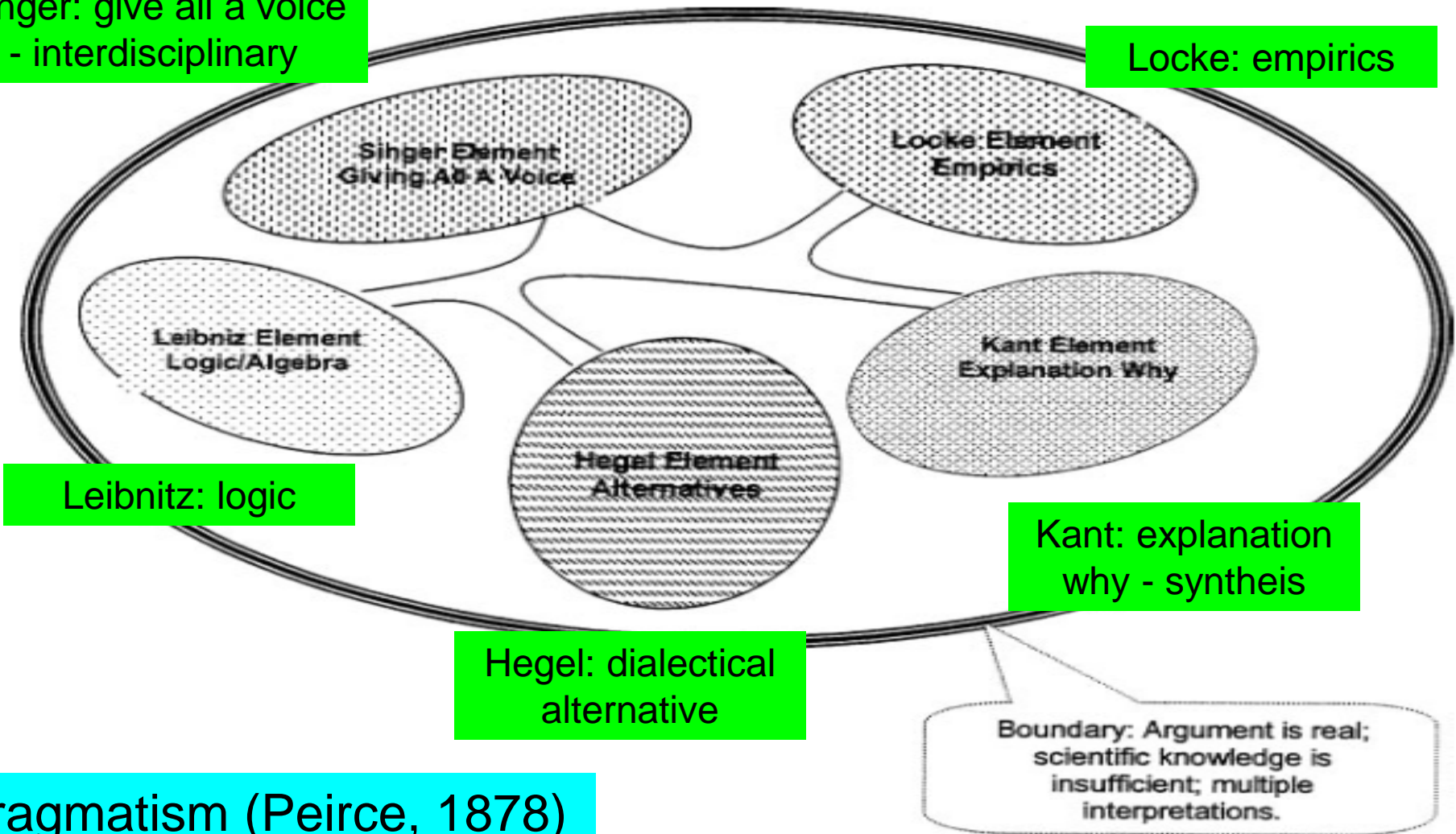
Pragmatism (Peirce, 1878)

Inquiry/Research Paradigm

embodied
in
Methodology M.P.
applied
to
Area of
Concern
A

Framework of
ideas F

yields

learning
about

Community

Any piece of inquiry (Checkland & Holwell, 1998)
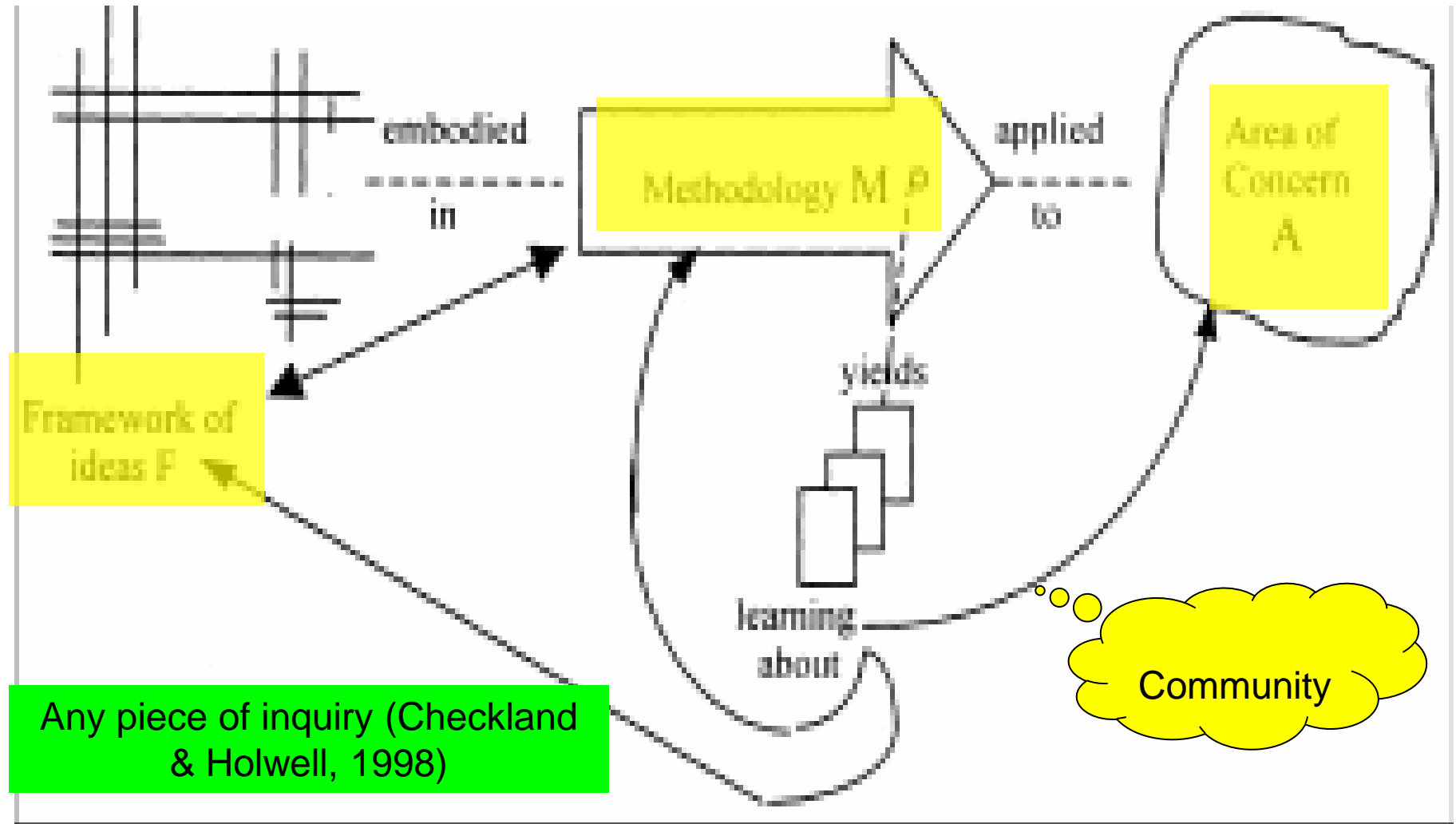
Inquiry/Research Paradigm

British (Lockean) empiricism – induction

French (Descartian) rationalism - deduction
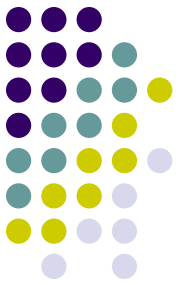
American (Peircean) pragmatism – abduction

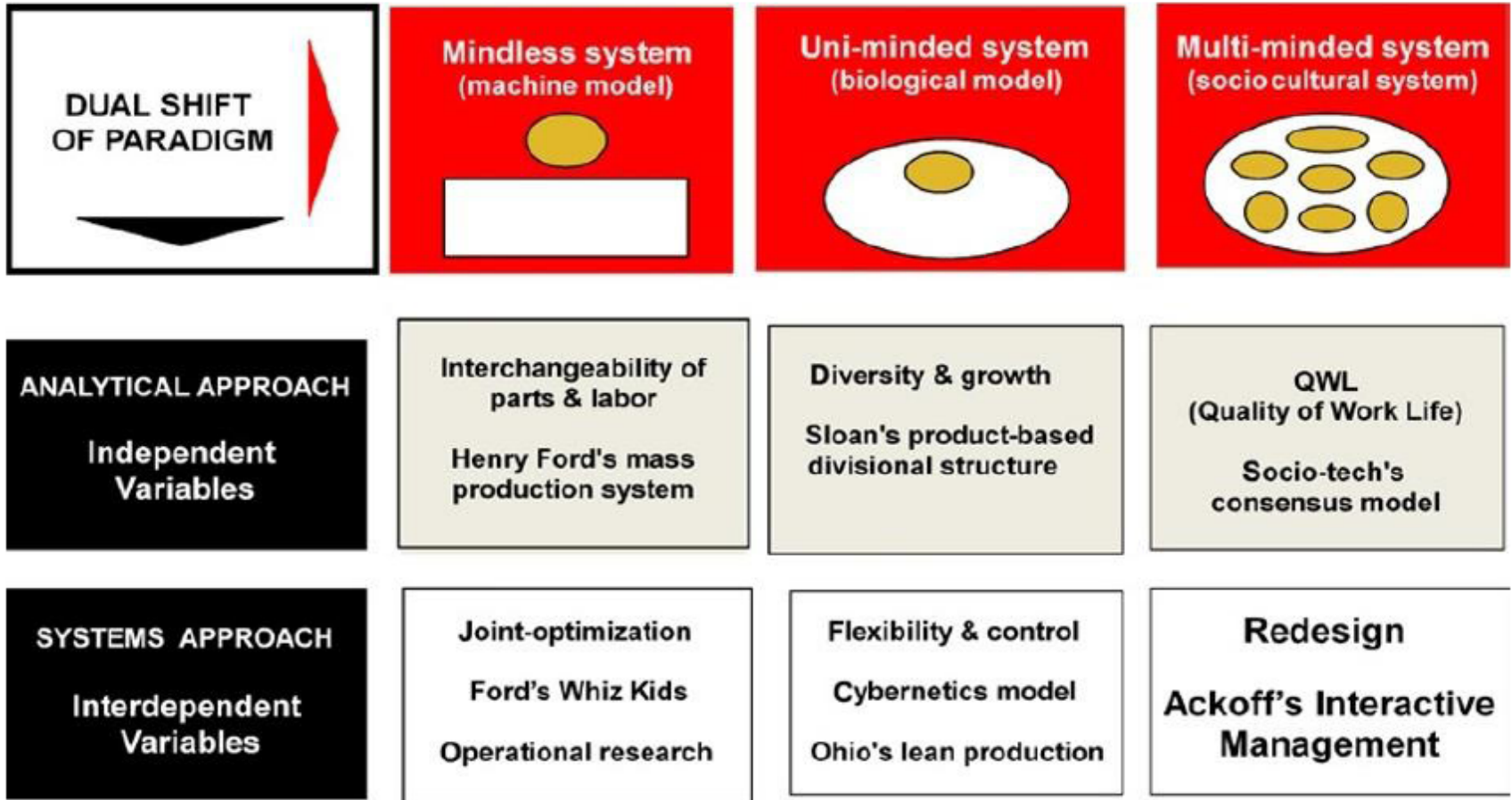|	Logic of justification		Logic of discovery
	deduction	induction	abduction
given	rule	case	rule
given	case	result/fact	result/fact
conclusion	result/fact	rule	case

SYSTEMS THINKING

Gharajedaghi, 2011

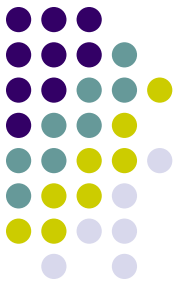| DUAL SHIFT OF PARADIGM	Mindless system (machine model)	Uni-minded system (biological model)	Multi-minded system (sociocultural system)
ANALYTICAL APPROACH Independent Variables	Interchangeability of parts & labor Henry Ford's mass production system	Diversity & growth Sloan's product-based divisional structure	QWL (Quality of Work Life) Socio-tech's consensus model
SYSTEMS APPROACH Interdependent Variables	Joint-optimization Ford's Whiz Kids Operational research	Flexibility & control Cybernetics model Ohio's lean production	Redesign Ackoff's Interactive Management

SYSTEMS THINKING

- **The machine mode of organization**
  - It has no purpose of its own.
  - It is a tool with a function defined by the user, an instrument for the owner to use to achieve his goal of making profit. The important attribute of this tool is its reliability, and its performance criterion is simply efficiency
  - The parts of a mindless mechanical system, just like the whole, have no choice.
  - Its structure is designed into it, leaving it with no ability to restructure itself.
  - The system functions reactively and can operate effectively only if its environment remains stable or has little effect on it

SYSTEMS THINKING

- ## The biological mode of organization
  - An organization is considered a uni-minded living system (e.g. a human being), with a purpose of its own.
  - To survive, biological beings have to grow by exploiting their environment
  - Growth is the measure of success, the single most important performance criterion, and that profit is the means to achieve it.
  - In contrast to the machine mode, in which profit is an end in itself, profit, for the biological mode, is only a means to an end. The association of profit with growth, considered a social good, gives profit the much needed social acceptability.

SYSTEMS THINKING
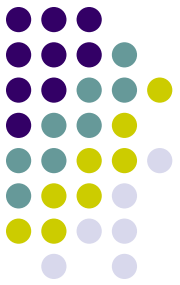
- **The socio-cultural mode of organization**
  - A socio-cultural view considers the organization a voluntary association of purposeful members who manifest a *choice* of both ends and means.
  - An entity is purposeful if it can produce (1) the same outcome in different ways in the same environment and (2) different outcomes in the same or a different environment.
  - An entity that can behave differently but produce only one outcome in all environments is goal-seeking, not purposeful
  - The result is a hierarchy of purposeful systems of three distinct levels. These three levels are so interconnected that an optimal solution cannot be found at one level independent of the other two. Aligning the interest of the purposeful parts with each other and that of the whole is the main challenge of the system.
  - For social organizations the problem of integration is a constant struggle and a continuous process

SYSTEMS THINKING
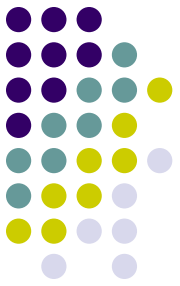
- The successive shift in our understanding of the nature of the organization, from a mindless mechanical *tool*, to a uni-minded biological *being* and, finally, to a multi-minded *organized complexity*

- Mechanical systems are *energy-bonded*
- Socio-cultural systems are *information-bonded*

SYSTEMS THINKING

Gharajedaghi, 2011

Table 2.1 Behavioral Classification of Systems

Behavior Process	Means Structure	End Function
Passive Tools	No choice, One **structure** in all environments	No choice, One **function** in all environments
Reactive State Maintaining	No choice Variable but Determined	No choice, One **function** in all Different environments
Responsive Goal seeking	Choice of means Variable and Chosen	No choice of ends Variable but Determined
Active Purposeful	Choice of means Variable and Chosen	Choice of ends Variable and Chosen

SYSTEMS THINKING

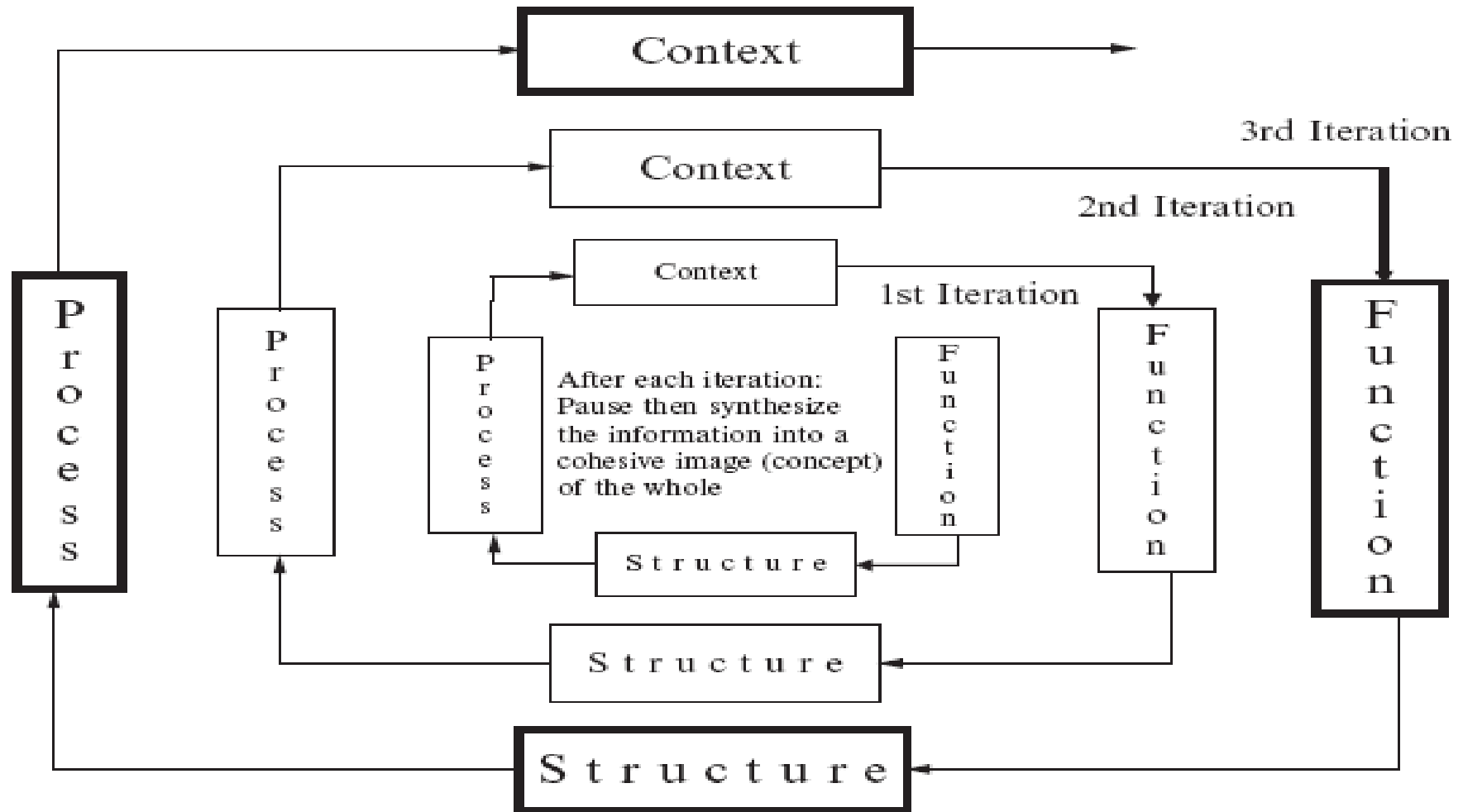FIGURE 5.4 Iterative process of inquiry for understanding complexity.
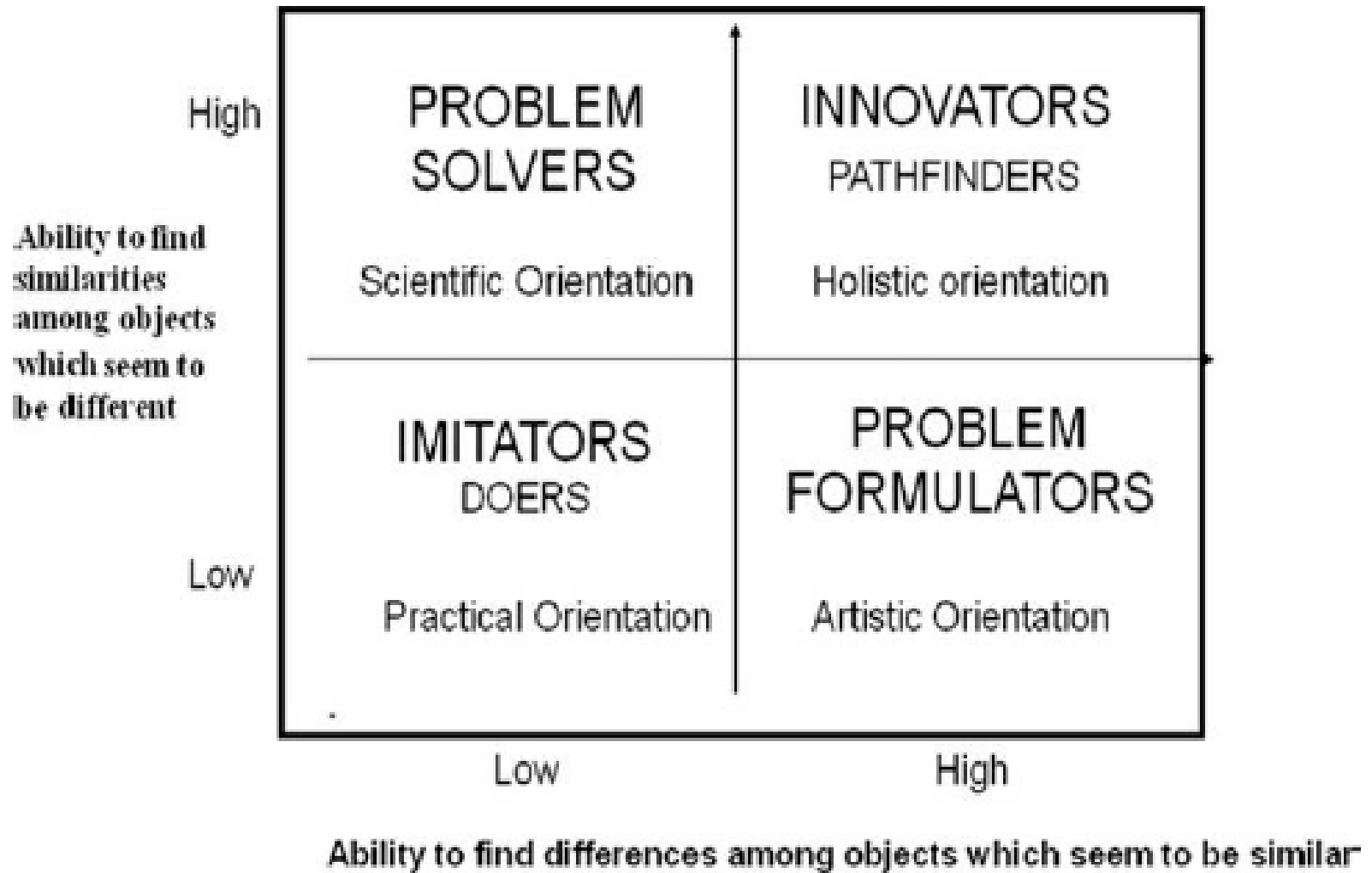
SYSTEMS THINKING

FIGURE 2.11 Innovative abilities.

SYSTEMS THINKING

- 4 different ways to deal with conflict: **solve, resolve, absolve, or dissolve**

  - To *absolve* a conflict is to wait it out, hoping that, if ignored, it will go away

  - To *solve* a conflict is to select a course of action believed to yield the best possible outcome for one side at the cost of the other; a win/lose

  - To *resolve* a conflict is to select a course of action that yields an outcome good enough and minimally satisfactory to both the opposing tendencies; a compromise.

  - To *dissolve* a conflict is to change the nature and/or the environment of the entity in which it is imbedded, thus removing the conflict.

    - To dissolve a conflict is to discover new frames of reference in which opposing tendencies are treated as complementary in a new ensemble with a new logic of its own. It requires reformulation or, more precisely, re-conceptualization of the variables involved.

    - Finally, to dissolve a conflict is to redesign the system that contains the conflict, creating "a feasible whole from infeasible parts."
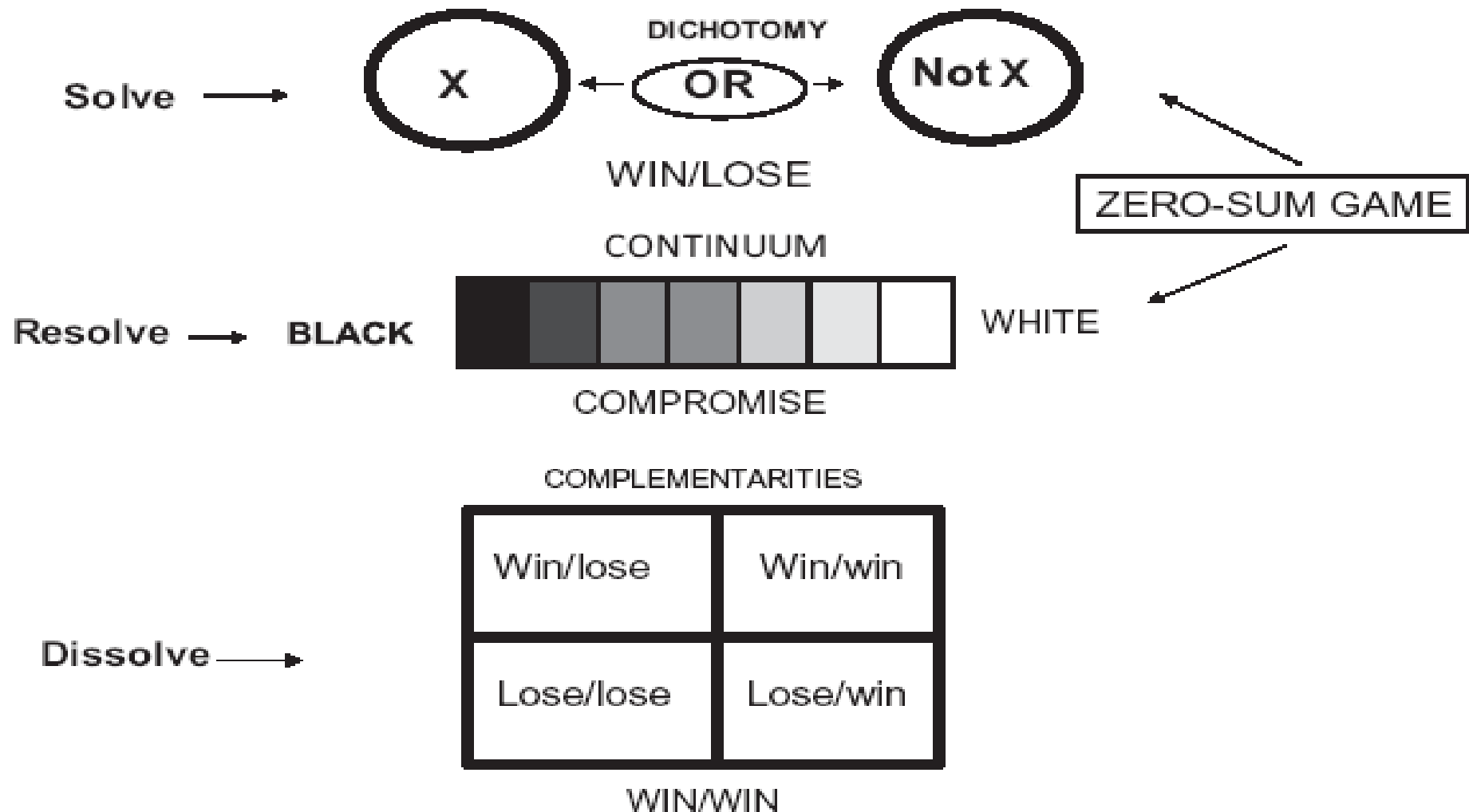
SYSTEMS THINKING

FIGURE 5.10 Nature of Conflict.

Ex: 'Systems Concepts' for Questioning

- Designing IT policy for Venezuela as the problem domain

Perspectives	Possible Questions
Purpose	- What was purpose of IT and an IT policy? - What is purpose of "self organisation"? - What purposeful actions are required, what resources and performance measures are relevant? - What purpose will stakeholders give to a self-organisation policy?
Boundary	- What is included in an IT policy? - What is to be excluded? - What is meant by self organisation, what does it include? - What are the sub and supra systems that IT, policy and self organisation operate within.

Metcalfe 2005

Ex: 'Systems Concepts' for Questioning

Stakeholders	• Who are the stakeholders, what is their worldview on this problem? • Who has how much power? • Who can block, who can help with the system? • Is consensus or agreement likely? • What are the concerns of those involved?
Analysis vs Synthesis	• Has this problem occurred elsewhere in the world? • Has this occurred with any other policy? • How is the Government functioning, what role is it performing? • How do other parts of the economy work? • What is the IT policy analogous to? • If the policy is a symptom, what is the disease?

Metcalfe 2005

Ex: 'Systems Concepts' for Questioning

TOP	• What are the Things, Organisations and People involved? • How will a scientist, a sociologist and a psychologist see the problem?
Connectivity	• What is IT part of, what is the bigger system involved? • What is the generic form of IT policy? • What is the connection with science, communications and commerce? • What is the history of this problem? • What evidence that the present IT policy has not worked? • Do leaderless or self organisation systems exist?

Metcalfe 2005

Ex: 'Systems Concepts' for Questioning

|	
Process, Transformation move border over?	• What would an IT policy change into what? • What are the inputs and outputs *Metcalfe 2005* • What are the feedback mechanisms between systems? • What are the IT policy making processes?
Contradictions, Underlying Tensions	• What are the underlying tensions that have created the absence of a self-organising IT policy? • What are the competitive contradictions that have resulted in the problem? • What will emerge if the situation stays the same? • Can a competitive discussion be set up to broaden the thinking about this solution?

Ex: 'Systems Concepts' for Questioning

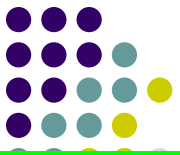| Learning From Actions	- What is the ideal, and why? - What trials (experiments) could be undertaken to understand the problem better? - What actions would inform those involved with not forming the policy?

Metcalfe 2005

Ex: "TOP + Synthesis" for Questioning

Metcalfe 2005
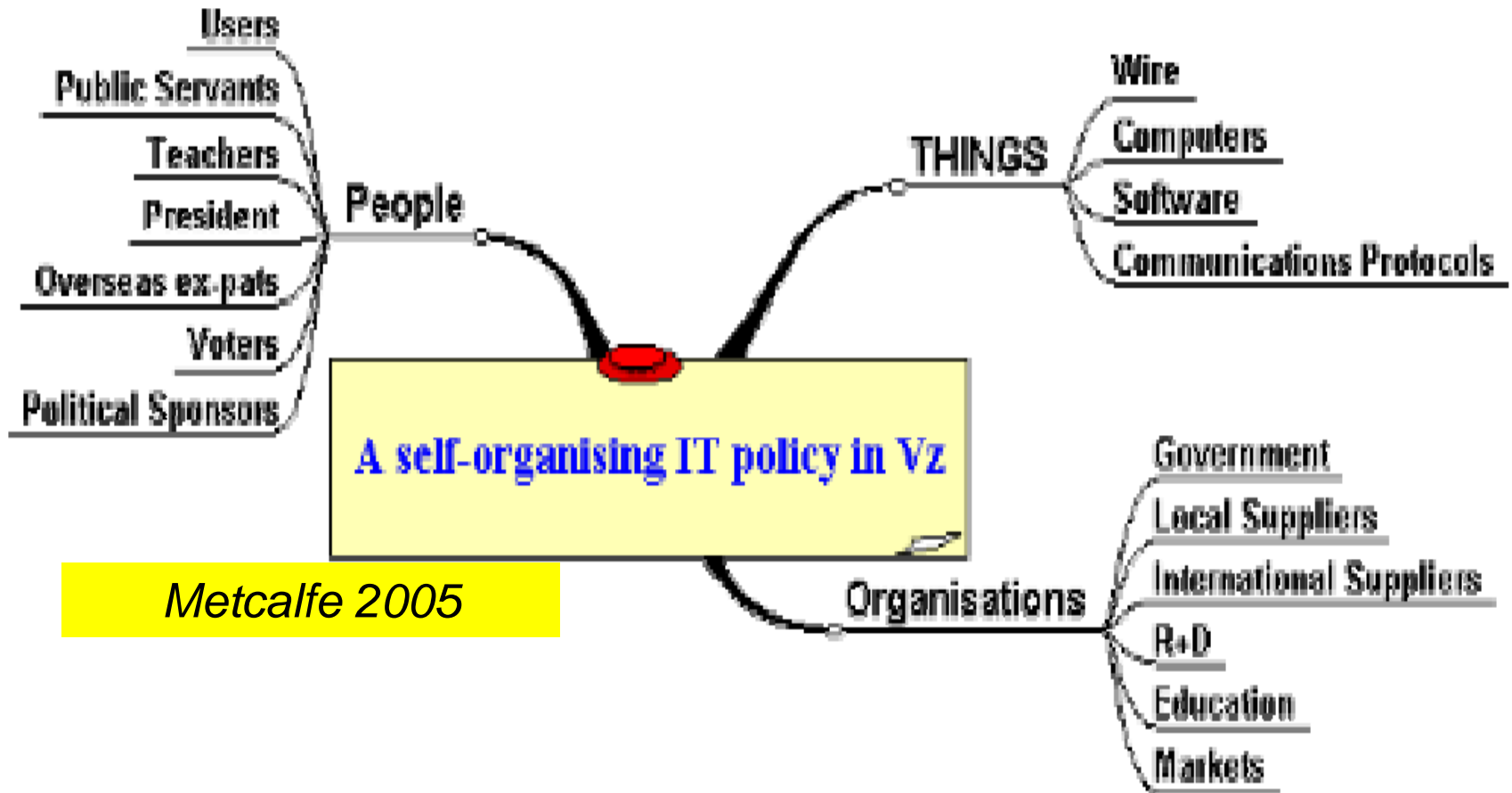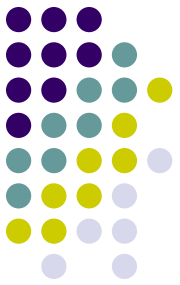
SYSTEMS THINKING

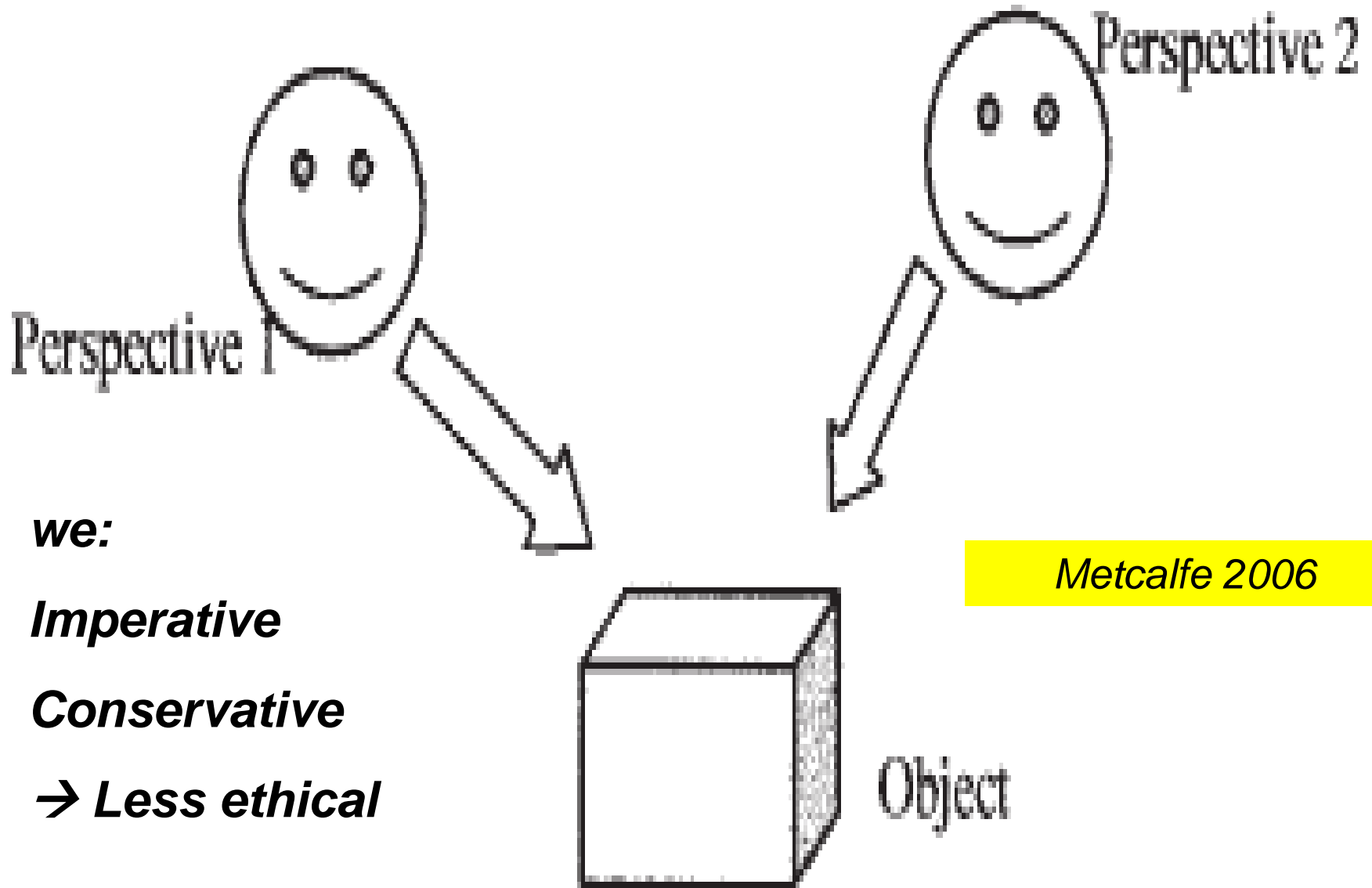| Machine-age thinking	Systems-age thinking
industrial revolution, analysis, reductionism, cause-effect relations, determinism value free	post-industrial revolution, synthesis, Butterfy Effect expansionism, producer-product relations, free will and choice value full Chaos Theory

- ❑ Reaction to failures of natural science to complex, real-world problems of social sciences (Checkland 1981)
- ❑ Hard – Soft – Critical systems thinking

Systems thinking: "Synthesise don't analyse!

Ethical (Churchman 1971)

SYSTEMS THINKING

Perspective 1

Perspective 2

Metcalfe 2006

Object

we:

Imperative

Conservative

→ Less ethical

SYSTEMS THINKING

Scientific Thinking: only 1 system – 1 universe, 1 truth (Metcalfe, 2006)

- ❑ **Concept list: boundary, purpose, stakeholder, process, contradictions, ….**

  - ➤ *Systems thinking vs. science thinking: boundary (Ackoff, 2000)*

- ❑ **Unit of analysis, mentally imagined, interconnected, bounded** (Metcalfe, 2006)

- ❑ **Multiple Perspective:** To be ethical, argument should give all stakeholders a voice and encourage innovative rationally justified ways of seeing situations (Churchman, Mason, Mitroff, Linstone)

Linstone (1984, 1993) TOP perspectives

(technical, organizational, personal)

Systems Thinking for Management

1) **Reality = interrelated systems of problems**, **NOT** problems taken separately; **MESSY PROBLEMS**

➢ **Destroy the whole by improving performance of parts separately !?**

➢ **Optimal performance of a part does not prevent the bankruptcy of the whole !? (Banathy 2001)**

2) **Management at interactions of parts**, **NOT actions of parts separately**

3) **Real world problems mostly are NOT best treated where they appear**

4) **Problems are disciplinary in nature. WRONG!**

Systems Thinking for Management

5) 3 different ways to deal with real world problems
(absolution →) Resolution → Solution → Dissolution

Learning, creativity ++

❑ **Problem resolving: satisficing; experience, trial & error; "clinical" approach to planning**

❑ **Problem solving: optimization; scientific methods; "research" approach; contained parts**

❑ **Problem dissolving: idealization; design approach; containing whole**

→ *Problem dissolving = synthesis of problem resolving + problem solving*
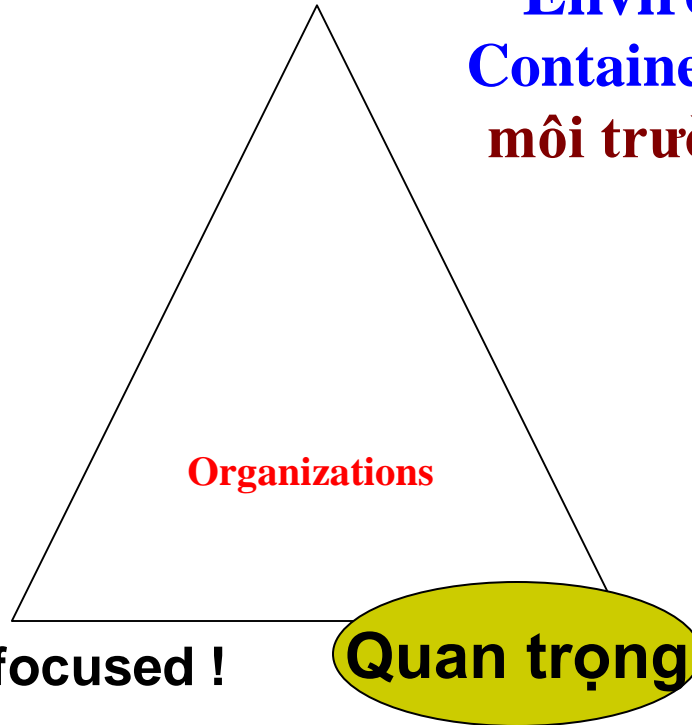
Systems Thinking for Management

Organization as purposeful social system

3 organizing problems

Environmentalization, Container, 3rd ness, Mục tiêu môi trường, thiết chế ngoài

Self-control, System, 1st ness, Mục tiêu tổ chức đang xét

Organizations

Humanization, Parts, 2nd ness, Mục tiêu nhân viên, bộ phận

currently 1st problem focused !

Quan trọng

Các vấn đề trong tổ chức đều có tương quan – "mess" (Ackoff 1973)

CASE STUDY METHOD FOR LEARNING (Ellet 2007)

- In the *lecture* method, learners receive knowledge from an expert.

- In the *case* method, learners make the knowledge with the assistance of an expert.

  - This fundamental shift causes many new case method students to be confused and uncertain about how they should go about learning.

- *Persuasion through argument*

CASE STUDY METHOD FOR LEARNING (Ellet 2007)

What? (conclusion)
The president is right to default on the country's foreign debt.

[because]

Why? (reason)
Full payment of the debt will destabilize the country.

Evidence

1. Debt payments will take money out of the country that is badly needed to support the economy and meet social needs such as education and healthcare.

   Evidence includes historical narrative showing that past economic downturns have impoverished the population and created political conflict that worsened the economic situation.

2. National finances are depleted.

   Evidence includes data and calculations showing that poor management of the economy has resulted in deficit spending and spotty tax collection.
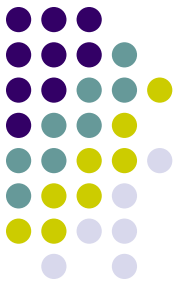
3. The national economy is just beginning to recover.

CASE STUDY METHOD FOR LEARNING (Ellet 2007)
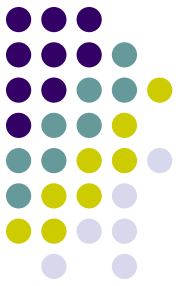
- Working on cases:

C1. Situation

C2. Questions

C3. Hypothesis

C4. Proof and action

C5. Alternatives

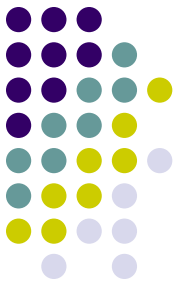# CASE STUDY METHOD FOR LEARNING (Ellet 2007)

C1. Situation (5 minutes)

- Understanding the big picture first and then filling it in with details.

- Start by asking this question: ***What is the situation?***

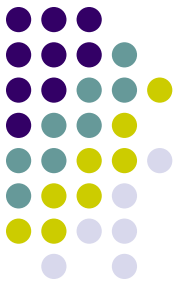- Usually reading the *first* and *last* sections of the case is sufficient to identify the situation

CASE STUDY METHOD FOR LEARNING (Ellet 2007)

Later …

- After reading the openings and closing sections, you should put the case aside *for a moment* and consider what you have learned.
  - Is the situation a *problem, decision, or evaluation?*
  - Do you have any ideas about the causal frameworks or criteria that might fit the situation?
  - Does it seem you'll have to cut through a large amount of information in the case or make many inferences because the information is scarce?
  - Are there any hints in the two sections about causes, criteria, or even a plausible decision or evaluation?
  - Do the hints seem reliable or just a way to throw you off?
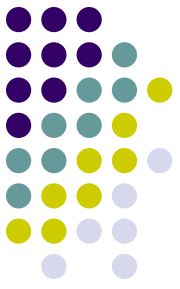
CASE STUDY METHOD FOR LEARNING (Ellet 2007)

C2. Questions (15 minutes)

- The most important = *What do I need to know about the situation?*

C21. PROBLEM

- Who or what is the subject of the problem (e.g., a manager, a company, a country)?

- What is the problem? Am I trying to account for a failure, a success, or something more ambiguous?

- What's the significance of the problem to the subject?

- Who is responsible for the problem (usually it is the protagonist) and what might he need to know to do something about it?
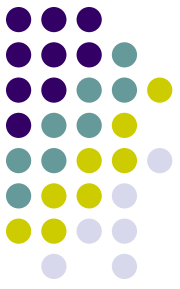
CASE STUDY METHOD FOR LEARNING (Ellet 2007)

- You won't be able to answer these questions now. That will take further study.
  - To do a content inventory.
  - To build a map of the useful content.
    - Because cases often aren't linear in their organization, this map is very important; pieces of information related to the same issue will be found in different sections of the case and in the exhibits.

Later …

C3. Hypothesis (45 minutes)

- *The most important phase of work on the case*

- Through close study of high value sections and exhibits, you narrow the possibilities to the one *that seems most plausible to you*

- My hypothesis is wrong?

  - *A hypothesis isn't wrong*; a hypothesis fails when you can't make a credible argument for it from case evidence

CASE STUDY METHOD FOR LEARNING (Ellet 2007)

C31. PROBLEM

- Make sure you know the problem that needs to be diagnosed. Consider whether the characteristics of the problem suggest causes.

- Think about the frameworks that seem most appropriate to the situation. Quickly review the specifics of the frameworks if you aren't sure of them.

- Pursue the diagnosis by looking at case information through the lens of the cause you are most certain about.

- For each cause, make a separate pass through the case looking for evidence of it.

- If the case has a lot of quantitative evidence, to what cause is it most relevant? If you don't have a cause relevant to the quantitative evidence, formulate one. Work up as much relevant, high-value quantitative evidence as you can.

- In a case with a protagonist, consider whether she is a potential cause. If you think she is, work out how she contributes to the problem.

# CASE STUDY METHOD FOR LEARNING (Ellet 2007)
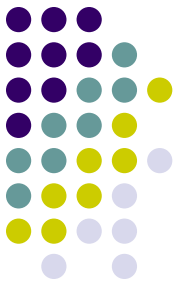
C4. Proof and Action (40 minutes)

- You want to prove something, not look for something to prove.

- ***Ask these questions:***
  - What evidence do I have that supports the hypothesis?
  - What additional evidence do I need?

- Go back into the case, with the single purpose of bringing out more evidence that aligns with your hypothesis.

- You don't have to work from the first page to the last. You can go directly to the sections and exhibits you think have what you need.

- Of course, you can work from beginning to end if that makes you more comfortable. Just be sure to stay focused on what you're trying to prove

CASE STUDY METHOD FOR LEARNING (Ellet 2007)

Later …
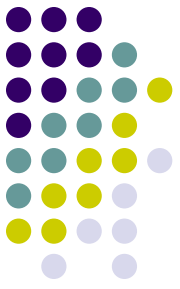
- Also give some thought to the actionable content of your position.
  - How would you implement the decision you're recommending?
  - What actions does your diagnosis or evaluation call for? Think in practical, real-world, not ideal-world, terms.
  - Don't just sketch out in your mind a broad approach to action.
  - Think about tangible actions and write them down.
  - Finally, give a bit of thought to the order of the actions. An action plan is a program in which actions are taken at a certain time for a reason. It isn't a to-do list.
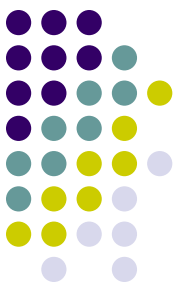
C5. Alternatives (15 minutes)

- The last phase of analysis should be *to question your own hypothesis:*
  - What is the greatest weakness of the hypothesis? What is the strongest alternative to it?

C51. PROBLEM

- Can the problem be defined differently? Would that make a difference to the diagnosis?
- Are there any holes in the diagnosis—could there be causes missing?
- What's the weakest part of the diagnosis?
- Could an entirely different diagnosis be made? What would it look like?

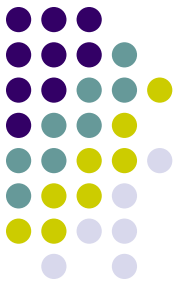# CASE STUDY METHOD FOR LEARNING (Ellet 2007)

- **Characteristics of case-based essays:**

  1. Answers 2 questions - What? Why? - and often a third - How?

  2. Makes a *position statement* (What?)

  3. Uses *evidence* to persuade the reader (Why?)

  4. If needed, provides an *action plan* (How?)

Case-based essay Q&A

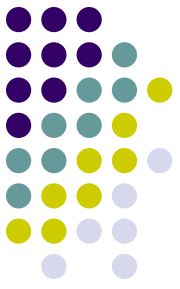| Question	Answer
What?	Position statement (expresses a conclusion)
Why?	Argument
How?	Action plan

CASE STUDY METHOD FOR LEARNING (Ellet 2007)

E1. An essay on a **problem** situation has 4 parts:

1. Problem definition
2. Diagnosis
3. Proof of causes
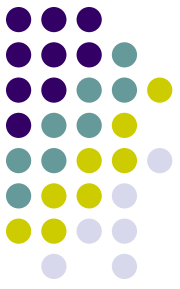4. Action plan

CASE STUDY METHOD FOR LEARNING (Ellet 2007)

E2a. Decision essays have 6 elements:

State-and-prove order

1. Recommended decision (position statement)
2. Decision options
3. Decision criteria
4. Proof of recommended option
5. Critique of options
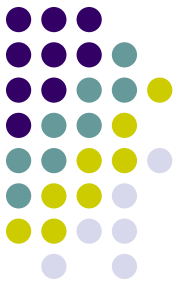6. Action plan

CASE STUDY METHOD FOR LEARNING (Ellet 2007)

E2b. **Decision** essays have 6 elements:

Prove-and-state order

1. Decision options
2. Decision criteria
3. Critique of other options
4. Proof of remaining option
5. Recommended decision
6. Action plan

CASE STUDY METHOD FOR LEARNING (Ellet 2007)

E3. An **evaluation** essay has 5 elements:

   1. Bottom-line evaluation (position statement)

   2. Evaluation criteria

   3. Proof of the evaluation

   4. Qualifications

   5. Action plan

CASE STUDY METHOD FOR LEARNING (Ellet 2007)

What action plans do

Case situation	Argument	Action plan
Problem	Prove cause-effect relationships that account for problem	Solve problem: fix weaknesses and reinforce or increase strengths
Decision	Recommend best decision	Implement decision: show the best pathway to achieve desired outcome
Evaluation	Provide detailed evaluation of performance, act, or outcome	Improve performance or outcome; implement or change decision

Later …

CASE STUDY METHOD FOR LEARNING (Ellet 2007)

- An effective action plan has 5 characteristics:
  - Sets goals based on the argument
  - Addresses the actionable content of the argument
  - Consists of specific steps
  - Has realistic short- and long-term steps
  - Identifies and responds to the major risk to the plan

Later …

THE END