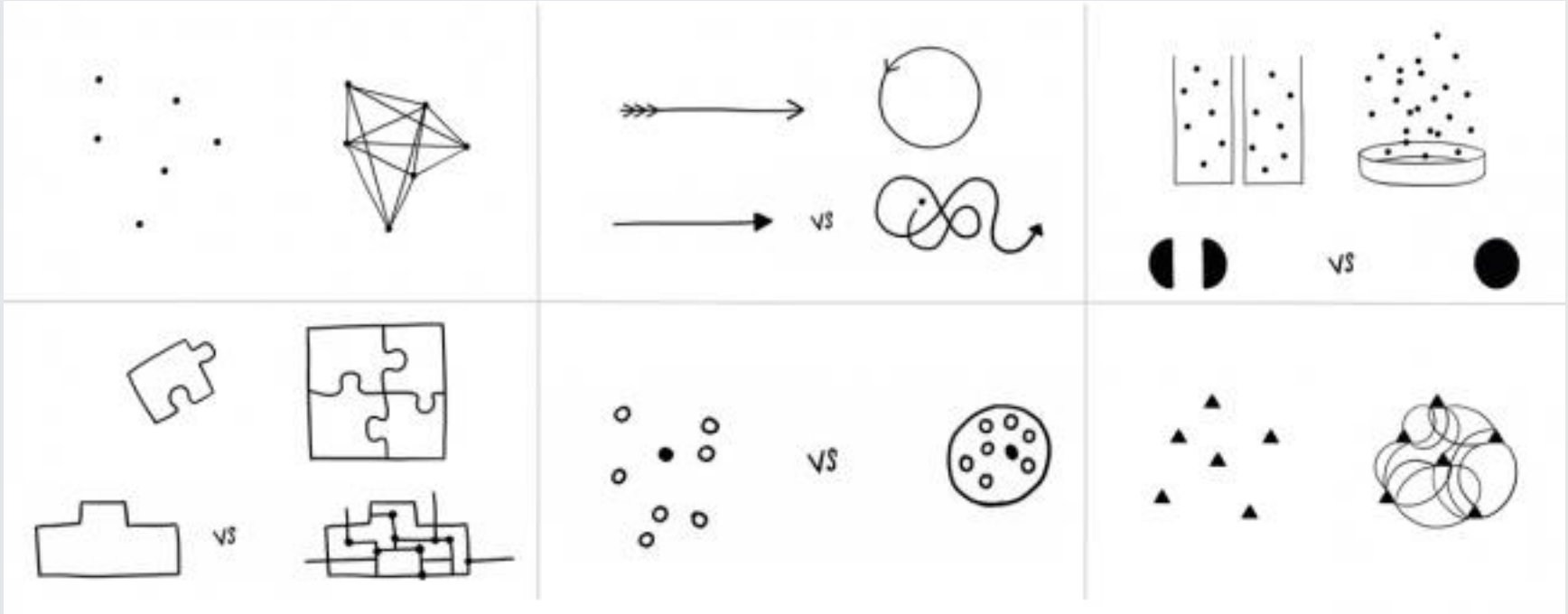
SYSTEMS THINKING TOOLS



BY

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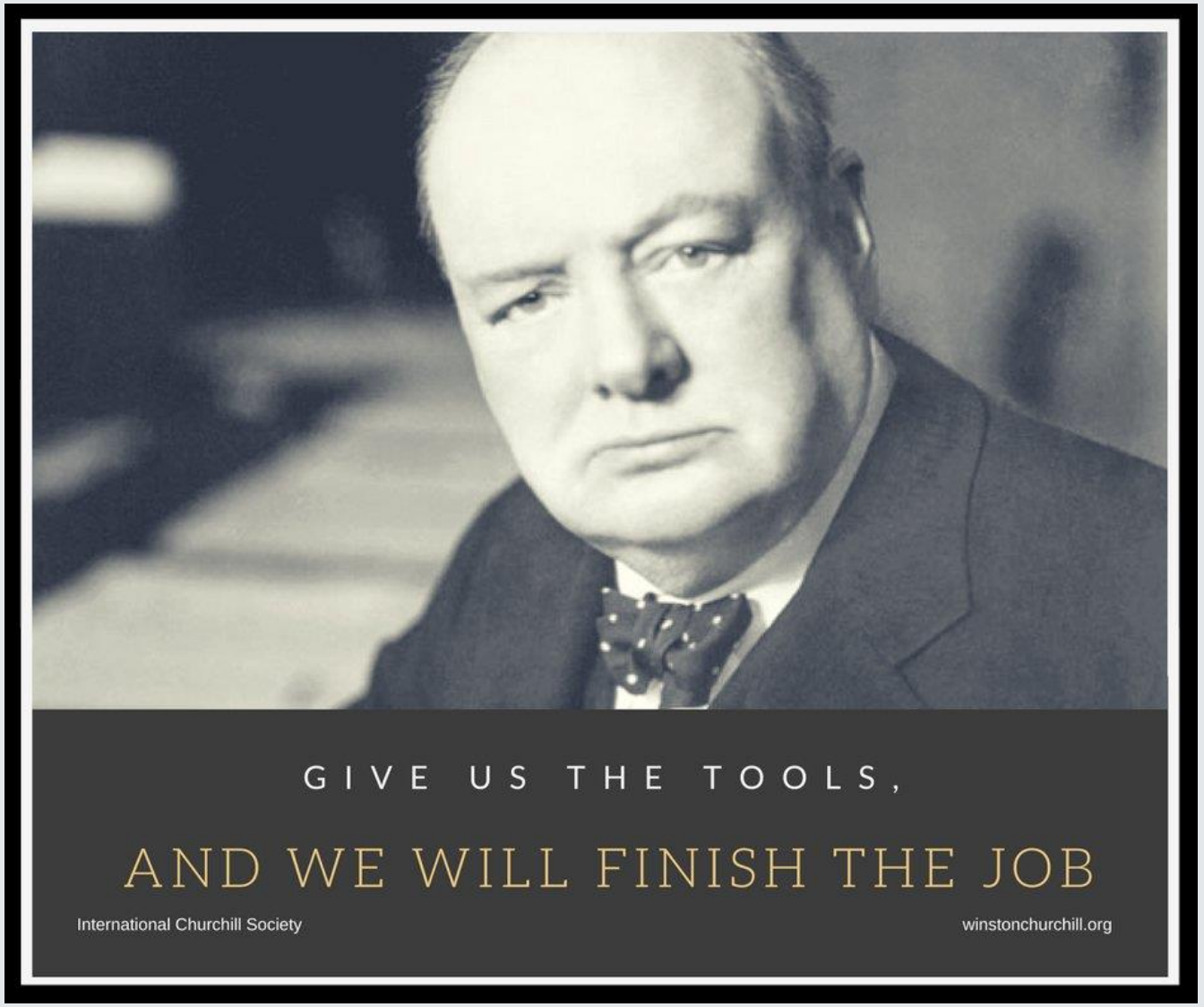
Comd 41 Engr Bde

INTRODUCTION



INTRODUCTION (CONT)

- Tools are an important element in being able to design or identify patterns with a system. Systems Thinking tools help to visualise systems in order to see their interconnectedness, structure and the dynamic relationships between the various components.

- Systems Thinking tools are broadly categorised into Brainstorming tools, Dynamic Thinking tools, Structural Thinking tools and Computer Based tools.
- Understanding how to apply these tools could be a quantum leap for students of strategy, political masters and chief executives who are the arrow heads of operational planning, strategy evolution and policy formulation.

PURPOSE

To arm you with an array of Analytical and Systems Thinking tools that would enhance your proficiency in strategic thinking.

AIM

To acquaint participants of AWCN Course 8/2024 with essential Analytical and Systems Thinking tools for use throughout the duration of their stay in the College.

SCOPE

- The presentation will cover the following:
  - General Strategic Analysis Tools.
  - Systems Thinking Tools.
    - Tree Diagram.
    - Cause and Effect Diagram.
    - Iceberg Model.
    - Systems Map.
    - Affinity Diagram.
    - Spray Diagram.
    - Causal Loop Diagram.
    - Behaviour-Over-Time Graph.

GENERAL STRATEGIC ANALYSIS TOOLS

- SWOT Analysis (and TOWS Strategy Analysis).
- PEST/PESTLE/STEEPLE.
- PMESII-PT/ASCOPE.
- McKinsey 7S.

SWOT ANALYSIS

- SWOT Analysis is framework used to evaluate an organisation's competitive position and to develop strategic planning options. SWOT Analysis assesses internal and external factors, as well as current and future potential.

- SWOT Analysis can guide an organisation towards strategies more likely to be successful, and away from those in which they have been, or are likely to be less successful.

SWOT ANALYSIS

STRENGTHS	WEAKNESSES
1. What is our competitive advantage? 2. What resources do we have? 3. What products/assets are performing well?	1. Where can we improve? 2. What products/assets are underperforming? 3. Where are we lacking resources?
OPPORTUNITIES	**THREATS**
1. What new technology can we use? 2. Can we expand our operations? 3. What new segments can we test?	1. What policies or regulations are changing? 2. What are competitors doing? 3. How are trends changing?

CONDUCTING A SWOT ANALYSIS

- Determine your objective.
- Gather resources.
- Compile ideas.
- Refine findings.

SWOT ANALYSIS

	Opportunities (external, positive)	**Threats** (external, negative)
Strengths (internal, positive)	**Strength-Opportunity strategies** Which of the company's strengths can be used to maximize the opportunities you identified?	**Strength-Threats strategies** How can you use the company's strengths to minimize the threats you identified?
Weaknesses (internal, negative)	**Weakness-Opportunity strategies** What action(s) can you take to minimize the company's weaknesses using the opportunities you identified?	**Weakness-Threats strategies** How can you minimize the company's weaknesses to avoid the threats you identified?

SWOT ANALYSIS EXAMPLE FOR OPHK

STRENGTHS	WEAKNESSES
1. Legitimacy. 2. World-Class training institutions and well-trained troops. 3. Manoeuvre, Firepower, Mobility. 4. Drones, Air Assets in Air Superiority. 5. Human, social and economic resources.	1. Weak Interagency cooperation, Limited knowledge of terrain. 2. Insufficient Mobility platforms, Young soldiers' inadequate training, Ineff Strategic Comms. 3. Hostile populace.
OPPORTUNITIES	**THREATS**
1. Space Technology for Surveillance of Ungoverned Spaces. 2. Influence can be expanded up to and into neighbouring countries. 3. Joint efforts and operations with allies.	1. USA and UK not open to aid with Kinetic Platforms. 2. BH more asymmetric, Biting Info Ops. 3. BH more popular with civilians, BH international alliances.

TOWS STRATEGY EXAMPLE FOR ENHANCING OPHK

SO: MAXI-MAXI

1. Diplomatic push for greater involvement of neighbours and allies to aid own ops and block economic sources of BH (S1,S2-O3).
2. Leverage Space Assets over neighbouring countries through cooperation and collaboration (S1,S5-O1,O3).
3. Incorporate firepower with space and air assets for remote delivery of lethal effects in ungoverned spaces(S3,S4-O2,O3).

ST: MAXI-MINI

4. Increase interagency trg at operational and strat levels and interagency exercises at tac levels (S2 – W1).
5. Increase CIMIC to win the hearts and minds of the populace (S5-W3).
6. Improve trg of young sldrs by creating cses at NA schs to prep them for gen inf tasks and spec roles in theatre of ops (S2-W2).

WO: MINI-MAXI

7. Employment of space technology for terrain analysis and navigation (W1-O1).
8. Leverage informal influence in other countries as medium for more effective Strat Comms (W2-O2).

WT: MINI-MINI

9. Enforcement of Social Media Policy and intensification of Strat Comms to project a more professional NA for Western nations to provide kinetic platforms for the Force (W2-T1).
10. Review Depot NA and NA Trg Schs curr to cater more for asymmetric threats (W2-T2).

PEST ANALYSIS

- PEST Analysis is a management tool for use by an organisation to assess major external factors that influence its operations in order to become more competitive in the landscape.

- PEST stands for Political, Economic, Social and Technological. A popular variation is the UK PESTLE which includes Legal and Environmental.

- It is believed that PEST Analysis was first introduced under the name ETPS by Harvard professor Francis J. Aguilar in the 1967 publication "Scanning the Business Environment."

- It is more effective with larger organisations which are more likely to experience the effects of macro events. Commonly used in conjunction with SWOT Analysis.

PMESII-PT

- PMESII-PT stands for Political, Military, Economic, Social, Information, Infrastructure, Physical Environment and Time. Analysis is a management tool for use by an organisation to assess major external factors that influence its operations in order to become more competitive in the landscape.

- PMESII-PT was developed by the US Military and can help in analysing the operational environment, the threats and opportunities within it and how to respond to them.

- It is normally used in tandem with ASCOPE which means Areas, Structures, Capabilities, Organisations, People, Events.

- It is more effective with larger organisations which are more likely to experience the effects of macro events. Commonly used in conjunction with SWOT Analysis.

ASCOPE/PMESII-PT

ASCOPE-PMSEII Matrix						
	POLITICAL	MILITARY	ECONOMIC	SOCIAL	INFRASTRUCTURE	INFORMATION
AREA	boundaries, districts, political party areas of support, ethnic or insurgent strongholds	Red, Blue, White Forces, law enforcement	agricultural, mineral (mines, oil and gas), offshore deposits	entertainment, religious sites	road, rail	coverage for media types.
STRUCTURE	government centres, legislative, executive and judicial (courts, prisons)	bases, police stations, paramilitary centres.	industrial zones, high technology and science parks, universities, schools farms, shops	leisure structures (e.g. restaurants, bars, cinemas), religious sites	SPOD, APODs, hospitals, power generation, sanitation, irrigation	cell radio, TV towers, fibre routes, media centres
CAPABILITIES	leadership effectiveness, opposition and other protest groups, Red Force effectiveness, NGOs, levels of corruption	combat power (Red, White, Blue Forces), missions, constraints	industrial, financial agricultural output, access to banks and finance, regulations, black market, other financial flows (e.g. hawala), corruption	ethnic groups, diaspora, tribes, clans, families, youth groups	effectiveness of utilities delivery , medical care	literacy; phone, TV and internet access; social media, languages, outreach of various factions
ORGANISATIONS	political parties, ethnic or indigenous groups, red-force groups, NGOs	dispositions	companies, business forums, centres of learning	ethnic, religious, charitable, youth,	ministries, construction and maintenance companies, NGOs	media organisations, government PR, Red Forces IO
PEOPLE	key leaders (government, opposition, judiciary, ethnic, Red Forces)	Red, Blue, White Forces, police	key leaders and influencers, legal and illegal trade	ethnic elders, local government, youth and cultural icons		media proprietors, journalists, group public media relations
EVENTS	elections, rallies, campaigns	wars, operations, parades, anniversaries	environmental effects (e.g. drought, seasons)	holidays, festivals, parades, ceremonies	new projects, closures	advertising campaigns, IO, new projects
As the cells (the factors) are being completed, analysts must ask themselves: Why is this factor relevant to the local Actors? How does it or could it affect the mission?						

MCKINSEY 7S FRAMEWORK

- The McKinsey 7S framework identifies 7 elements that are key to determining how well an organisation performs and what has an impact on how it operates.

- The model contains 3 “hard elements” of **Strategy, Structure** and **Systems**, along with 4 other “soft elements” of **Shared Values, Skills**, **Style** and **Staff**.

- The model can help an organisation identify how each area fits into prevailing gaps and how the company can influence each aspect to better conform to long term objectives.

MCKINSEY 7S FRAMEWORK (CONT)

- **Strategy** refers to the approach that a company uses to gain a competitive advantage and reach its long-term goals..
- **Structure** describes organizational structure. In simple terms, it involves the chain of command and knowing who takes instructions from whom.
- **Systems** refers to the processes and procedures that conducts a business' daily activities. It considers the SOP of a company.

MCKINSEY 7S FRAMEWORK (CONT)

- **Shared Values** include norms and behaviour that are expected from all staff members. They form the core of the organisation's identity.
- **Skills** describes the skills and competencies of people whom the company employs.
- **Style** refers to the management style that is prevalent in a company. It also includes the company's informal rules and culture.
- **Staff** not only includes employees, but also involves how to hire, train, and maintain them. One must also consider other factors, such as the size of the workforce, its diversity, employee benefits, etc.

BROAD CLASSIFICATIONS OF SYSTEMS THINKING TOOLS

- **Purpose of the System**. Tree Diagram, Cause and Effect Diagram (Fishbone/Ishikawa).
- **Context**. Iceberg Model, System Map.
- **Nature of the System**. Affinity Diagram.
- **Internal Structure and Dependencies**. Spray Diagram.
- **System Behaviour**. Causal Loop Diagram, Behaviour-Over-Time Graph.

TREE DIAGRAM

- A Tree Diagram allows a team to organise a large number of ideas, opinions and issues into a meaningful structure that permits the communication of those ideas in a simple but powerful hierarchical representation.

- It is often used in conjunction with a divergent tool such as brainstorming or Affinity Diagram.

- They show functional and structural hierarchies which might not be readily intuitive to the human mind. Basic building style is **What-How** relationship.

- They are used to organise and manage purpose, goals or objectives, task or activity, product, need or requirement, problem or issue.

TREE DIAGRAM (CONT)

Creating a Tree Diagram

1. Goal

Develop a statement of the goal, project, plan, problem or the item under study

2. Question

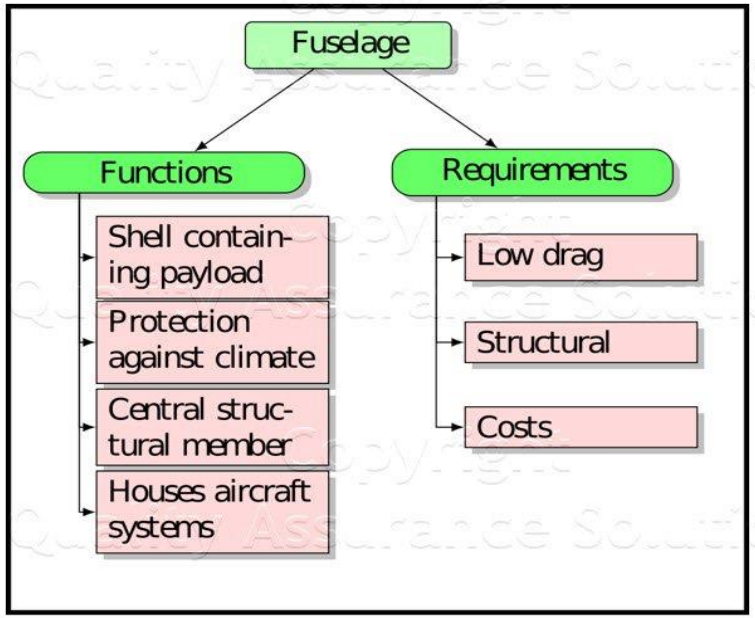
Ask a targeted question that leads you to the next level of detail.

3. Brainstorm

Brainstorm all possible answers

4. Check

Complete a "necessary and sufficient" check. Make sure items are at the correct level



5. New Subjects

Each of the new branches now becomes the subject: a goal, objective or problem statement

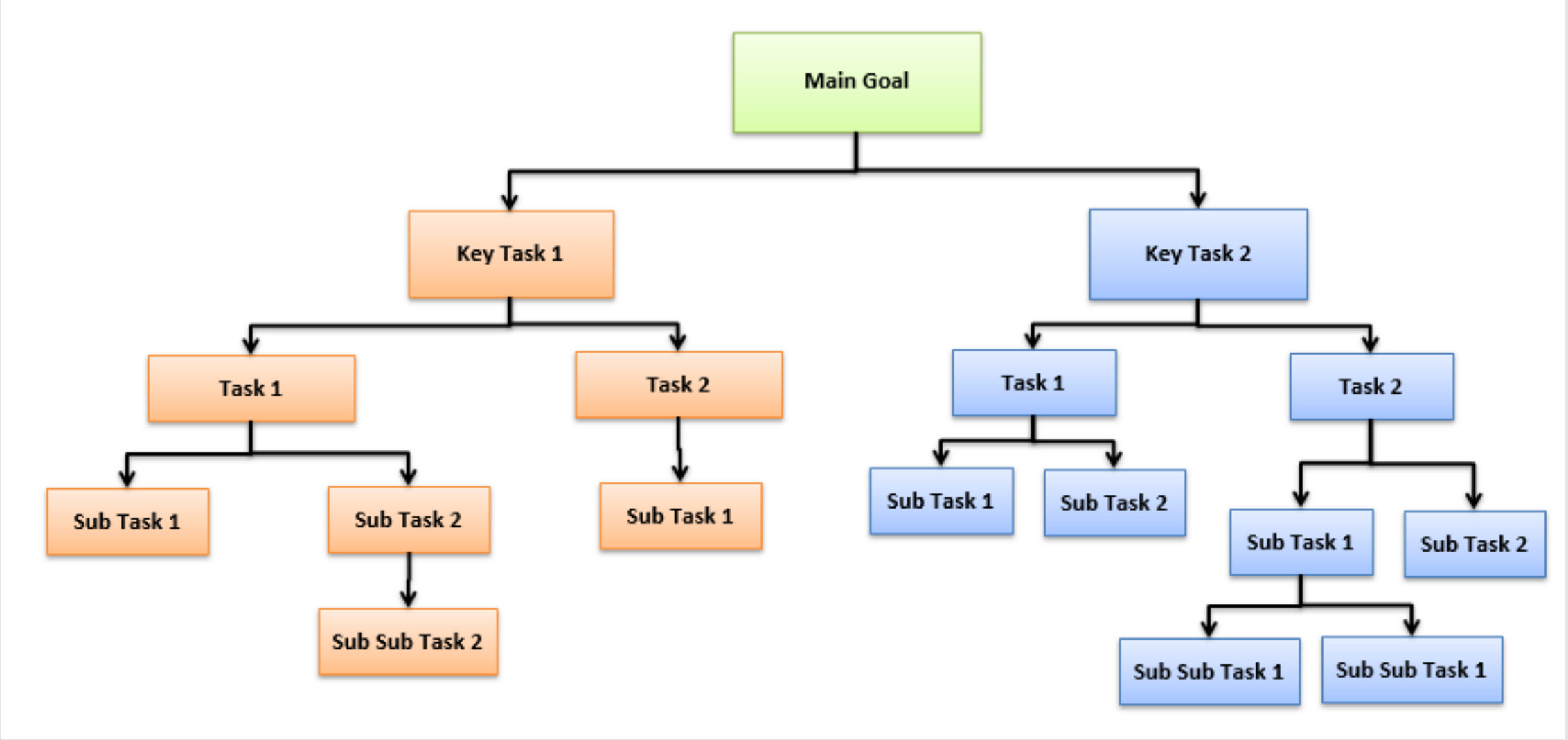
6. Further Expand

Continue to turn each new idea into a subject statement and ask the question. Do not stop until you reach fundamental elements: specific actions, not divisible components, or root causes.

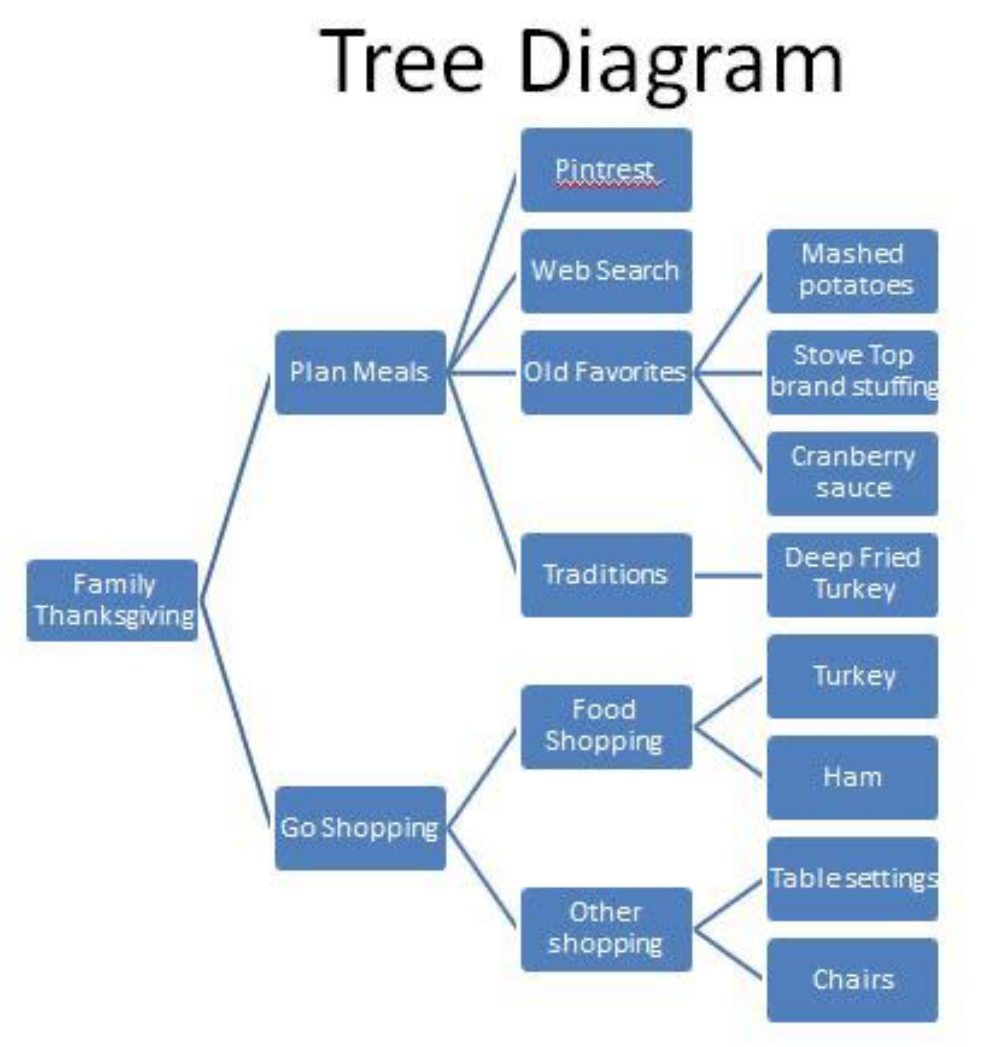
7. Check

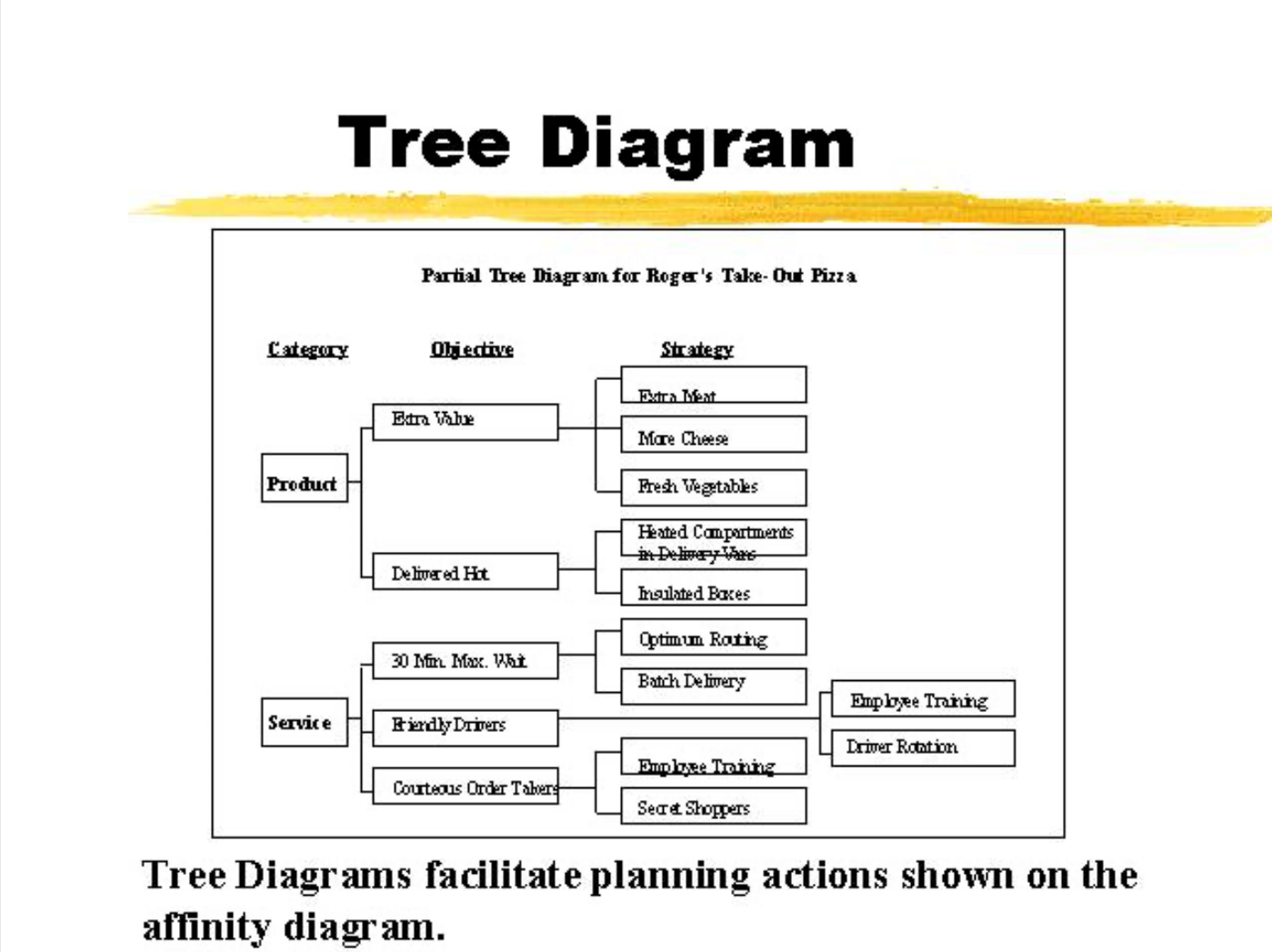
Complete a "necessary and sufficient" check of the entire diagram

TREE DIAGRAM



TREE DIAGRAM





Tree Diagrams facilitate planning actions shown on the affinity diagram.

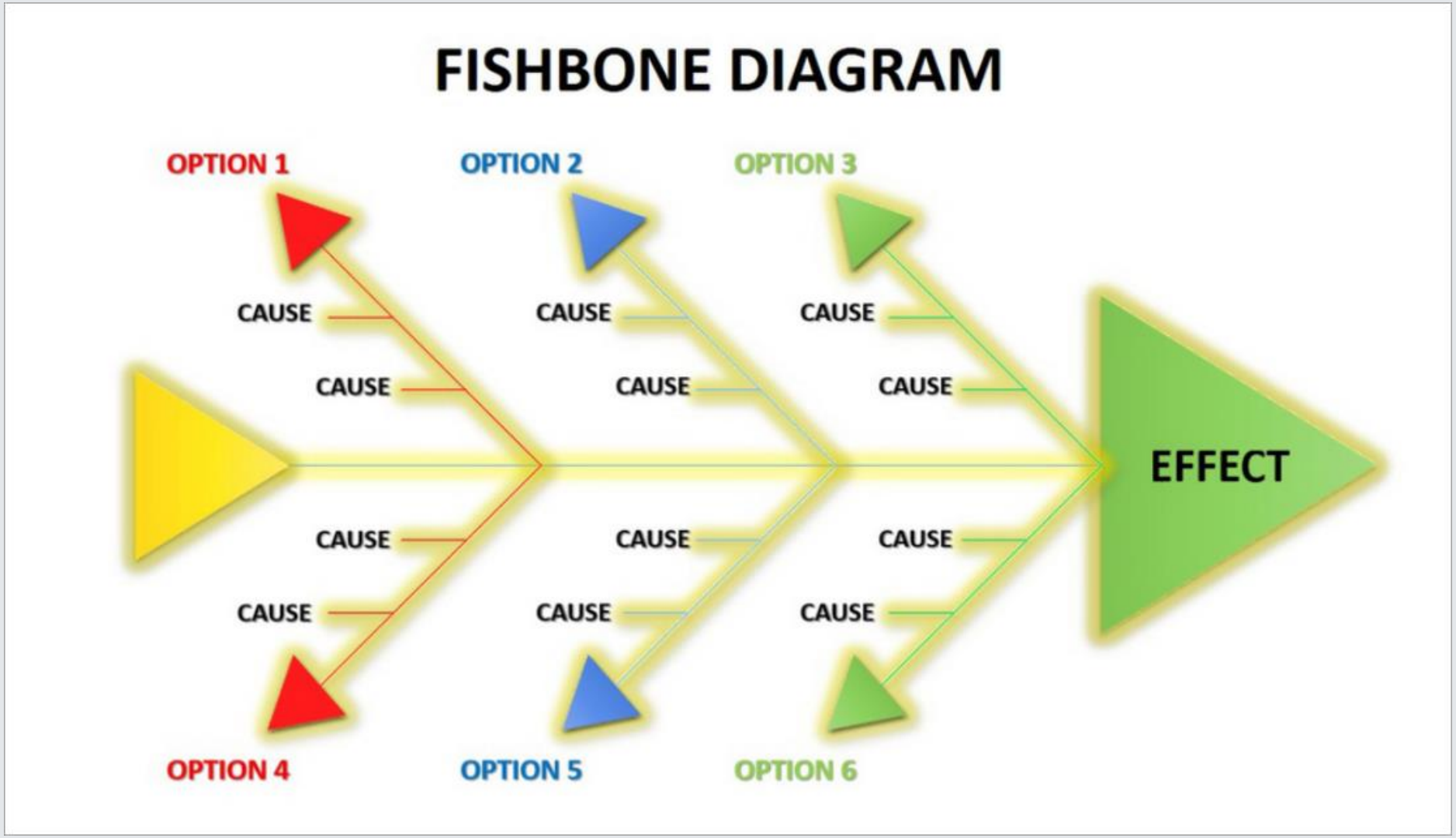
CAUSE AND EFFECT DIAGRAM

- A Cause and Effect Diagram also known as Fishbone/Ishikawa Diagram indicates possible causes of a problem. They are employed in Root Cause Analysis.

- The Fishbone Diagram is usually read from left to right and consists of bones, indicating possible causes of a problem, connected to a spine leading into the fish's head, which symbolizes the defect or problem.

- By visually sorting possible defect causes, identifying cause and effect relationships, and determining which causes are having the greatest impact on the problem, the Fishbone Diagram enables people to address the problem rather than its symptoms.

CAUSE AND EFFECT DIAGRAM



CAUSE AND EFFECT DIAGRAM PROCEDURE

- Identify the problem and write it in a box. This is the fish's head. Draw an arrow leading into the head.
- Brainstorm categories for potential causes and write them as branches from the arrow.
- Brainstorm all potential causes and write them under the appropriate category (a cause might fall under more than one category). As you brainstorm, ask "why" each potential cause happens, and use these suggestions to generate more causes.
- As you group the causes of the problem, it will become apparent which categories are having the largest effect on the problem.
- When you've finished brainstorming, prioritize the causes by how likely they are to be the cause of the problem and how easy they are to fix, focusing on the causes that are having the greatest effect on the problem.

CAUSE AND EFFECT DIAGRAM

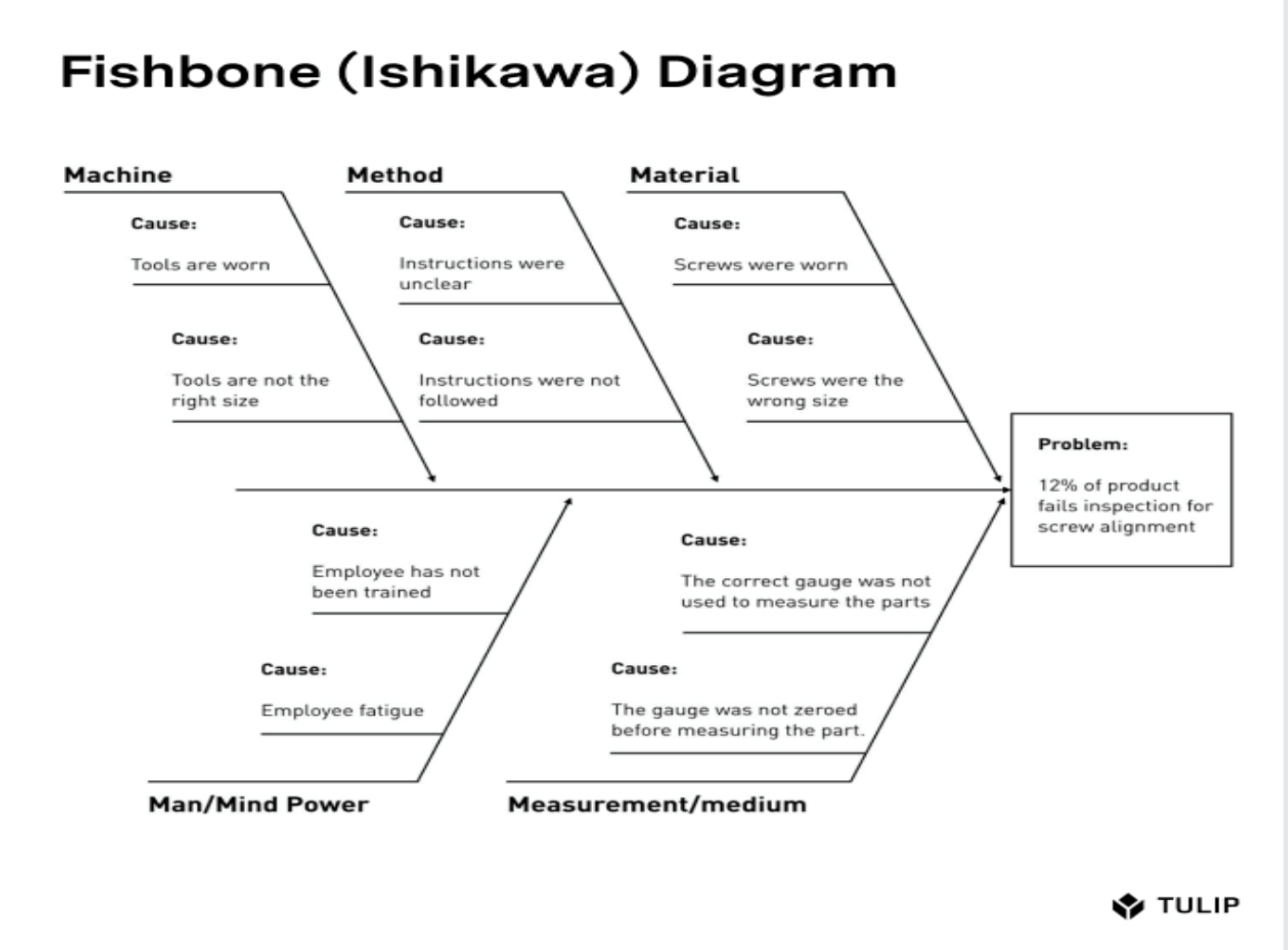


Figure: Example of a Fishbone Diagram

FRAMEWORK FOR OPERATIONAL ANALYSIS
DOTMLPF-P

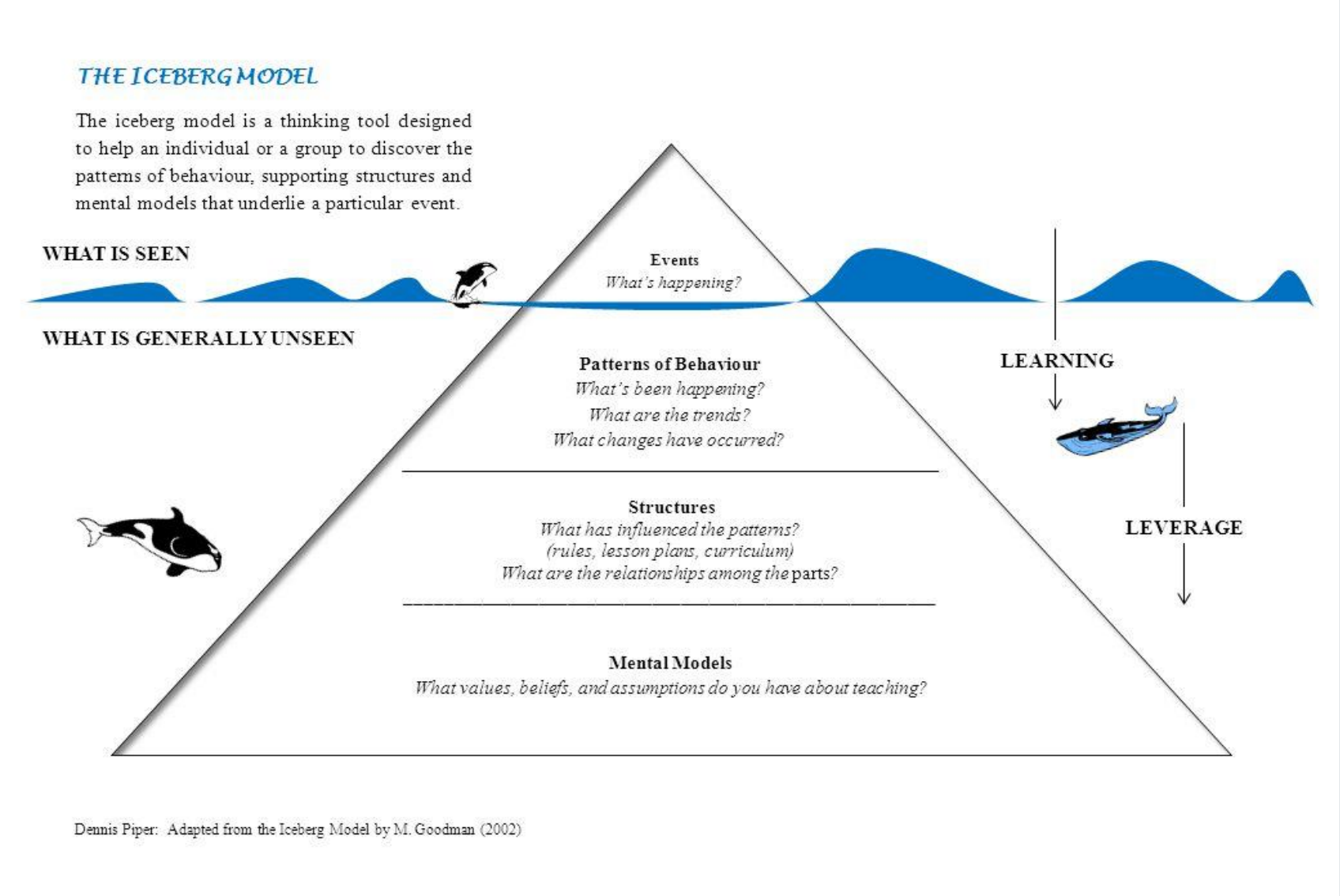
- **D**octrine.
- **O**rganisation.
- **T**raining.
- **M**ateriel.
- **L**eadership and Education.
- **P**ersonnel.
- **F**acilities.
- **P**olicy.

ICEBERG MODEL

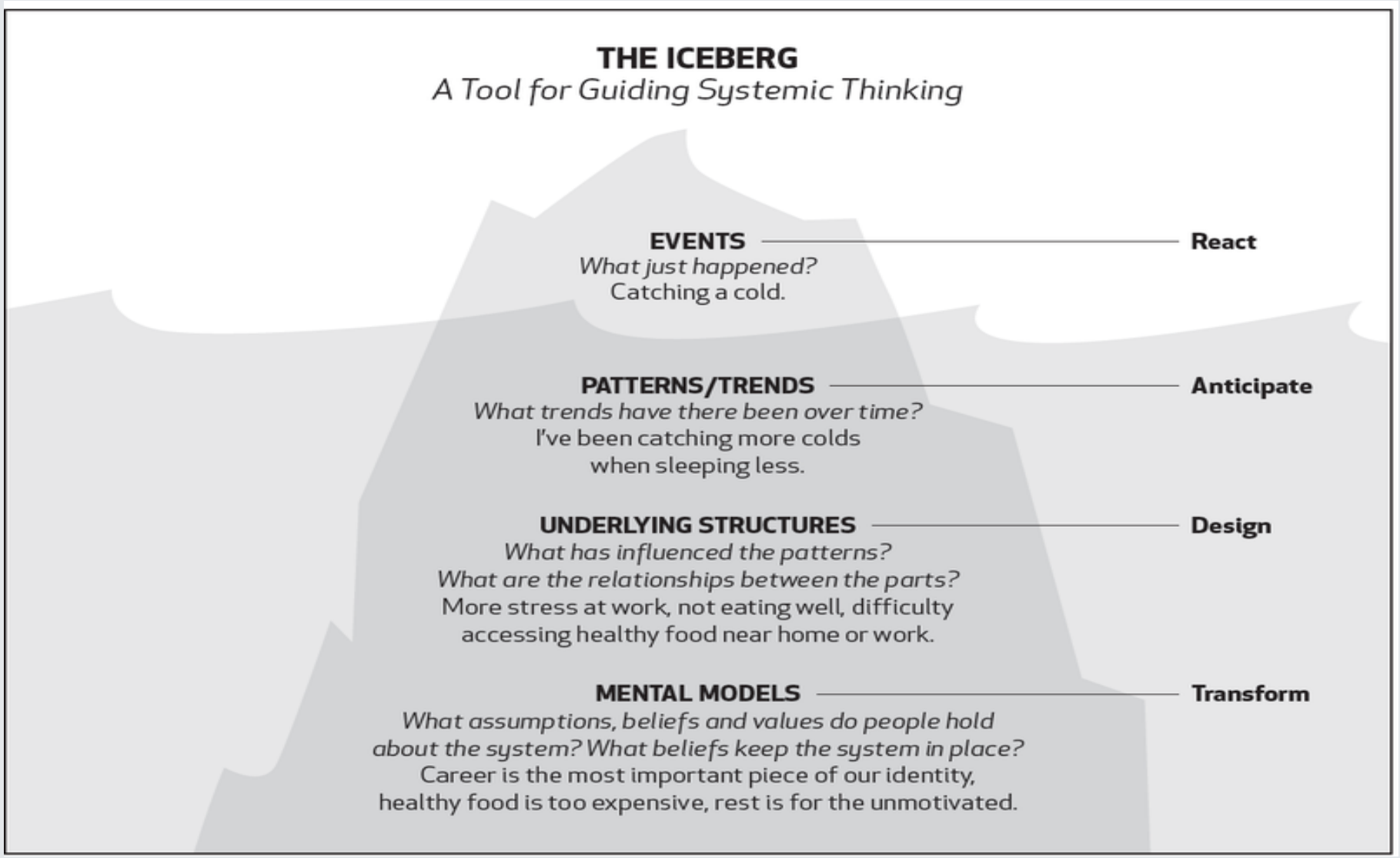
- The Iceberg Model is a Systems Thinking tool designed to help discover the patterns of behaviour, supporting structures and mental models that underlie a particular event.

- **Event**: What is happening?
- **Patterns of Behaviour**: What has been happening? What are the trends? What changes have occurred?
- **Structures**: What has influenced the patterns? What are the relationships between the parts.
- **Mental Models**: What values, beliefs and assumptions are fueling the structures?

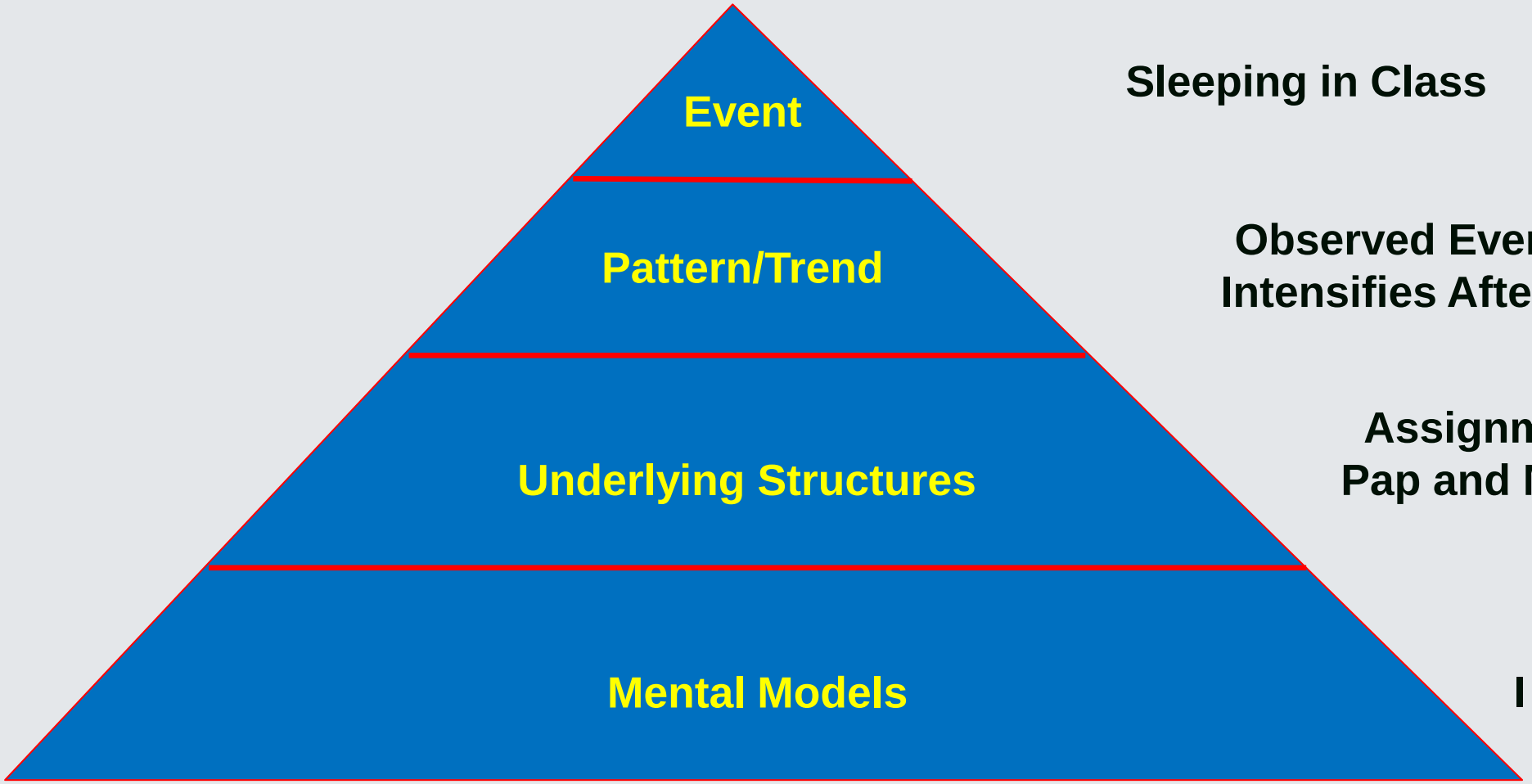
ICEBERG MODEL



ICEBERG MODEL



ICEBERG MODEL



Sleeping in Class

Observed Every Tuesday
Intensifies After Tea Break

Assignments on Monday?
Pap and Moi Moi Tea Break?

Pap is a Sleep Inducer
I Must Eat What is Served
at Tea Break

SYSTEM MAP

- A System Map is a tool to create a simple high-level diagram of the situation under investigation.
- It helps to define boundaries, indicate the major components (subsystems) that lie within the boundaries, indicate the major items in the system's environment and identify the relationships between the components.
- System Maps exploit the concept of hierarchy to capture and manage complexity through subdivision.

SYSTEM MAP

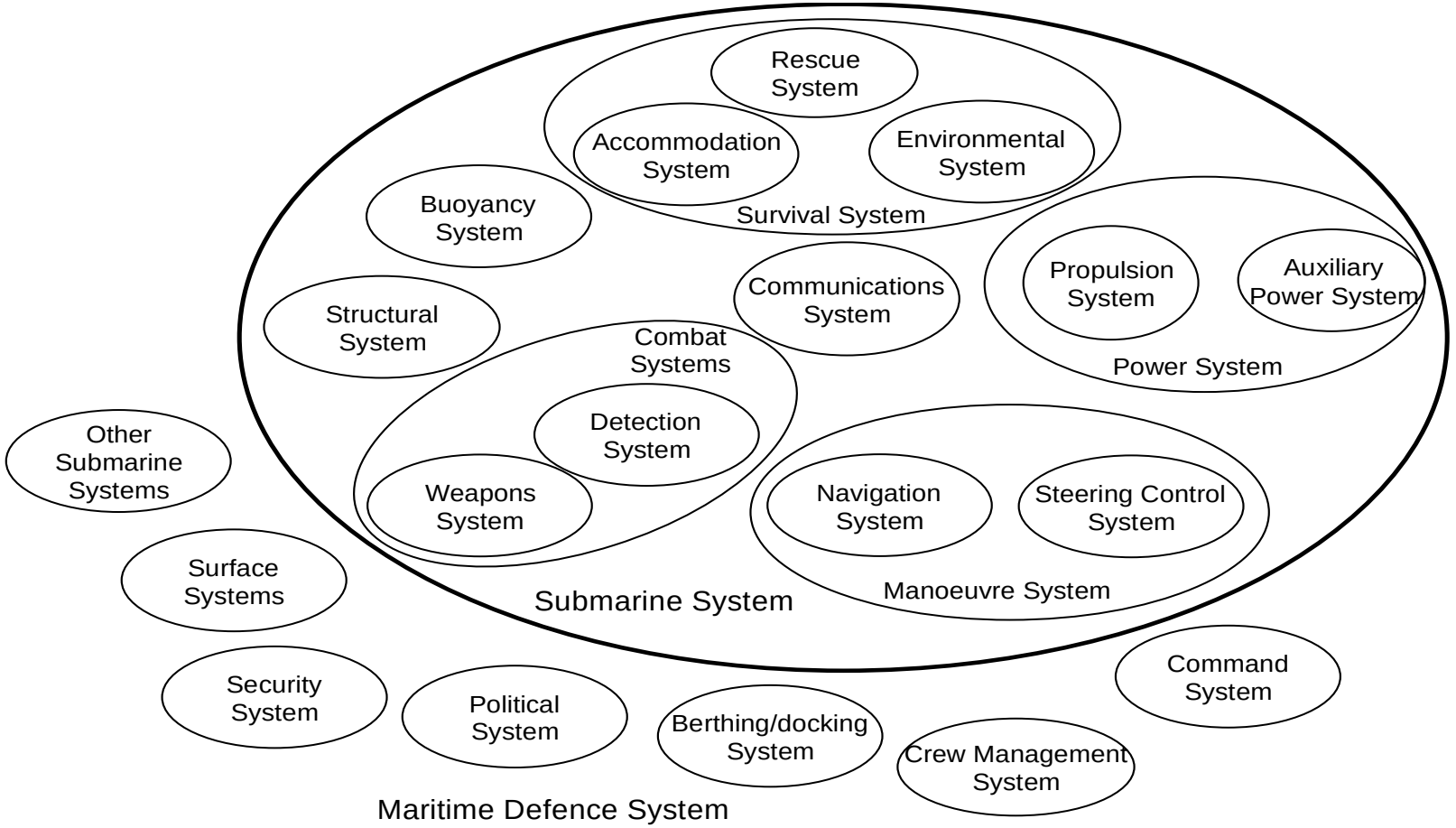


Figure: A System Map for a Submarine

SYSTEM MAP

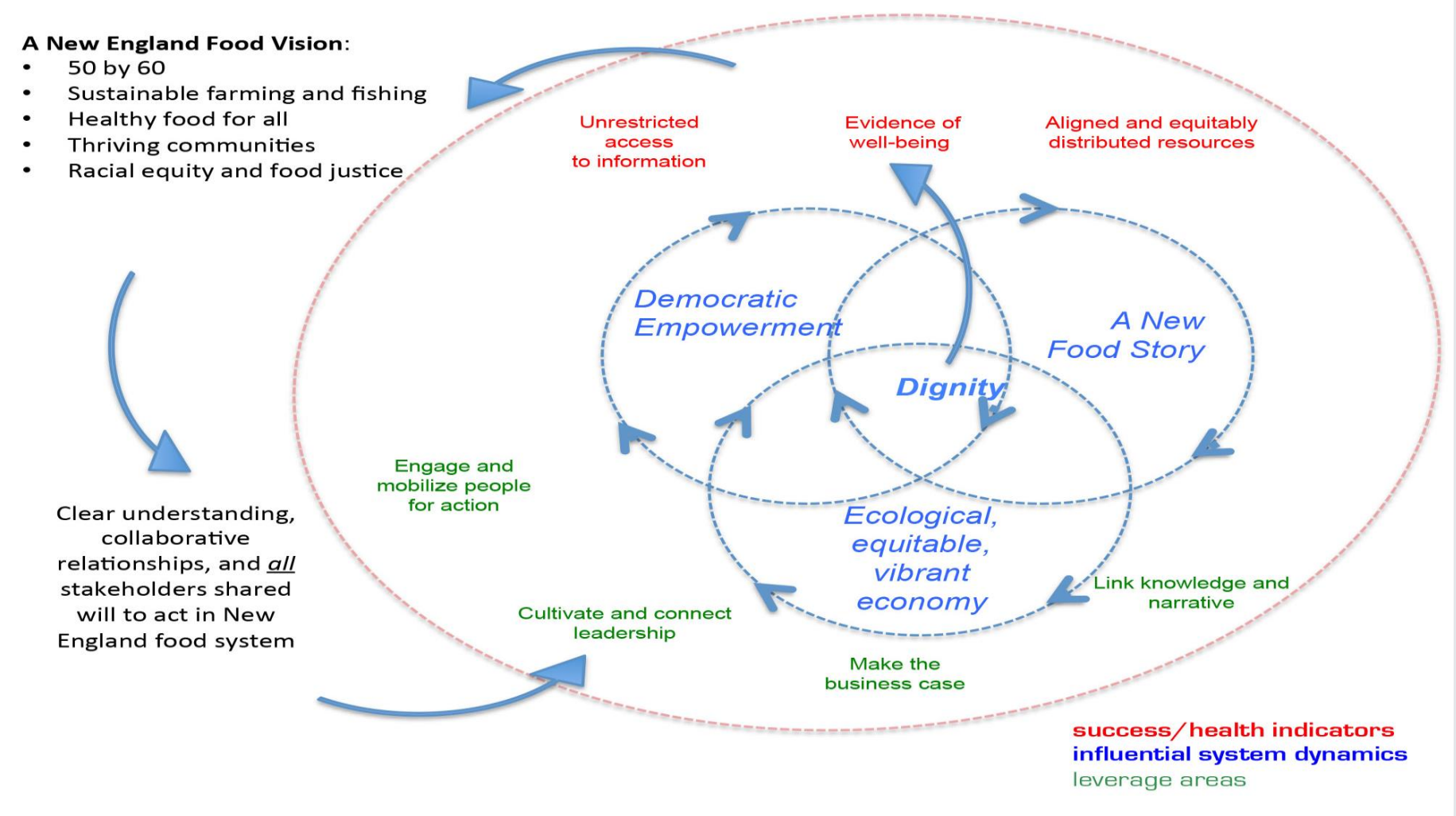


Figure: A System Map of Food Vision in New England

SYSTEM MAP

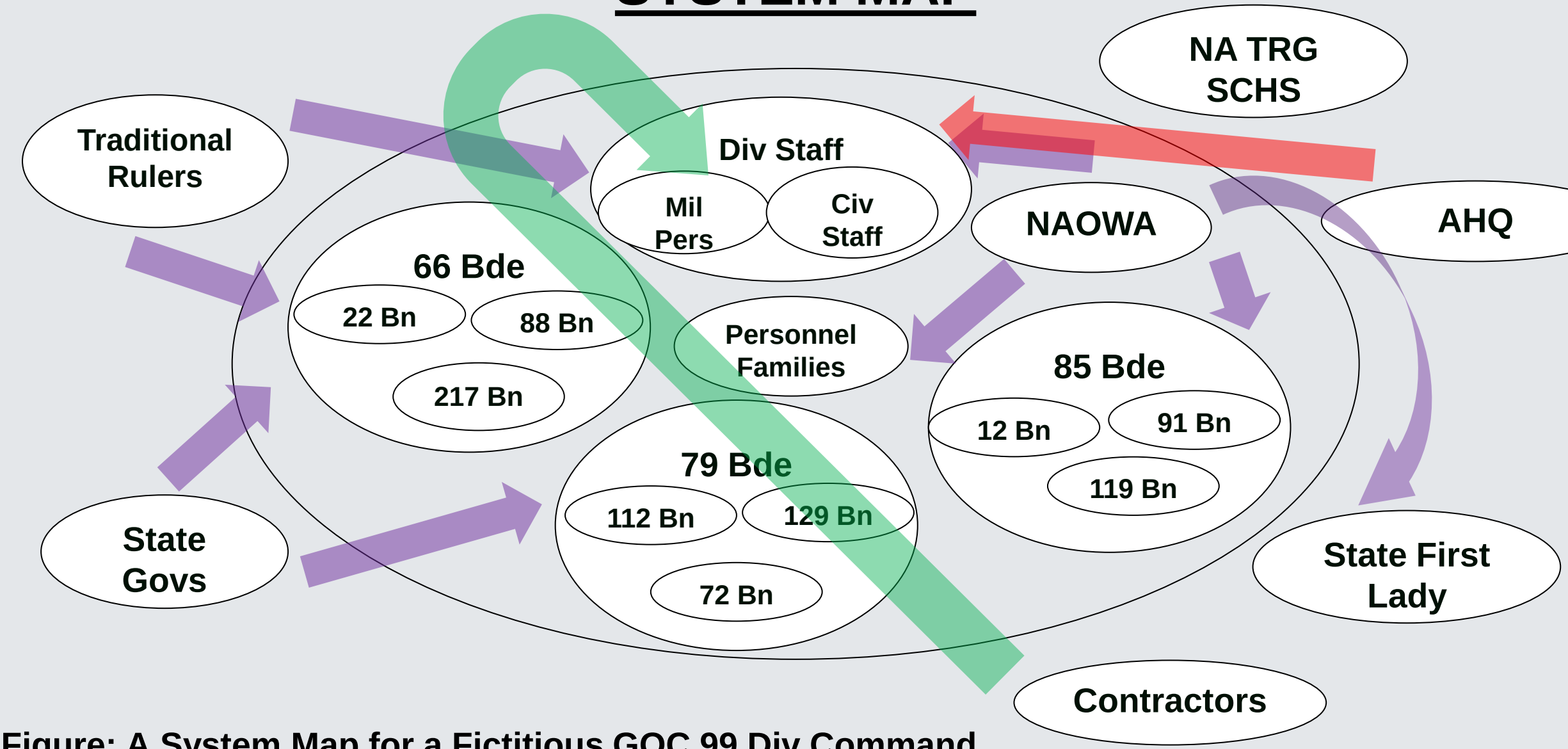


Figure: A System Map for a Fictitious GOC 99 Div Command

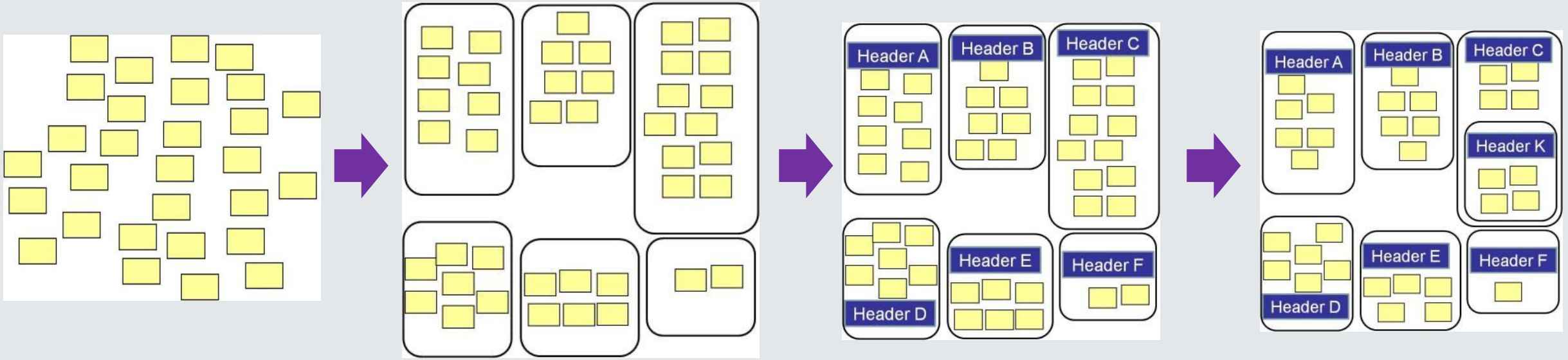
AFFINITY DIAGRAM

- Affinity Diagrams help a team to generate ideas about a situation or problem; organise a large number of ideas into meaningful groups and communicate the ideas in a simple and powerful representation.

- Affinity Diagrams are employed in creative thinking especially during brainstorming. They help to sort a large number of divergent ideas into groups to ease the process of convergent thinking for the production of viable solutions.

- Affinity Diagrams offer an organised and structured output, balanced individual output and easily reviewable output. Also, through duplications a qualitative measure of importance can be recognised.

AFFINITY DIAGRAM (CONT)



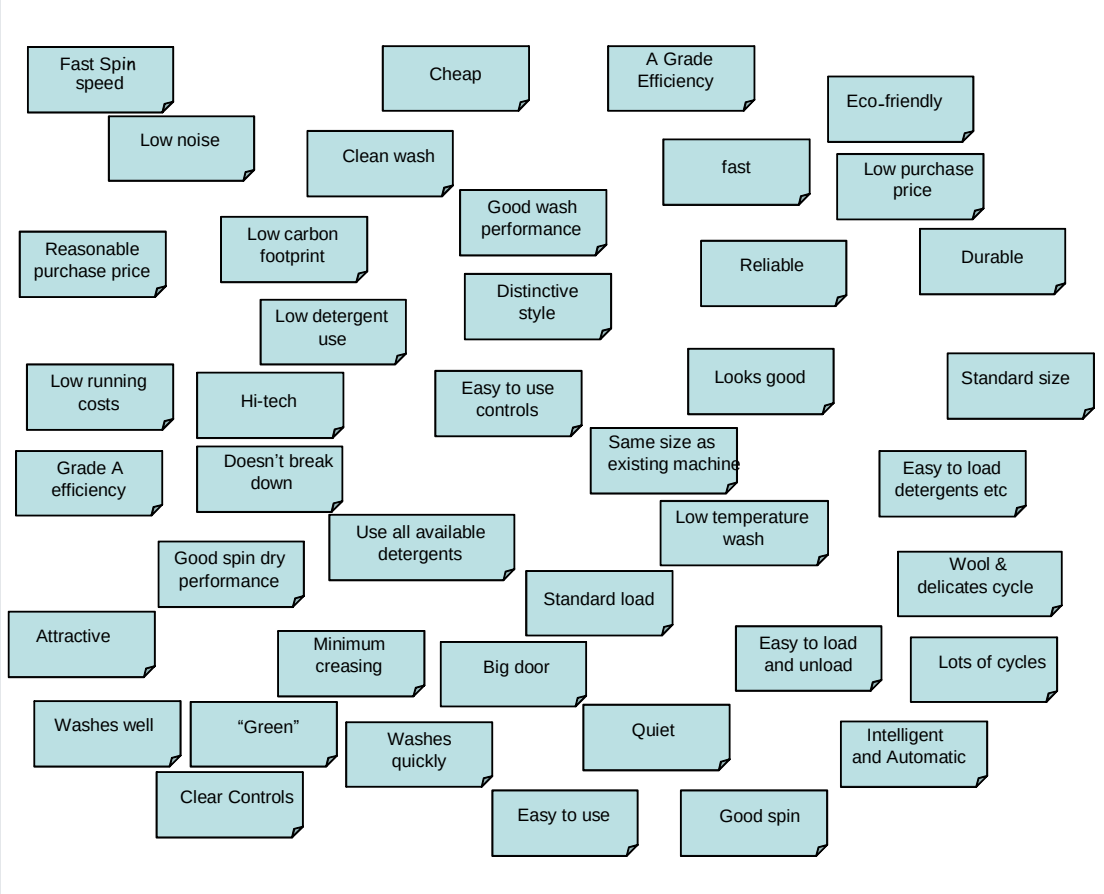
DIVERGENT THINKING

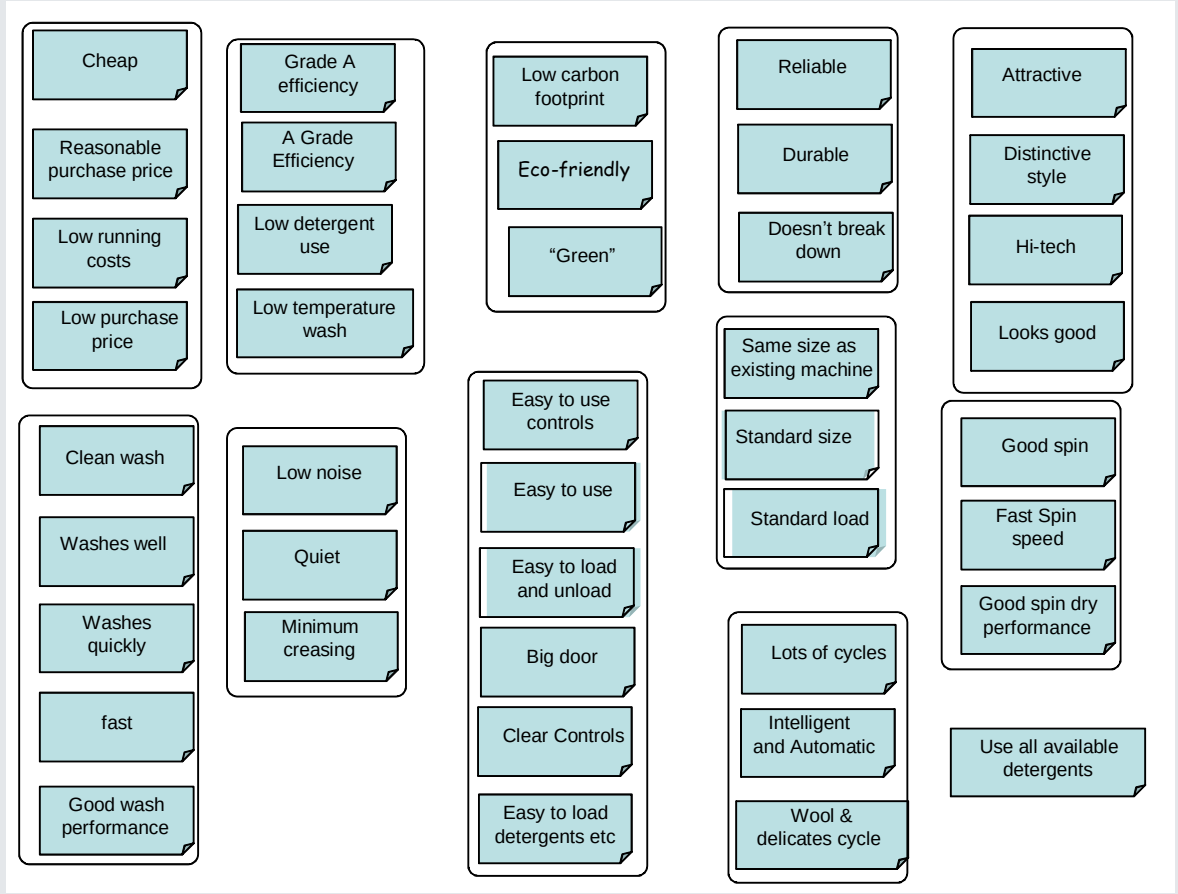
CONVERGENT THINKING

REFINING

REVIEW

AFFINITY DIAGRAM (CONT)





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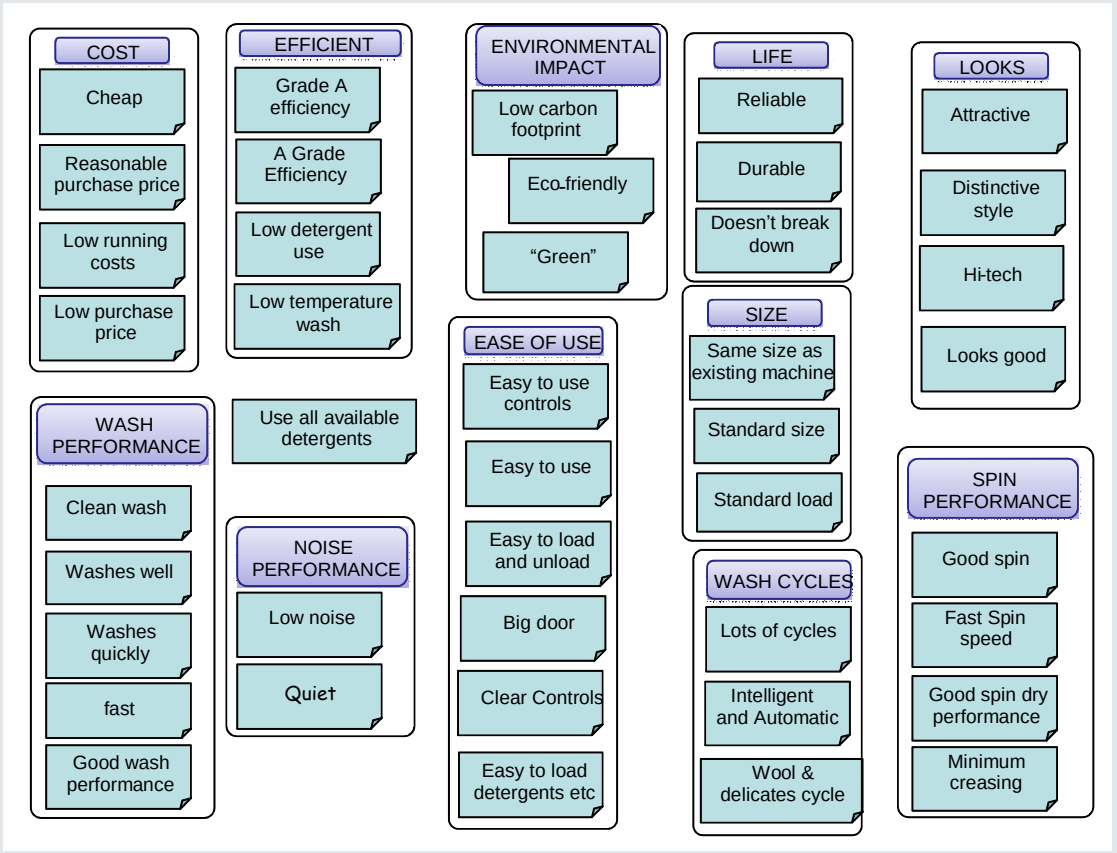
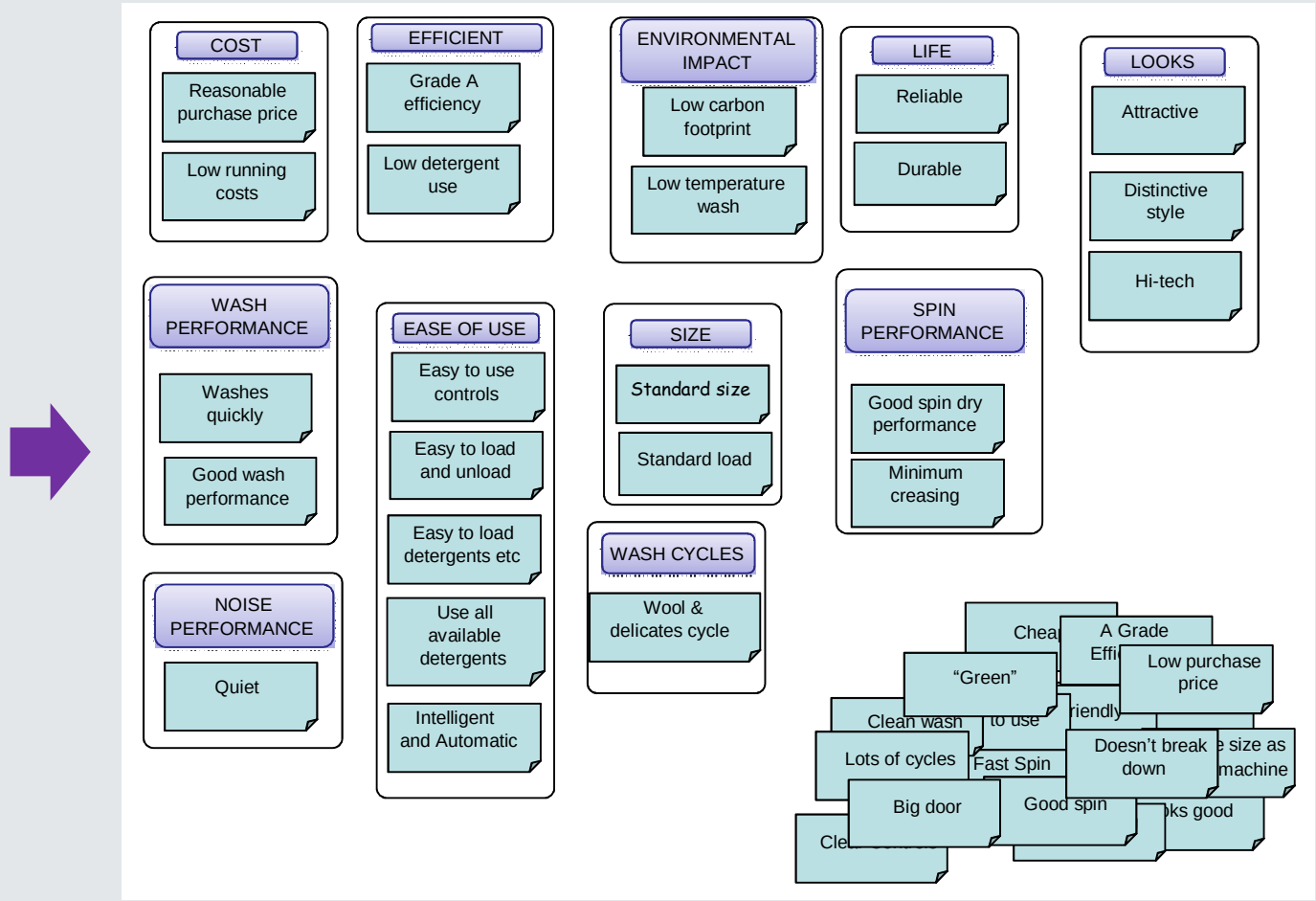




AFFINITY DIAGRAM TO TREE DIAGRAM

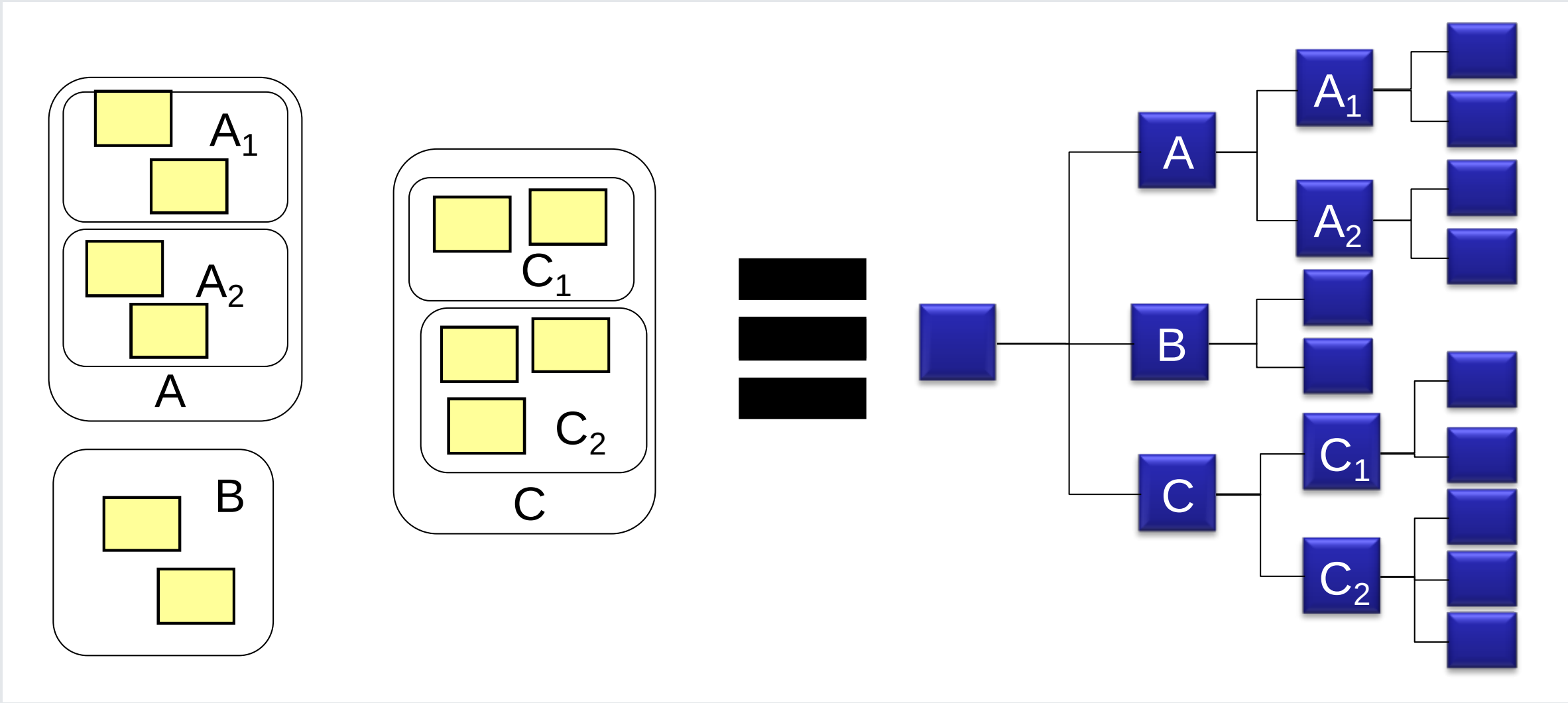
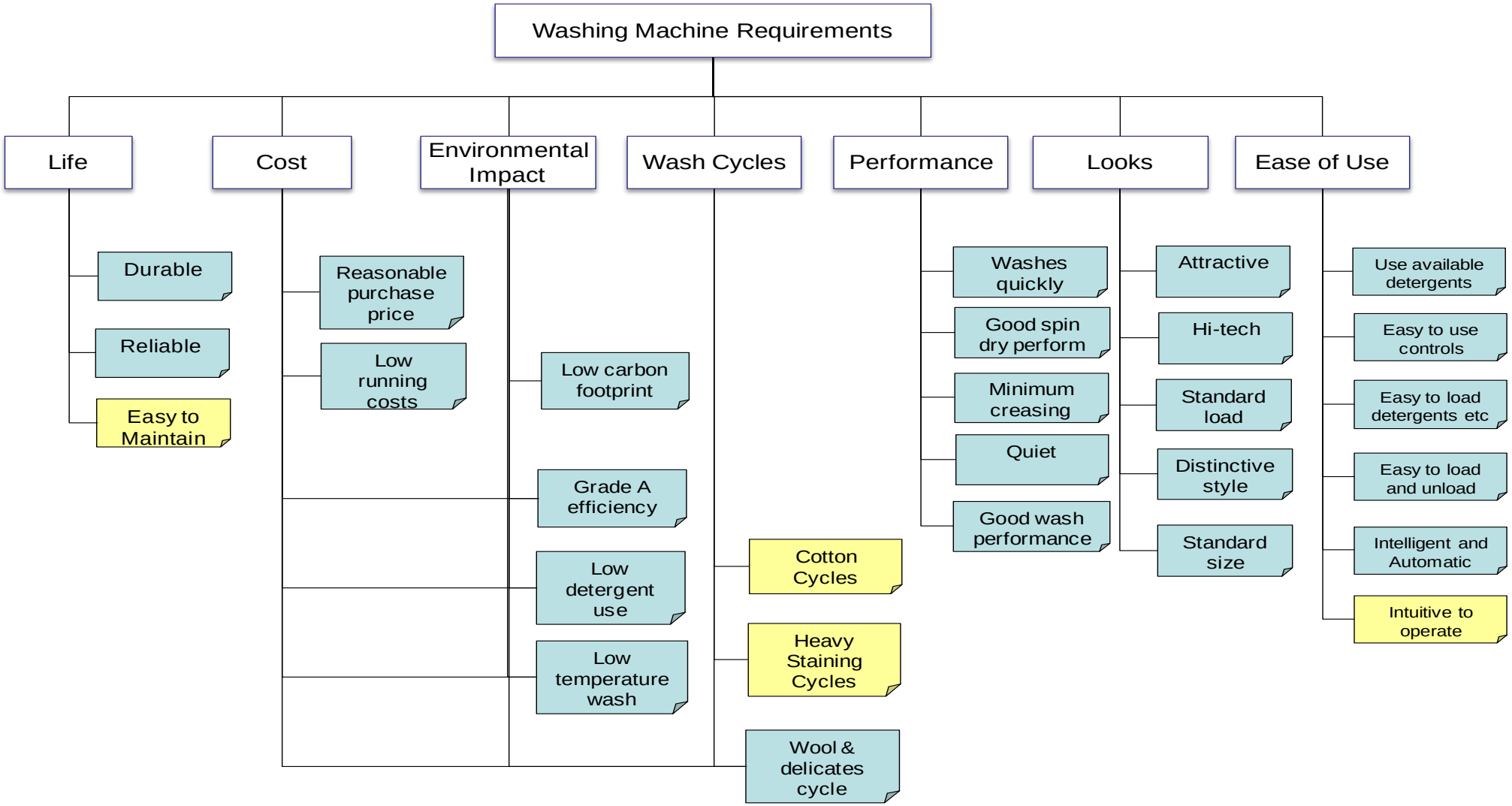


Figure: Structural Equivalence Between Affinity Diagrams and Tree Diagrams

TREE DIAGRAM



SPRAY DIAGRAM

- A Spray Diagram is an output from a divergent thinking process. It allows a team to generate and capture thoughts and associated ideas about a situation or problem and communicate their ideas in a simple and powerful representation.

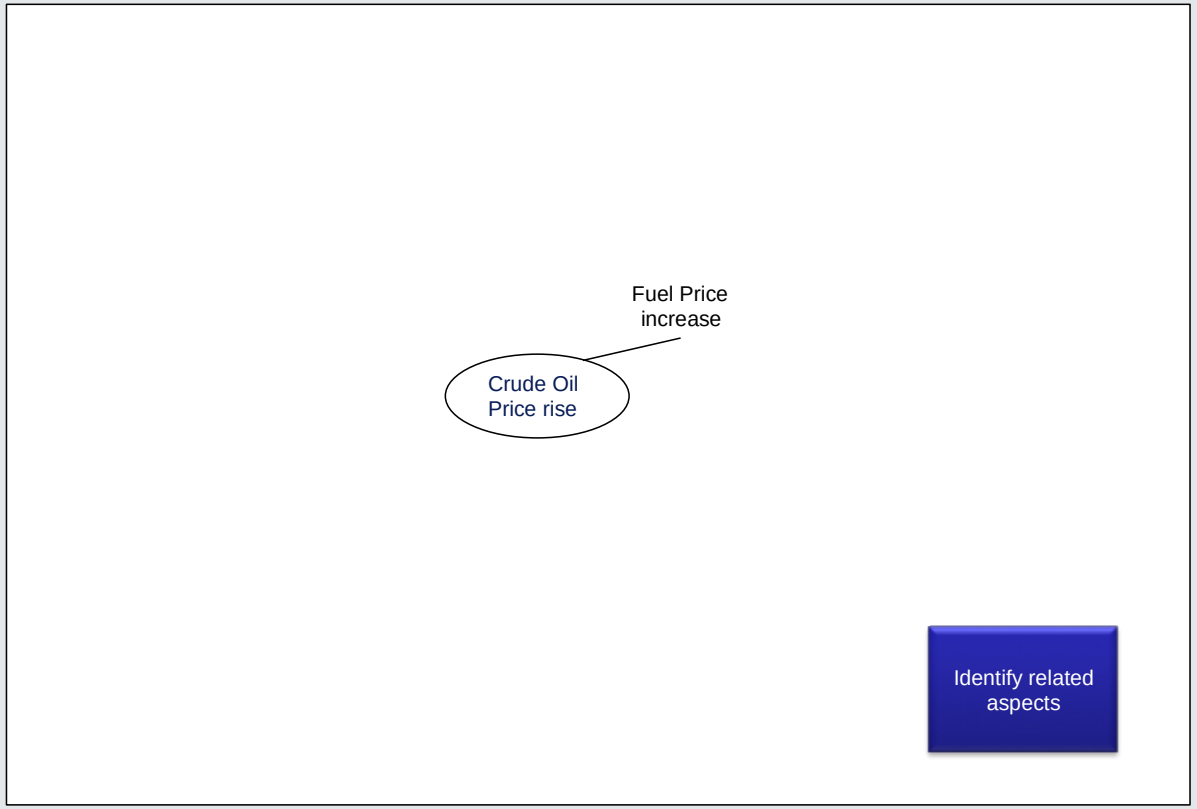
- The Spray Diagram is an alternative to brainstorming. It is particularly useful when the situation or problem is considered too complex to be handled by a simple brainstorming session.

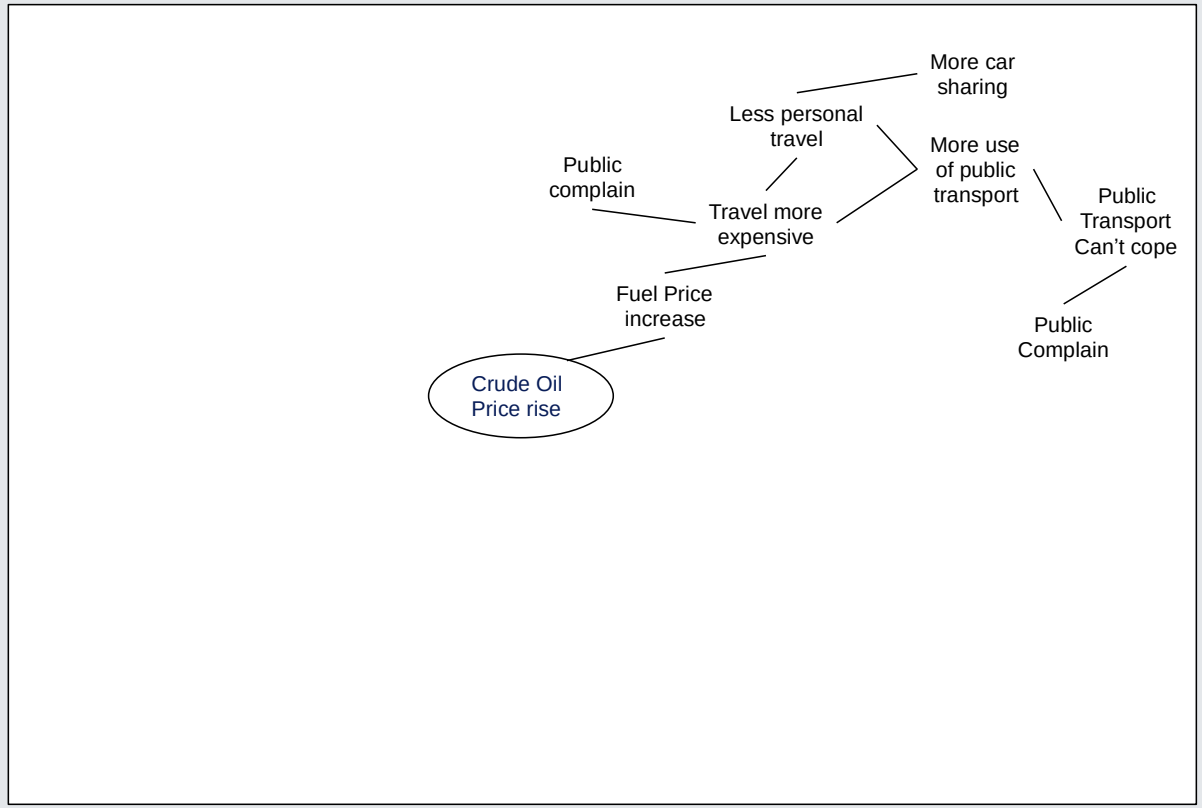
- The Spray Diagram captures not only the thoughts or ideas generated by the team or individual but also how the thoughts evolved. This can be highly useful in Root Cause Analysis by subliminally “asking” the team to “dig deeper”. It is similar to the 5 “Whys” used in Root Cause Analysis.

SPRAY DIAGRAM IN PRACTICE

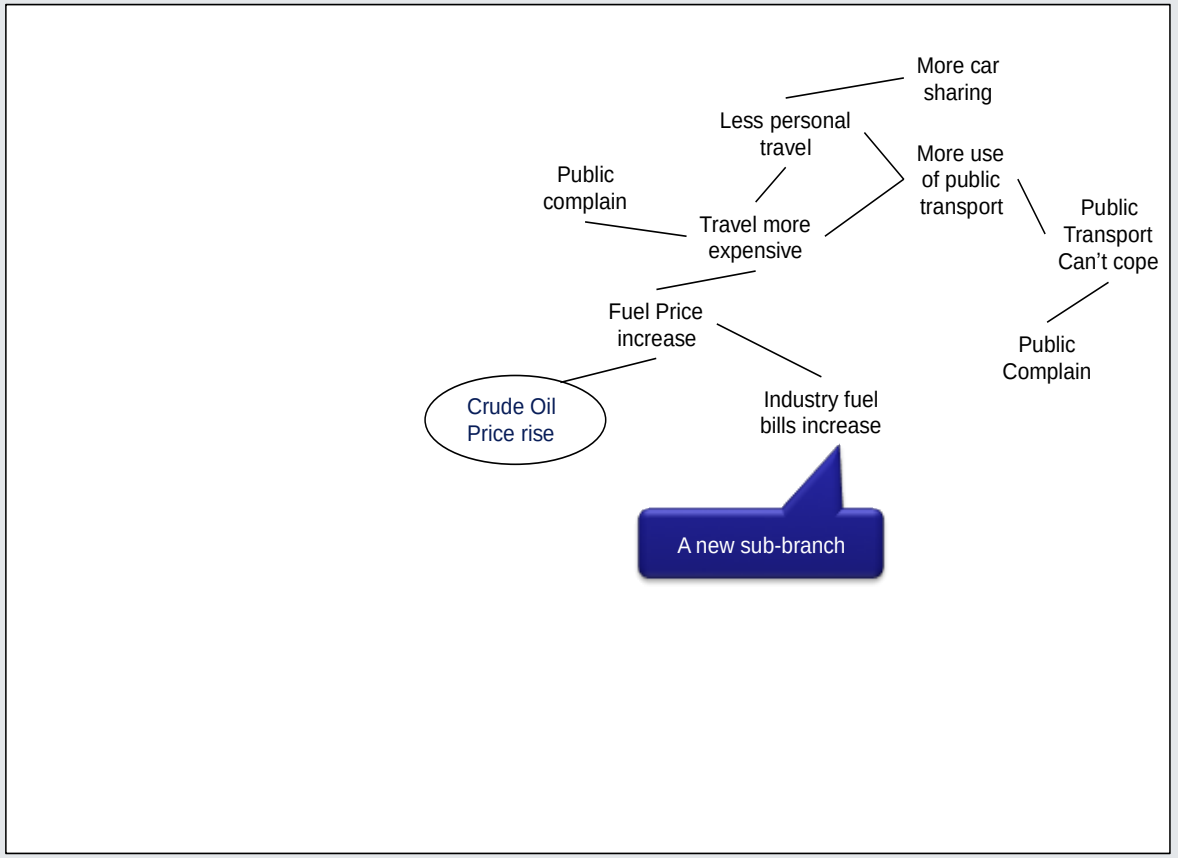
- Spray Diagrams can be used to generate ideas about a problem, an opportunity or a situation. The starting statement must be clear and precise.
- The team now use thought association, like word association, to generate information about the situation.
- As each new thought or idea is expressed it should be captured on the emerging Spray Diagram with a line to indicate where that particular item came from.
- The use of lines is important since it subliminally causes the team to pursue a “chain of thought”.

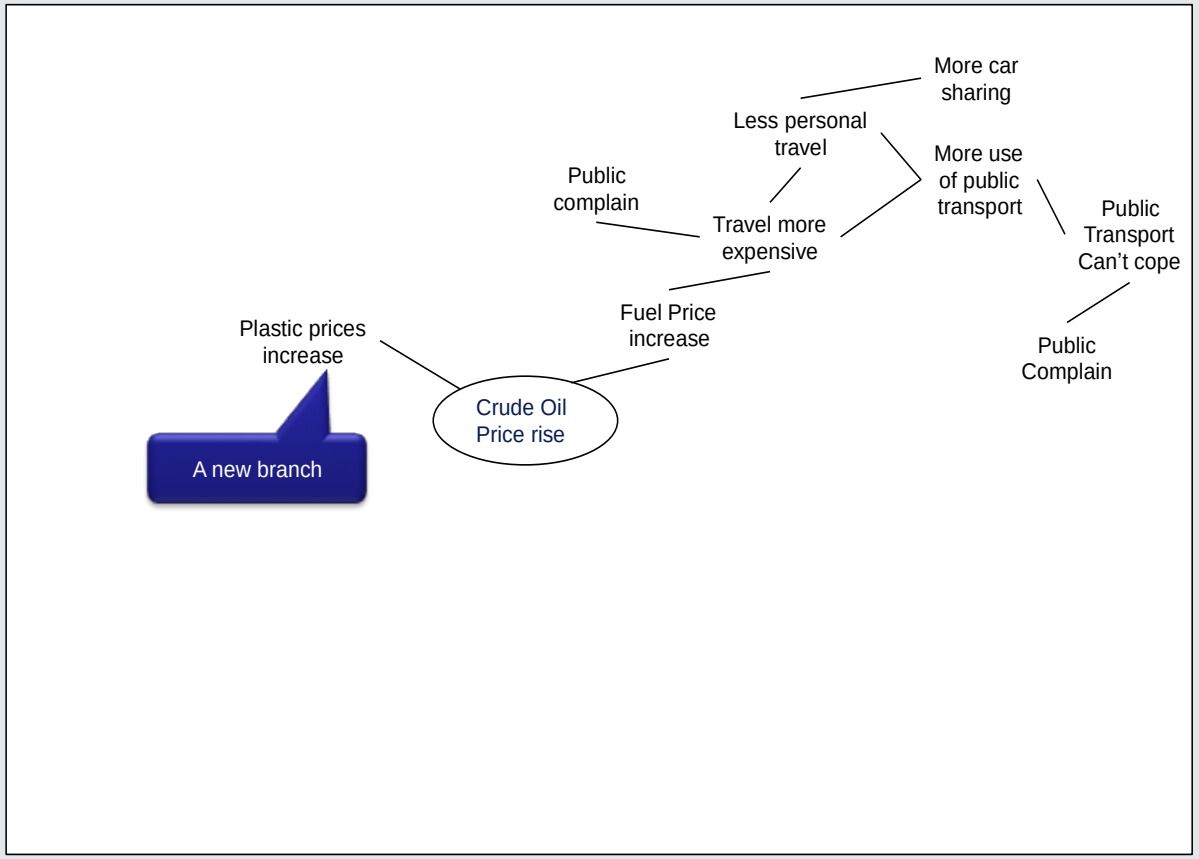
SPRAY DIAGRAM IN PRACTICE



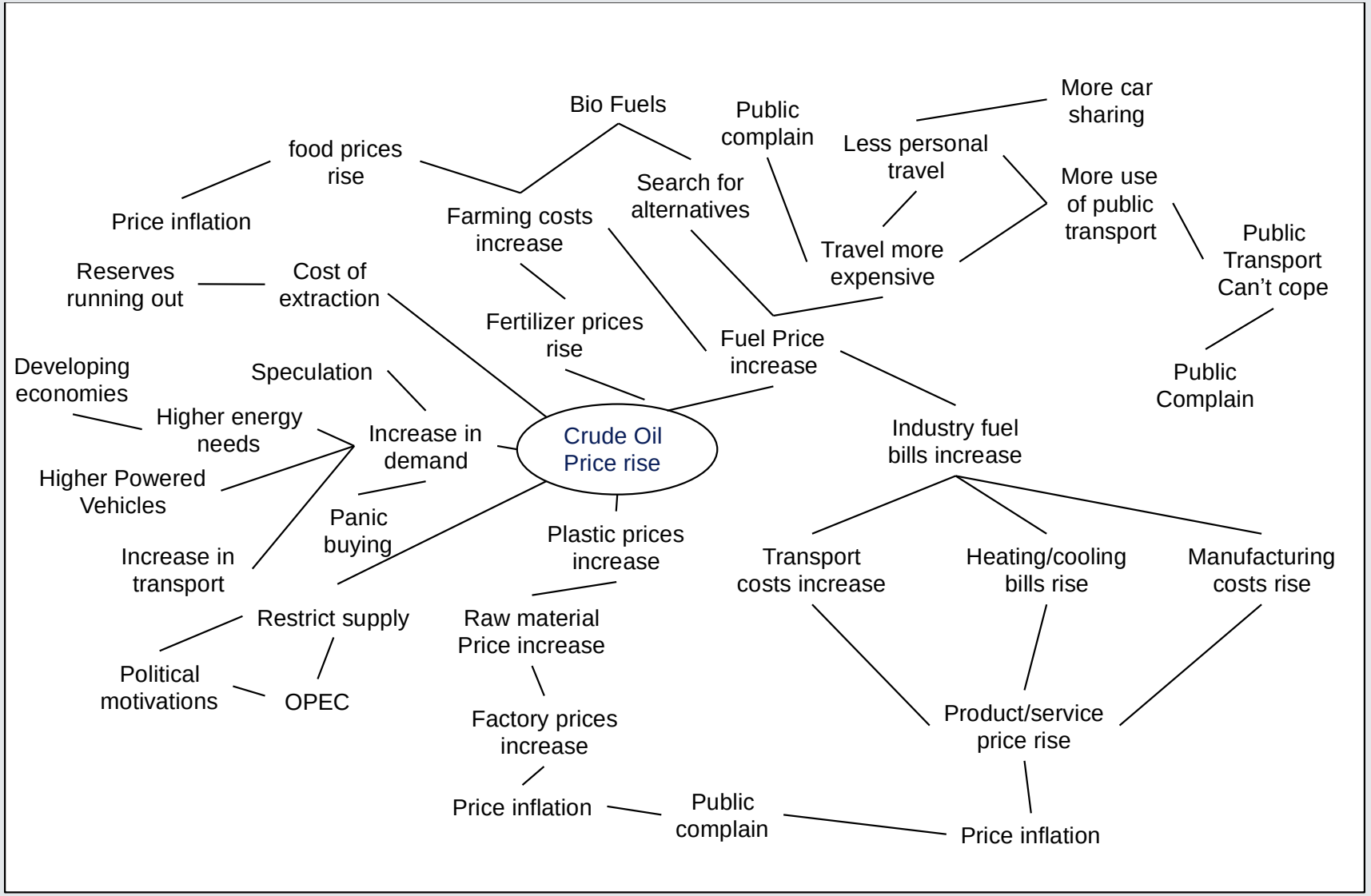


SPRAY DIAGRAM IN PRACTICE





SPRAY DIAGRAM IN PRACTICE



CAUSAL LOOP DIAGRAM

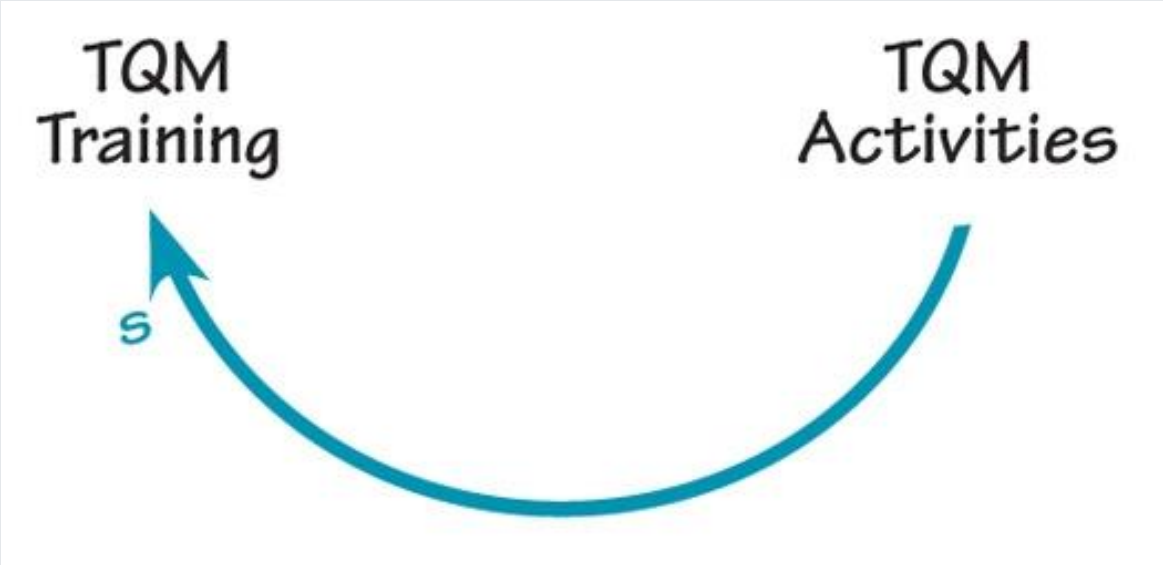
- Causal Loop Diagrams are used to understand system behaviour over a period of time. By representing a problem or issue from a causal perspective, you can become more aware of the structural forces that produce puzzling behaviour.

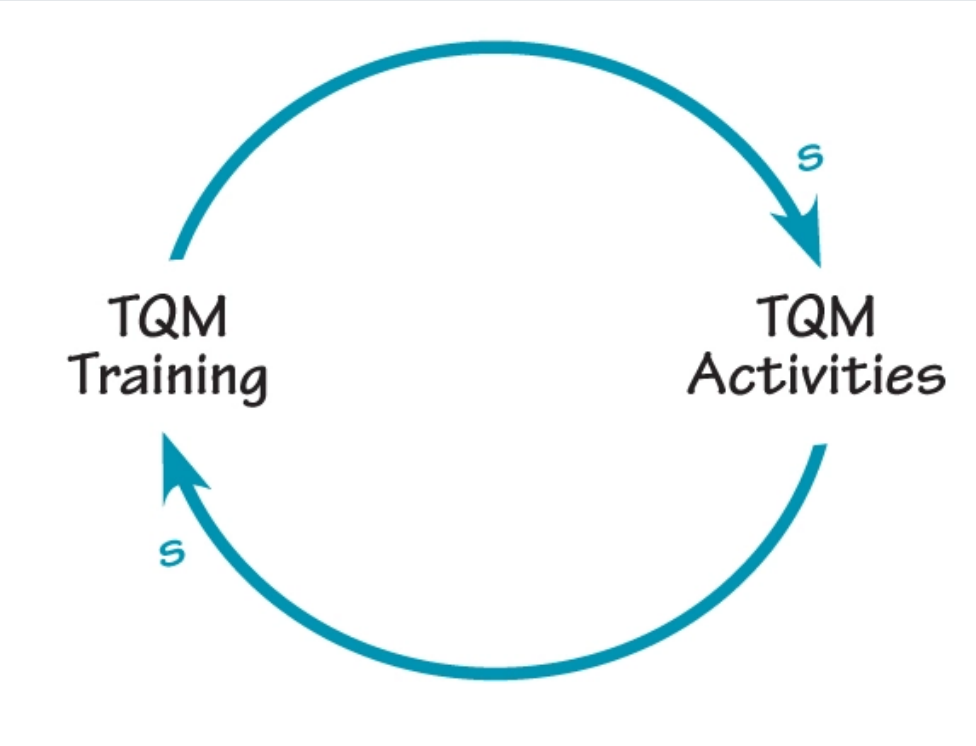
- A Causal Loop Diagram consists of 4 basic elements: the variables, the links between them, the signs on the links (which show how the variables are interconnected) and the sign of the loop (which shows what type of behaviour the system will produce).

CAUSAL LOOP DIAGRAM IN PRACTICE

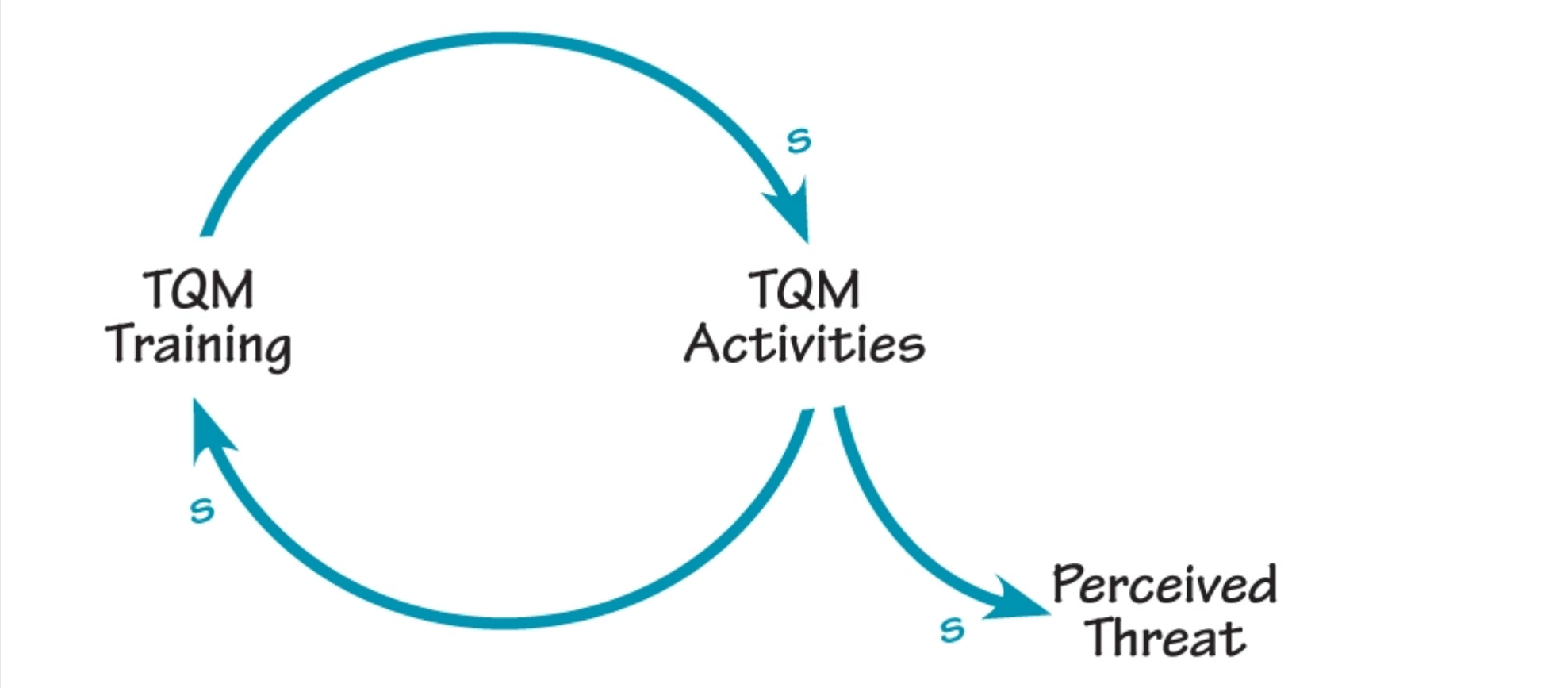
- Create variable names.
- Draw the links.
- Label the loop.
- Talk through the loop.
- Tell the story.

CAUSAL LOOP DIAGRAM IN PRACTICE

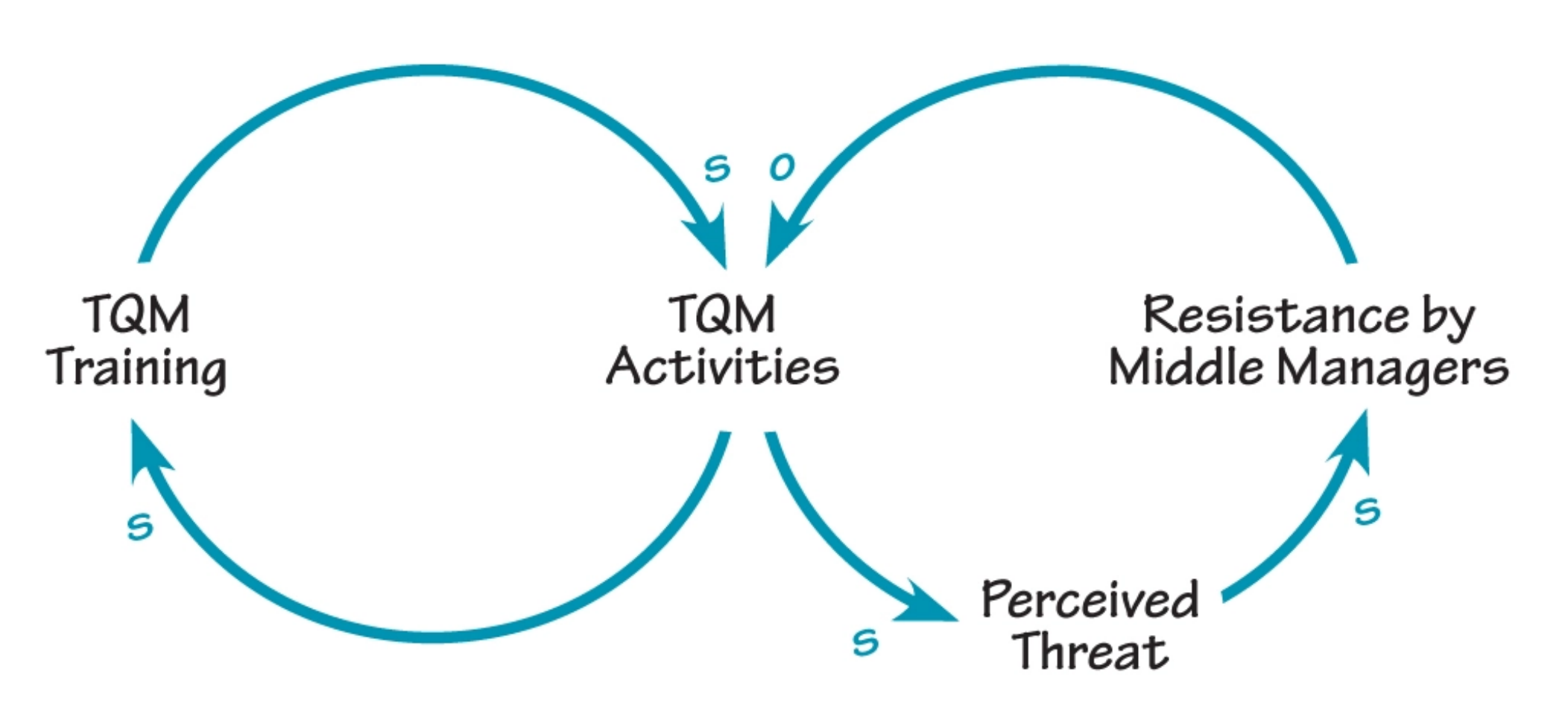




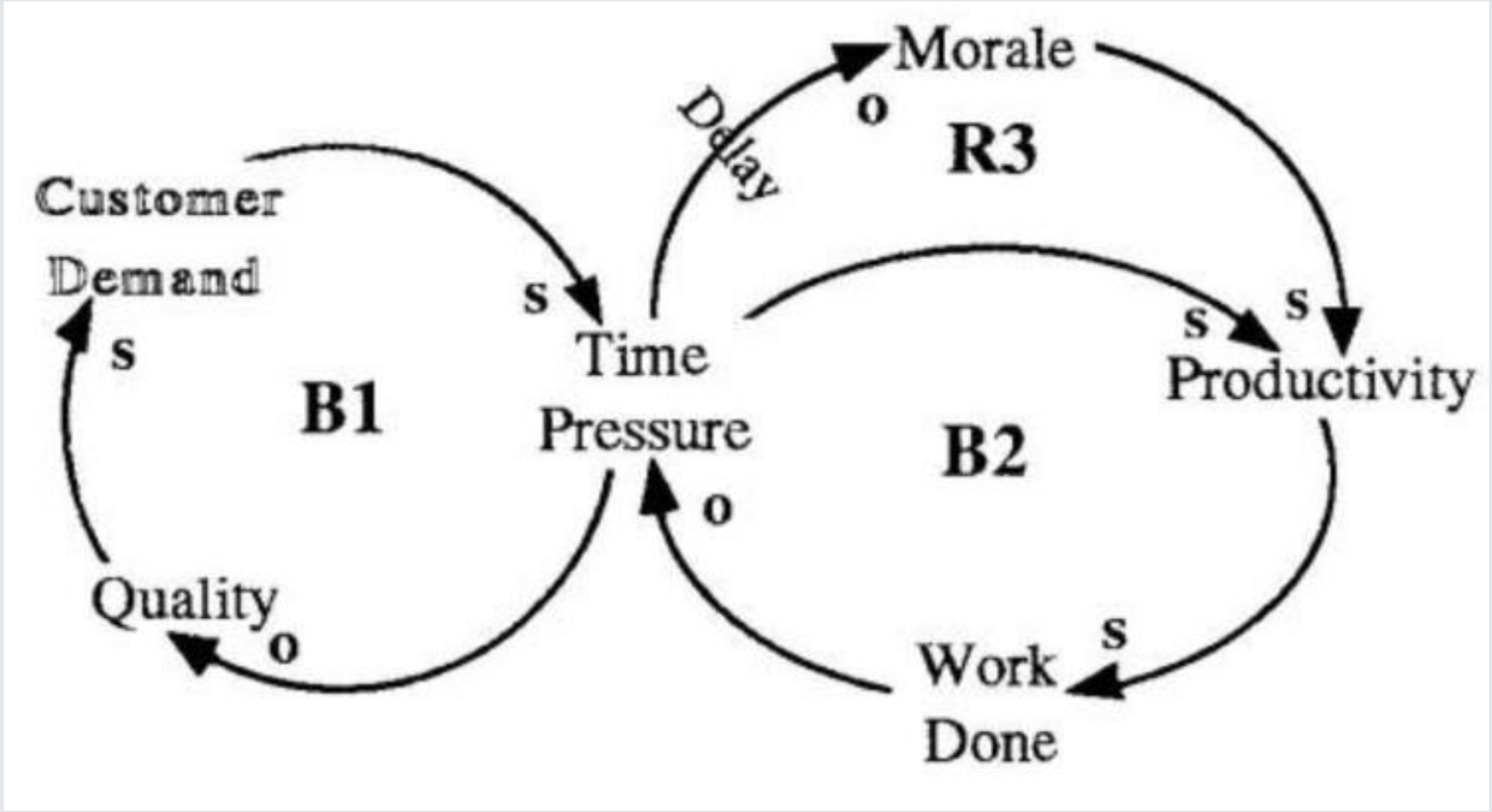
CAUSAL LOOP DIAGRAM IN PRACTICE



CAUSAL LOOP DIAGRAM IN PRACTICE

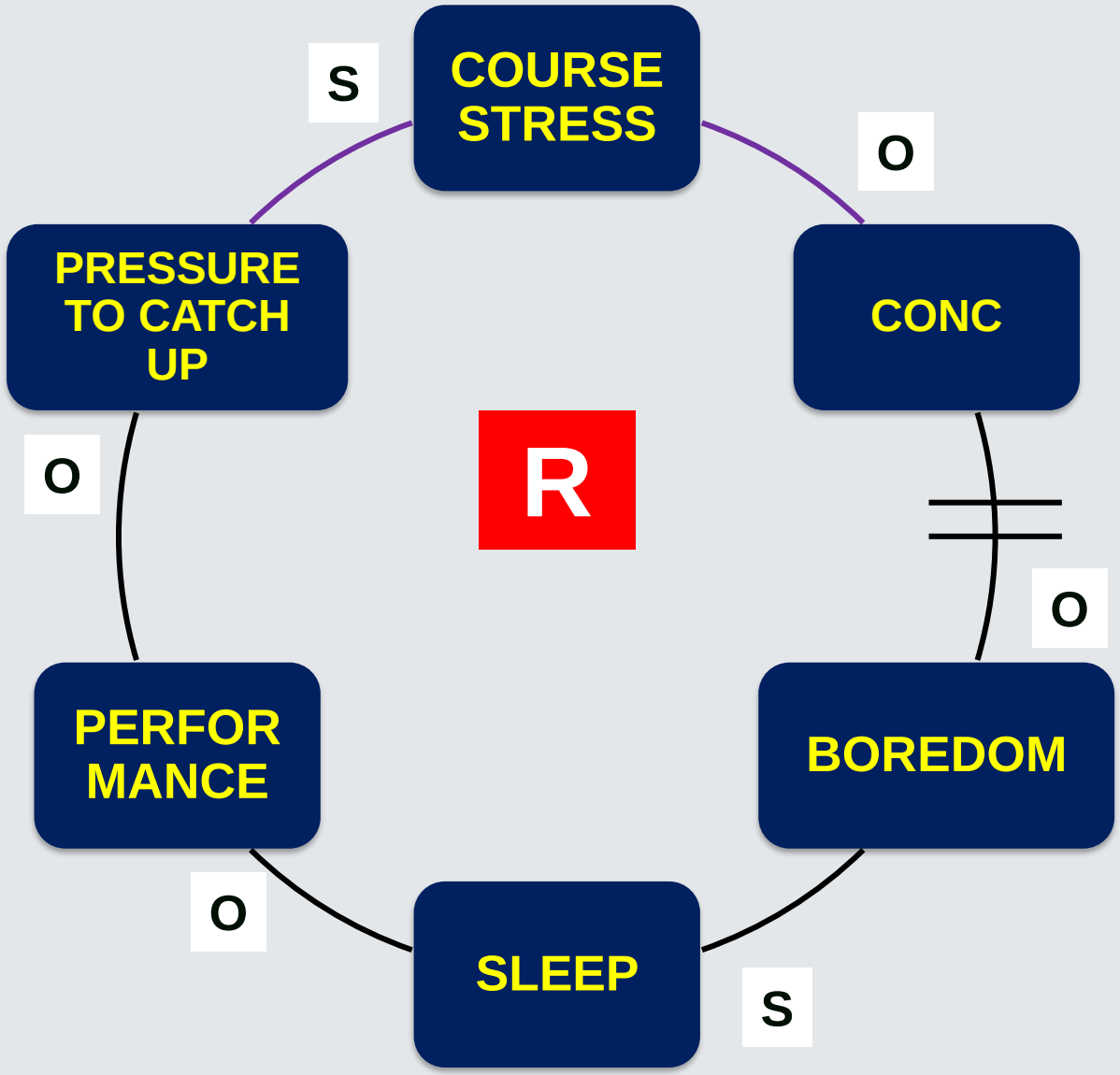


CAUSAL LOOP DIAGRAM IN PRACTICE

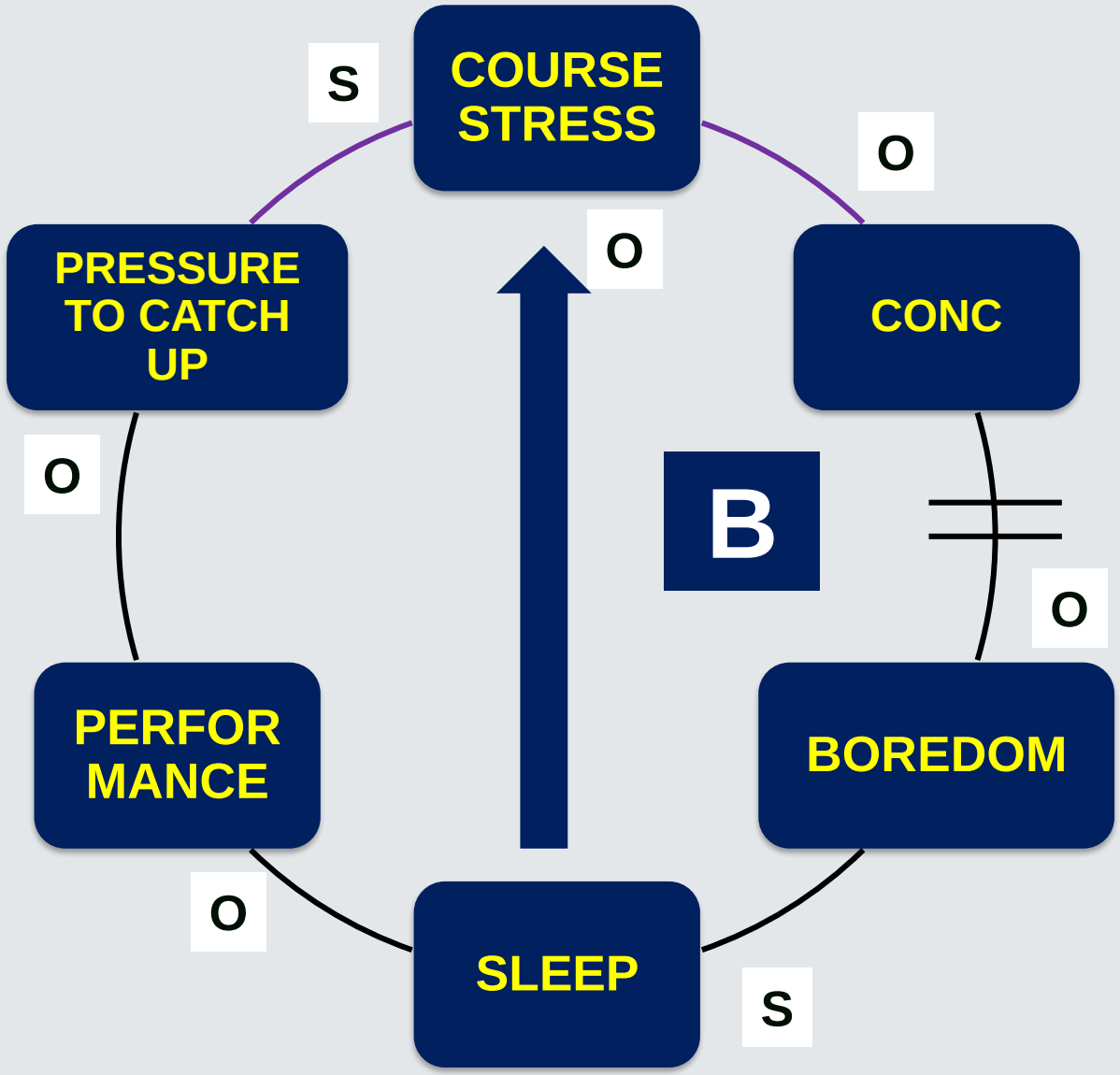


TIME-PRESSURE LOOPS

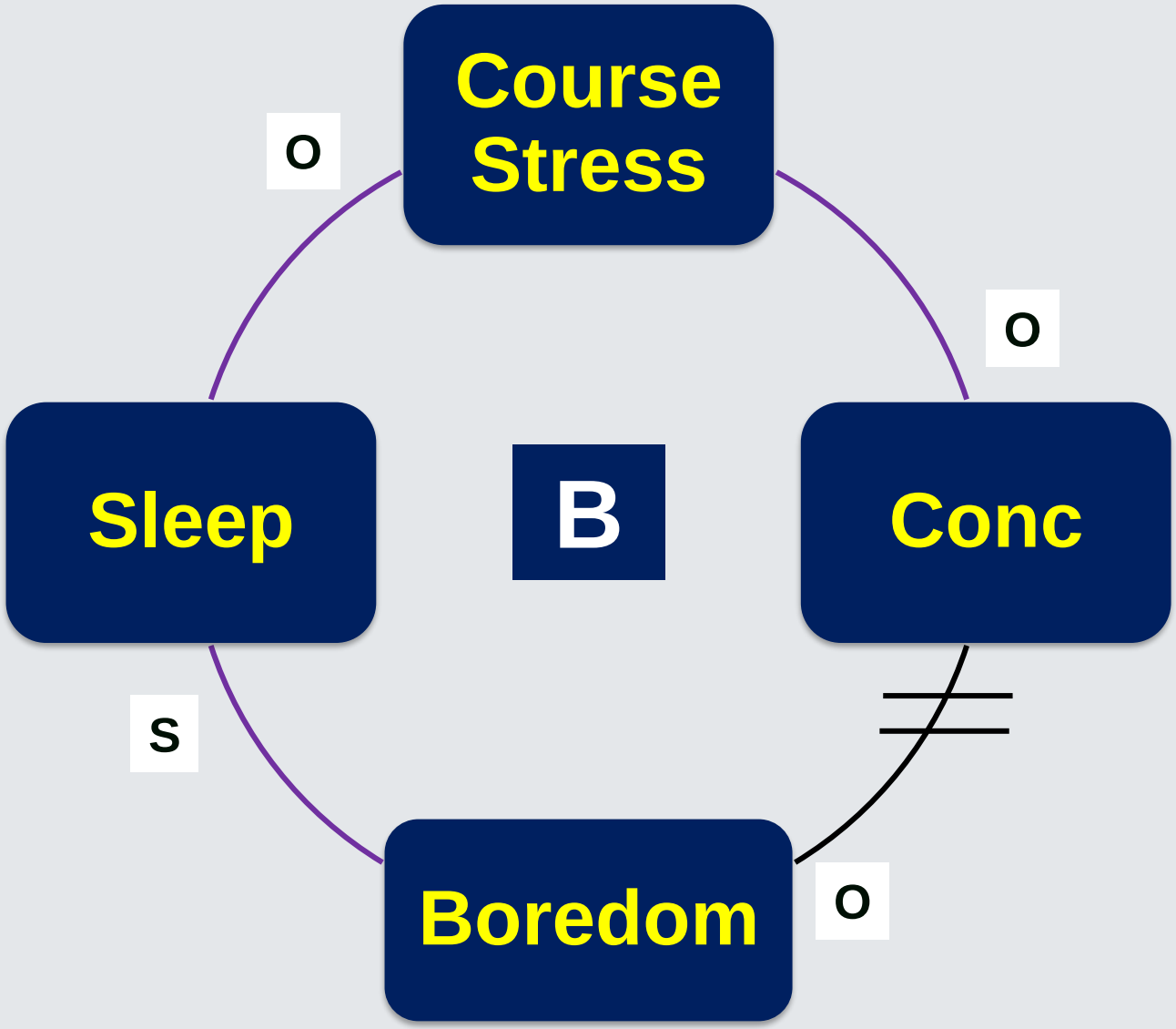
CAUSAL LOOP DIAGRAM IN PRACTICE



CAUSAL LOOP DIAGRAM IN PRACTICE



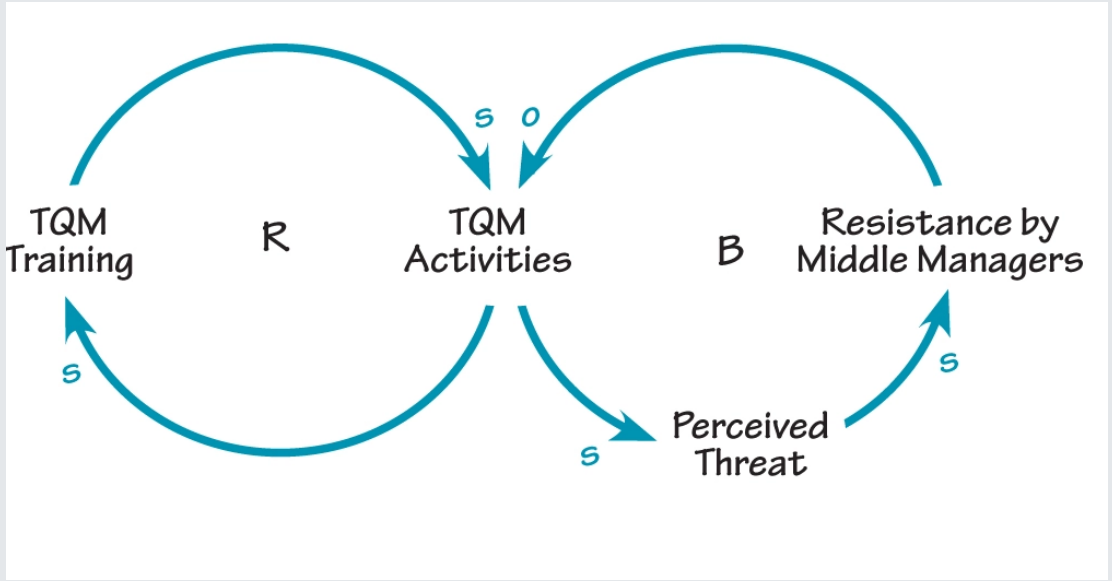
CAUSAL LOOP DIAGRAM IN PRACTICE

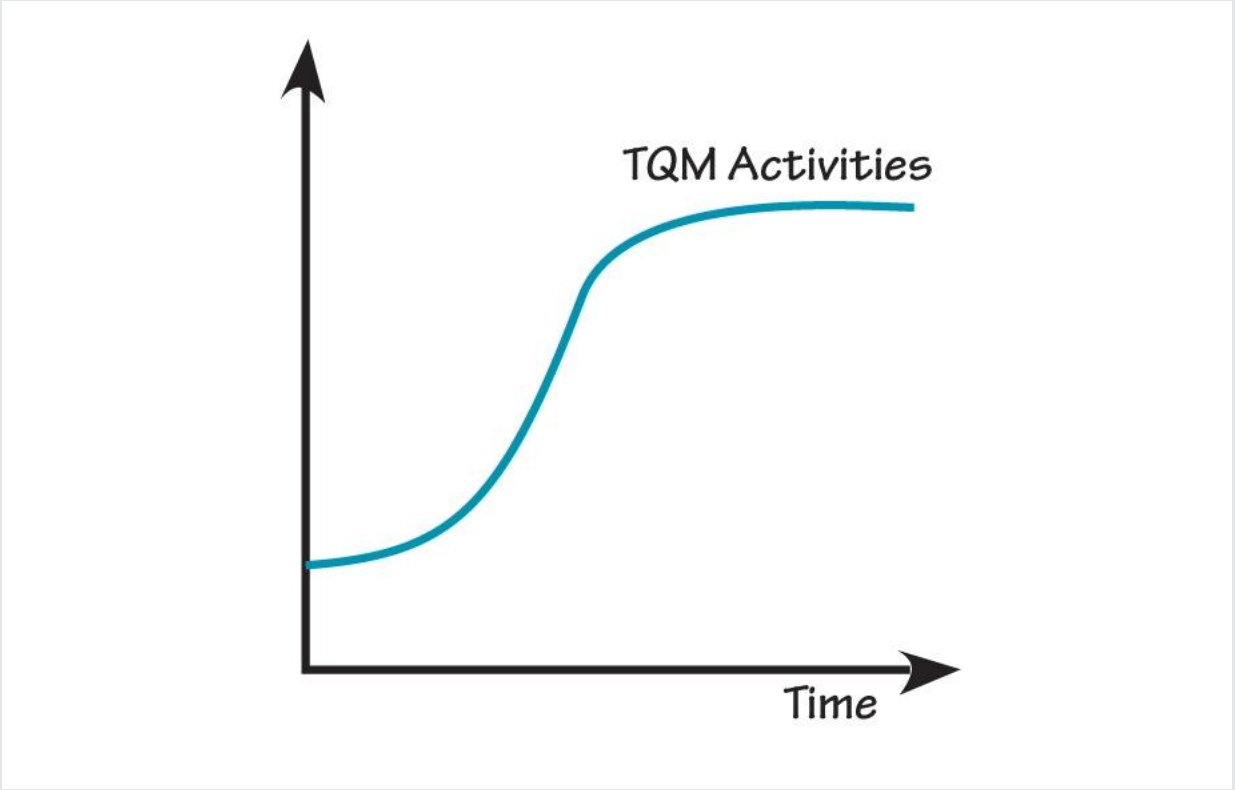


BEHAVIOUR-OVER-TIME GRAPH

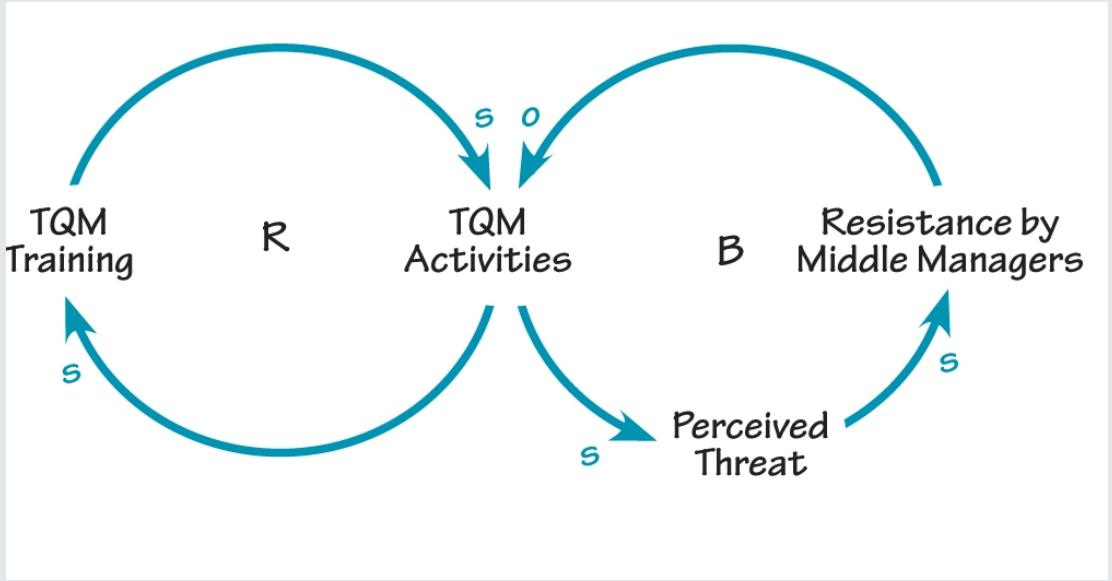
- Behaviour-Over-Time (BOT) graphs can help to break the data availability dilemma by building causal theories before necessary data is gathered.
- BOTs can be used to connect past observed behaviour with future behaviour in a way that offers insight into the causal structures underlying the case.
- BOTs guide the use of data but are not data-bound.

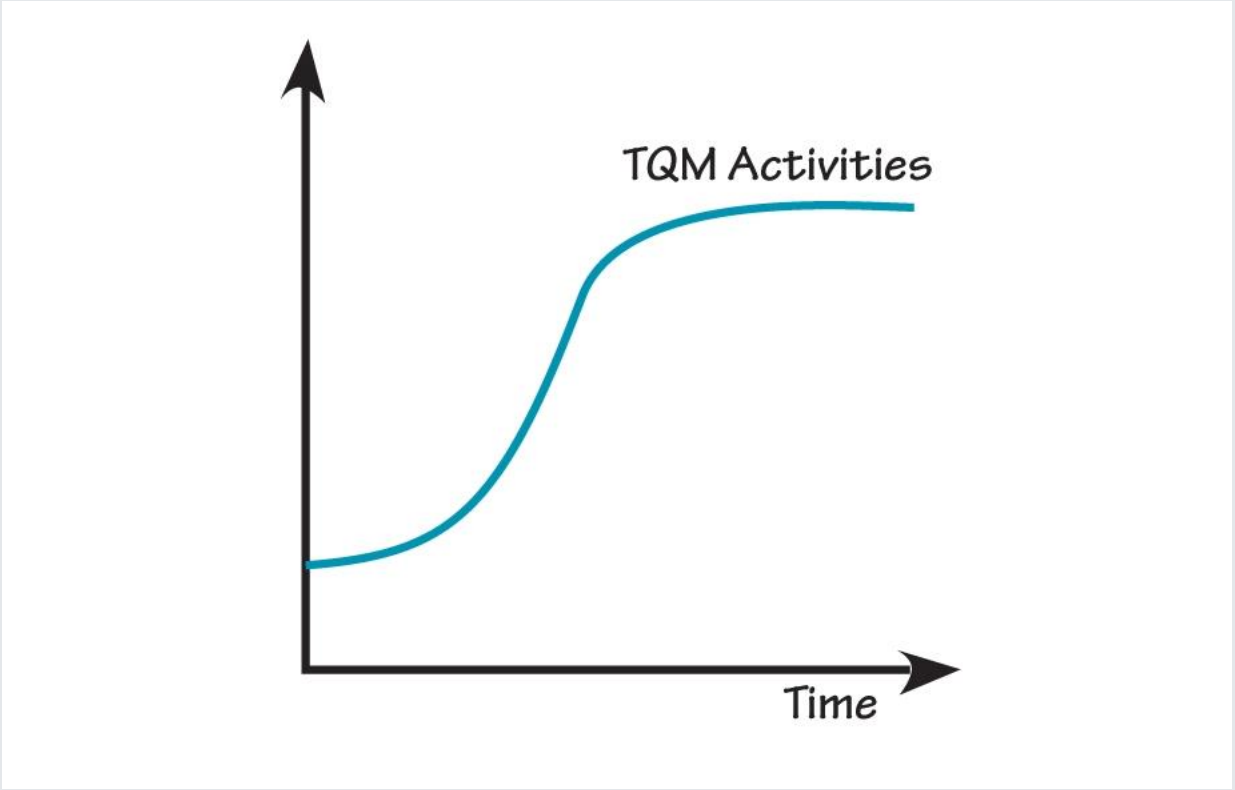
BEHAVIOUR-OVER-TIME GRAPH (CONT)



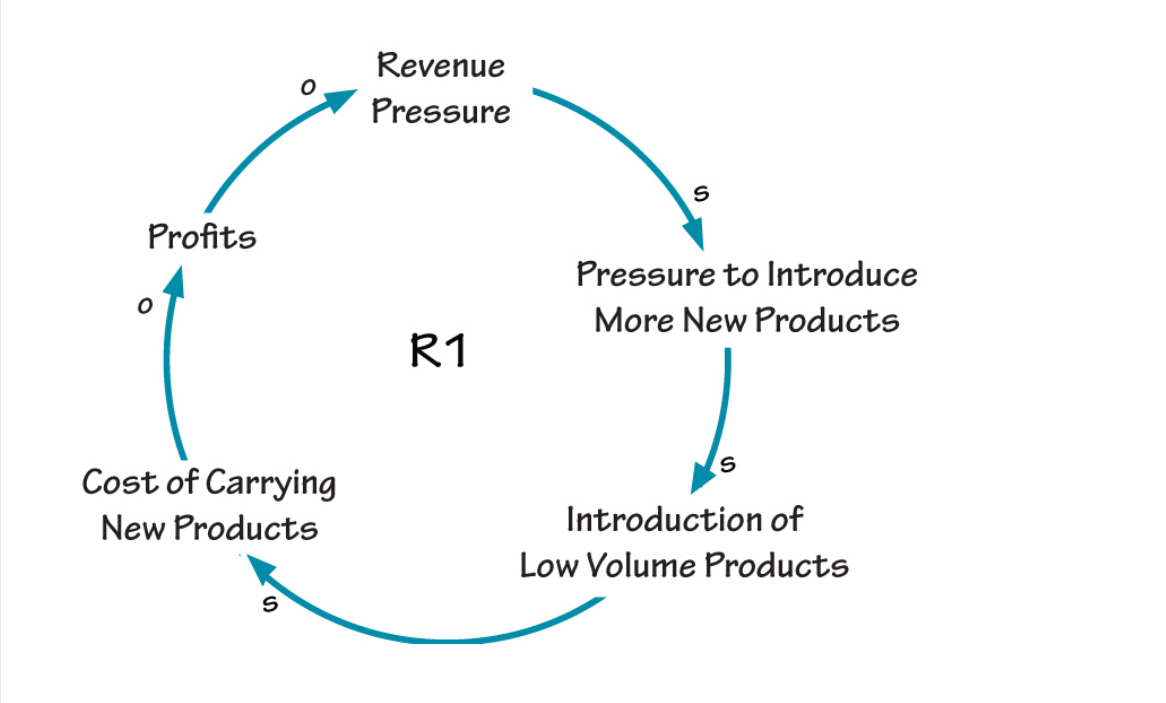


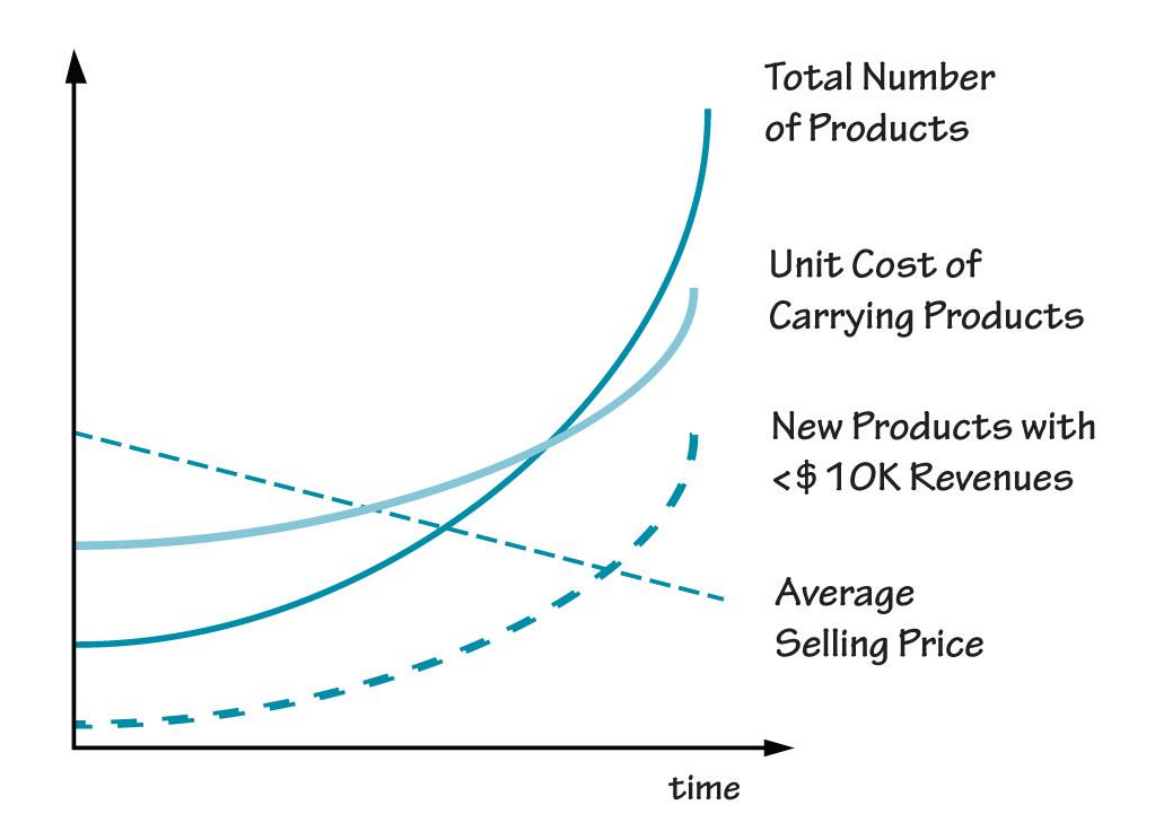
BEHAVIOUR-OVER-TIME GRAPH (CONT)





BEHAVIOUR-OVER-TIME GRAPH (CONT)





CONCLUSION

THANK YOU FOR YOUR RAPT ATTENTION