

1 Module 1: ANALYTICAL AND PROBLEM SOLVING SKILLS

Key Words:

Analysis, problem solving, critical thinking, mind maps, brainstorming, flowcharts, 5Whys, Decision Tree

Duration:

4 HOURS

Learning Outcomes

- To learn about what are analytical and problem solving skills
- To acquire techniques and strategies for dealing with problems in order to achieve the best possible results
- To be able to analyse different situations and contexts, formulate thesis/hypothesis, draw conclusions, predict outcomes and monitor results
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1.1 Introduction and Definitions

Analytical and problem solving skills are some of the most important and useful skills to have, both in the workplace and also in everyday life. These skills can be innate, and one can possess them naturally, but they can also be trained, and with enough training and practice, one can become proficient at analysing and deconstructing information, draw conclusions, identify problems and find the best possible solutions.

Although they are two different skills, and can be considered separately, analytical and problem solving skills are strictly related to each other, since analytical skills can be used in the process of identifying and solving problems that may not have obvious solutions.

Analytical and problem solving skills are sought out by employers, no matter the job role one is applying for, as in any workplace, project or task there will be challenges and obstacles which need to be overcome, so it's important to train these skills and be able to highlight them when looking for a job. These transferable skills can be learned in both educational settings, or they can be gained from each career experience, including internships, freelance jobs or volunteering. They are skills that can be used in any educational or work setting. Possessing these skills can turn a good employee into an invaluable employee, and if one has them, employers don't have to worry about training new staff on them, making it easier for them to integrate into a new organisation, and achieve career advancements.

This unit will look more in detail at what analytical and problem solving skills are, how they can be trained, and how they can be demonstrated when applying for a job.

Analytical skills

Analytical skills refer to an individual's ability to identify a problem, investigate to find out relevant facts, and find a logical solution (Corporate Finance institute, n.d.)

They're the abilities that let you break information down into smaller sets to draw conclusions. You use analytical skills when spotting patterns, interpreting data,

considering new information and making decisions based on those factors (Buffet, 2021)

Analytical thinking is a complex skillset which comprises several different skills such as:

- **Research**

It is essential to be able to effectively collect data and research on a topic. Gathering the right information isn't always easy, and a good researcher needs to be able to discern which information is relevant and which isn't, which sources are relevant, and which aren't. Moreover, this should be done in a timely manner, in line with the organisation's needs.

- **Data analysis**

The next logical step after collecting the relevant information, is to be able to analyse it. Analysing data is something that people do on a daily basis, both in the workplace or in everyday life. It refers to the ability to examine data, making sense of it, detect trends and patterns, and provide different logical solutions.

- **Critical thinking**

Critical thinking is the ability to think clearly and rationally, understanding the logical connection between ideas. It's the ability to engage in reflective and independent thinking. It is about being an active learner rather than a passive recipient of information. Critical thinking means questioning ideas and assumptions rather than accepting them at face value (Skills You Need, n.d.). It's about assessing and analysing information without bias or preconceptions that might limit our ability to be objective.

- **Communication**

Communicating effectively with others in and out of the workplace is essential in order to avoid confusion and solve issues in a timely and efficient manner. Communication involves sharing information, findings, decisions and solutions. Depending on the type of information one wants to share, the most suitable means of communication must be chosen. For example, if some

piece information is too complex to be communicated properly in writing, one may consider other solutions, such as face to face meetings or video calls.

- **Creativity**

Using creativity in problem solving means being able to consider a problem from different points of view, and come up with solutions that are not always the most obvious ones. Creativity also means being flexible and consider all alternatives to have a high variety of choices. In the world of work, this skills is often associated with the metaphor “thinking outside the box”, which means “*to think differently, unconventionally, or from a new perspective*” (Wikipedia, n.d.).

Putting an effort to train these analytical skills can bring numerous benefits; not only will they make it easier for a jobseeker to land a good job, but it will also give you higher chances of promotion once you are there. Employers highly consider these skills and it’s important that you can highlight these abilities in your CV or during a job interview, with concrete examples.

Problem solving

Problem solving can be considered as *the ability to define or identify the problem, generate alternatives or potential solutions, evaluate and choose between these and implement the chosen solution* (University of Leeds, n.d.).

As individuals or as members of a team we are constantly faced with problems, both in our personal and professional lives. It is fundamental to have the ability to work through the details of a problem in order to reach a solution. As a problem arises, there may be several possible solutions. It’s important to look at all possible solutions and the outcomes for each solution and then choose on the option that we consider the best one.

According to Pierce J. Howard (2014) there are two different kinds of problems:

- 1) Problems for which possible the solutions are unknown. In this case we don’t know the solution, so we need to find it out.
- 2) Problems for which we have solutions, but the best solution is not obvious.

These two categories can be further divided into other subcategories. In the first case, we can have:

- Problems where the cause is unknown and we need to find it. Once we find the cause, we just have to get rid of it and the problem is solved.
- Problems where the cause is known, or is unknown and irrelevant. Even if we know the cause, that's not relevant and we need to find a solution.

In the second case, there can be:

- Solutions with certain outcomes. We know the outcomes, we just need to choose which one is the best.
- Solutions with uncertain outcomes. We can only know the outcome after we've chosen a solution. In this case we need to envisage what each solution will bring and take it from there.
- Solutions that need to be prioritised. There are many outcomes and we need to prioritise and create a sort of order.

Different types of problems may require different types of solutions, See table below:

TYPE OF PROBLEM	TYPE OF SOLUTION
Problem with unknown cause	Finding the cause
Problem with known or irrelevant cause	Generating ideas that could fix the problem
Decision between solutions with certain outcomes	Deciding on one best solution
Decision between solutions with uncertain outcomes	Deciding which solution has the highest probability of success
A jumbled list	Determining the priority order

Source: Pierce Howard. Problem-Solving: The Owner's Manual (Owner's Manual for the Brain)

The problem-solving process can be approached in two different ways, either in an analytical way, or in a creative way. Analytical problem solving involves researching

facts and figures, categorise the facts, and use the right ones in the right ways, to think logically about a possible outcome. Creative problem-solving, on the other hand, is required to find solutions to problems with complex and abstract elements, where there is no correct answer that applies to every situation (Craig, n.d.).

Generally speaking, finding a possible solution to a problem can be divided into 4 different steps:

- 1) Defining the problem. In this phase it's important to focus on the problem, not just the symptoms, and define which are the root causes.
- 2) Generating different solutions. Considering multiple alternatives can lead to better decision making on the ideal solution.
- 3) Evaluating the alternatives. This involves thinking about what outcomes the different solutions may bring, and selecting the alternative that best fits within the organisation's restrictions.
- 4) Implementing a solution and monitor its impact.

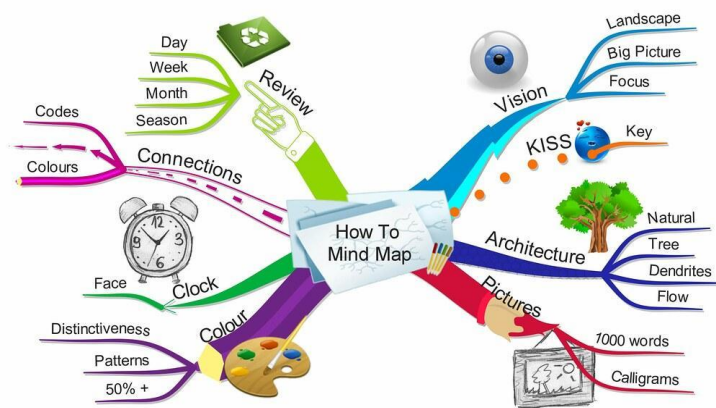
1.2 Methods and Tools of Application

There is a wide range of tools that you can use to develop your analytical and problems solving skills. These tools are useful to start developing a systematic thinking process that will help you adopt an appropriate mindset in any situation. Different tools can be used at different stages of the analysis or problem solving process, so it's important to have a good grasp of them.

The following tools are used mainly at the stages of research, definition of a problem, and finding causes of a problem.

Mind maps

A mind map is a diagram in which information is represented visually, usually with a central idea placed in the middle and associated ideas arranged around it (Oxford Dictionary, n.d.). It allows to organise your thoughts and visually structure them in a hierarchical way. Usually the main concept is put in the middle and around it are linked all concepts, items and words associated with it.

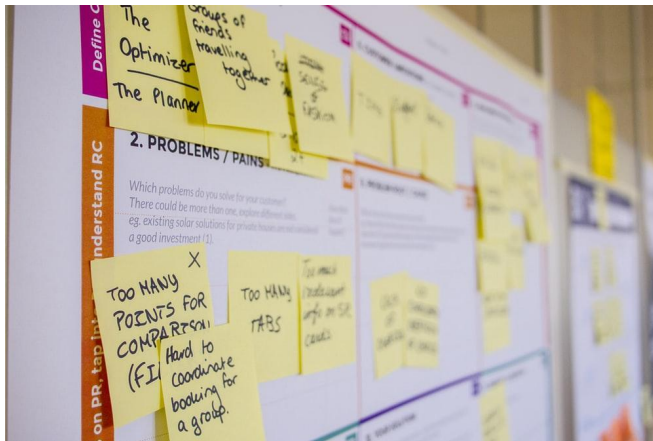


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Brainstorming

Brainstorming is a group activity used to generate ideas in order to solve a problem. During the activity participants share their ideas as they come to mind, however odd they may first appear. Ideas generated are then categorised and ranked and later discussed. In a brainstorming activity quantity of ideas is more important than quality, and there is no judging or criticism, every person and idea has equal worth. Brainstorming provides an open environment where everyone in a group is free to participate (TWI, n.d.).



Affinity Diagrams

This tool is used to organise ideas and data. It usually follows a brainstorming session and as the name suggests it's used to establish relationships among different pieces of information. This method is used in cases where there is a lot of ideas, information, or facts to take into account, which at first seem to have no direct correlation. During this process, after ideas are collected and recorded (usually on sticky cards), the ideas that look related are put together, and then, in a team effort, they are assigned to the identified categories.

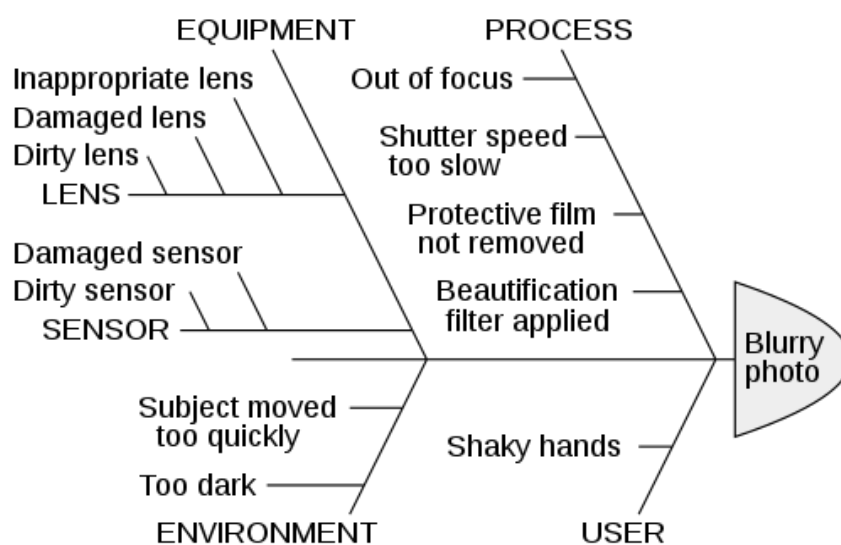


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Cause and effect /Fishbone diagram

The fishbone diagram is used to identify many possible causes for a problem, and sort them into useful categories. It is so called because the diagram looks like the bone of a fish.

Similar to the mind map tool, it's first necessary to establish what the problem is and write it at the centre right of a paper/board/flipchart. Then you should identify (possibly through brainstorming), the major categories that cause that problem. Then write the categories of causes as branches from the main arrow. For each category, you should ask yourself/ves why this happens, and write down the possible answers. You can generate deeper levels by writing sub-causes which will branch off the causes, and continue to ask why this happens. When you run out of ideas, you should focus on the areas where the ideas are few (ASQ, n.d.).

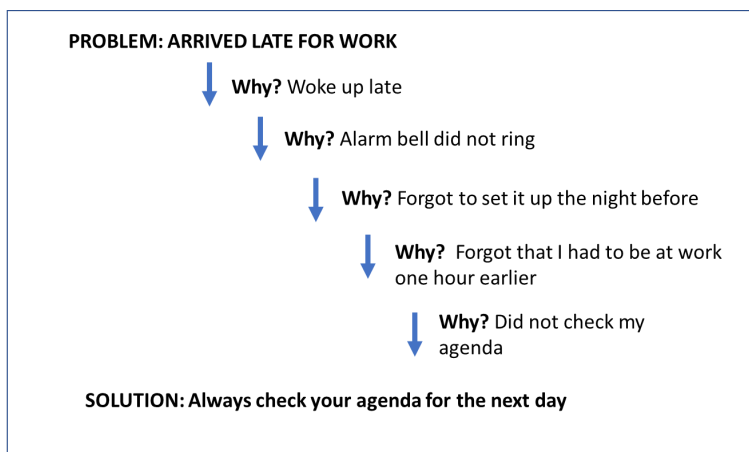


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The 5 WHYS

The 5 Whys is another useful tool to get to the source of a problem. It's most effective when used to resolve simple or moderately difficult problems.

The method is very simple. Once you have defined the problem, you ask: "why?" 5 consecutive time. This will make it possible to go to the source of the problem and find possible counter measures.



The next methods are more orientated towards decisions, outcomes and impact.

Decision Matrix

A decision matrix is a tool that can help the decision-making process and select the best out of a series of options available and different factors to take into account. Although easy to apply, this method is most effective when you need to choose among multiple options that can be evaluated using the same criteria.

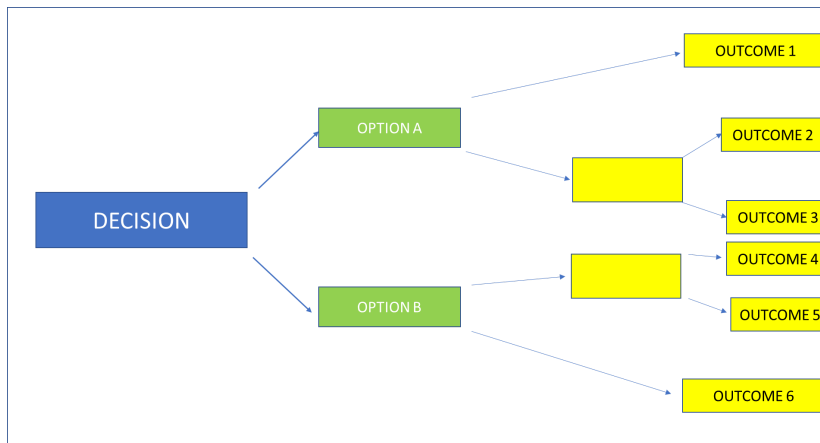
When creating a matrix, you first need to identify the possible alternatives, and then the evaluation criteria you want to consider. Based on that, you will then create the grid, and fill it in using your preferred score method. Finally, you can calculate the score for each alternative, and you will have a clear number based answer on which alternative is the best. Sometimes, certain considerations are more important than others, in which case you can use a weighed decision matrix.

	Concepts						
Criteria	A	B	C	D	E	F	G
Cost	-	+	-	0	+	+	-
Effectiveness	-	+	+	+	+	+	0
Speed	-	0	-	+	+	+	0
Portability	+	+	+	+	+	+	+
Mani ability	0	+	-	+	+	+	0
Total Weight	-2	4	-1	4	5	5	0

Concepts: A= Telescopic Net Catcher
 B= Football with sensors
 C=Drone Football Catcher
 D= 3D Moving Automatic Football Catcher
 E= 2D Moving Automatic Football Catcher
 F= Glowing Football with LED's
 G=Pivoting /Collapsing Net Catcher

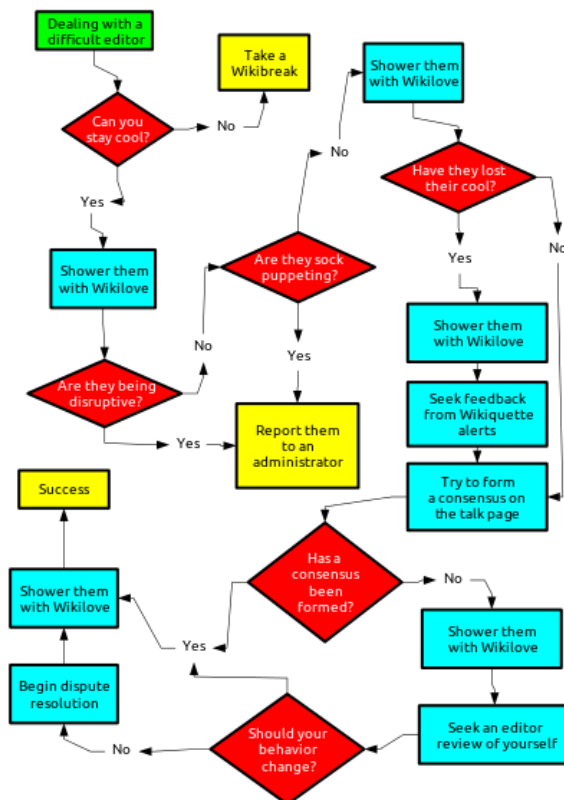
Decision Tree

The Decision Tree is yet another tool that can help us choose the best option based on the outcomes each decision will lead to. We have a to take a decision and we have different options. For each one there is a number of different outcomes. Once we have established the outcome, we are going to prioritise and select which is the best outcome.



Flowcharts

Flowcharts are similar to mind maps and can be a useful tool for problem solving, but while mind maps are good for non-linear thinking, flowcharts work better when the process requires more a step-by-step solution. A flowchart is a chart representing a process workflow, with various shapes connected by arrows representing each step. Each step can lead to different paths depending on the answers to the questions in each step (Lucidchart, n.d.). A flowchart represents the series of steps required to solve a given problem.



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1.3 Glossary and Bibliography

Glossary

5 Whys/5Ys. A powerful tool used for getting to the root of a problem .

Affinity Diagram. A tool used in problem-solving for gathering ideas and opinions, about an issue and organise them into categories based on their natural relationships.

Analytical. Related to using analysis or logical reasoning.

Brainstorming. An informal approach for problem solving where people in teams are encouraged to express their thoughts on a topic, without interruption.

Critical Thinking. A process involving analysing facts in detail to reach a conclusion.

Decision Matrix. A tool that helps evaluating different options related to a problem in a clear and objective way.

Decision Tree. A tool used in decision-making in order to analyse different solutions and their outcomes.

Fishbone Diagram/Cause and Effect Diagram A visual tool to look at cause and effect which can help identify possible causes for a problem.

Flowchart. It's a diagram used to represent a workflow or process.

Mind Map. A diagram used to visually organise thoughts and information showing relationships among the pieces of the whole.

Problem solving. The act of determining the cause of a problem and find appropriate solutions.

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1.4 Activities

Quiz (Random question order)

1) Multiple choice (more than one correct answer)

Which of the skills below analytical skills?

Critical thinking

Persuasion

Negotiation

Communication

Perseverance

Research

2) Multiple choice (one correct answer)

Problem solving is:

- The ability to determine the cause of a problem and find possible solutions
- The ability to execute complex mathematical calculations
- The ability to be flexible and adaptable in the workplace
- The ability to show initiative in the workplace

3) Matching (scramble answers!)

Match the concept with the correct definition

Mind map	A tool to help you organise your thoughts where you visually represent the information on a paper or board, putting the issue at the centre and then connecting it with associated elements relevant to the central theme
Brainstorming	A group activity used to generate ideas in order to solve a problem where participants share their ideas as they come to mind, however odd they may first appear. Ideas generated are then categorised and ranked and later discussed.
Affinity Diagram	A way to organise information where different pieces of information, ideas, facts, etc. are divided in groups according to their mutual relationship
Decision Matrix	A tool used to evaluate alternative solutions to a problem, where these are evaluated and given a score according to different criteria

Flowchart	A tool used to represent a process workflow, where each step undertaken can lead to different paths depending on how each step is dealt with.
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4) True/false

Analytical thinking is the perfect method to use when dealing with problems with complex or abstract elements, where there is no correct answer that applies to every situation.

Correct answer: false

Feedback: This kind of problems would rather require using creative problem solving or a mix of both analytical and creative problem solving techniques. Analytical is best used when solving logistical problems

5) Multiple choice (1 correct answer)

The 5 Whys method is so called because:

- You need to ask 5 different people why a problem occurs
- It's been proven that going down 5 consecutive levels into the cause/effect of a problem is a good method to find the root cause of a problem.
- Asking "why" 5 times releases stress and helps thinking
- The number 5 symbolises balance

6) Multiple choice (one correct answer)

What is the best way to approach a problem

- Define the problem, Think of solutions, Evaluate the alternatives, choose a solution and evaluate its impact
- Define the problem, look how much it's impacting the organisation. If the impact is limited, leave the problem for another time
- Define the problem, search on Google for possible solutions, and implement the best rated solution
- Define the problem, wait for more problems to accumulate so you can solve them all at once

7) True/false

How timely and effectively you can communicate with others can strongly influence how fast and accurately you can solve a problem

Correct answer: true

Feedback: Communication is an important analytical skill to possess

8) Multiple choice (more than one correct answer)

When you have different possible solutions to a problem what can you do to find the best solution?

- Use decision matrix to evaluate each solution using relevant criteria
- Brainstorm possible solutions
- Use 5Whys to find the causes
- Use flowcharts to analyse how the solutions will be implemented step by step

9) Drag and drop into place

Practice affinity diagrams. You are presented with a list of words which are the result of a brainstorming session.

Lack of staff training, difficult recruiting, high overtime, insufficient ovens, limited storage space, variable ingredients quality, not enough trucks, packaging not strong enough, cooling system in trucks unavailable, product damaged in transit, seasonal demand.

Can you place them in the correct category?

STAFF	DISTRIBUTION	QUALITY	CAPACITY
Lack of staff training	not enough trucks	variable ingredients quality	insufficient ovens
difficult recruiting	cooling system in trucks unavailable	packaging not strong enough	seasonal demand
high overtime	product damaged in transit		limited storage space

Activity 2 – Activity type: Assignment (online submission or file upload)

Showing off your analytical and problem solving skills in your CV or during a job interview.

Analytical and problem solving skills are very much sought after by employers. It's important that you are able to show them off in your CV or during an interview. It's important not only to mention that you have these skills, but also to be able to provide details on when you used these skills. For example:

- I was a member of school council when I was a student in college, and had to organise several fundraising campaigns...
- I volunteered for a charity where we frequently had brainstorming sessions...
- I worked as assistant manager at a company and my role involved....

Try practice what you would write on your CV and cover letter and how you would reply during an interview for the following:

- Problem solving
- Analytical skills
- Critical thinking



- Research
- Creativity
- Data analysis
- Decision making
- Communication
- I used the following analytical/problem solving tools in the past...

Activity 3 – Activity type: Assignment (online submission or file upload)

Practice analytical thinking and problem solving tools

Consider the problem: you are an employee for an online store selling office supplies. Recently you have been experiencing a lot of complaints for delays in processing orders. How would you deal with the issue? Try to use some of the different tools provided in the theory section. You can make up details if you need to.

You can upload any type of file (photos, text, etc.).