



Creating Outstanding Problem Solvers

Module 1 Session 1 of 3: Thinking and systems thinking

Rev 3.3.12

Creating Outstanding Problem Solvers

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Objectives of module

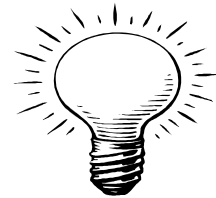
1. To learn about thinking
2. To learn about and use a number of systems thinking tools
3. To learn that systems thinking is generally applied but in an incomplete ad-hoc manner
4. To recognize the need to go beyond systems thinking

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Topics

1. Thinking
2. Systems thinking (introduction)
3. Tools to assist thinking
4. Systems thinking and beyond
5. Exercises



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Knowledge component

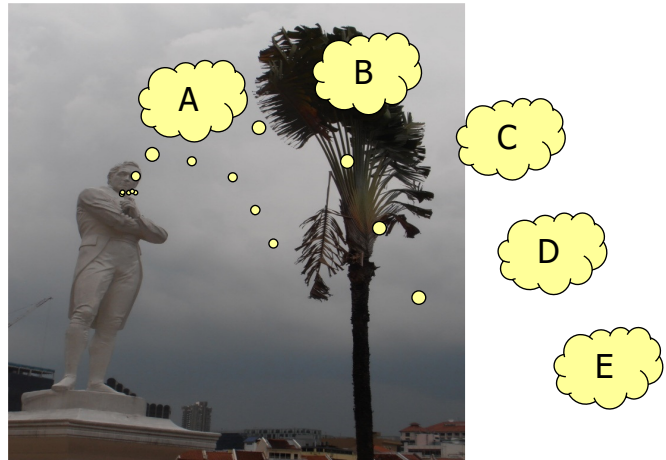
1. Lecture
 - Overview and summary of readings
2. Readings
 - 0102 Holistic Thinking Chapter 1: Section 1.1.
 - 0103 Kasser J.E., A theoretical multi-tasking executive function for the information processing model of the human brain, Proceedings of the 3rd International Conference on Applied Human Factors and Ergonomics (AHFE), Miami, FL, 2010
3. References
 - Systems Thinker's Toolbox for individual tools discussed
 - 0150 Basics of Causal Loop Diagrams - University of Saskatchewan (66 PowerPoint slides), <https://www.cs.usask.ca/faculty/ndo885/Classes/CMPT858Spring2011/LectureSlides/Lecture%206%20--%20Causal%20Loop%20Diagrams.pdf?fbclid=IwAR3R1es-NVtUI87s9LScREq1bQDXa9sw55rLDGMtfqaGiks16YsIFRnCC8Y>, last accessed 13/8/2021
4. Exercises

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Thinking

The exercising or occupying of the mind, especially the understanding, in an active way; engagement in mental action or activity*



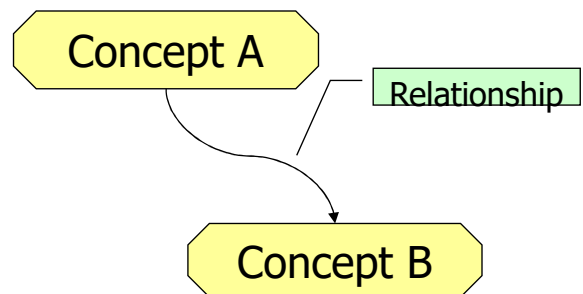
* Oxford English Dictionary

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Concept maps (thinking tool)*

1. Connecting the ideas
2. Represents relationships
 - Linear
 - Circular
 - Hierarchical
 - Spider
 - Centre outward
 - Other

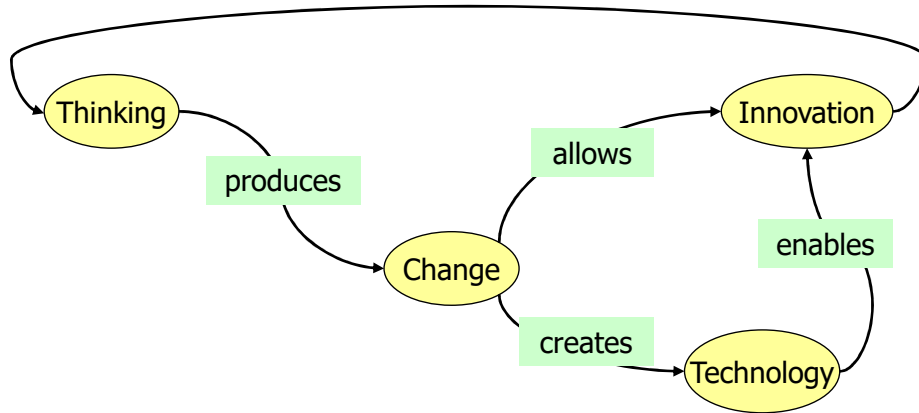


* STT 6.1.2 Concept maps

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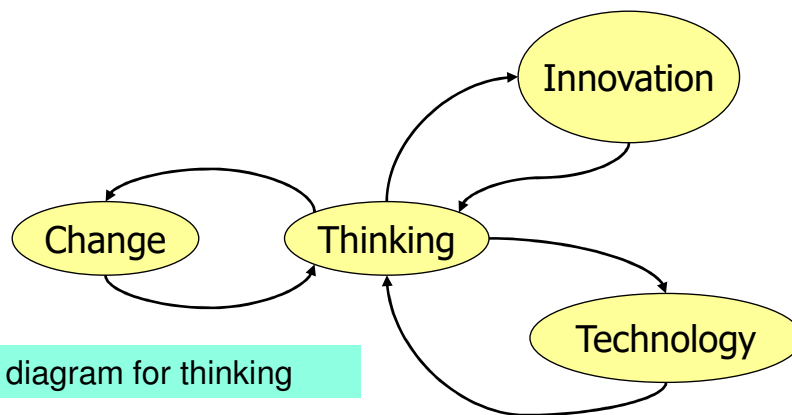
Typical concept map



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Typical concept map-2



Context diagram for thinking

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Thinking about a situation*

1. Who, Where, When and Why⁵
 - Develops understanding
2. What
 - Defines the problems and solutions
 - What is the root cause
 - What needs to be done
3. How
 - Develops understanding
 - Is the solution

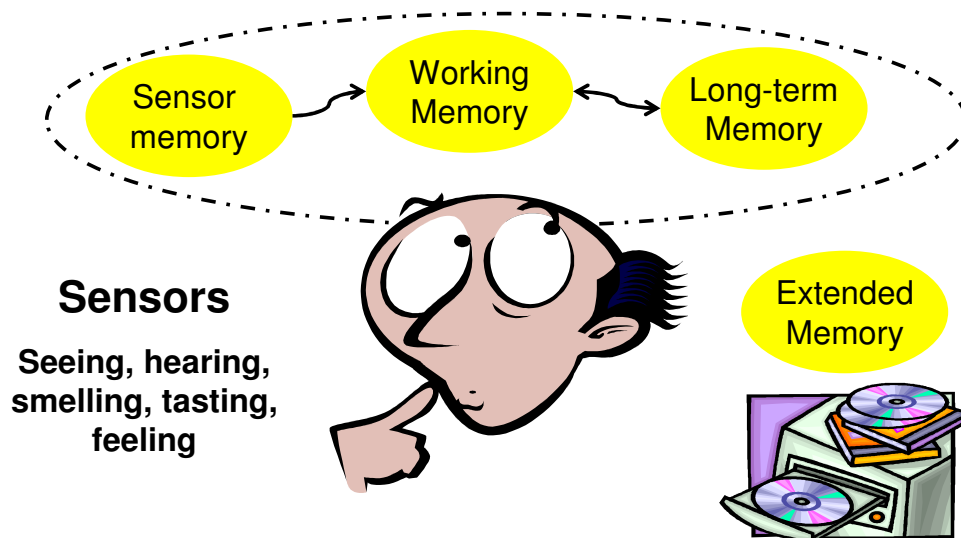


* STT 7.5 Five Y's; 7.6 Kipling questions

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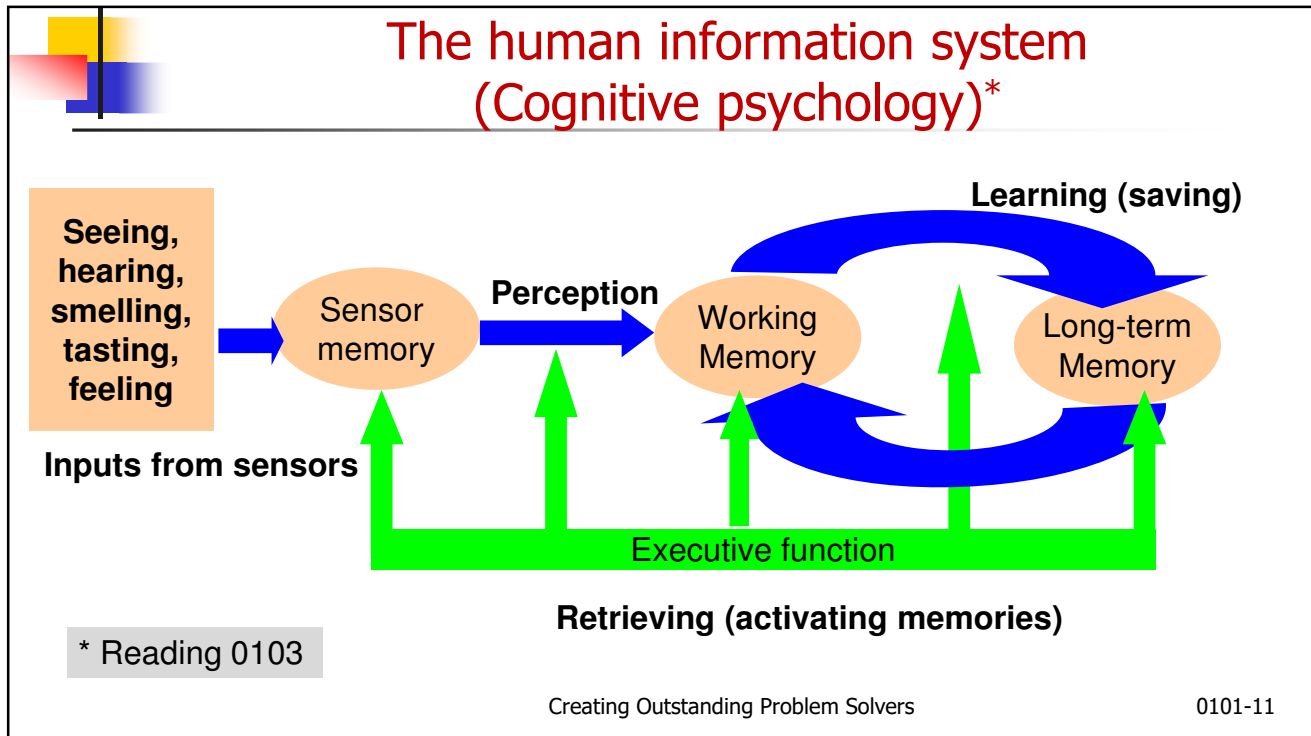
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Human information system



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Topics

1. Thinking
- 2. Systems thinking (introduction)**
3. Tools to assist thinking
4. Systems thinking and beyond
5. Exercises

A stylized illustration of a man in a dark suit and tie, standing with his arms outstretched in a gesture of presentation or surprise. He is positioned to the right of the list of topics.

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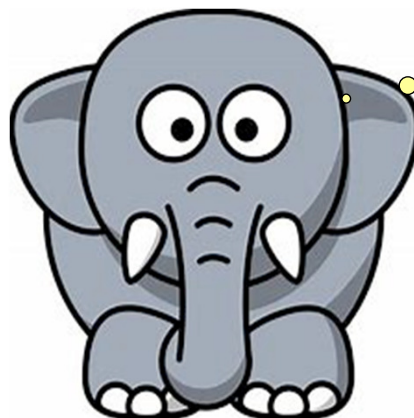
Why use systems thinking or what's in it for you?

1. "When people know a number of things, and one of them understands how the things are systematically categorized and related, that person has an advantage over the others who don't have the same understanding"
 - Luzato, M.C., *The Way of God*, circa 1735
2. You see solutions where other people see problems
3. You think for yourself so you are less likely to be manipulated by other people

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Limits of a single perspective



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What is systems thinking?

1. It depends on who you ask or read
2. Difficult to learn
3. Difficult to teach
4. Two schools of thought
 1. Systemic – the system
 2. Systematic – the process
5. Holistic approach
 - Systemic
 - Be all the blind men
 - Systematic
 - Use the problem-solving process



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Aggregating views

1. *Systemic thinking*
 - Thinking about a system as a whole to gain an understanding of the system
 - Not as a whole to be taken apart (Ackoff 1991)
2. *Systematic thinking*
 - Employing a methodical step-by-step manner (process) to think about something or to achieve a goal
3. *Beyond systems thinking*
 - Both are needed (Gharajedaghi 1999)
 - More than that, Ackoff wasn't entirely correct
 - The perspectives to understand the situation you need depend on the problem
 - Need even more perspectives for solving the problem

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Topics

1. Thinking
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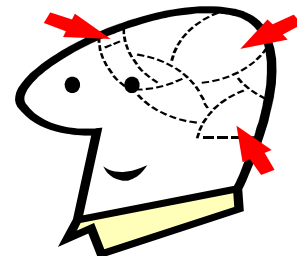


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Show or explain relationships between objects

1. Lists
2. Concept maps
3. Loops
4. Cartoons
 - Make specific points
5. Systems dynamics
6. N^2 charts
7. Drawing tools



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Laundry lists

- “Laundry list thinking”
 - Treats contribution of each factor as separate
 - Often ranks importance
 - Overlooks their inter-relationships

- Systems thinking
 - Need the list to identify inter-relationships
 - Takes lists one step further

* STT 9.4

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Laundry lists

Laundry-list thinking is defined by a set of four meta assumptions that are used to structure cause-and-effect relationships.

1. The items in the list (causes) each operate independently on “the effect”
2. The causality runs one way
3. The causal impacts are implicitly assumed to be “linear”
4. The causal impacts unfold “instantaneously” (which is to say, without any significant delay)

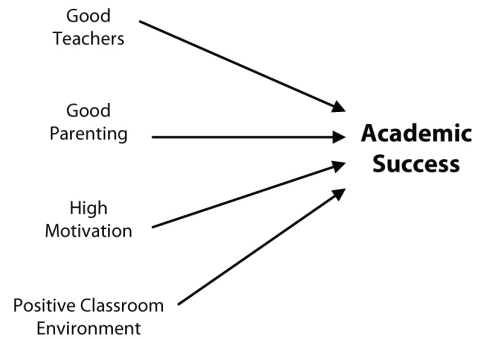
* Barry Richmond, THE THINKING IN SYSTEMS THINKING: EIGHT CRITICAL SKILLS,
<https://thesystemsthinker.com/%EF%BB%BFthe-thinking-in-systems-thinking-eight-critical-skills/>, accessed 23 December 2022

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Factors contributing to academic success*

1. Four factors
 1. Good teachers
 2. Good parenting
 3. High motivation
 4. Positive classroom environment
2. Laundry list thinking
 - ignores feedback relationships
 - Ignores interrelationships
3. Barry Richmond pointed out
 - Can't use the laundry list to build understanding (models)
4. Seems to have evolved into "don't use lists to study relationships"



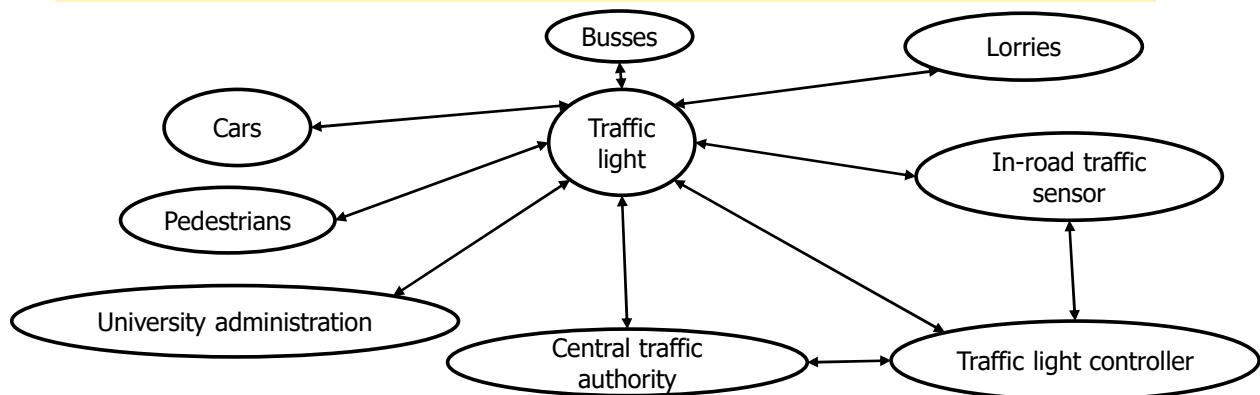
* Barry Richmond, THE THINKING IN SYSTEMS THINKING: EIGHT CRITICAL SKILLS, <https://thesystemsthinker.com/%EF%BB%BFthe-thinking-in-systems-thinking-eight-critical-skills/>, accessed 23 December 2022

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Traffic light problem

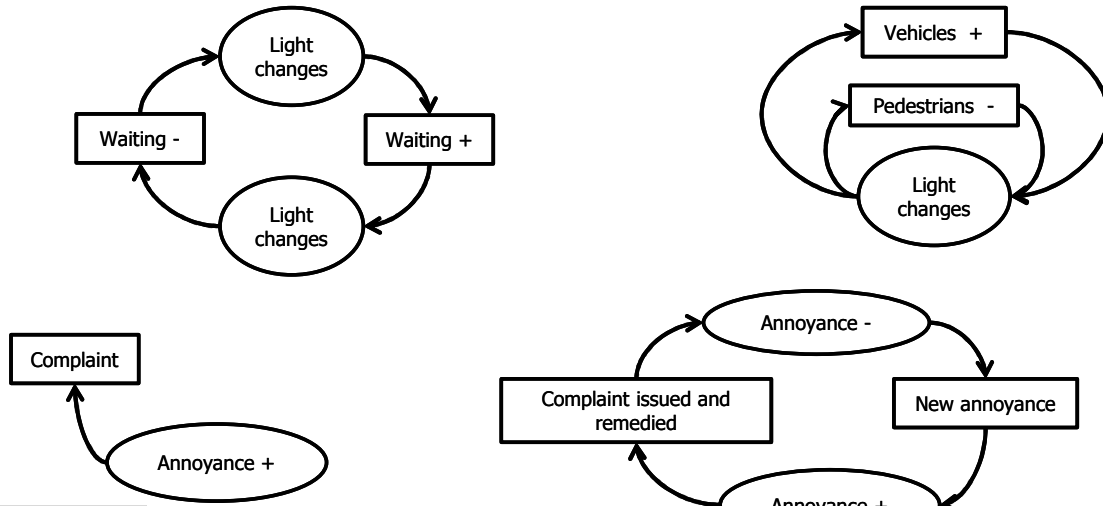
- Students have complained about long waiting time at traffic lights outside university
- Context diagram = list in graphical format with focus



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Relationships and causal loops*



* STT 6.1.1

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Creating a composite causal loop

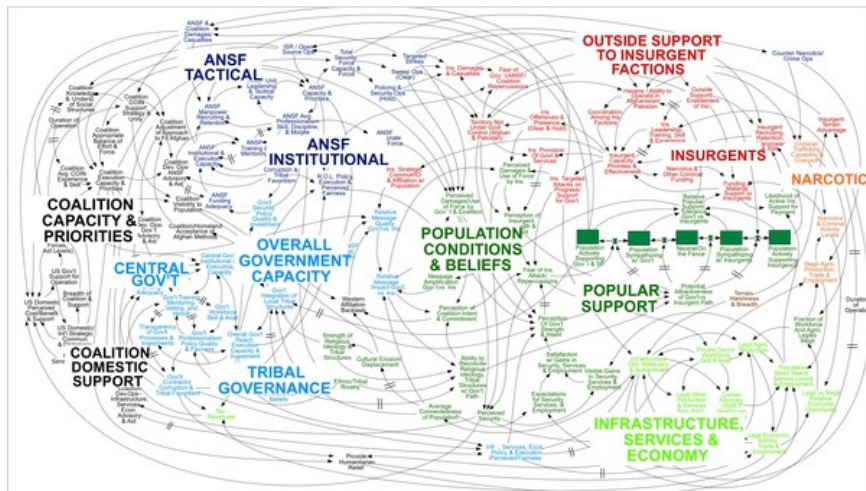
In an iterative manner

- Identify items or factors
 - Create the list
- Identify relationships (draw causal loops) between factors in list
 - There may not be feedback between every pair of elements in the list
- If no relationship is identified, then there is at least one missing factor
 - The X factor
- If new factors are seen when building the causal loops, add them to the lists in the appropriate places
- If you can, quantify the relationship and accuracy of estimates

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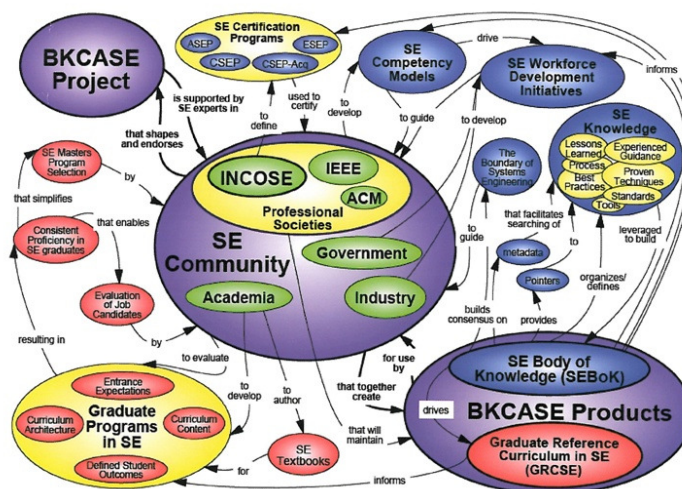
Creating artificial complexity



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Creating artificial complexity



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Keep it Simple, Student (KISS)*

- Important fundamental rule
- Often violated particularly in drawings
 - Created from a brain dump
 - Creates artificial complexity
 - Makes things complicated and complex
 - Too much in a single drawing
 - Information from several perspectives
 - Trying to use one drawing for multiple purposes
- Remember Miller's rule (Miller, 1956)
 - 7 ± 2 chunks of information
- Need to sort out what is pertinent to issue
 - Signals and noise

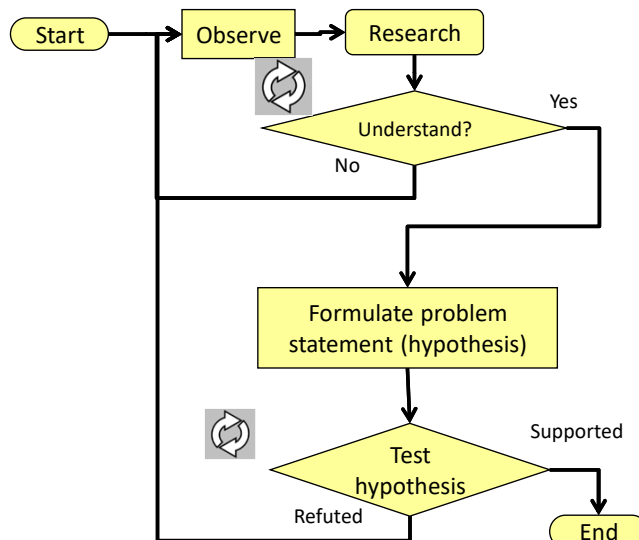
* STT 3.2.3

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Flowchart*

1. Main flow is unidirectional
2. Shows sequential flows
 - Concept map
3. Contains decision nodes that alter flow
4. **Functional** flowchart
 - Can loop back
 - 'Causal loop' with decisions brought out
5. **Process** flowchart is time ordered
 - Shall not loop back
 - Blocks shall repeat
6. Shapes have meanings



* STT 2.7

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Table used as tool: Exercise compliance matrix*

Instructions	Answers in Sections

* STT 9.5.2

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Exercise 1-11

1. List the elements involved in this class
2. Identify at least 5 different relationships between various elements in the list
3. Create at least one context map of the relationships in this class
4. Prepare a <5 minute presentation containing
 1. This slide and the version number of the lesson
 2. The list of elements
 3. The context map(s)
 4. The causal loops (if any)
 5. A compliance matrix for the exercise
 6. Lessons learned from exercise
5. Save as a PowerPoint file in format Exercise1-11-abcd.pptx
 - abcd = 4 characters that will identify your postings in this course
6. Post in the asynchronous group as instructed

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Exercise 1-12 knowledge presentation

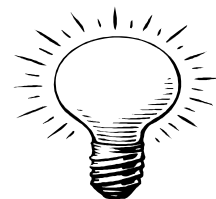
1. Prepare a brief on two main points in reading 0103 (< 5min)
2. Presentation to contain
 1. A summary of the content of the reading (<1 minute)
 2. The compliance matrix
 3. This slide and version number of session
 4. A list of the main points
 5. The two briefings
 6. Reflections and comments on reading (<2 minute)
 7. Comparisons of content with other readings and external knowledge
 8. Why you think the reading was assigned to the module
 9. Lessons learned from module and source of learning e.g. readings, exercise, experience, etc. (<2 minutes)
3. Save as a PowerPoint file as Exercise1-12-abcd.pptx
4. Post/email presentation as, when and where instructed
5. Brief on one main point

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Summary

1. Thinking
2. Systems thinking (introduction)
3. Tools to assist thinking
4. ~~Systems thinking and beyond~~
5. Exercise
 - Opportunity to practice what you learnt



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Meeting the objectives of the session

1. Learnt about thinking
2. Learned about and used a number of systems thinking tools
3. ~~Learnt that systems thinking is generally applied but in an incomplete ad hoc manner~~
4. ~~Recognized the need to go beyond systems thinking~~

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Any questions ?

1. Best
2. Worst
3. Missing



Email: beyondsystemsthinking@yahoo.com

Subject: <class title> BMW Lesson #

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