Innovation Process

Creative problem solving & Idea generation techniques

Learning Outcomes

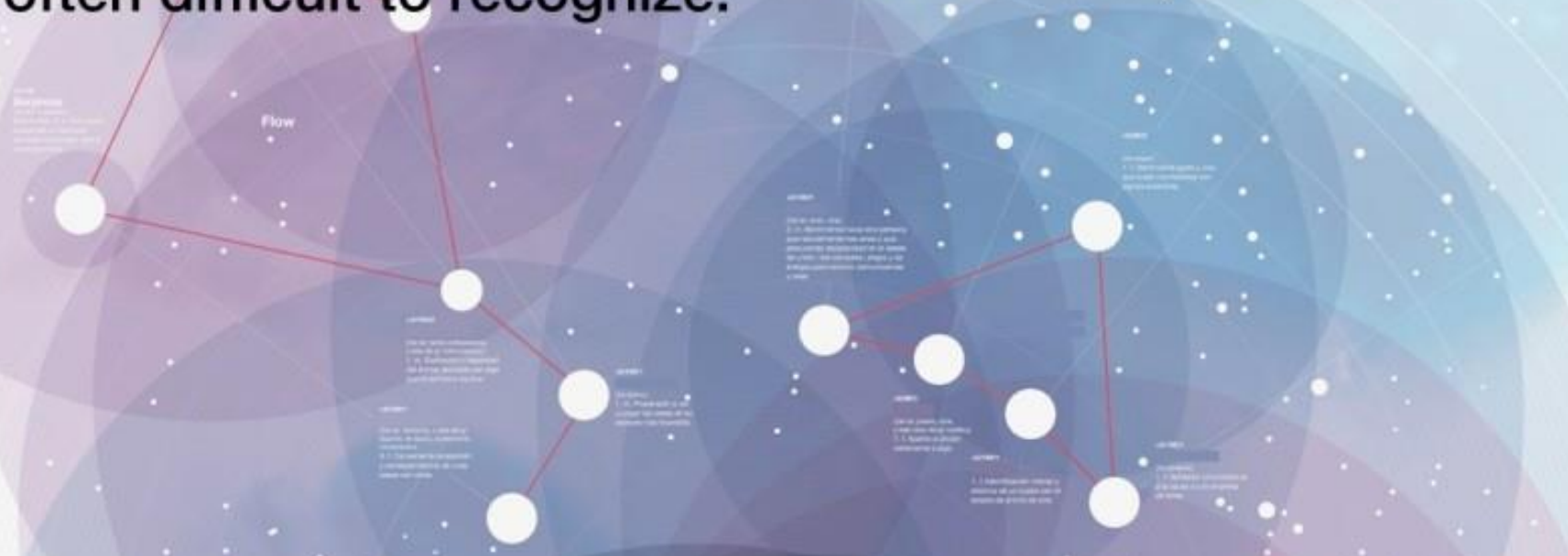
In this lecture, the students should be able to understand the concepts on:

- Wicked problem
- Creative Problem Solving
- Idea generation technique (Mind-mapping & Lotus blossom)
- Idea generation techniques (Concept Fan, Fishbone & SCAMPER)
- Evaluate your ideas (Stormdraining)

WICKED PROBLEM.

noun | wi-kəd | prä-bləm

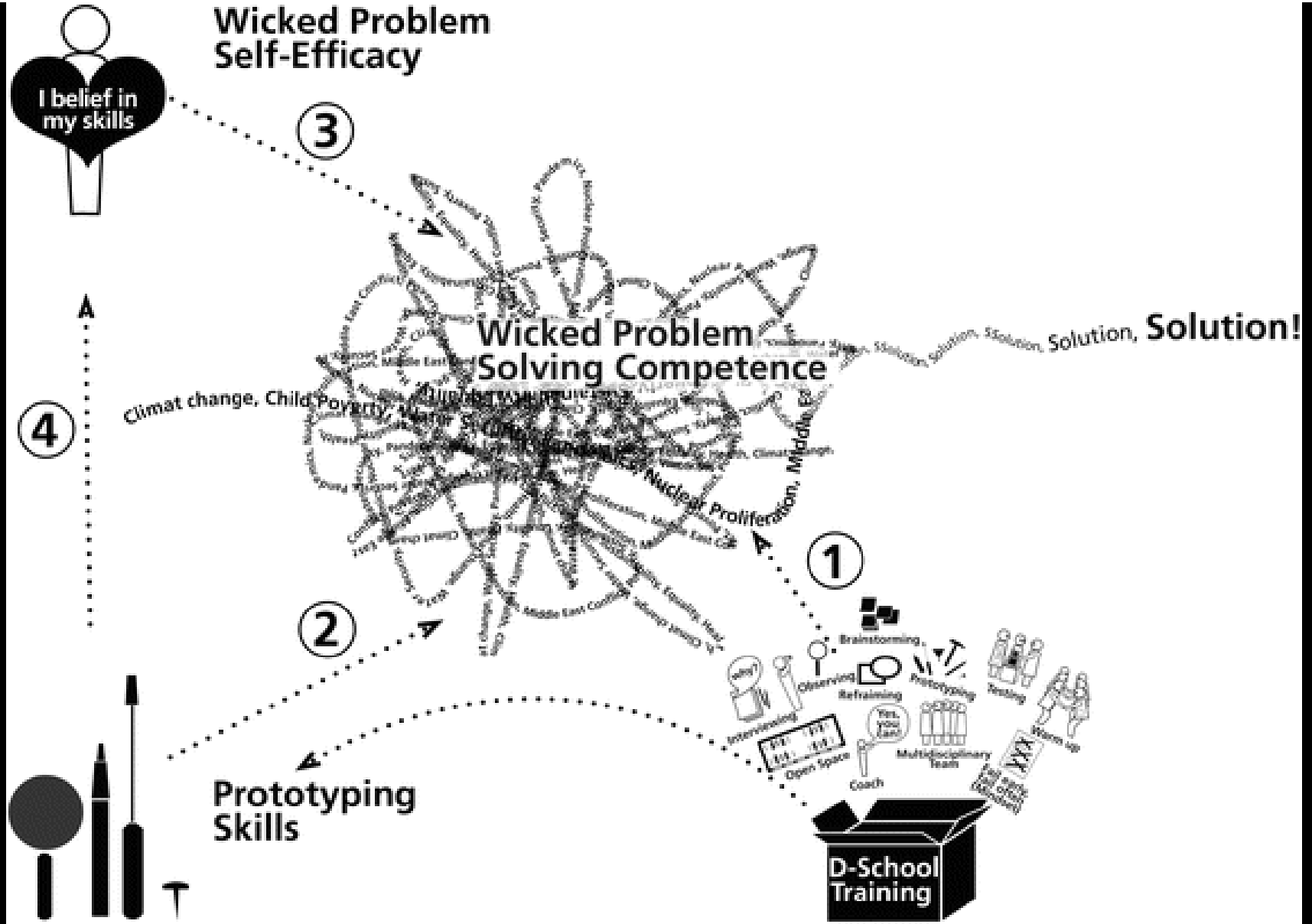
a problem that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize.



Strategy as a Wicked Problem

- Wicked problems often crop up when organisations face constant change or unprecedented challenges.
- They occur in a social context; the greater the disagreement among stakeholders, the more wicked the problem.
- In fact, it’s the social complexity of wicked problems as much as their technical difficulties that make them tough to manage.
- Not all problems are wicked; confusion, discord, and lack of progress are telltale signs that an issue might be wicked.

How Prototyping Helps to Solve Wicked Problems



Creative Problem Solving

The componential theory of individual creativity

Teresa Amabile

- According to conventional wisdom – creativity is something done by creative people
- Even creative researchers, for several decades, seemed to guide their work by this principles, focusing predominantly on individual differences

The componential theory of individual creativity

Teresa Amabile

- In contract to the traditional approach, the componential theory of creativity assumes that all humans with normal capacities are able to produce at least moderately creative work in some domain.

- The theory includes three major components of individual (or small team) creativity: expertise, creative-thinking skills, and intrinsic task motivation

- https://www.youtube.com/watch?v=YRnvox6_o2M

- https://www.youtube.com/watch?v=XVTSmCIf2Xc&list=PLf5T9fbblkLOz2kfXTogDc3cFM4oljUL1&index=4

Idea generation techniques: Mind-mapping & Lotus blossom

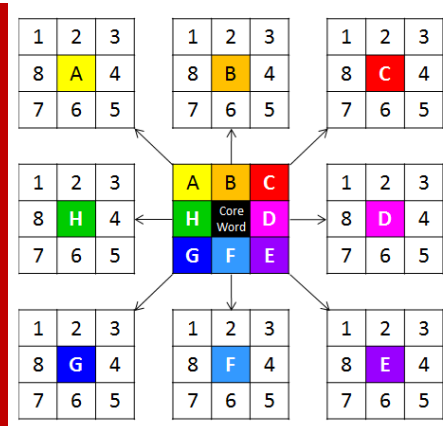
1. Mind-mapping

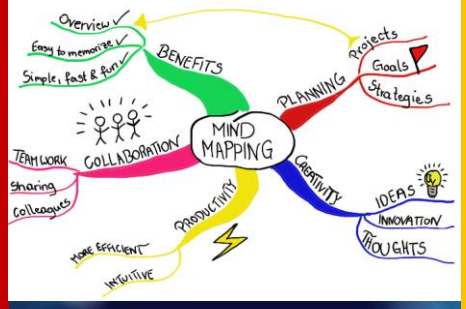
A mind map is a tool for the brain

that captures the thinking that

goes on inside your head. Mind mapping helps you think, collect knowledge, remember and create ideas. Most likely it will make you a better thinker (source: https://simplemind.eu/how-to-mind-map/basics/

- Central theme
- Association
- Keywords





2. Lotus Blossom

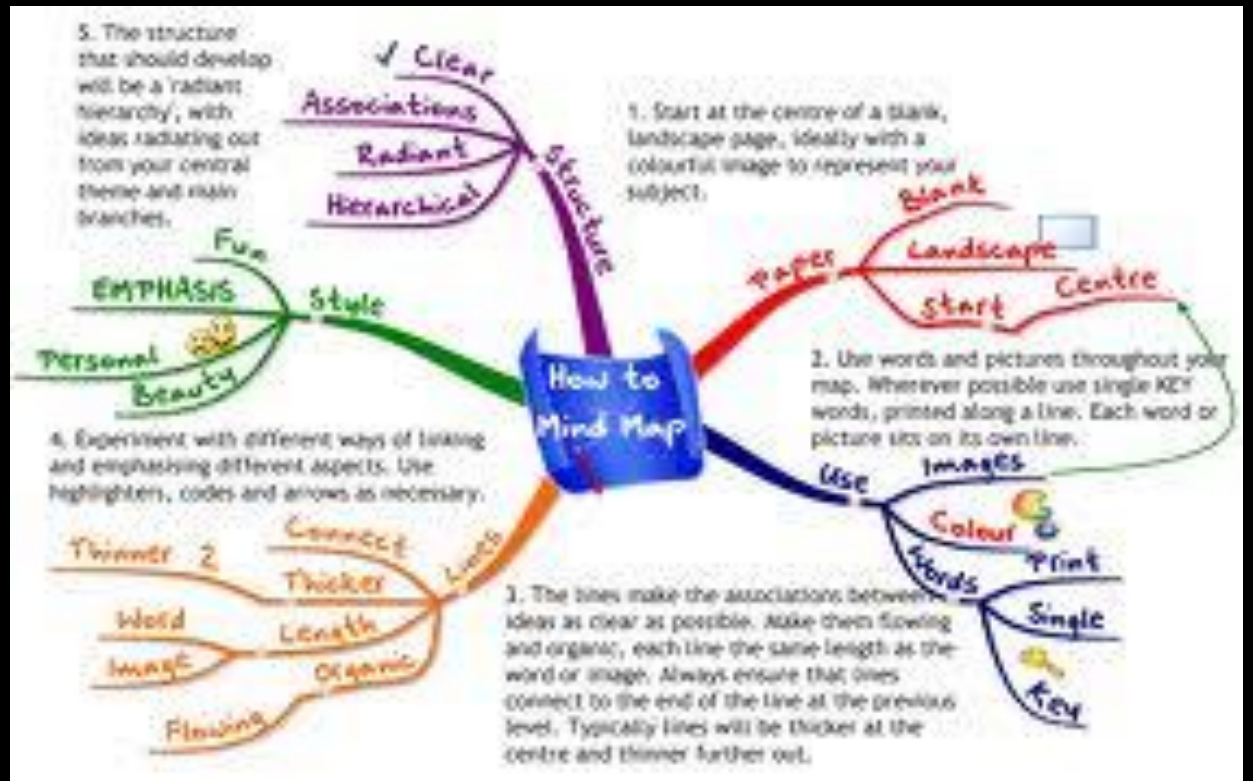
(source: https://thoughtegg.com/lotus-blossom-creative-technique/) The Lotus Blossom technique focuses the power of brainstorming on areas of interest. It does so though the use of a visual representation of ideas and is similar to a mind-map but is more structured and pushes you in ways you don't experience in classic mind-mapping.

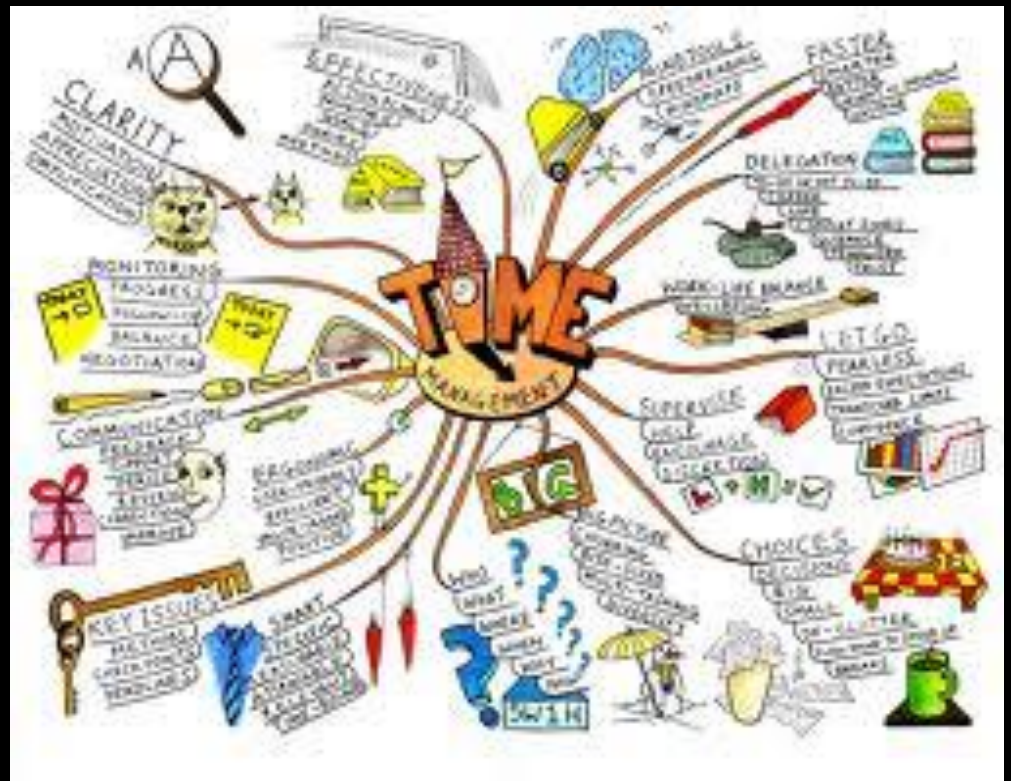
The layout **Box Keywords: The initial problem or concept.** This box contains the problem to be solved or the concept to be explored.

Boxes A-H: Related concepts. These boxes contain concepts or ideas related to the initial concept in box keywords. Note that the boxes immediately surrounding the initial concept
are repeated as seeds for the blossoms arranged around the outer edge.

The 5 essential characteristics of Mind-mapping

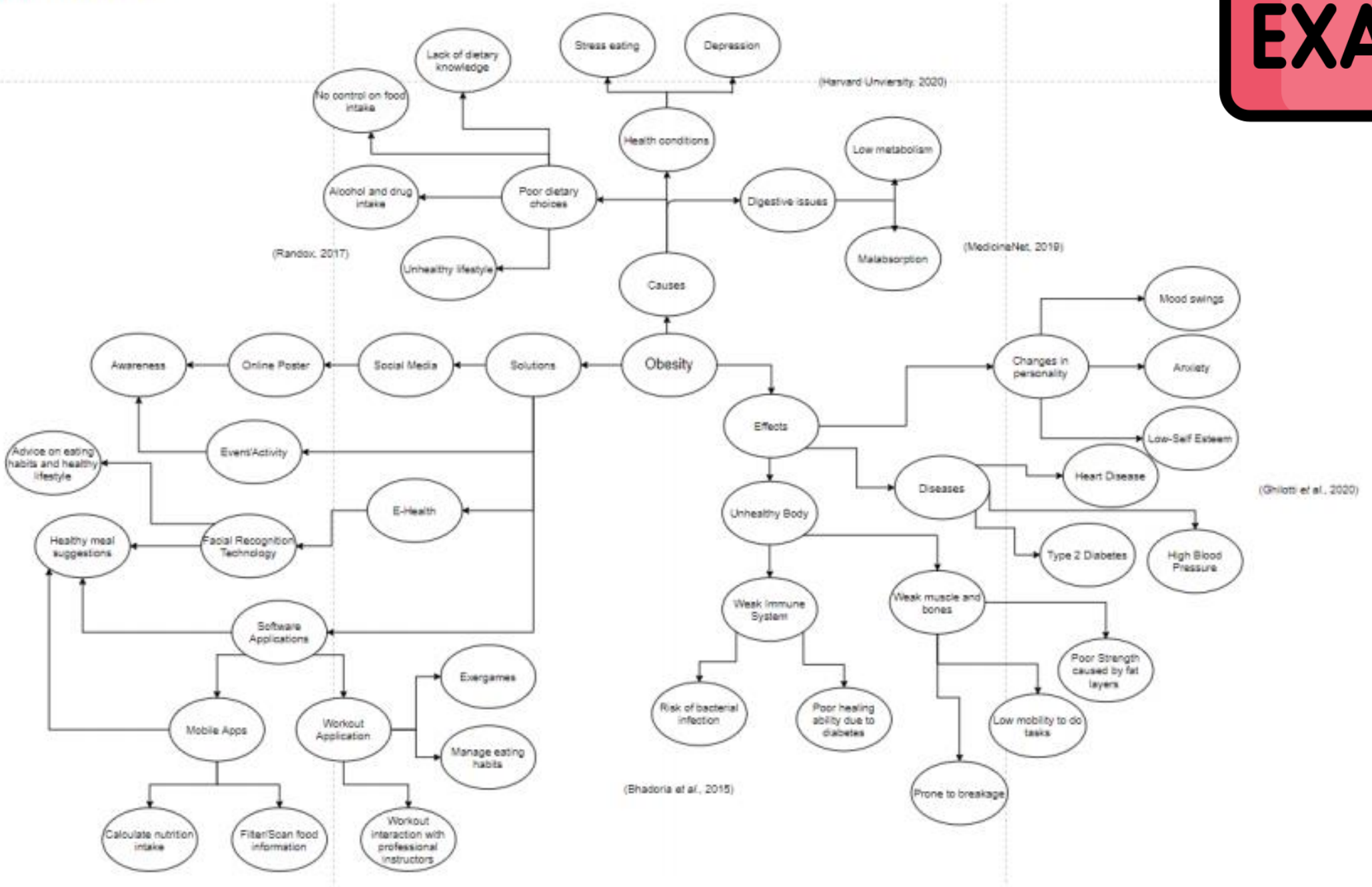
- The main idea, subject or focus is crystalised in a central image.
- The main themes *radiate* from the central image as 'branches'.
- The branches comprise a key image or key word drawn or printed on its associated line.
- Topics of lesser importance are represented as 'twigs' of the relevant branch.
- The branches form a connected nodal structure.



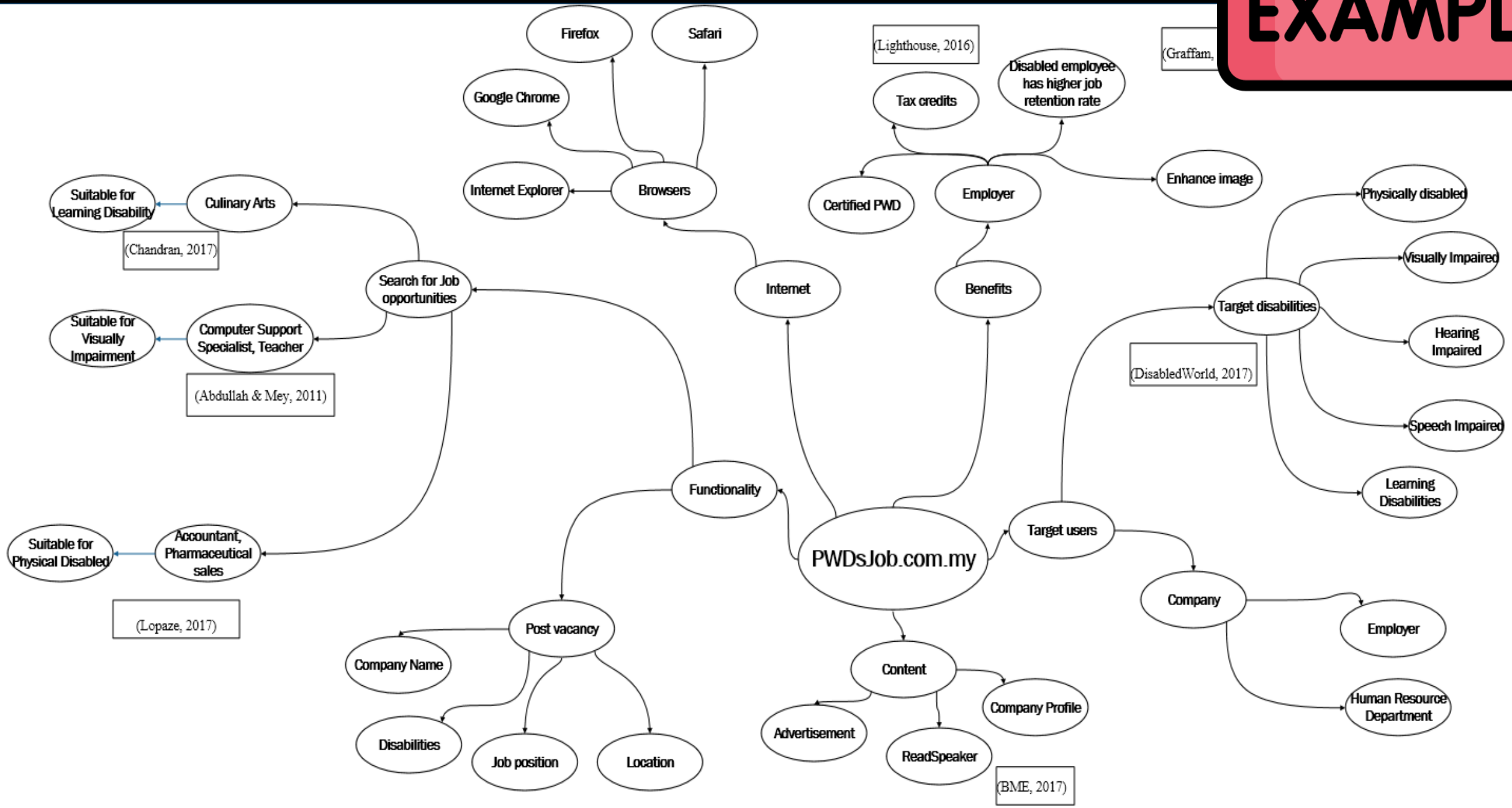


Mind mapping

EXAMPLE



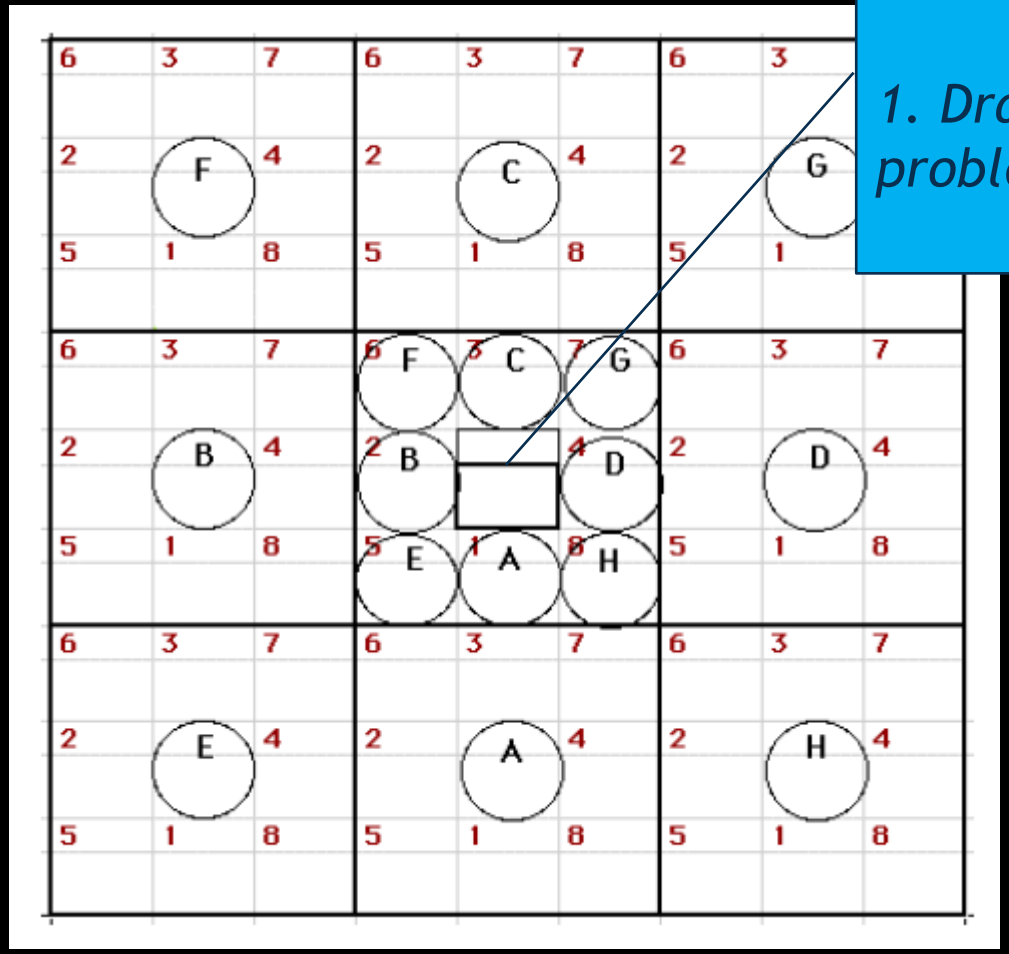
EXAMPLE


PWDsJob.com.my
Internet
Browsers
Firefox
Safari
Google Chrome
Internet Explorer
Benefits
Employer
(Lighthouse, 2016)
Tax credits
Disabled employee has higher job retention rate
Certified PWD
Enhance image
(Graffam,
Functionality
Search for Job opportunities
Culinary Arts
Suitable for Learning Disability
(Chandran, 2017)
Computer Support Specialist, Teacher
Suitable for Visually Impairment
(Abdullah & Mey, 2011)
Accountant, Pharmaceutical sales
Suitable for Physical Disabled
(Lopaze, 2017)
Post vacancy
Company Name
Disabilities
Job position
Location
Content
Advertisement
ReadSpeaker
Company Profile
(BME, 2017)
Target users
Target disabilities
Physically disabled
Visually Impaired
Hearing Impaired
Speech Impaired
Learning Disabilities
(DisabledWorld, 2017)
Company
Employer
Human Resource Department

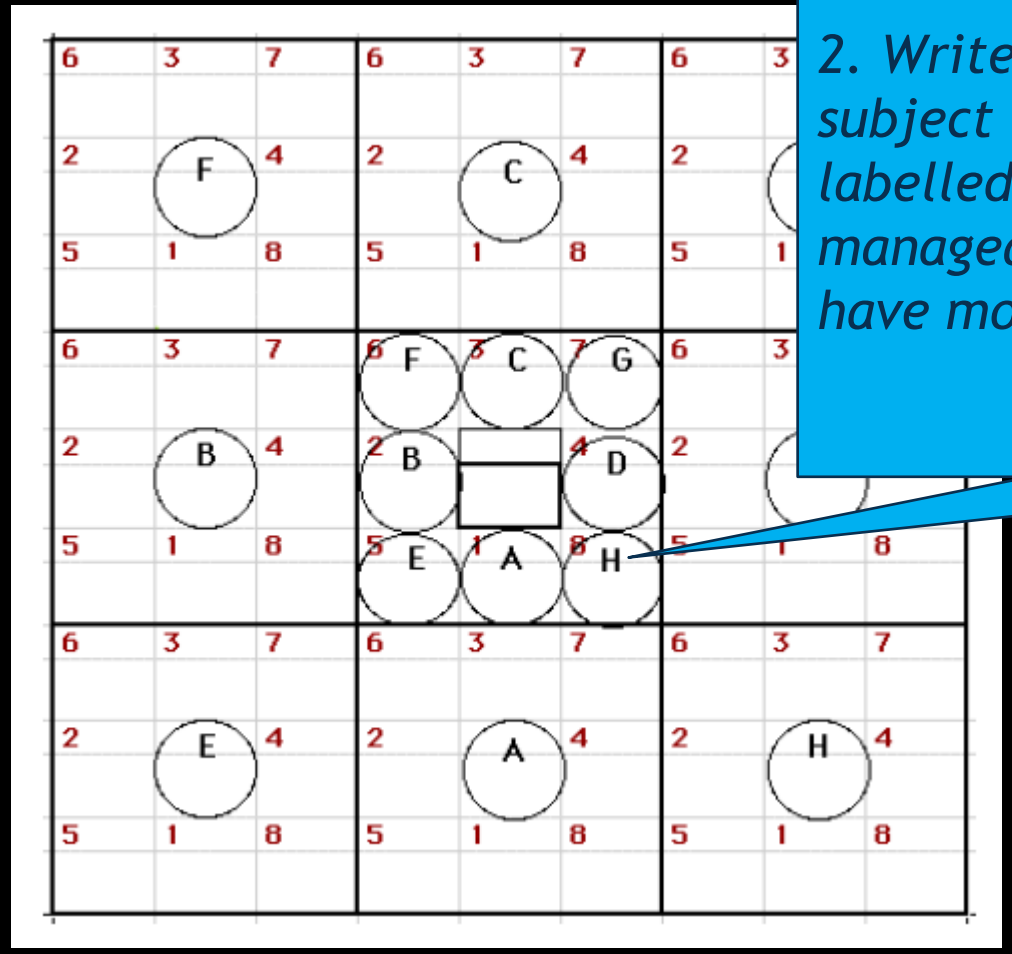
Lotus blossom

- This exercise involves starting with a central theme or problem and working outward, using ever-widening circles or “petals”.
- Central themes lead to ideas that themselves become central themes, and so forth.
- The unfolding themes trigger new ideas and new themes.

There are 5 steps in completing the exercise of Lotus Blossom technique

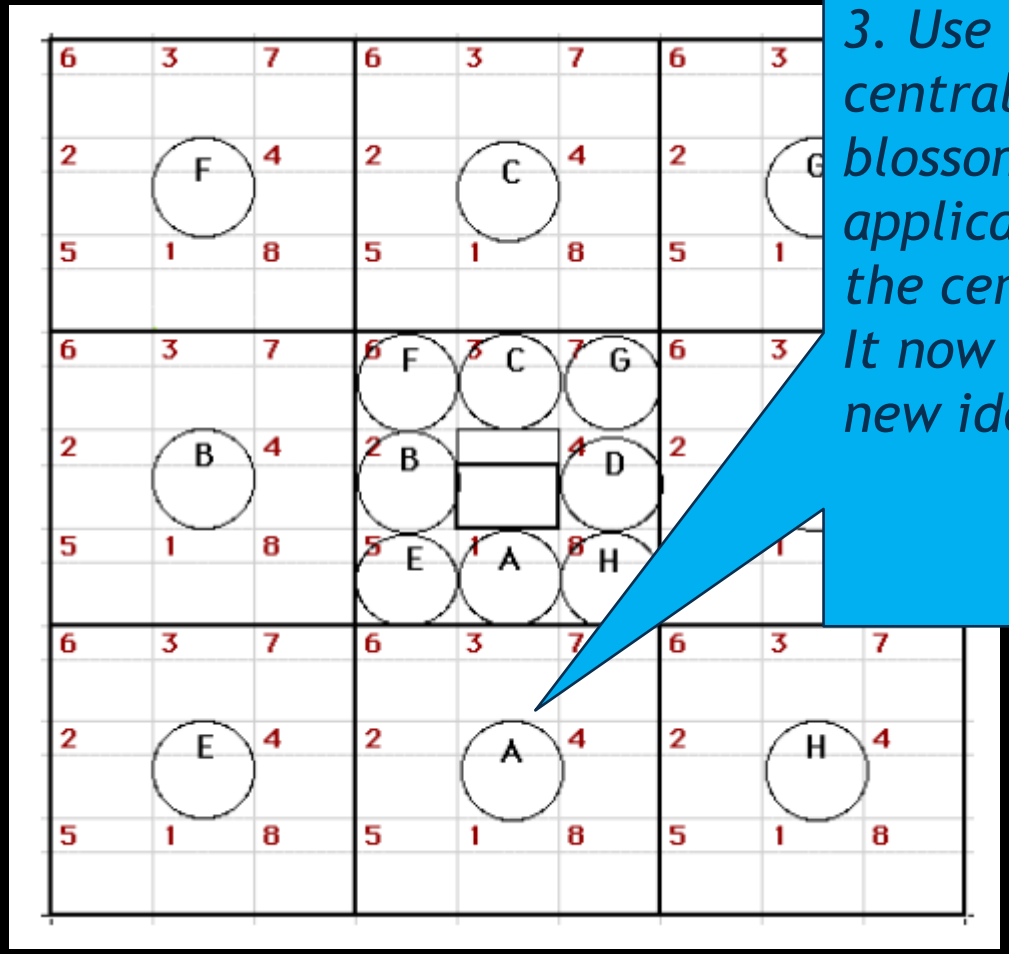


1. Draw a Lotus Blossom diagram and write the problem or idea in the centre of the diagram.

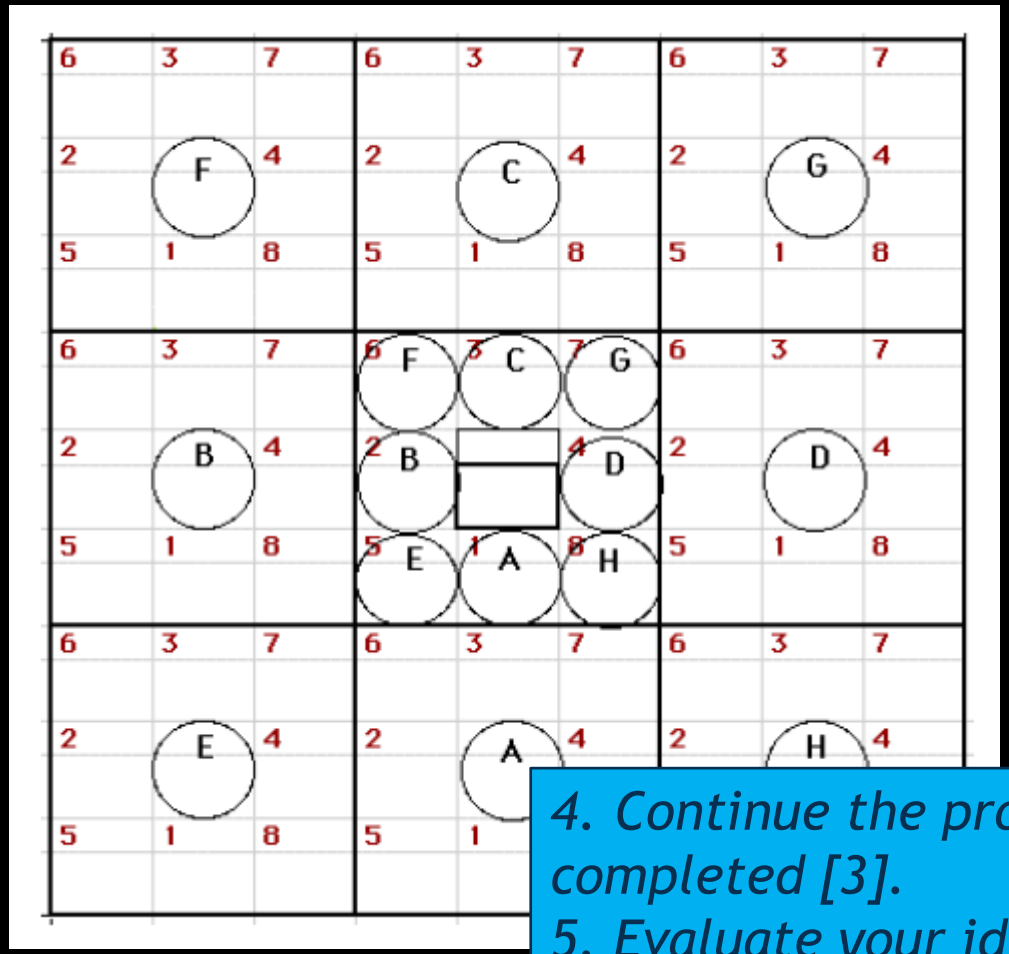


2. Write the significant components or themes of your subject in the circles surrounding the centre circle, labelled A to H. The optimal numbers of themes for a manageable diagram is between six and eight. If you have more than eight, make additional diagrams.

- To help you decide what themes to use, ask questions like:
  - What are my specific objectives?
  - What are the constants in my problem?
  - What are the dimensions of my problem?



3. Use the ideas written in the circles as the central themes for the surrounding lotus blossom petals or boxes. Thus, the idea or application you wrote in circle A would become the central theme for the lower middle box A. It now becomes the basis for generating eight new ideas or applications.



4. Continue the process until the lotus blossom diagram is completed [3].
5. Evaluate your ideas [1].

Search Engine	Categorise Insects	Smart Filtering	Saving Location	Hotspot	Altimeter	Anomaly Detection	Predictive Data Analysis	Exploratory Data Analysis
Videos/ Pictures	**Data Repository**	Online/ Offline Accessibility	Intelligent Rerouting	**Global Positioning System**	Online/ Offline Navigation	Machine Learning	**Data Mining**	Identify Dense Area of Insects
Recent Searches	Voice Recognition	Smart Auto-Completion	Spoken voice	Connection to Data Repository	Avoid Traffic	On-Line Analytical Processing	Actionable Information	Automated Pattern Recognition
Look for Professionals	Location Setting and Sharing	Send Reminder	Data Repository	Global Positioning System	Data Mining	Micro transactions	Quizzes	Unlock Insect Details
Forecast Weather	**Bioblitz**	Create Private/ Public Event	Bioblitz	**BUG-A-LORE**	Insect Exploration Game	In-Game Social Interaction	**Insects Exploration Game**	Points Awarding System
Postpone Event	Proximity Settings	Event Promotion	Image-Based Recognition	Augmented Reality	Social Platform	Insect Puns	Rewards after Certain Achievement	Leader Scoreboard
Record Observation	Blob Detection	Identify Insect	3D Rotational View	AR Card	Augmented View	Social Media Ads	Bot Moderators	Portal to Educate Beginners
Colour Histogram	**Image-Based Recognition**	Pattern Recognition	Interactive Animation	**Augmented Reality**	Insect Sound	Social Live Streaming	**Social Platform**	Share Public Post
1080p resolution or higher	In-App Photo Snapping	Avoid Online Images	Information Pop-Up	Level of Graphics	Tracking	Notify Upcoming Events	Group Chat	Crowdsource Discussion

CREATIVE THINKING

THE SKILL TO THINK OUT OF THE BOX

Creative thinking is not a talent, it is a skill that can be learned. It empowers people by adding strength to their natural abilities which improves teamwork, productivity and, where appropriate, profits.

— Edward de Bono —

AZ QUOTES

Solving Problem Creatively with Concept Fan Technique

- When trying to think of new ideas and solutions to problems it is very tempting to go with your first ideas.
- However, first ideas are not always the best.
  - *Edward de Bono developed the 'Concept Fan' technique for taking a step back to get a broader perspective and thereby a new view of the subject, what you want to achieve and new ways of solving the problem.*

Concept fans : Examples

- The *Concept Fan* is a way of finding different approaches to a problem when you have rejected all obvious solutions.
- It develops the principle of 'taking one step back' to get a broader perspective.

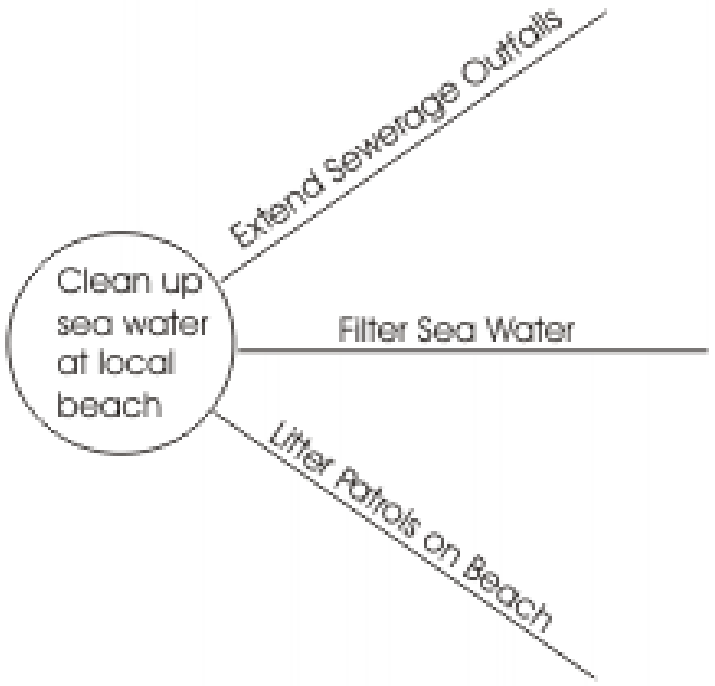


Figure 1: First Stage of a Concept Fan

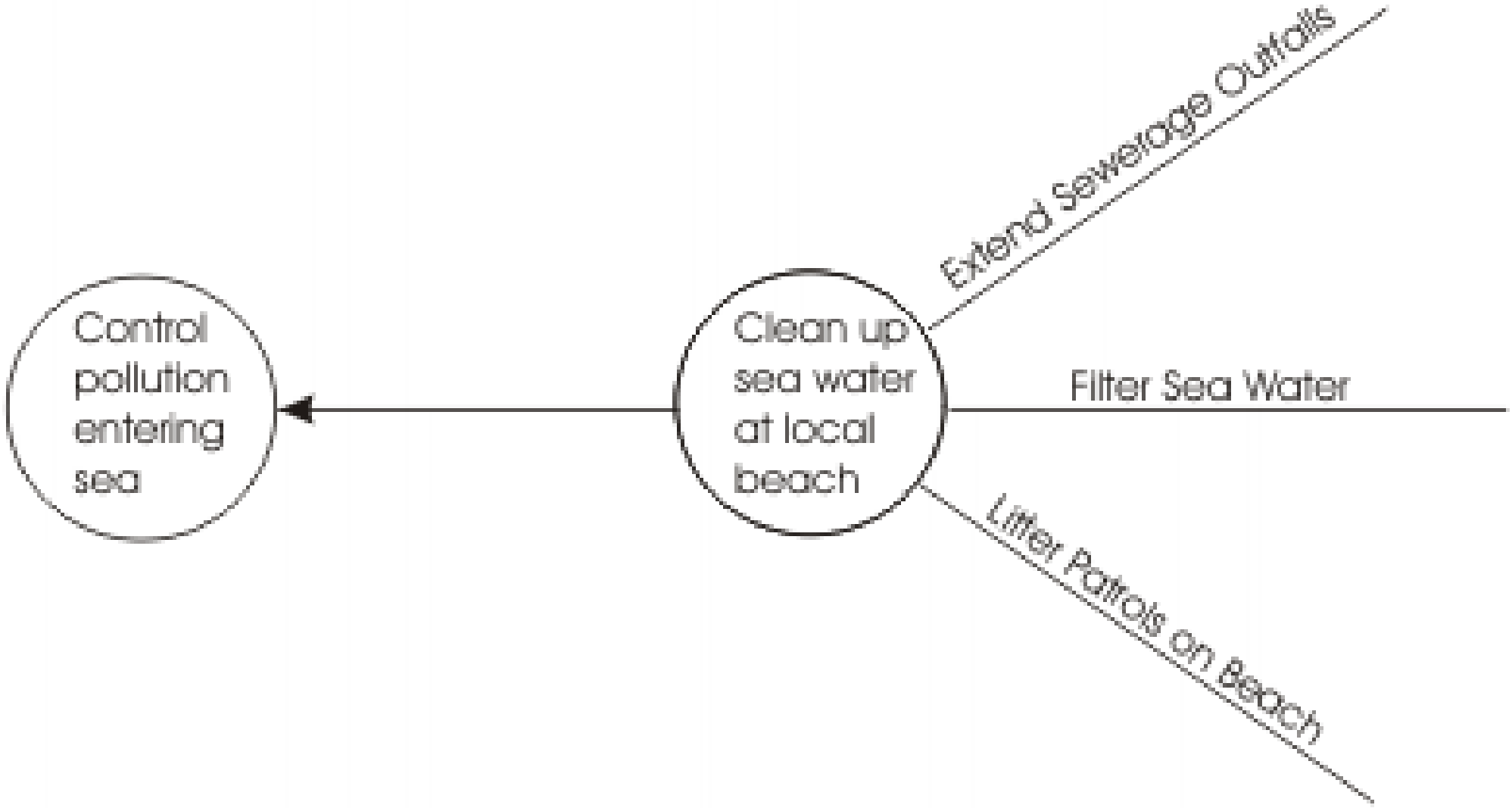


Figure 2: Broadening the Problem Definition on a Concept Fan

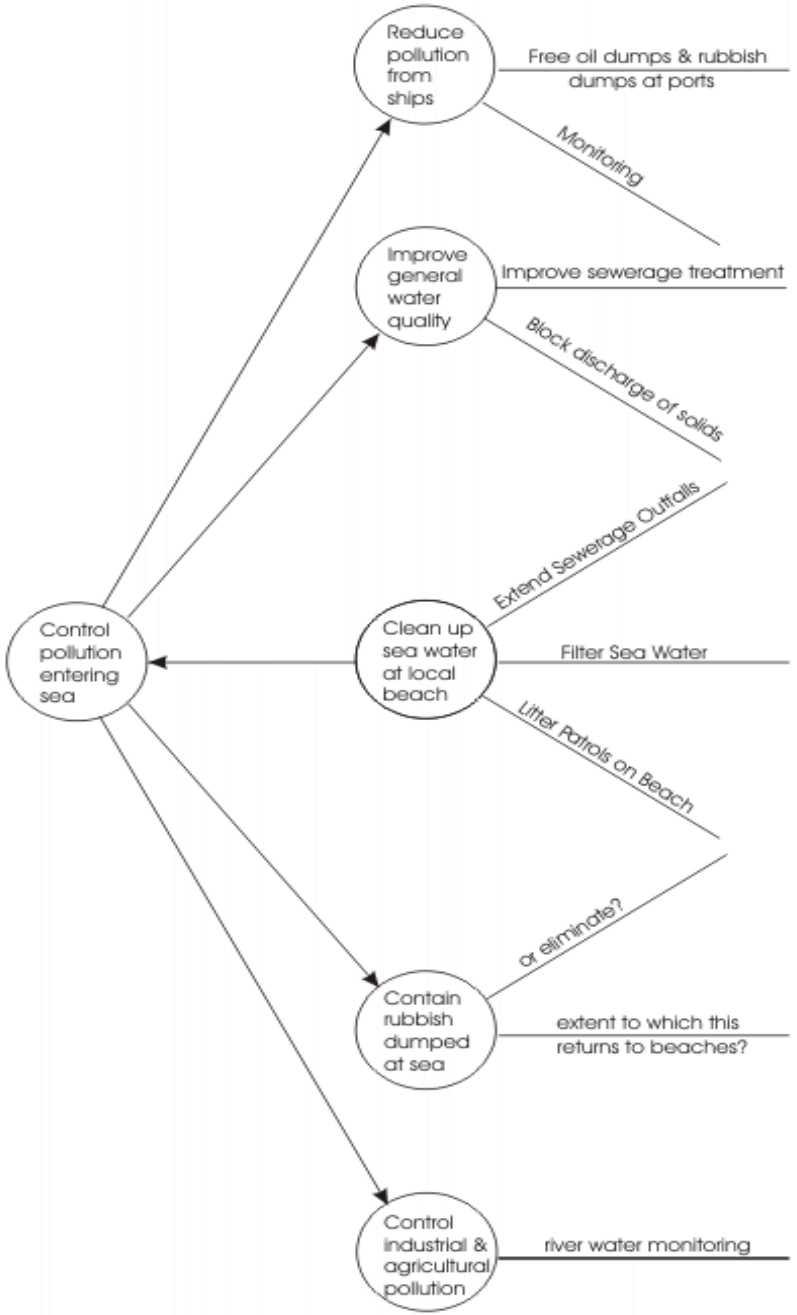


Figure 1.6.3: Radiating Ideas from the Broader Problem Definition

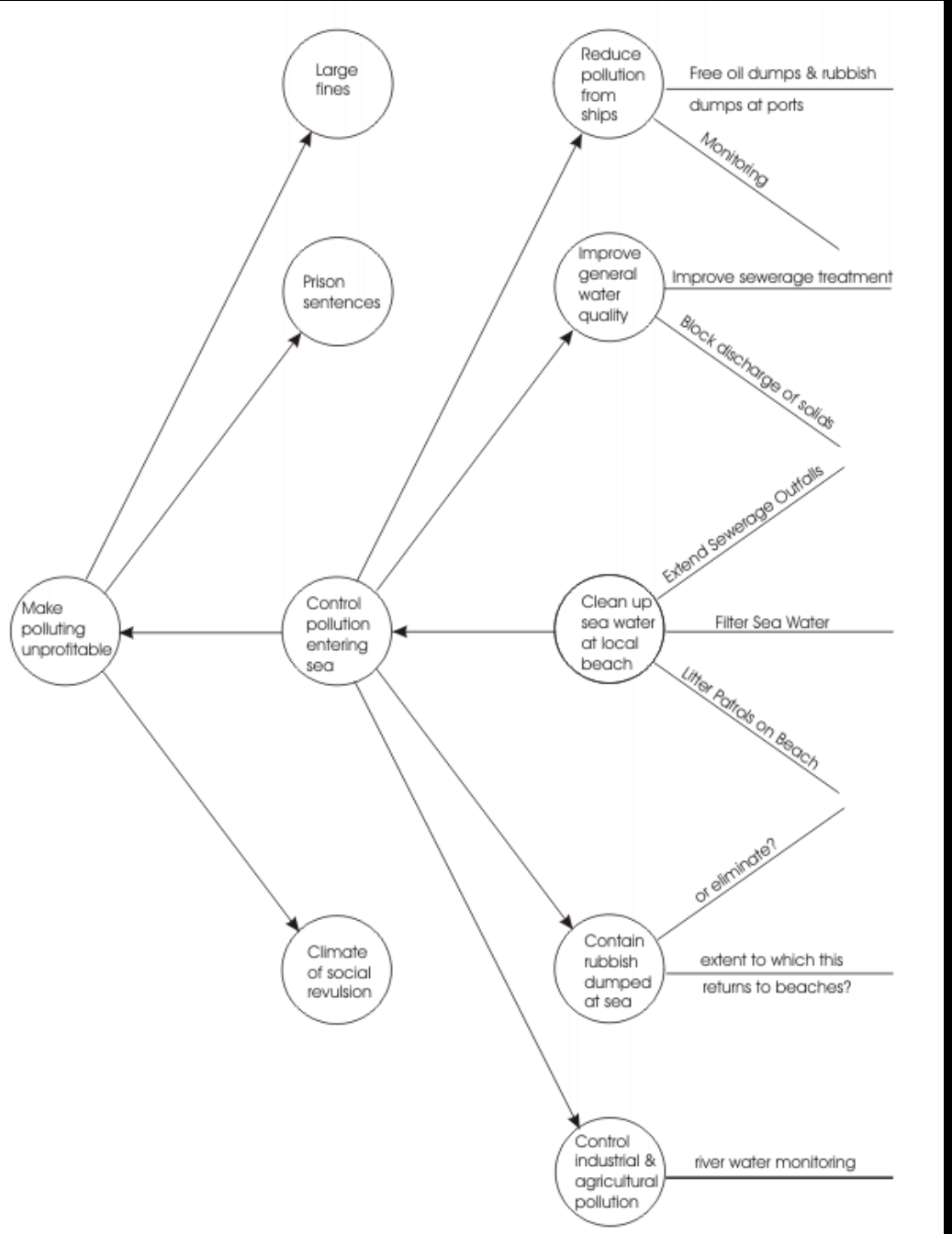
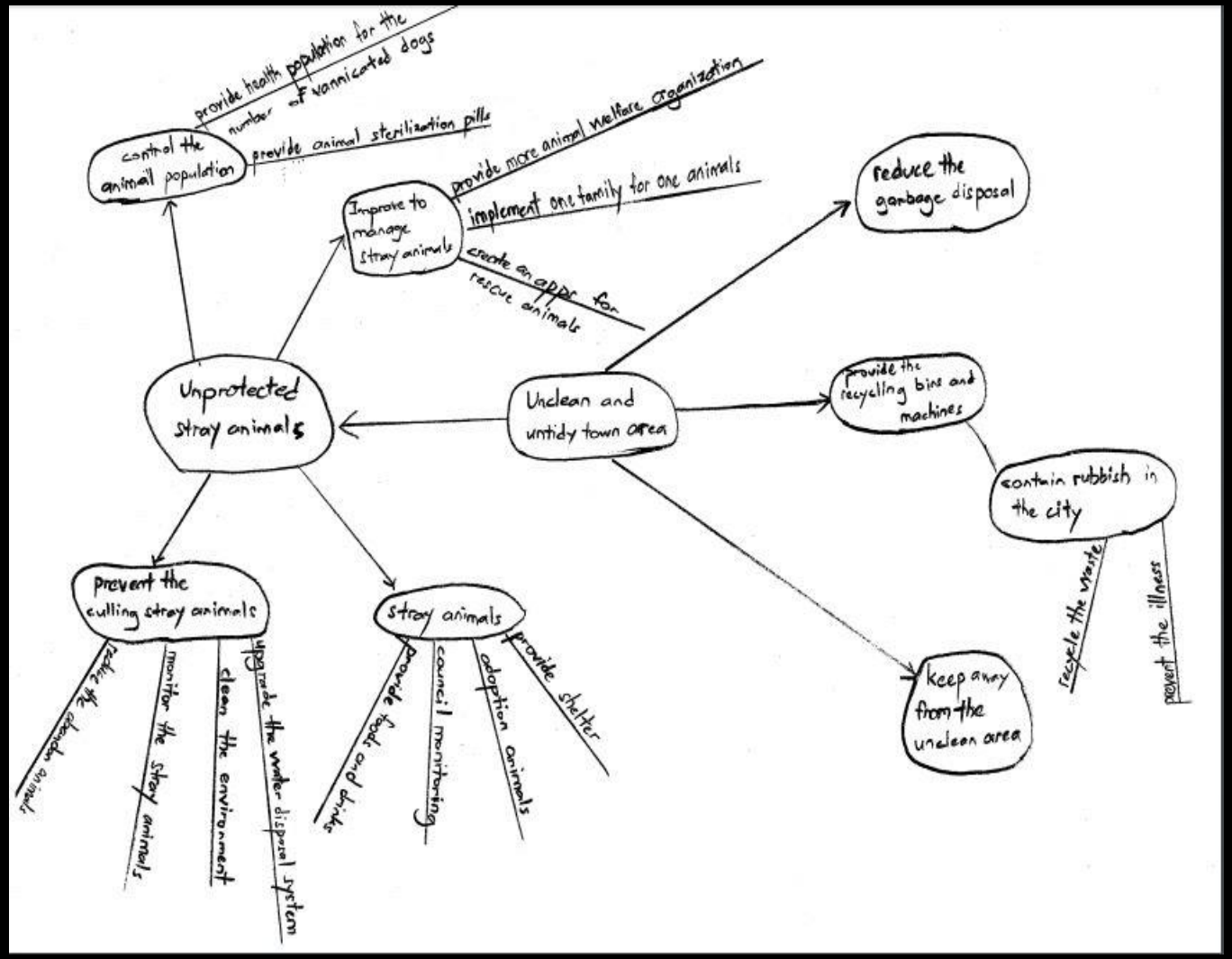
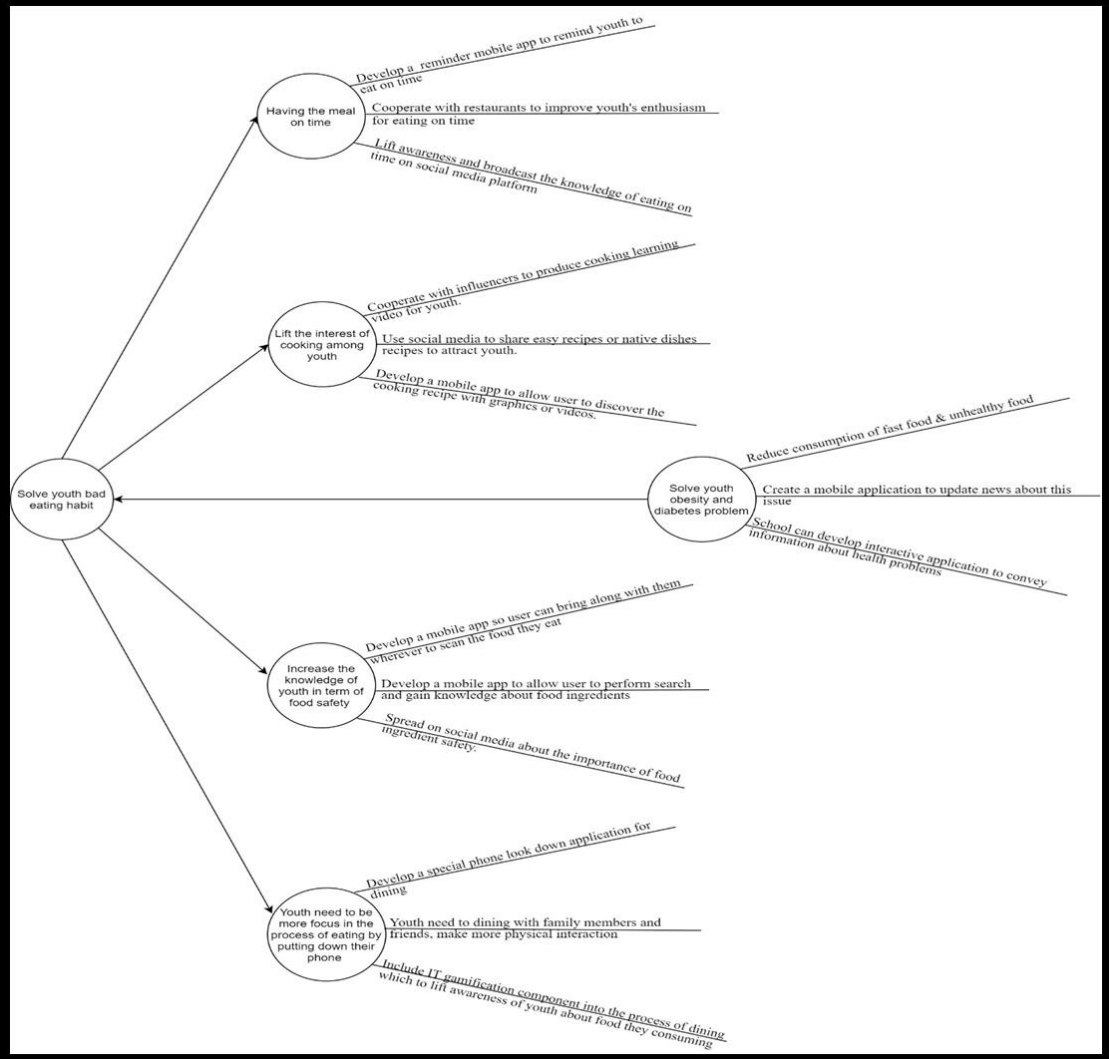


Figure 4: A Developed Concept Fan

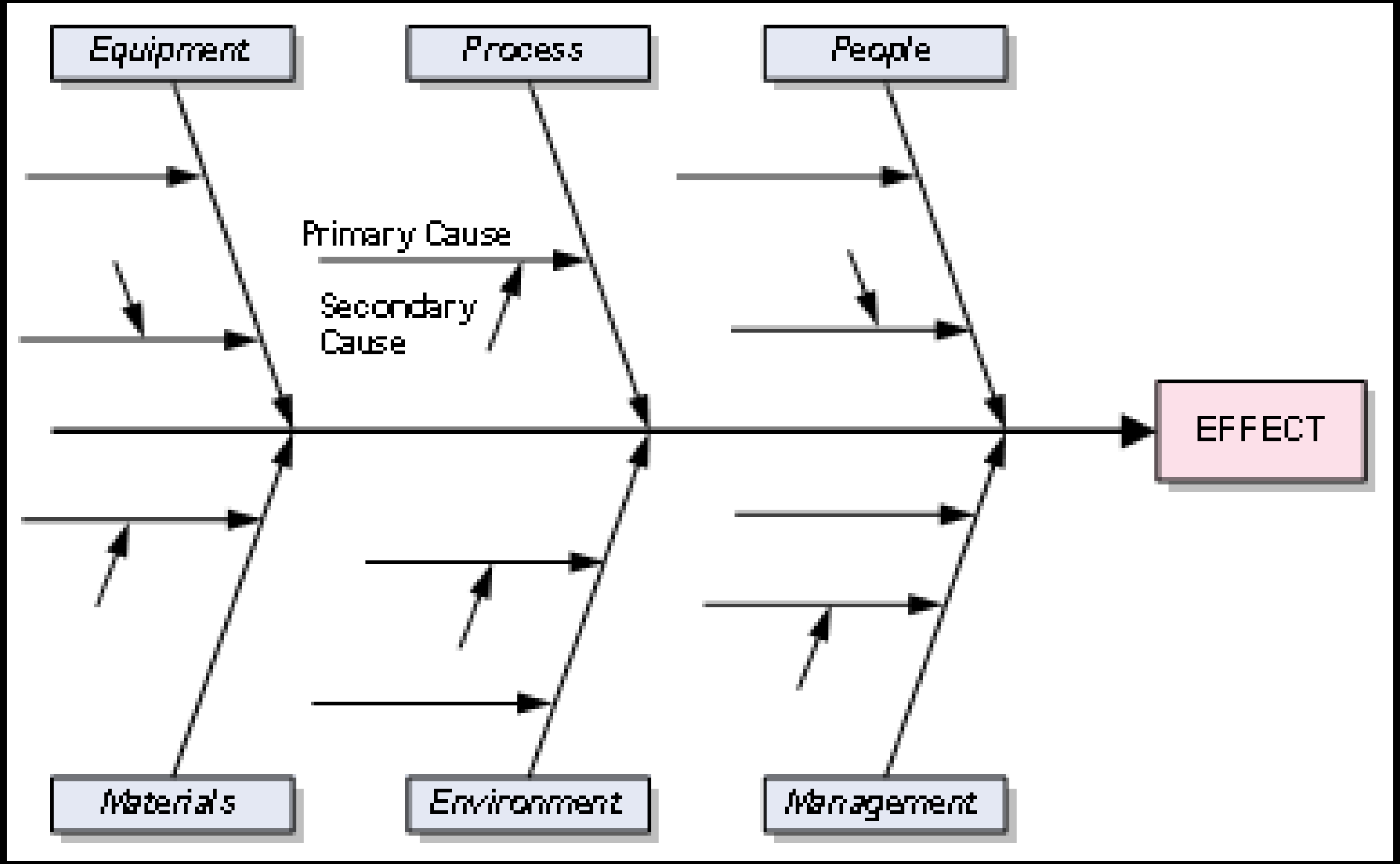
Example from Students





Fishbone

- Cause and Effect Analysis
- Identifying the Likely Causes of Problems
  - *(Also known as Cause-and-Effect Diagrams, Fishbone Diagrams, Ishikawa Diagrams, Herringbone Diagrams, and Fishikawa Diagrams.)*
- When you have a serious problem, it's important to explore all the things that could cause it, before you start to think about a solution.


Equipment
Process
People
Primary Cause
Secondary Cause
EFFECT
Materials
Environment
Management

SCAMPER

Generating new ideas to develop a product or service is a key skill in business.

- You use the tool by asking questions about existing products, using each of the seven prompts. These questions help you produce creative ideas for developing new products, and for improving the current products.

- Alex Osborn, credited by many as the originator of brainstorming, originally produced many of the questions used in the technique. However, it was Bob Eberle, an education administrator and author, who organised these questions into the SCAMPER mnemonic.

Instructions

- Describe the key attributes or components of a situation you wish to improve or change.
- Apply the SCAMPER questions to your situation to generate ideas for achieving your goal

S = Simplify or substitute? (other ingredients, materials, etc.)
C = Combine or condense?
A = Adapt or alter (pace, etc.) ?
M = Modify, magnify or miniaturize?
P = Put to other uses?
E = Eliminate or expand?
R = Reverse (roles, etc.) or rearrange (patterns, etc.) ?

S SUBSTITUTE:

Replace a thing, or concept with something else.

C COMBINE:

Unite! What? Who? Ideas? Materials?

A ADAPT:

Adjust to a new purpose. Re-shape? Tune-up?

M MODIFY, MAGNIFY, MINIFY

Change the colour, sound, motion form, size.
Make it larger, stronger, thicker, higher, longer.
Make it smaller, lighter, slower, less frequent, reduce.

P PUT TO ANOTHER USE:

Change when, where, location, time, or how to use it.

E ELIMINATE:

Omit, get rid of, cut out, simplify, weed out...

R REARRANGE, REVERSE

Change the order, sequence, pattern, layout, plan, scheme, regroup, redistribute...

Bob Eberle (1971); SCAMPER: Games for Imagination Development

SCAMPER Model

SUBSTITUTE	Replace one part of the Product with another that works Better.
COMBINE	Put Different Components together to Improve a Product.
ADAPT	Update the Product to new Customer Preferences.
MODIFY	Change How the Product looks. Its Appearance and Presentation.
PUT TO ANOTHER USE	Use a Product for a Purpose for which it was not Designed.
ELIMINATE	Get rid of Parts that are almost useless or not Valued by Clients.
REVERSE	Deconstruct the Product or Re-Think some of its main Pillars.

Example from Student 1

SCAMPER	New Smart Recycle Bin Idea
Substitute	Replace the plastic recycle bin container with non-rusting metal (MID CITY STEEL, 2013).
	Replace user manually category waste approach with machine auto sorting waste approach by using Artificial Intelligence(AI) technology (Singh & Shree, 2016).
	Replace electricity energy supply with solar energy supply (Dezfooli, et al., 2017).
	Replace multiple recycle bin types with all-in-one recycle bin types (Matchar, 2017).
Combine	Combine recycle bin with GPS (Heun, 2011).
	Combine recycle bin with solar system (Dezfooli, et al., 2017).
	Combine recycle bin with smart sensors (DUBLIN, 2017).
	Combine recycle bin with Artificial Intelligence(AI) technology (Singh & Shree, 2016).
	Combine recycling process with mobile application (Flora, et al., 2014).
	Combine recycling process with reward system (Eerde, 2017).
Adapt	Reuse sunlight energy to supply power for all sensors in the bin instead of using electricity (Dezfooli, et al., 2017).
	Deploy small LED panel at the front part of the bin to display the current fill level (Hyun, et al., 2016).
Modify	Modify the recycle bin size is possible in order to fulfill the need of user and situation.
	Add new components to the bin such as compressor and fire sensor (S.Nirmala, et al., 2017).
	Take out the GPS receiver is possible if user wants to use it as indoor purpose.
Put to another use	It can used to detect the air condition of the placement location (Zimmer, 2012).
	It can used to detect the temperature of the placement location (Zimmer, 2012).
	It can used to convert the sunlight energy into electricity energy and provide power (Dezfooli, et al., 2017).
Eliminate	Eliminate use of electricity power (Dezfooli, et al., 2017).
	Eliminate use of labor to categorize the waste from recycle bin (Singh & Shree, 2016).
Reverse	Swap labor with Artificial Intelligence(AI) technology (Singh & Shree, 2016).
	Swap electricity supply with solar energy supply (Dezfooli, et al., 2017).

Example from Student 2

SCAMPER	Food Waste
Substitute	Replace the manual record with auto detection approach for the inventory record system (Kitchen Management)
Combine	Combine the bin with AI and IoT sensors (Kitchen Management)
	Combine the ingredients rack with IoT sensors (Kitchen Management)
Adapt	Deploy small LED in front of the bin to show the current fill level (Kitchen Management).
	Deploy a camera beside the rack to scan the type of ingredients and record the stock in date.
Modify	Modify the application so it can provide other feature besides tracking calorie for food health (food health)
	Modify the size of the smart bin so that it is possible to fit for restaurant usage. (Kitchen Management)
Put to Another Use	Besides counting calories, it can also monitor exercise activity (food health)
	It can use to detect the general feedback of each food (Kitchen Management).
	It can use to detect the location of each ingredients on the rack (Kitchen Management).
Eliminate	Eliminate the process of checking expiry date of ingredients (Kitchen Management).
Reverse / Rearrange	Swap labour with Artificial Intelligent in checking the stocks (Kitchen Management)
	Change the food intake to a healthier one (Food Health)

STORMDRAINING: Distill a large set of ideas to its essence

Brainstorm Session Results	The 5 Rules of Storm Draining
Enter the ideas, requirements, design components, process steps, or other design elements here	**1. Everything is on the table** *Don't mark anything as "Must Keep." Every single item is fair game for going down the drain.* **2. Delete is the default** *Turn the pencil around and make liberal use of the eraser. Not sure if something should be deleted? Only one way to find out….* **3. Build on other people's deletions** *Your teammate's suggestion to remove one thing likely points to other parts to remove. The objective is to reduce quantity and home in on the essentials, so practice "Yes, and…."* **4. Make it fun** *Celebrate and encourage the deletions. Compliment people's creativity and courage when they propose sending something down the drain.* **5. When you delete something, really delete it** *Don't set it aside and save it for posterity. Don't take a photo to preserve the moment. Erase it. Drain it. Make it go away*