

Two major misconceptions of Systems Thinking exposed

Some knowledge of Systems Thinking required

Version 1.0.2

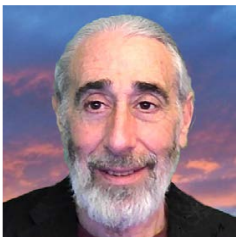
BCS Webinar
3 April 2023

Joseph Kasser
Bruce Lerner

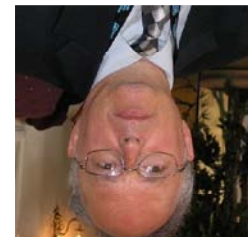
Two Major Misconceptions of Systems Thinking exposed

1

Why you should watch this video




1. If you are having problems actually applying systems thinking you are not alone.
2. We explain two of the misconceptions that are thwarting your use of systems thinking
3. Stay to the end to find out how you can get a **free gift** that will help you understand critical thinking and systems thinking and beyond



Two Major Misconceptions of Systems Thinking exposed


2



Two Misconceptions of Systems Thinking

1. Reductionism doesn't work, you need to use systems thinking instead
2. "Open" and "closed" systems are different types of systems

Two Major Misconceptions of Systems Thinking exposed 3

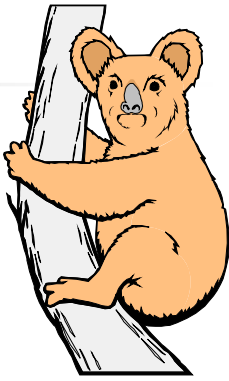


Overview - synopsis

1. Misconception 1 is based on a misunderstanding of "in isolation"
 - Reductionisms and Systems Thinking are analysis tools for understanding different types of situations
 - Both can suffer from blind spots
 - "in isolation" has a place in the process of gaining an understanding
2. Misconception 2 came about by people always bounding the same system of interest (SOI) and only dealing with one type of problem
 - The observer bounds the SOI to suit the problem
 - Always consider both the internal and external perspectives when assessing a problem
3. Introduces the updated systems approach
 - Combines the best of Reductionism and Systems Thinking
 - **Builds on the General Systems Theory (GST)** to provide a methodology which minimizes blind spots and provides a universal systemic and systematic approach to identifying and remedying complex problems.

Two Major Misconceptions of Systems Thinking exposed 4

Topics



1. Who we are
2. First misconception
3. Second misconception
4. Introducing the updated systems approach
5. Conclusions
6. Lessons learned
7. The free gift

Two Major Misconceptions of Systems Thinking exposed 5

Who we are: Joseph Kasser



1. Doctor of Science in Engineering Management (GWU)
2. Fellow of the Institute of Engineering and Technology
3. Chartered Engineer (UK and Singapore)
4. ICPM Certified Manager
5. INCOSE Fellow (1995 - 2018)
6. Award winning 40-year international career in industry
 - E.g. NASA's Manned Spaceflight (Silver Snoopy) Award, 1991
7. An international reputation as a leading academic, iconoclast and original thinker in systems engineering
 - United States Air Force (USAF) Office of Scientific Research Window on Science program visitor, 2004
8. Author of *The System's Thinkers Toolbox* and seven other books on systems engineering, systems thinking and project management
9. Awards, letters and certificates of appreciation from employers, and clients

Two Major Misconceptions of Systems Thinking exposed 6

Who we are: Bruce Lerner


1. B.S. Computer Eng. ('81)/M.S. Management of Engineering ('91)
2. Certified SDMRM Trainer ('99)
3. Certificate in Systems Engineering ('05)
4. IEEE 1986-present, INCOSE 1997-present
5. 2 Patents (communications network & dispatching)
6. 25 years contributing to and managing teams developing software controlled electro-mechanical systems
7. Process manager for software processes and early systems engineering deployment.
8. Revitalized the innovation process by refocusing it on the DOD/DHS TRL definitions and integrating this technology pipeline process into the existing corporate stage gate business process
9. Coaching Structured Decision Making/Risk Management techniques and develop tools



Two Major Misconceptions of Systems Thinking exposed

7

Topics

1. Who we are
2.  **First misconception**
3. Second misconception
4. Introducing the updated systems approach
5. Conclusions
6. Lessons learned
7. The free gift



Two Major Misconceptions of Systems Thinking exposed

8

Misconception 1: Reductionism doesn't work

Many systems thinkers tend to dismiss reductionism because their perception is

- Examining parts in isolation does not provide information about the system's behaviour
 - *"The behavior of a system cannot be known just by knowing the elements of which the system is made".*
 - Donella H. Meadows; Diana Wright. Thinking in Systems: A Primer (Kindle Location 264). Chelsea Green Publishing. Kindle Edition, 2008

1. This statement does not feel right
2. Reductionism does work in some situations

Reductionism [philosophy]*

"Reductionism, in philosophy, a view that asserts that entities of a given kind are identical to, or are collections or combinations of, entities of another (often simpler or more basic) kind or that expressions denoting such entities are definable in terms of expressions denoting other entities".

"Thus, the ideas that physical bodies are collections of atoms or that a given mental state (e.g., one person's belief that snow is white) is identical to a particular physical state (the firing of certain neurons in that person's brain) are examples of reductionism".

* <https://www.britannica.com/topic/reductionism>, accessed 4 December 2022

Reductionism [psychology]*

- "Reductionism is the belief that human behavior can be explained by breaking it down into smaller component parts."
- "Reductionists say that the best way to understand why we behave as we do is to look closely at the very simplest parts that make up our systems, and use the simplest explanations to understand how they work."**
 - "Reductionism is based on the scientific assumption of parsimony - that complex phenomena should be explained by the simplest underlying principles possible**. Strong supporters of reductionism believe that behavior and mental processes should be explained within the framework of basic sciences (e.g. physiology, chemistry....)"

* <https://www.simplypsychology.org/reductionism.html>, accessed 4 December 2022

** Occam's Razor

Reductionism to Systems Thinking

- The term "Reductionism" originated in 1925*, to describe in retrospect, the successful methodology used throughout history up to and including the machine age to gain an understanding of what were then perceived as complex problems (not for solving the complex problem)
- The meaning of Reductionism has evolved since then in different ways
- The term Systems Thinking was introduced in 1950 as a result of a paradigm shift in the concept of a "complex system"

* Merriam-Webster Dictionary on-line viewed 2023-02-1: <https://www.merriam-webster.com/dictionary/reductionism>

** Ludwig von Bertalanffy, "An Outline of General System Theory," The British Journal for the Philosophy of Science, Vol. 1, No. 2 (Aug., 1950), pp. 134-165

Ackoff's timeline*

1. World War II marked the beginning of the end of what might be called the Machine Age, an age that began with the Renaissance
2. The dominant mode of thought in the Machine Age was called analysis
3. Like a child, man sought **understanding by means of a three-step process**:
 1. taking apart the things he wanted to understand,
 2. trying to understand how these parts worked,
 3. assembling his understanding of the parts into an understanding of the whole
4. Machine-Age man, who believed in the possibility of complete understanding, also believed it could be derived from understanding ultimate indivisible parts, elements
5. The doctrine based on these beliefs is called **reductionism**

* Russell L. Ackoff, The Future of Operational Research is Past, The Journal of the Operational Research Society , Feb., 1979, Vol. 30, No. 2 (Feb., 1979), pp. 93-104

Two Major Misconceptions of Systems Thinking exposed

13

One source of the misconception



<https://encyclopaedia.hereditorial.com/wiki/Archivo:Bertalanffy.jpg>

*"in the past centuries, science tried to explain phenomena by **reducing them to an interplay of elementary units which could be investigated independently of each other.**"**

"independently of each other" has been misinterpreted to mean understanding the parts "in isolation"

* Von Bertalanffy, L. (1950). An outline of general system theory. *British Journal for the Philosophy of Science*, 1, 134–165. <https://doi.org/10.1093/bjps/1.2.134>

Two Major Misconceptions of Systems Thinking exposed

14

Part of misconception of "in isolation"


1. Taken out of context
2. It's the first step in **creating a model for** understanding some types of situations
3. The variables in the system of interest (SOI) are identified
 - E.g. inputs, the subsystems of the metasytem
4. The effect of each variable on the whole **in isolation** is considered (**one at a time**) to create an equation showing the effect of that variable on the whole
 - All variables are held constant and one is changed
5. The model is then developed from the resulting set of equations
6. Applies to analysis of existing situation, as well as creating a conceptual model

Two Major Misconceptions of Systems Thinking exposed 15

Another source of the misconception

Analysis
(used in Machine age and earlier)

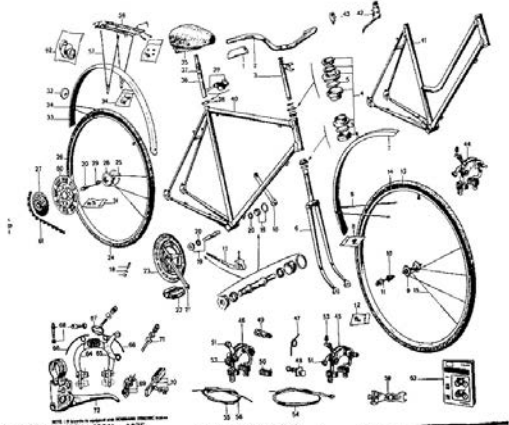

1. "Taking apart the things to be understood"
2. Trying to understand how these parts worked **[in isolation]**
3. Assembling an understanding of the parts into an understanding of the whole"^{*}



^{*} Russell L. Ackoff, The Future of Operational Research is Past, The Journal of the Operational Research Society , Feb., 1979, Vol. 30, No. 2 (Feb., 1979), pp. 93-104

Two Major Misconceptions of Systems Thinking exposed 16

A bicycle

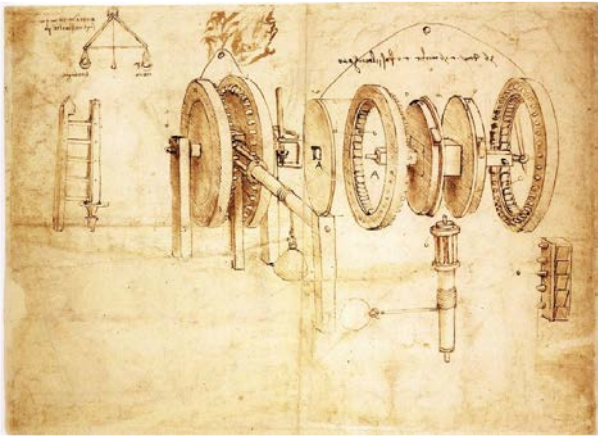


Two Major Misconceptions of Systems Thinking exposed

17

Exploded diagrams

- *“They are a graphical communication technique that shows the relationship between parts by separating them, as if there has been a small ‘explosion’ along an axis.”**
- *“This innovation was a product of the Renaissance ... ”***



Two Major Misconceptions of Systems Thinking exposed

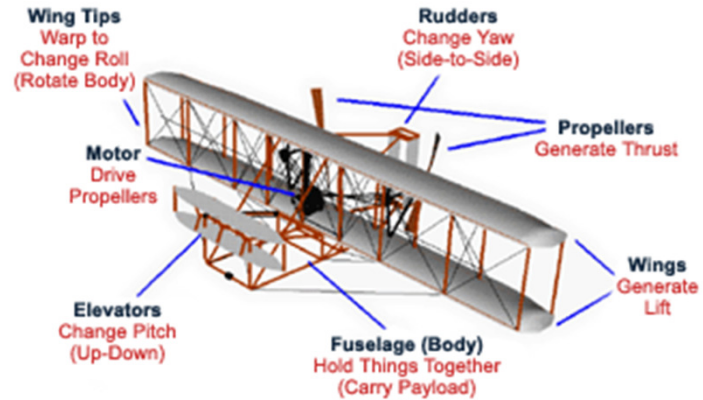
18

* <https://www.bbc.co.uk/bitesize/guides/zrx7xfr/revision/6>, accessed 22 December 2022

** <https://www.domestika.org/en/blog/4278-what-is-exploded-view-drawing>, accessed 22 December 2022

Wright Brother's flier, 1903

Used the 'lift equation' to calculate the amount of lift that a wing would produce



https://www.nasa.gov/audience/foreducators/k-4/features/F_Wright_Brothers_Story.html, accessed 22 December 2022

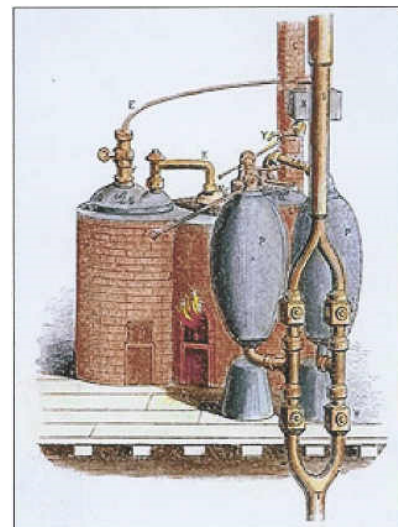
Two Major Misconceptions of Systems Thinking exposed

19

Steam engines

The 1698 Savery Steam Pump - the first commercially successful steam powered device, built by Thomas Savery

By Original: UnknownSource: Institute of Human Thermodynamics and IoHT Publishing Ltd. - <http://www.humanthermodynamics.com/HT-history.html#element59>, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=7711134>



Two Major Misconceptions of Systems Thinking exposed

20



Roman aqueducts



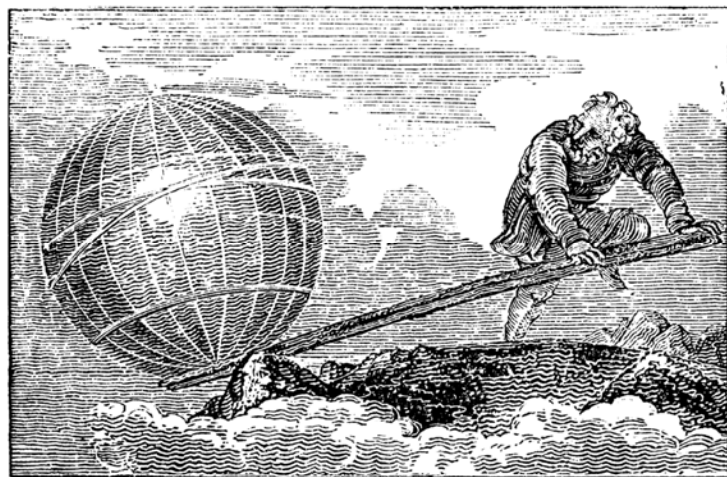
Wiener, J. B. (2017, October 24). **Segovia's Roman Aqueduct**. *World History Encyclopedia*. Retrieved from <https://www.worldhistory.org/image/7485/segovias-roman-aqueduct/>

Two Major Misconceptions of Systems Thinking exposed

21



Archimedes lever



Unknown author - Engraving from *Mechanic's Magazine* (cover of bound Volume II, Knight & Lacey, London, 1824). Courtesy of the Annenberg Rare Book & Manuscript Library, University of Pennsylvania, Philadelphia, USA.

Two Major Misconceptions of Systems Thinking exposed

22

The missing link*

"An understanding of the whole can be achieved only if the relationships between the parts are understood"

*Found in the original paper, BUT not in the subsequent literature that cites the original paper

Key research finding

* Russell L. Ackoff, The Future of Operational Research is Past, The Journal of the Operational Research Society , Feb., 1979, Vol. 30, No. 2 (Feb., 1979), pp. 93-104

Two Major Misconceptions of Systems Thinking exposed

23

Correcting the Popular Misconception

Analysis

(used in Machine age and earlier)

1. *"Taking apart the things to be understood"*
2. *Trying to understand how these parts worked [in-isolation]*
3. *Assembling an understanding of the parts into an understanding of the whole"**



* Russell L. Ackoff, The Future of Operational Research is Past, The Journal of the Operational Research Society , Feb., 1979, Vol. 30, No. 2 (Feb., 1979), pp. 93-104

Two Major Misconceptions of Systems Thinking exposed

24

Reductionism (as it really is)*

1. "Taking apart the things to be understood"
2. Trying to understand how these parts worked
3. Assembling an understanding of the parts into an understanding of the whole
 - "An understanding of the whole can be achieved **only if the relationships between the parts are understood**"*
 - Properly performed reductionism (**analysis**) provides an understanding of the system of interest (SOI)



* Russell L. Ackoff, The Future of Operational Research is Past, The Journal of the Operational Research Society, Feb., 1979, Vol. 30, No. 2 (Feb., 1979), pp. 93-104

Two Major Misconceptions of Systems Thinking exposed

25

Question and answer

- Question
 - If Reductionism was a successful method for gaining an understanding of a situation, why did Von Bertalanffy need to develop and use Systems Thinking for the same purpose?
- Answer
 - It was a change in the perception of the nature of complex problems



Two Major Misconceptions of Systems Thinking exposed

26

General Systems Theory



<https://encyclopaedia.hereditorial.com/wiki/Archivo:Bertalanffy.jpg>

Ludwig von Bertalanffy (1901–1972)

- Stated that concepts of reductionism (“in isolation”) were helpless in appreciating dynamics of organisms
- Expanded concept to all systems (so-called ‘natural’ and ‘man-made’)
- Theorized systems as being ‘open’ and ‘closed’
 - Von Bertalanffy, L. (1950). An outline of general system theory. *British Journal for the Philosophy of Science*, 1, 134–165. <https://doi.org/10.1093/bjps/1.2.134>

Two Major Misconceptions of Systems Thinking exposed

27

Systems Thinking

A three step process*

1. *“A thing to be understood is conceptualized as a part of one or more larger wholes, not as a whole to be taken apart.*
2. *An understanding of the larger containing system is sought.*
3. *The system to be understood is explained in terms of its role or function in the containing system”*



* Russell L. Ackoff, The Future of Operational Research is Past, The Journal of the Operational Research Society , Feb., 1979, Vol. 30, No. 2 (Feb., 1979), pp. 93-104

Two Major Misconceptions of Systems Thinking exposed

28

What about these problems?

A three step process

1. *"A thing to be understood is conceptualized as a part of one or more larger wholes, not as a whole to be taken apart.*
2. *An understanding of the larger containing system is sought.*
3. *The system to be understood is explained in terms of its role or function in the containing system"*

- I have a really bad pain in my side
- David is falling down
- Fred's PC has locked up
- Lily's bicycle has a flat tire
- Our cat does not want to eat anything
- The bus will not start in the morning

* Based on Russell L. Ackoff, The Future of Operational Research is Past, The Journal of the Operational Research Society, Feb., 1979, Vol. 30, No. 2 (Feb., 1979), pp. 93-104

Two Major Misconceptions of Systems Thinking exposed

29

The bus will not start in the morning

A three step process (rephrased)

1. *"A thing to be understood is conceptualized as a part of one or more larger wholes, not as a whole to be taken apart.*
2. *An understanding of the larger containing system is sought.*
3. *The system to be understood is explained in terms of its role or function in the containing system"*

A three step process

1. The bus is a subsystem in at least two larger wholes (metasystems)
 1. Traffic system
 2. Fleet of busses
 - depot, maintenance facilities, etc.

* Based on Russell L. Ackoff, The Future of Operational Research is Past, The Journal of the Operational Research Society, Feb., 1979, Vol. 30, No. 2 (Feb., 1979), pp. 93-104

Two Major Misconceptions of Systems Thinking exposed

30

The bus will not start in the morning

A three step process (rephrased)

1. "A thing to be understood is conceptualized as a part of one or more larger wholes, not as a whole to be taken apart.
2. An understanding of the larger containing system is sought.
3. The system to be understood is explained in terms of its role or function in the containing system"

A three step process

1. The bus is a subsystem in at least two larger wholes (metasystems)
 1. Traffic system
 2. Fleet of busses
 - depot, maintenance facilities, etc.
2. Understand the traffic and fleet meta-systems
3. The role of the bus in the fleet meta-system includes
 - Being maintained and repaired when break-downs occur
 - Being stored in garages

* Based on Russell L. Ackoff, The Future of Operational Research is Past, The Journal of the Operational Research Society , Feb., 1979, Vol. 30, No. 2 (Feb., 1979), pp. 93-104

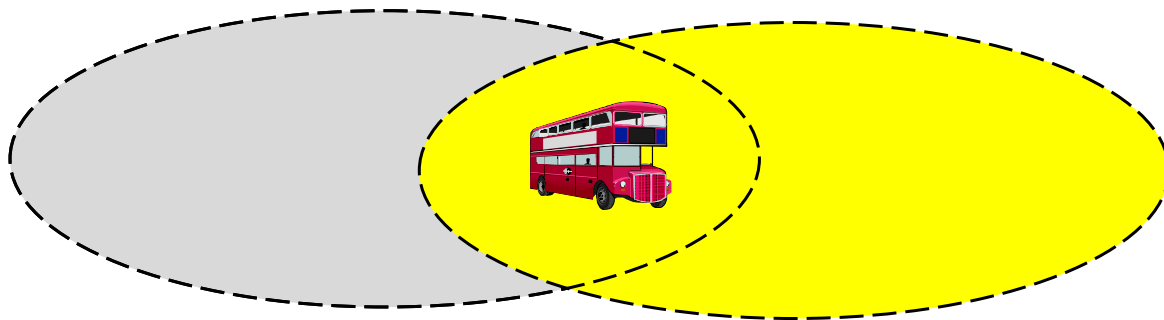
Two Major Misconceptions of Systems Thinking exposed

31

Two of the metasystems of the bus

Traffic system

Fleet of busses



Only consider the pertinent metasystem

Two Major Misconceptions of Systems Thinking exposed

32

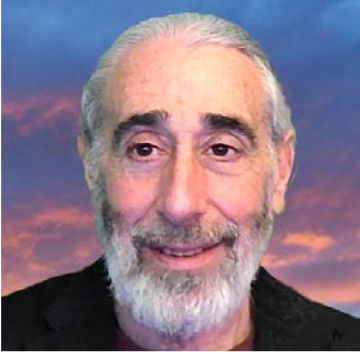
?

1. So how does systems thinking help you find out why the bus won't start in the morning?
 - Understand the 'fleet of busses' meta-system
2. Call maintenance
 - Pass the problem to maintenance
 - Does maintenance use systems thinking to find out why the bus won't start in the morning?
 - If they do they address the fleet of busses metasystem call themselves
- Which results in an infinite loop

Two Major Misconceptions of Systems Thinking exposed 33

Questions

- Do you mean they are going to use Reductionism?
- So when do we use Reductionism and when do we use Systems Thinking?



Two Major Misconceptions of Systems Thinking exposed 34

Answer

1. **We do not use them** to create a solution to a problem
2. **We use them** to gain an understanding of the problem (undesirable situation), e.g.
 - To learn about something
 - To find the root cause of a symptom
 - To analyze a proposed (conceptual) solution to a problem



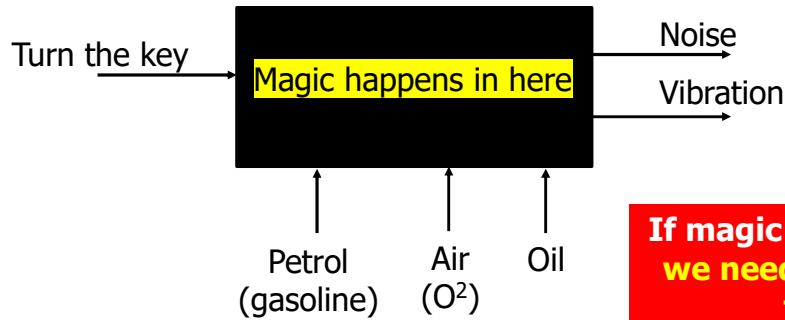
A bus won't start in the morning

1. Problem
 - Why is the bus not starting in the morning (effect)?



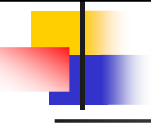


Pertinent *Operational* perspective



**If magic doesn't happen
we need to look inside
the bus**

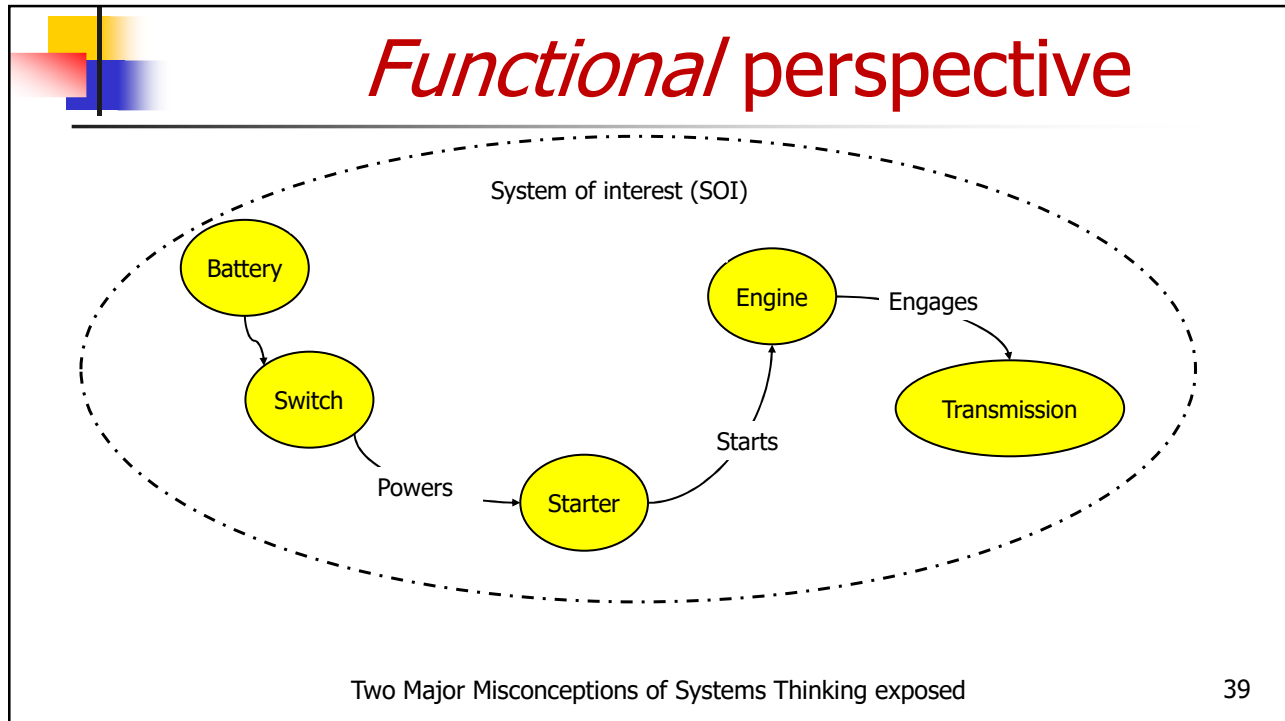
Non-metasytem external view
(open system)



Pertinent subsystems (components)

1. Battery
2. Engine (subsystem)
 - e.g. fuel, oil, air subsystems
3. Starter
4. Switch
5. Transmission
6. Wiring





- ## Determining the cause
- Using the Fishbone diagram (possible causes identification tool)
1. Battery discharged
 2. Starter failure
 3. Switch failure
 4. Transmission locked
- Two Major Misconceptions of Systems Thinking exposed 40

Determining the cause

Using the Fishbone diagram (possible causes identification tool)

1. **Battery discharged**
2. Starter failure
3. Switch failure
4. Transmission locked

The bus battery is discharged

1. Problem
 - Why is the bus not starting in the morning (effect)?Solution
 - The battery was discharged
2. Problem
 - Why is the battery discharged in the morning?



Pertinent subsystems (components) of bus

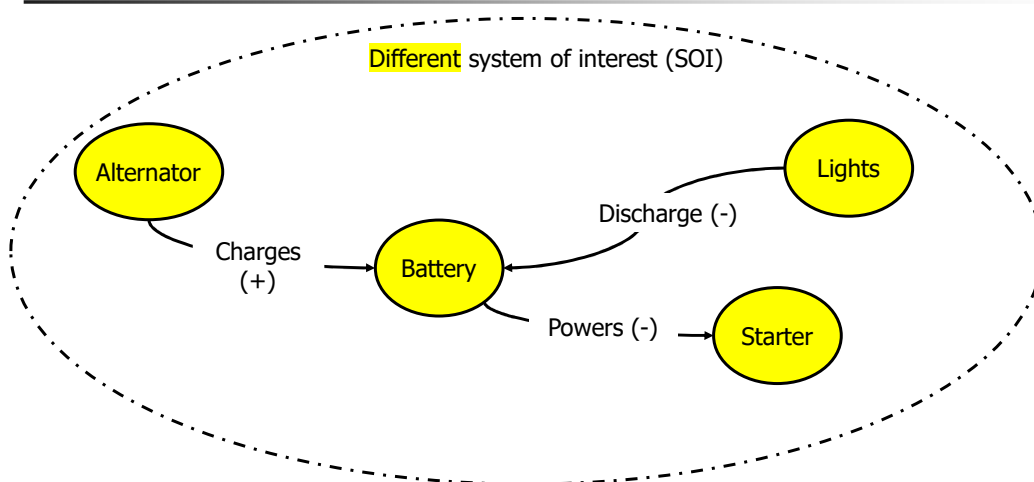
1. Alternator
2. Battery
3. Engine
4. Lights
5. Starter
6. Switch
7. Transmission
8. Wiring



Two Major Misconceptions of Systems Thinking exposed

43

Functional perspective



Two Major Misconceptions of Systems Thinking exposed

44



Determining the cause

Using the Fishbone diagram (possible causes identification tool)

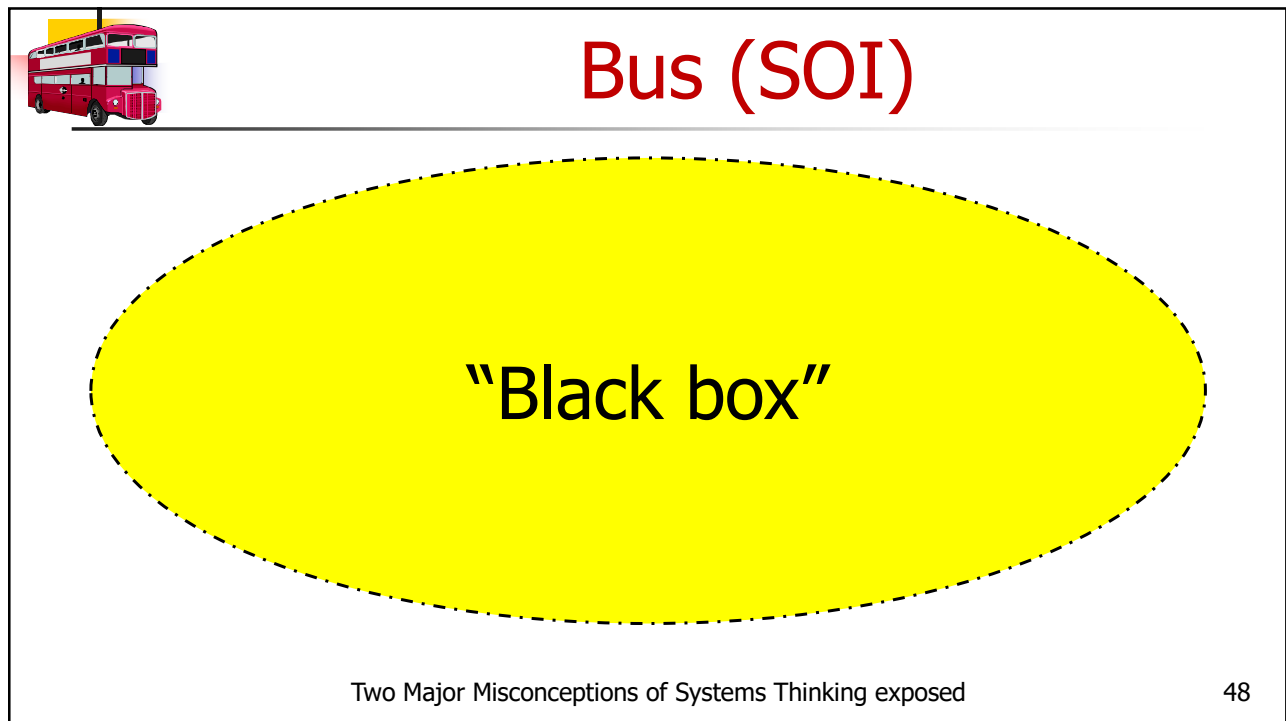
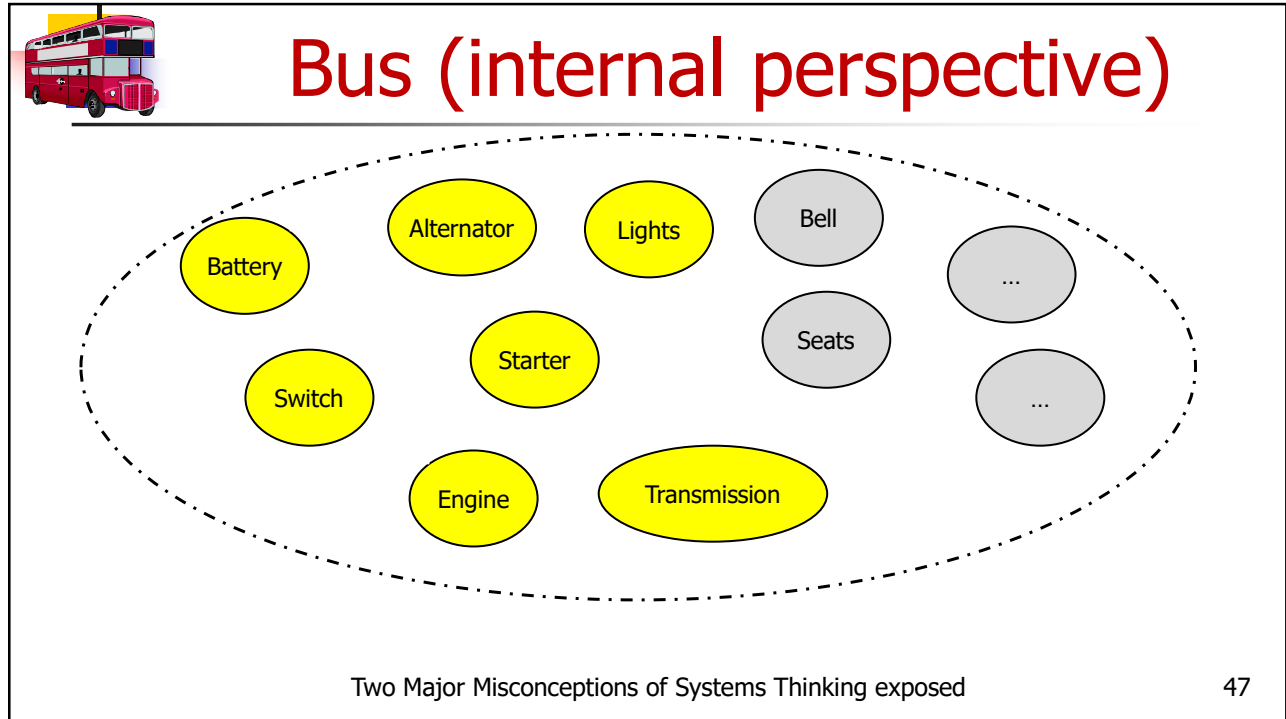
1. Discharged due to load left on overnight
 - Lights
2. Not charging
 - Alternator failure

Further investigation determines the actual cause



Different types of problems

1. Bus route
 - How frequently to run the buses
2. Bus and passengers
 - Boarding and alighting
3. Bus needing to cross lanes to make turn at intersection
4. Bus and other vehicles
 - Bus blocking traffic
 - Bus needing to get through traffic during peak hours
5. Others



Bus (external perspective)

The diagram shows a central yellow circle labeled "BUS" with a dashed border. It is connected to six other yellow circles, each representing a component. Three arrows point towards the bus from the left, and three arrows point away from the bus to the right. This illustrates the bus as a central hub for communication between components.

Two Major Misconceptions of Systems Thinking exposed

49

Metasystem-1 (traffic)

The diagram is identical to the one on slide 49, showing a central "BUS" connected to six components. However, a red dashed oval encloses the bus and the three components on the right side of the diagram. This highlights the bus and its immediate right-side connections as a specific sub-system or "metasystem" related to traffic flow.

Two Major Misconceptions of Systems Thinking exposed

50

Metasystem-2 (fleet)

The diagram illustrates a central node labeled 'BUS' (a yellow circle) with five arrows pointing outwards to five other yellow circles. Three of these outer circles are enclosed within a dashed purple oval, while two are outside it. This represents a sub-system or a specific focus area within a larger fleet.


Two Major Misconceptions of Systems Thinking exposed 51

Busses running late at certain times of the day

1. Problem
 - Why are the busses running late at certain times of the day?

A red double-decker bus is shown on the right side of the slide. It is a classic two-story bus with a white stripe and a blue stripe on the front.


Two Major Misconceptions of Systems Thinking exposed 52



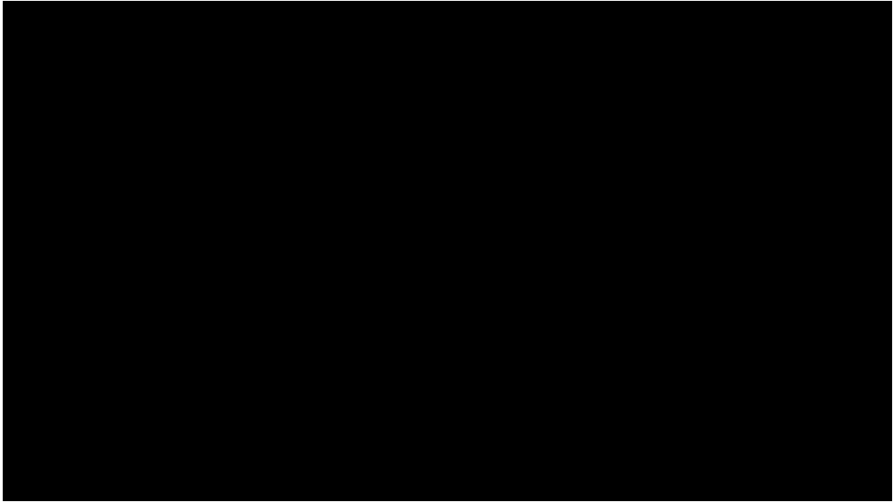
Pertinent subsystems (components) of traffic metasystem

1. Bus
2. Pedestrians
3. Other buses
4. Traffic lights
5. Vehicles
 - Vans, trucks, lorries, etc.

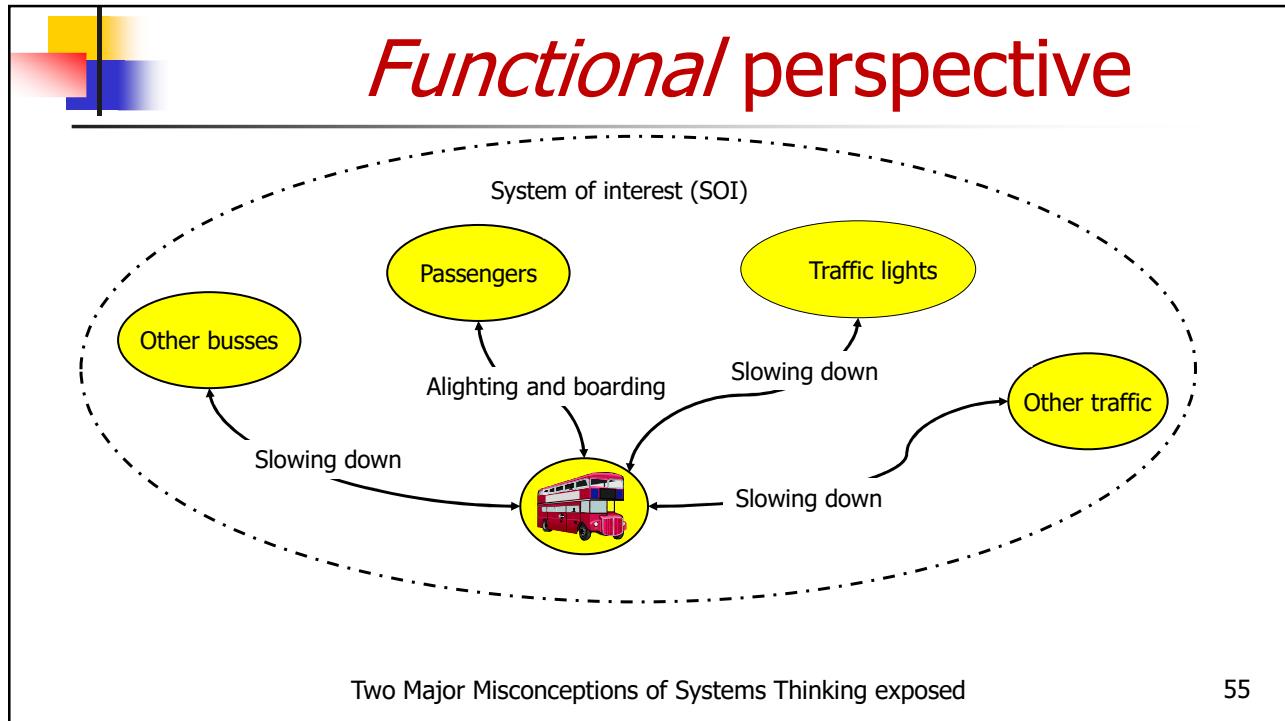
Two Major Misconceptions of Systems Thinking exposed 53




Operational perspective




Two Major Misconceptions of Systems Thinking exposed 54



- ## Determining the cause(s)
- Using the Fishbone diagram (cause identification tool)
1. Passengers alighting and boarding
 2. Too many other busses
 3. Too many other vehicles
 4. Some of the above
 5. All of the above
- Two Major Misconceptions of Systems Thinking exposed 56




- Wait a minute, you just treated the internal and external problems in the same way
- So what are the appropriate problems for Systems Thinking and Reductionism?




Two Major Misconceptions of Systems Thinking exposed 57

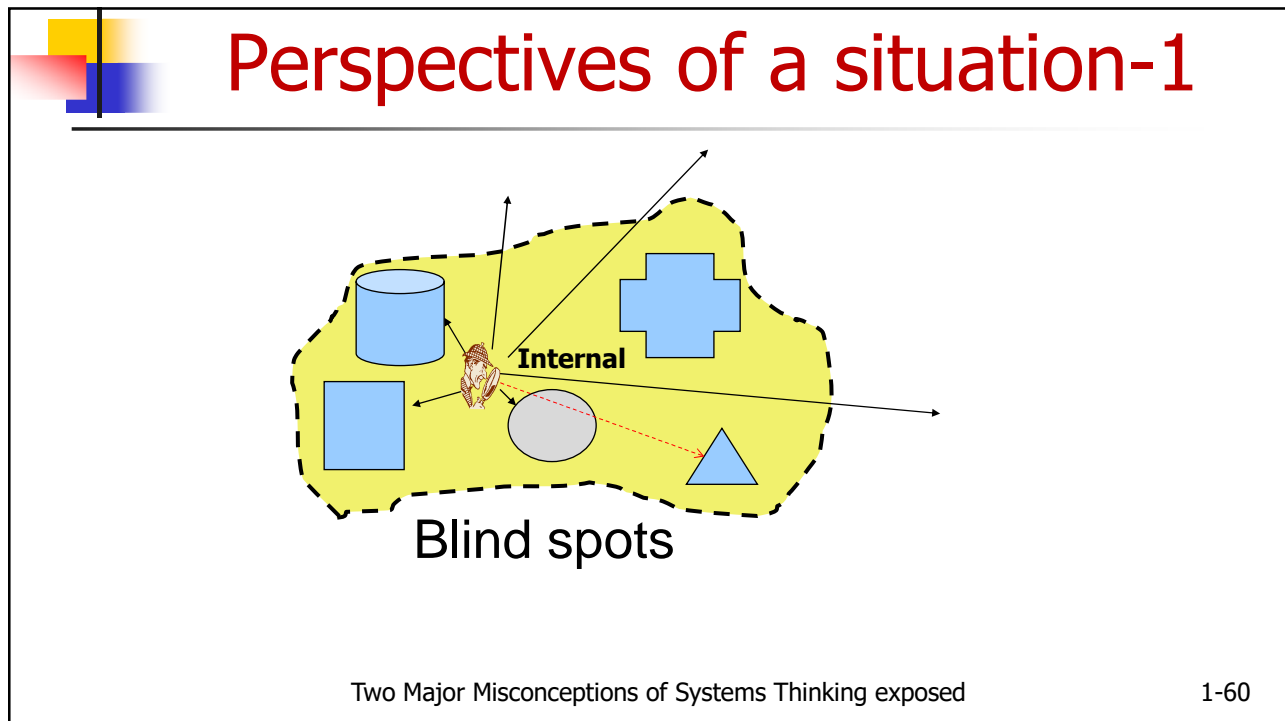
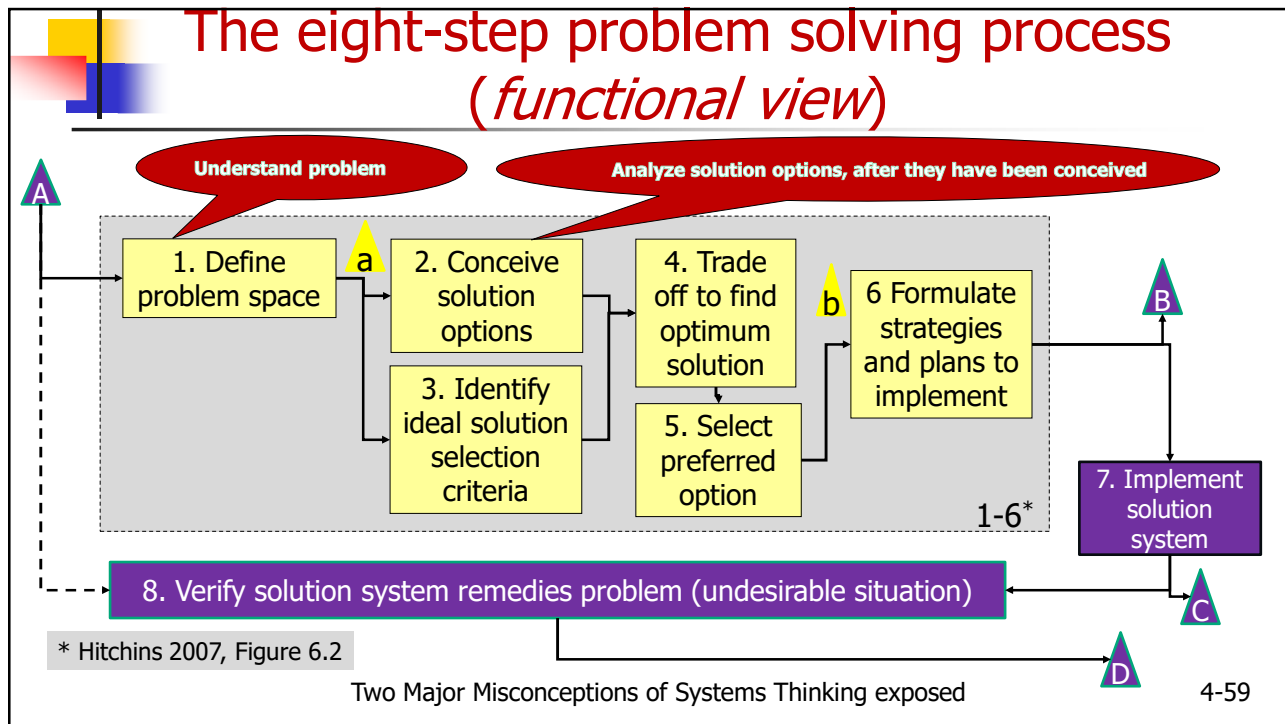
"it depends"



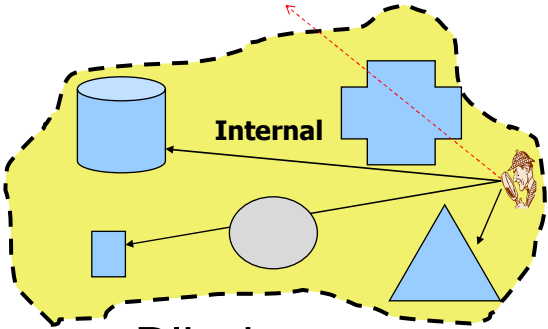
- Which one to use to "gain an understanding of the undesirable situation" depends on the nature of the problem
- Actually we did better
- We changed the paradigm and dissolved the misconception completely
- Let me show you how
- Consider the problem-solving process



Two Major Misconceptions of Systems Thinking exposed 58



Perspectives of a situation-1a



The diagram shows a yellow irregular shape representing a system, enclosed in a dashed black border. Inside, there are several blue shapes: a cylinder, a cross, a square, and a triangle, along with a grey circle. A small figure of a person is positioned on the right side of the system. A red dashed arrow points from the person towards the top right, away from the system. The word "Internal" is written in the center of the system. Below the system, the text "Blind spots" is written.

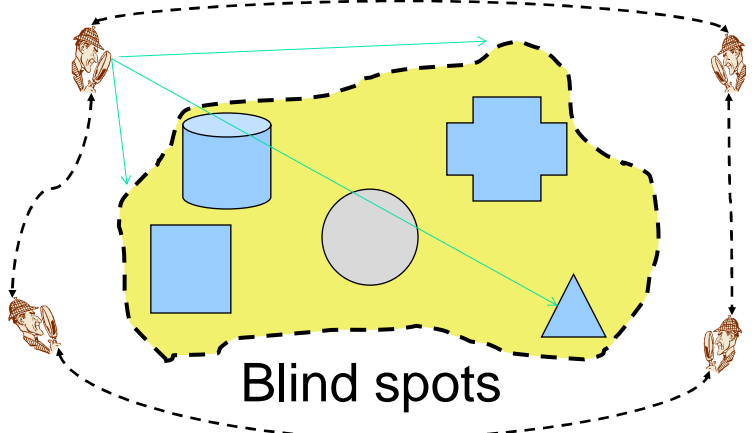
Internal

Blind spots

Two Major Misconceptions of Systems Thinking exposed 1-61

Perspectives of a situation-2

External (inwards)



The diagram shows the same yellow irregular system as in slide 1a, but now enclosed in a larger dashed black border. Four small figures of people are positioned at the corners of this outer border, looking inward towards the system. Green arrows point from each of these figures towards the center of the system. The text "Blind spots" is written below the system.

Blind spots

Overcome blind spots by viewing from above (Metasystem)

Two Major Misconceptions of Systems Thinking exposed 1-62

Perspectives of a situation-3

External (outwards)

Blind spots

Overcome blind spots by viewing from above (Metasystem)

Two Major Misconceptions of Systems Thinking exposed

1-63

Internal problem

1. Identify SOI from system viewpoint (bus)
2. Extract appropriate SOI (a subset of the subsystems of the bus)
3. Understand the subsystems and the relationships between them to gain an understanding of the undesirable situation

```
graph TD; Bus[Bus] --- Battery; Bus --- Starter; Bus --- Engine; Bus --- Transmission; Bus --- Alternator; Bus --- Others;
```

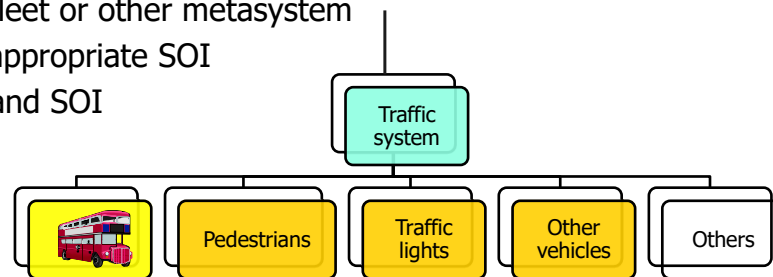
Battery Starter Engine Transmission Alternator Others

Two Major Misconceptions of Systems Thinking exposed

64

External problem

1. Identify appropriate containing system (metasystem)
2. It's an internal problem when viewed from that metasystem
3. For example
 - Problem with bus
 - Traffic, fleet or other metasystem
 - Extract appropriate SOI
 - Understand SOI



Two Major Misconceptions of Systems Thinking exposed

65

Example: The systems approach

- Bus won't start in the morning
- Let bus be system (need external view)
- Driver identifies appropriate metasystem
 - Fleet of busses
 - SOI is the bus and maintenance (maintenance repairs buses)
- Calls maintenance
- Let bus be system (need internal view)
- Maintenance selects appropriate SOI from subsystems in bus
 - As described earlier



Two Major Misconceptions of Systems Thinking exposed


66


Misconception 1: summary

1. Misconception 1 is based on a misunderstanding of "in isolation"
 - Reductionisms and Systems Thinking are analysis tools for understanding different types of situations
 - They are both tools for performing an analysis
 - Both can suffer from blind spots
 - "in isolation" has a place in the process of gaining an understanding


Two Major Misconceptions of Systems Thinking exposed 67

Topics

1. Who we are
2. First misconception
3.  **Second misconception**
4. Introducing the updated systems approach
5. Conclusions
6. Lessons learned
7. The free gift




Two Major Misconceptions of Systems Thinking exposed 68



Misconception 2


“Open” and “closed” systems are different types of systems



Two Major Misconceptions of Systems Thinking exposed 69



Origin



*“We call a system closed if no materials enter or leave it. It is open if there is inflow and outflow, and therefore change of the component materials.”**

<https://encyclopaedia.hereditorial.com/wiki/Archivo:Bertalanffy.jpg>

* Von Bertalanffy, L. (1950). An outline of general system theory. *British Journal for the Philosophy of Science*, 1, 134–165. <https://doi.org/10.1093/bjps/1.2.134>

Two Major Misconceptions of Systems Thinking exposed 70

From misconception to reality



"A closed system is one that has no environment. An open system is one that does."

By Bkobres - Own work, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=4766619>

* Russell L Ackoff, TOWARDS A SYSTEM OF SYSTEMS CONCEPTS *Management Science* (pre-1986); Jul 1971; 17, 11; ABI/INFORM Global pg. 661

Two Major Misconceptions of Systems Thinking exposed

71

From misconception to reality



"A closed system is one that has no environment. An open system is one that does."

...
...

'Openness' and 'closedness' are simultaneously properties of systems and our conceptualizations of them."

By Bkobres - Own work, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=4766619>

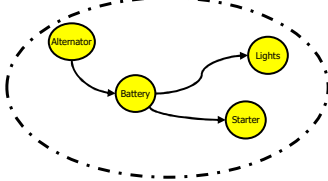
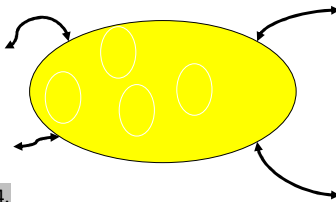
* Russell L Ackoff, TOWARDS A SYSTEM OF SYSTEMS CONCEPTS *Management Science* (pre-1986); Jul 1971; 17, 11; ABI/INFORM Global pg. 661

Two Major Misconceptions of Systems Thinking exposed

72

Reality

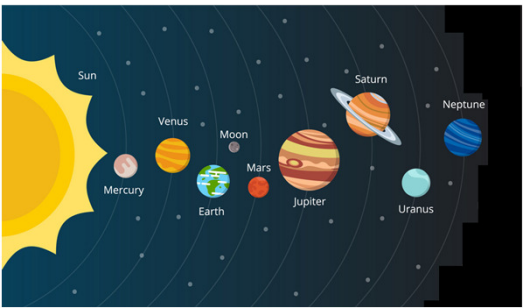
1. "Open" and "closed" systems are different perspectives (SOI) of the same system
 - So-called 'closed systems'
 - SOI when the problem is inside the boundary
 - So-called 'open systems'
 - SOI when the problem is outside the boundary
2. The problem bounds the system of interest (SOI)
 - The boundary is crafted by the observer to enclose a section of the real world
 - (Churchman, 1979 page 91; Jackson and Keys, 1984; Beer, 1994 page 7)

Beer, S., *The Heart of Enterprise*, John Wiley & Sons, Stafford Beer Classic Edition, Chichester, 1994.
 Churchman, C. W., *The Systems Approach and its Enemies*, Basic Books, Inc., New York, 1979.
 Jackson, M. C. and Keys, P., *Towards a System of Systems Methodologies*, Journal of the Operations Research Society 35 (1984), no. 6, 473-486.

Two Major Misconceptions of Systems Thinking exposed 73

Solar system




- Boundary defines SOI as far out as Neptune
- Internal view from boundary
 - Ignores
 - Stars
 - Interstellar phenomena

<https://www.nssa.gov.bh/wp-content/uploads/2019/06/Solar-1.png>

Two Major Misconceptions of Systems Thinking exposed 74

Pendulum clock




- Boundary defines SOI
- Internal view from boundary
 - Ignores
 - Gravity
 - Air flows

https://i5.walmartimages.com/asr/2f0908c0-4eda-495d-b226-3179d0379afe_1.f2e55e1a713626039e2a709a1cbc69f2.jpeg

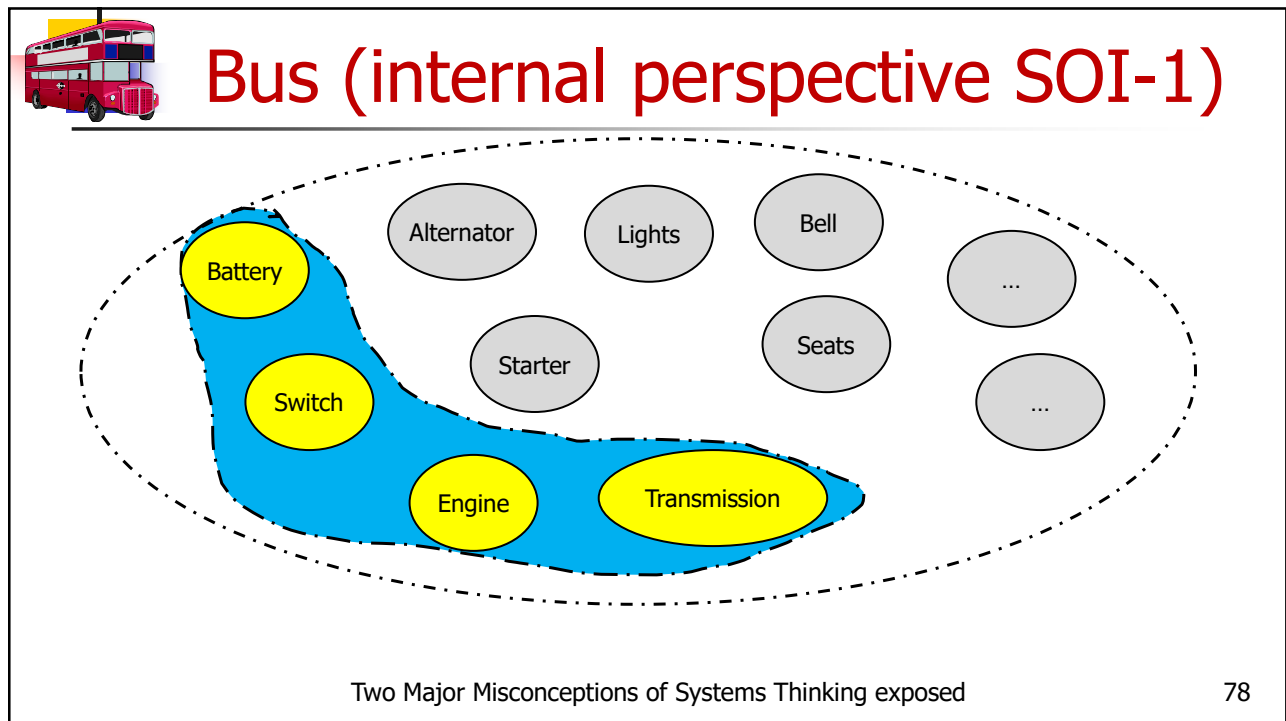
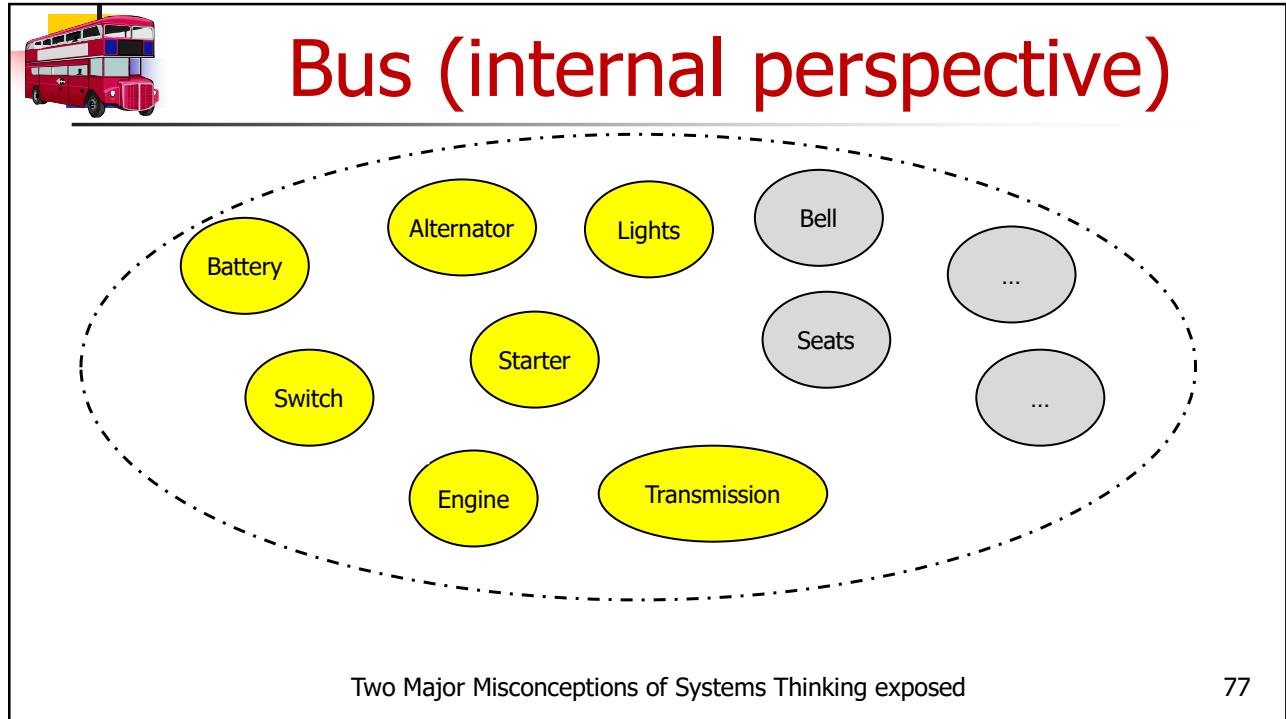
Two Major Misconceptions of Systems Thinking exposed 75


A bus



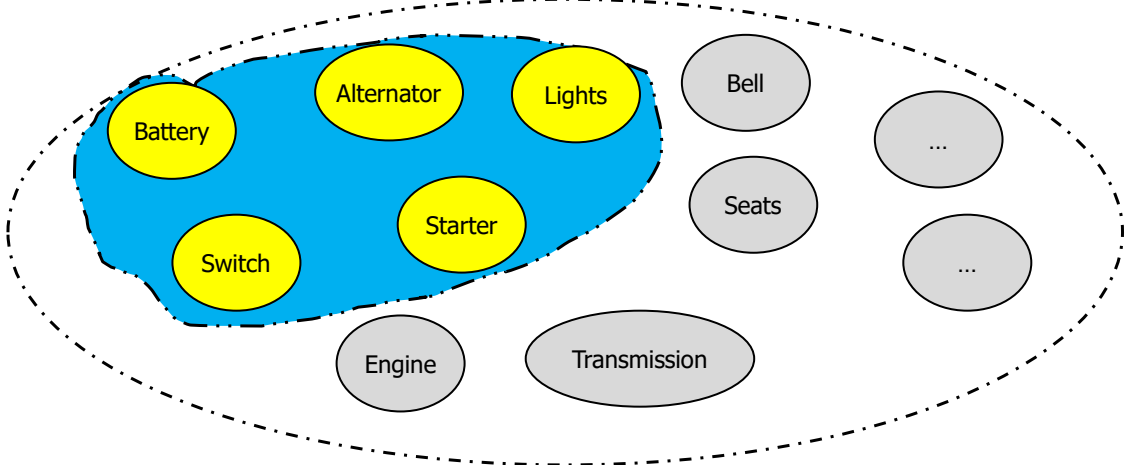
- How it works
 - "closed system"
 - Internal view from boundary
 - Structural and functional views
- How it behaves
 - "open system"
 - External view from boundary
 - Operational view
 - SOIs in various scenarios in different metasystems

Two Major Misconceptions of Systems Thinking exposed 76






Bus (internal perspective SOI-2)




Two Major Misconceptions of Systems Thinking exposed

79



A bicycle




- How it works
 - Structural and functional views
 - "closed system"
 - Internal view

<https://velospeak.com/exploded-view-bicycle-wall-mount/>

Two Major Misconceptions of Systems Thinking exposed

80

A bicycle




- How it works
 - Structural and functional views
 - "closed system"
 - Internal view
- How it is used
 - Operational view
 - "open system"
 - External view
 - SOIs in various scenarios

Two Major Misconceptions of Systems Thinking exposed

81

Human being

- How it behaves
 - "open system"
 - External view from boundary
 - Operational view
 - SOIs in various scenarios in different metasystems



Two Major Misconceptions of Systems Thinking exposed

82

Human being

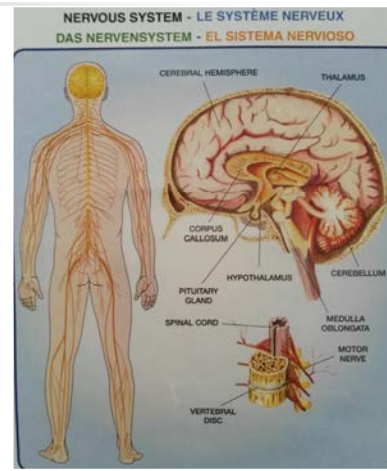
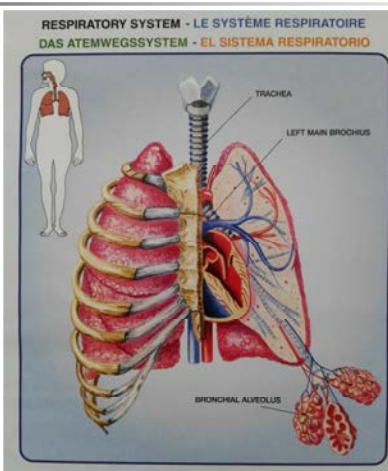
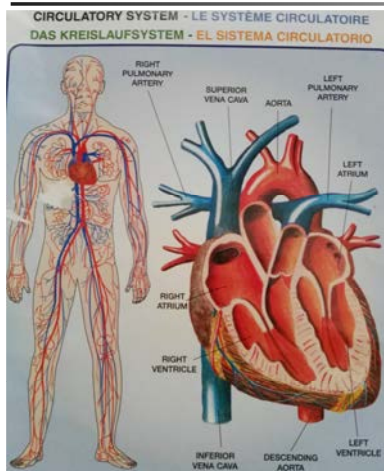
- How it behaves
 - "open system"
 - External view from boundary
 - Operational view
 - SOIs in various scenarios in different metasystems
- How it works
 - "closed system"
 - Internal view from boundary
 - Structural and functional views
 - Cardio-vascular SOI
 - Skeleton SOI
 - Chi SOI



Two Major Misconceptions of Systems Thinking exposed

83

SOI depends on problem



Two Major Misconceptions of Systems Thinking exposed

84

Misconception 2: summary

“Open” and “closed” systems are different types of systems

1. Misconception 2 came about by people always bounding the same SOI and only dealing with one type of problem
2. The observer bounds the system of interest (SOI) to suit the problem
3. Always consider both the internal and external perspectives when assessing a problem

Topics

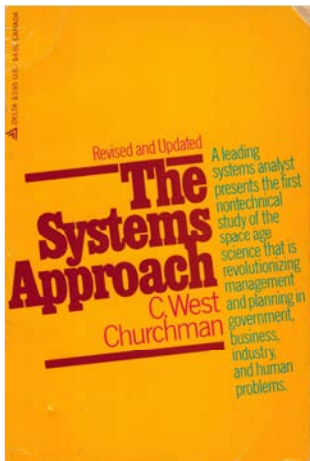
1. Who we are
2. First misconception
3. Second misconception

4. **Introducing the updated systems approach**

5. Conclusions
6. Lessons learned
7. The free gift



The systems approach 1969



C. West Churchman (1913 –2004)

- Internationally known for his pioneering work in operations research, system analysis and ethics
- Discussed
 - the systems approach as a way to tackle increasingly complex problems*
 - systems thinking as a part of the systems approach*
- Did not actually define “the systems approach”

* Churchman, C.W., *The Systems Approach*, Delacorte Press, New York, 1968/1979.

Two Major Misconceptions of Systems Thinking exposed

87

The systems approach (1973)

Simon Ramo (1913-2016)

“The systems approach is a technique for the application of a scientific approach to complex problems.

It concentrates on the analysis and design of the whole, as distinct from the components of or the parts.

*It insists upon looking at a problem in its entirety, taking into account all the facets and all the variables, and relating the social to the technological aspects”**

* Ramo, S., "The Systems Approach," *Systems Concepts*, R. F. Miles Jnr (Editor), John Wiley & Son, Inc., 1973, pp. 13-32 (p15).



Picture from Wikipedia

Two Major Misconceptions of Systems Thinking exposed

88

The systems approach (2010)

Robert Halligan

Project Performance International

*"An approach to problem solving that views any problem as a part of a bigger system, and in developing a solution, sees that solution being achieved through the interaction of system elements, such that the properties of the whole are beyond the properties of the individual parts"**



Halligan, R., "A Systems Approach to Love, Life and Business", proceedings of INCOSE Singapore January 2010 Chapter Meeting, Singapore, 2010.

Two Major Misconceptions of Systems Thinking exposed

89

The systems approach (2023)

The systems approach is a technique for the application of a scientific approach **to identifying and remedying** problems.

The systems approach, in a systemic and systematic manner:

1. Gains an understanding of an undesirable situation **in its entirety, taking into account all the facets and all the variables** by perceiving it from the **appropriate metasystem** depending on the nature of the problem.
2. Plans and performs a transition from the undesirable situation to a feasible desirable situation, via one or more iterations.



Two Major Misconceptions of Systems Thinking exposed

90

Conclusions

1. Misconception 1 is based on a misunderstanding of "in isolation"
 - Reductionisms and Systems Thinking are analysis tools for understanding different types of situations
 - Both can suffer from blind spots
 - "in isolation" has a place in the process of gaining an understanding
2. Misconception 2 came about by people always bounding the same SOI and only dealing with one type of problem
 - The observer bounds the system of interest (SOI) to suit the problem
 - Always consider both the internal and external perspectives when assessing a problem
3. The systems approach
 - Combines the best of Reductionism and Systems Thinking
 - **Builds on the GST** to provide a methodology which minimizes blind spots and provides a universal systemic and systematic approach to identifying and remedying complex problems.

Two Major Misconceptions of Systems Thinking exposed

91

Lessons learned

1. **Don't assume a precept is true**
2. **Try to access the primary source** and read the entire section of the source before citing it
3. If the primary source is unavailable, cite the secondary source citing the primary source
 - E.g. (Ackoff, 1979, cited by Kasser and Lerner, 2022)
4. A research journey may not end up where you intended

Two Major Misconceptions of Systems Thinking exposed

92

Now for the free gift I promised you at the start of this video

HOLISTIC THINKING



CREATING INNOVATIVE SOLUTIONS TO COMPLEX PROBLEMS

DR JOSEPH KASSER

- It's a pdf version of this 585 page book on systems thinking and beyond (available from Amazon in Kindle and paperback hard copy)
- Just send Prof Kasser an email stating you've watched the video and request the book



Two Major Misconceptions of Systems Thinking exposed

93

Questions and comments?

Our thanks to

Ahmad Abbadi,
 Raid AlQaisi,
 Martin Hugi,
 Pascal Bohulu Mabelo,
 Niels Malotaux,
 Shirley Tseng and
 Bo Wang,

who made useful comments in the online Oasis café and in Prof Kasser's classes during the preparation of this presentation



Two Major Misconceptions of Systems Thinking exposed

94