



UNIT 3 The Problem Solving Tools & Techniques

Learning Outcomes

By the end of this unit the learner will be able to:

- ✓ Think creatively and be a contributing member of a problem solving team
- ✓ Select the best approach for making decisions



Unit 3

The Problem Solving Toolkit

The Basic Tools

There are some techniques we can use to help us at every stage of the problem solving process.

The Lasso

Can we tighten up our definition of the problem?

- “How can we improve communication in our group?” What do we mean by communication?
- “How can we get our work done more efficiently?” What do we mean by efficiently?

Is/Is Not

The Is/Is Not technique lets us eliminate assumptions and emphasize facts. For example, someone says, “The telephone system isn’t working.” You might ask them to list what isn’t working and list what is working. Perhaps all functions are affected, or perhaps only incoming calls have been affected.

Graphics

A diagram allows us to see things visually. For example, think of personality types, which can be depicted visually as well as verbally. For some, a graph is more beneficial than a score or a label. For others, one type of categorizing is better than another type of categorizing.

Basic Questions

Who, what, where, when, why, how?

Criteria

In many situations it can be very helpful to have already determined what the criteria will be for your best solution. For example, let’s say that you and your spouse are going out to celebrate your anniversary. Where are you going to go? Well, rather than the old harangue about: “Where do you want to go?” and, “I don’t care. It’s up to you,” how about developing criteria ahead of time?



Some examples:

- The place must have a liquor license, since you want a glass of wine with your meal.
- It shouldn't cost an arm and a leg, yet you don't want the fast food joint just down the road. A cost of \$20 to \$30 per person is another criterion.
- You want a place where you can have chicken and your spouse can have seafood.
- It shouldn't be more than 50 miles away, since you both have to work tomorrow.
- It should take reservations. You don't want to go to all that trouble and then find the place has no table for you.

Now you can brainstorm, but the brainstorming will be modified or restrained, since you've already identified the criteria that the restaurant must meet.

Force Field Analysis

Force field analysis examines restraining forces (forces that discourage the problem) vs. sustaining forces (forces that encourage a problem). Take an example like John arriving late for work.

What are the restraining forces?

- Boss is angry
- John is behind with his work
- Parking spots all gone

What are the sustaining forces?

- Gets to sleep an extra 15 minutes
- Takes the kids to the babysitter
- Misses traffic on way to work

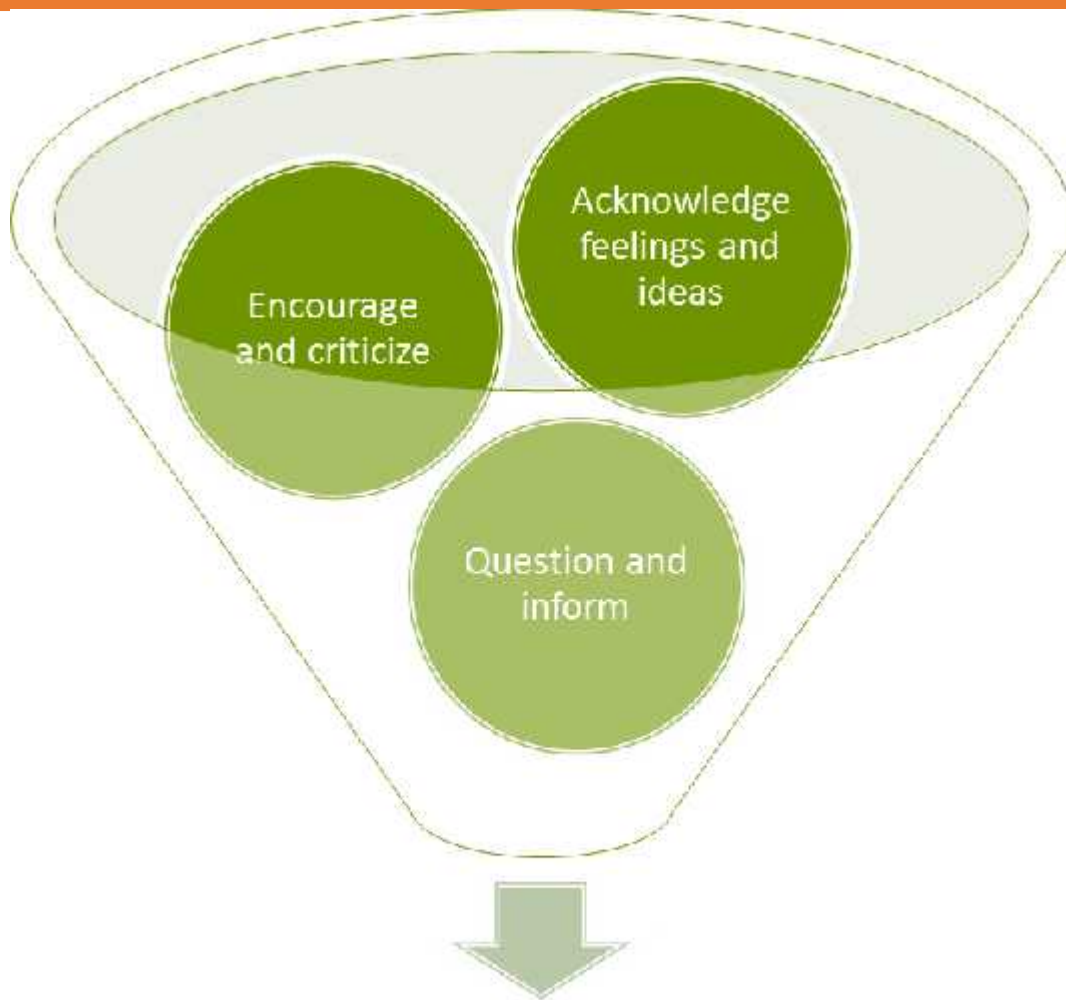
Then the question becomes, how can we weaken the sustaining forces and strengthen or shore up some of the restraining forces?

Legitimizing Problems and Positions

Problems are okay. Everyone has problems. They are a fact of life. Human beings couldn't live without change in their environment, without stimulation, and problems provide that change and stimulation. So it's all right to have a problem as long as you are willing to do something about it.

In our society we often think that having a problem is like admitting failure. Some of us refuse to admit we have problems, or we ignore or hide them.

Everyone sees things differently, especially problems. Did you ever stop children from fighting and ask what the problem was? You would usually get a discordant chorus of responses as to why they were fighting, and each would see the fight from their own perspective. This expression of our personal view, no matter how discordant it may be, needs to be legitimized. To do this, we can use the communication funnel.

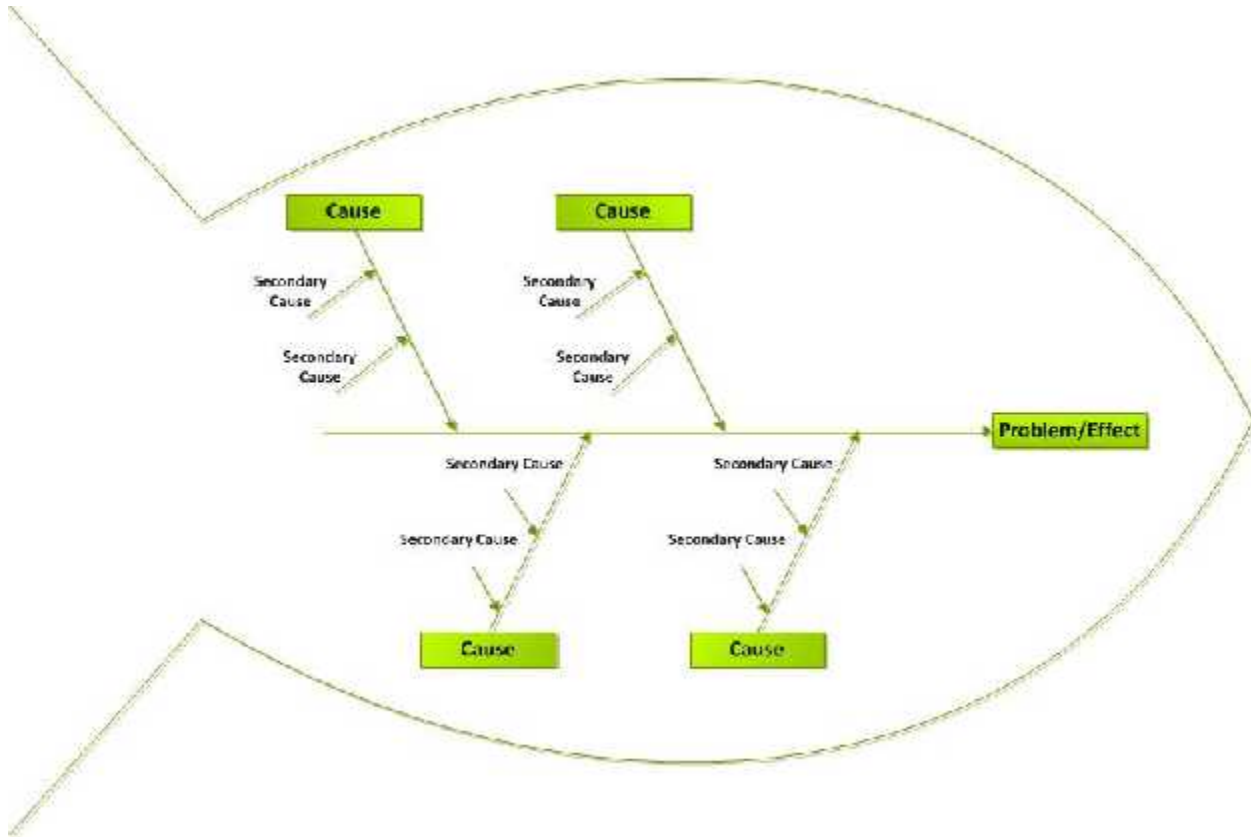


Communication

If you are working with two employees who are in conflict, for example, each one must have their perception of the problem legitimized. You aren't telling one they are right and the other they are wrong. Rather, you are demonstrating that you accept and support each view as legitimate, and will protect it from attack until it has been explored. Showing people that their view has been heard and accepted will reduce the tension and let them relax, at least a bit. Only then can you go on to find common ground, identify what's at the root of the problem, make decisions on solutions, and move ahead.

The Fishbone

The fishbone problem solving tool visually organizes information:



This tool is also called the **Ishikawa diagram**, after the Japanese quality management consultant who created it. It is an excellent method for solving complex problems, and for identifying the root cause(s) associated with it. It is most effective when used by a group. The facilitator starts the discussion by drawing the outline of the diagram, and then asks for assistance from the group to identify the main causes. Each cause is listed separately (one per fishbone). The team continues making suggestions to fill out the entire diagram. Once the problem is laid out in this visual way, the team can decide what the root causes of the problem are. The causes are highlighted, and then can be acted upon.

One advantage of the fishbone diagram is that we can clearly see the reasons that a situation or problem exists, because we list all the factors that influence it. It is also possible to identify solutions that might help solve more than one problem, especially if you are applying it in a larger workplace where manufacturing, building, or other processes are taking place. This diagram can be used as a one-time exercise, or it can become a working document that is updated as various solutions are tried or more information becomes available.



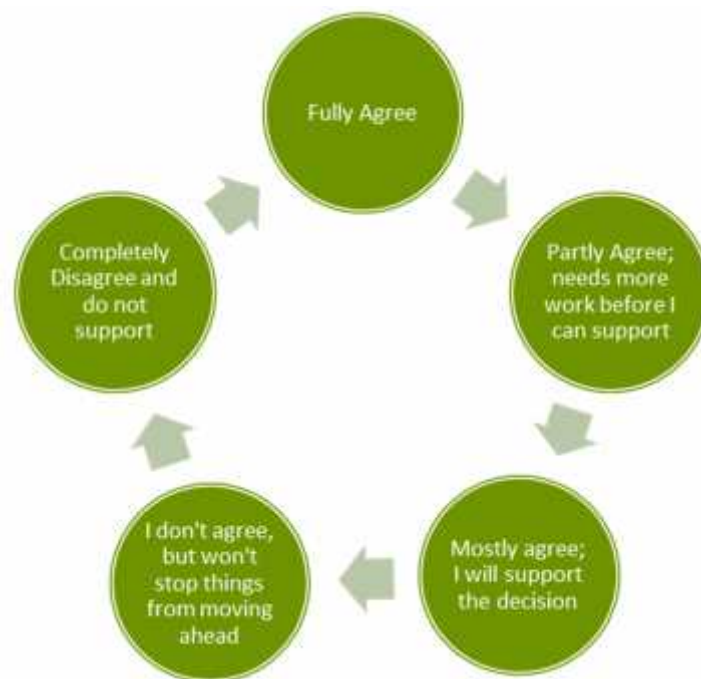
Degrees of Support

There are shades of grey everywhere in life, and decision making is no different. If participants can apply the degrees of support instead of having to select yes or no, they may feel some relief that they are not taking sides. The degrees of support may help them articulate exactly how they feel about a decision.

No Need for Black and White Thinking

Using Degrees of Support will help a group realize that consensus does not mean that everyone agrees to the same degree. The circular nature of the diagram (which reflects the symbol for degree, or °) demonstrates how we may increase or decrease the strength of our commitment to a decision in response to getting more information, considering a different perspective, and moving through the problem solving process.

Degrees of Support



Little in life is really so clear that it needs to be discussed in terms of an absolute yes or no. Like the diagram, we really consider things in terms of degrees, especially when moving through the problem solving process.

Creative Thinking Methods

Brainstorming

About Brainstorming

We talked very briefly about brainstorming earlier to get you started thinking about it. Brainstorming is the first thing that comes to most people's minds when we talk about creative thinking. In a brainstorming session, people are encouraged to say what comes to their mind, and all the ideas generated are recorded. People are encouraged to say whatever they are thinking, and are not to fear looking foolish since wild ideas are explicitly encouraged. There is no one right way to run a brainstorming session. Rather, you should tailor it to your needs and resources. In doing so, you may find it useful to consider the following guidelines.

Before Brainstorming

- Define your purpose. Think of what you would like to walk out of the meeting with.
- Choose the participants. The group should be large enough to provide a stimulating exchange, yet small enough to encourage both individual participation and invention. This usually means between five and eight people.
- Change the environment. Select a time and place that distinguishes the session as much as possible from regular discussions. The more different a brainstorming session seems from a normal meeting, the easier it is for participants to suspend judgment.
- Design an informal atmosphere. What does it take for you and others to relax? It may be talking over a drink, meeting at a vacation lodge, or simply taking off your tie and jacket during the meeting.
- Choose a facilitator. Someone at the meeting needs to facilitate to keep the meeting on track, make sure everyone gets a chance to speak, enforce any ground rules, and stimulate discussion by asking questions.

During Brainstorming

- Seat the participants facing the problem side-by-side. Physically sitting side-by-side can reinforce the mental attitude of tackling a common problem together. People sitting side-by-side in a semicircle of chairs facing a flip chart, for example, tend to respond to the problem depicted on the chart.
- If the participants do not all know each other, the meeting begins with introductions all around.
- Then, clarify the ground rules, including a no-criticism rule.
- Outlaw negative criticism of any kind.
- Once the purpose of the meeting is clear, let your imaginations go. Try to come up with a long list of ideas, approaching the question from every conceivable angle.
- Record the ideas in full view. Recording ideas on large sheets of paper gives the group a tangible sense of collective achievement, reinforces the no-criticism rule, reduces the tendency to repeat, and helps stimulate other ideas.

After Brainstorming

- After brainstorming, relax the no-criticism rule in order to bring the most promising ideas to the surface. You are still not at the stage of deciding; you are merely nominating ideas worth developing further. Circle the ideas that members of the group think are best.
- Take one promising idea and invent ways to make it better and more realistic, as well as ways to carry it out. The task at this stage is to make the idea as attractive as you can. Preface constructive criticism with: “What I like best about that idea is...” or, “Might it be better if...?”
- Before you break up, draw up a selective and improved list of ideas from the session and set up a time for deciding which of these ideas to take further and how.

Limitations of Brainstorming

There are some noted challenges with brainstorming, although it remains a favorite method of creative idea generation. Despite a facilitator’s best efforts to get everyone involved, there are always some people who limit or filter what they say in a brainstorming session, and the sessions can sometimes benefit from the extroverts more than the introverts. Verbal traffic jams, where we are waiting for our turn to share, lead to filtering our own ideas before stating them or even forgetting what we wanted to say.

Another limitation to brainstorming relates to its very social nature. If we are involved in a brainstorming session and it is set to take place off site, or involves a particular group of people, production can be lower than expected in a brainstorming session. Fortunately, there is a great tool to overcome these problems: brainwriting.

Brainwriting

Brainwriting takes all the best elements of brainstorming (plentiful ideas creatively generated) and makes them even more effective. Brainwriting was originally made popular in Germany during the 1970’s, although it may have originated prior to that. Further developed by creativity expert Arthur B. VanGundy, Ph.D. (1946-2009), brainwriting uses individual work to creatively increase the number of ideas generated.

There are several methods to brainwriting. The **interactive method** has everyone gather around a table. Each will write down one idea on a piece of paper and then pass the paper to the person beside them. That person will read what is on the page and use the initial idea as stimulus for a new idea, modify or enhance the original idea, and then pass the page to the next person. You can set a limit of 15-20 minutes for the exercise, which will end when each person gets their original page back.

There are plenty of variations you can apply to this exercise to encourage creative thinking. You could use differently colored paper or hang flip chart pages on the wall and have participants move around the room instead of passing paper around. You could also fold paper into paper airplanes, throw them to each other, and write all over the wings. Get as creative as you like! Another idea: have the writing surface somehow reflect the problem, the environment, or just get people moving.

In-depth research conducted by Dr. VanGundy demonstrated that brainwriting consistently produced more ideas than traditional brainstorming, given the same sized group and amount of time. He attributes the difference to “production blocking,” where only one idea can be generated and written down at a time during brainstorming, as opposed to each member of the group writing simultaneously. (See Dr. VanGundy’s books *Techniques of Structured Problem Solving* and *Managing Group Creativity*.)



Mind-Mapping

Once the ideas have been generated, mind-mapping can be used to organize them.

Step One: Create a List

Topic

- Adopting a puppy

Related Ideas

- Adoption = community oriented
- Require warranty for good health
- Must be neutered/spayed
- Can be male or female
- What breed?
- Family dog?
- What size?
- Dry food, canned, or raw?
- Company during lonely evenings
- Training required!
- Requires brushing regularly
- Will get me out walking every day
- Needs a sweater
- I need to learn to trim nails
- Need a vet



Step Two: Create the Diagram

List each idea in its own box, with the main topic at the center.



Step Three: Link and Categorize

Now, you can begin linking and categorizing the ideas:



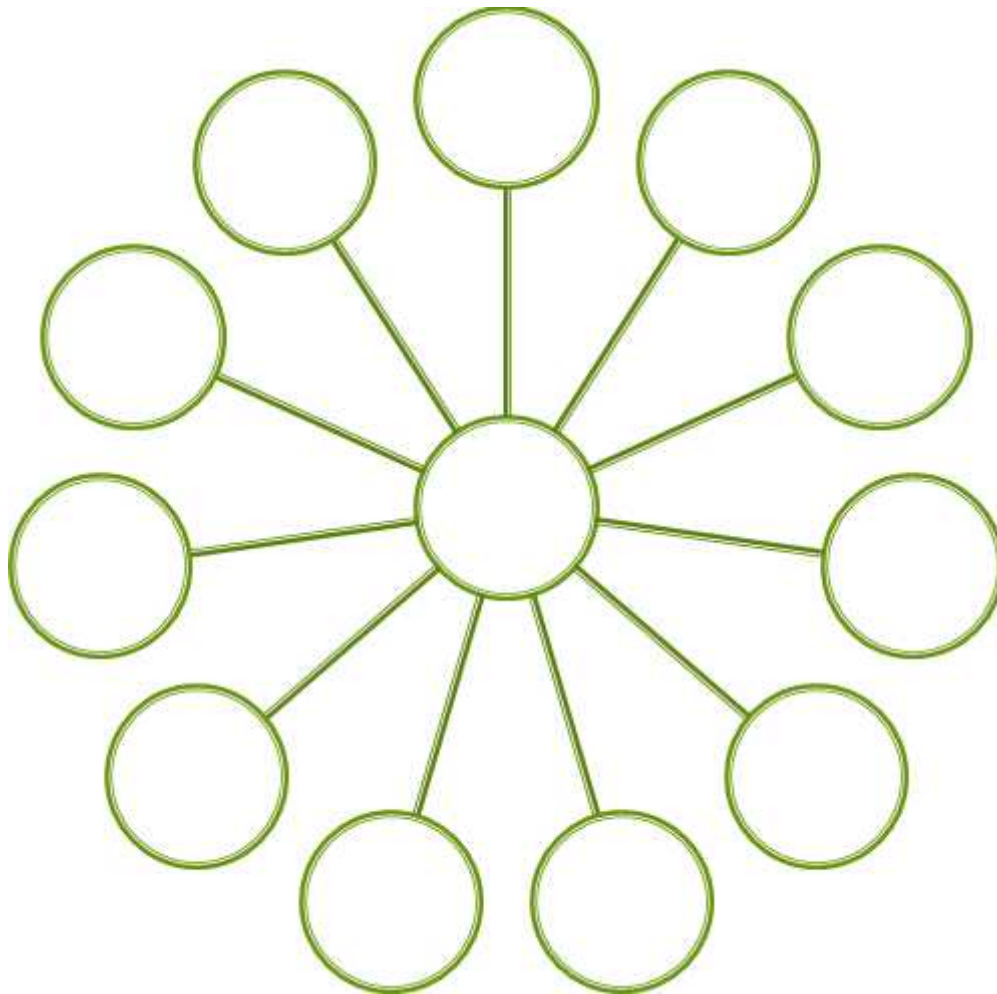
Step Four: Finalize and Review

Look at the final product. Evaluate and review as needed.





Brainstorming and Brainwriting



More Methods

Random Word Method

Another interesting technique is the random word method. First, open a dictionary. Then, close your eyes, choose a page, and point to a word. You must use the first word you choose. Then, write the word on a flip chart and try to figure out how that word applies to your problem. Perhaps you're working on a decline in sales and your word is "tiger." You could say that we need a tougher approach, or a brighter idea.

Don't Re-Invent the Wheel

When you've solved a problem successfully, or if you hear about a creative solution, write the solution down in a log. Then, when you're having trouble problem solving, refer back to the log to get your creative juices started. You may even be able to take certain elements of different solutions and bring them together to create a solution for your particular problem.

Do Something Different

Creativity takes work. Don't be surprised if sometimes you are supposed to be problem solving, and your ideas don't flow, so you do something different. Take a walk, bounce a basketball, browse a bookstore, or do something that is at a different pace, in a different place, or requires a different part of your brain. You will find yourself refreshed and recharged when you get back to the problem at hand.

Aspirinia

Decision Information

Introduction

You work for the Super Aeronautic Space Science Institute (SASSI for short). The group is international, but then, so is everything these days. The old concept of separate countries vying for their piece of Earth, wealth, and power has given way in the need for survival. You have been selected to be a part of a team of scientists and astronauts getting ready to leave Earth to explore Aspirinia, a moon that appears able to sustain life and currently orbits Earth with our original Moon.

Sounds like science fiction? Think again!

The year is 2111. A hundred years ago, there was a massive shift in space, and a catastrophic astronomical storm destroyed orbit patterns, sent moons and planets in unimaginable directions, and re-wrote the map of the universe. The storm pushed tens of thousands of pieces of rock and space junk into the asteroid belt. Many pieces burned through the outer edges of Earth's atmosphere and crashed into Earth itself. Millions of people



were killed in the constant showers of rock and minerals, earthquakes, landslides, tsunamis, and severe weather. Despite celebrating the birth of the 7 billionth person in 2011, current census results indicate there are no more than 1 billion people left on the entire planet Earth.

In the destruction, many of Earth's great scientific minds were killed. Air travel, cellular technology, the Internet, and contact with other regions are all extremely limited, and very costly. Short wave radios are most commonly used and Morse code is once again the language of the airwaves. Dirty water is a constant threat. Food is scarce and rationed everywhere. There is high security around technical installations and food and water treatment and preparation facilities. The greatest threat, however, is the cooling of the Earth's core. An ice age is imminent.

As well, the moon Aspirinia that was once orbiting around Jupiter now orbits Earth with Earth's original moon, having broken away from Jupiter's orbit. Earth's own axis shifted by nine degrees, and Earth's moon shifted so that 50% of what used to be known as its dark side now faces the planet below.

One hundred years after The Shift, Earth's fractured self is still adjusting to the changes. The ground is so unstable that earthquakes can no longer be told apart from aftershocks in several regions. Areas that were at around sea level before the shift are now underwater (perhaps permanently). Survivors have relocated themselves far inland, often living in family groups and tribes in small villages and learning to survive by practicing ancient techniques of water treatment, farming, and sustainability.

The surviving members of the science community were left with access to a multitude of information, and a possibly crazy idea. Aspirinia seemed to quickly stabilize when it took up position beside Earth's original Moon, and has remained there. The question is: can it sustain life?

Before The Shift, SASSI was involved in a terramanipulation experiment on Earth's Moon. The terramanipulation was an effort to make the moon livable for humans and animals. Scientists were able to manipulate and secure the moon's gravitational pull, create thousands of hectares of farmable land, and generate drinkable water. They were in the process of completing the final touches on the ecosystem, complete with insects, birds, and farm stock, when The Shift hit and the project was abruptly ended. By the time The Shift finished its active phase, the Moon showed significant damage, with enormous craters and at least three cracks the size of Earth's Grand Canyon. The scientists and settlers on the Moon all perished when the Moon's gravitational pull returned to its pre-terramanipulation state.

Aspirinia, however, appeared to be another matter. It was significant enough to be a planet in its own right, judging by its size and composition. Positioned as the next door neighbor to Earth's Moon, scientists are confident that Aspirinia could be the savior they are looking for. At about two-thirds the size of Earth, Aspirinia shows evidence of plant growth and water on the surface at some time, and its gravity and placement have been consistent over the past 90 years or so. Could terramanipulation, once a story in science fiction tales but partially proven on Earth's old Moon, be made to work? Could Aspirinia save humanity?



Individual Action Steps

There are several things that your team will need to do before leaving for Aspirinia. Go through the list below individually and rank the tasks from 1 through 8, with 1 being the most important, and 8 the least. All tasks must be completed, and all must have a different ranking.

Individual Ranking	Task	Group Ranking
	Hire three security personnel to protect the SASSI center, including an airstrip.	
	Reassign resources (food, water, electricity, heating fuel, medical supplies, and water purification chemicals) from the local village to the space team.	
	Visit the neighboring village to solicit their support for the project.	
	Make repairs to the space suits, which are now 100 years old and must be made secure against leaking. You will not know enough about the atmosphere on Aspirinia until you get there.	
	Form a team to create ration packages to last at least six months. You will be dehydrating food that is harvested by the local villagers and rationed in the village.	
	Establish your realistic launch date.	
	Send ahead two unmanned shuttles with supplies.	
	Arrange for a launch party that includes the villagers.	



Swotting Up

SWOT Analysis

Solving business problems can be a bit different than everyday dilemmas. One suitable problem-solving method is to use the SWOT analysis, where the members of your team attempt to identify the assets and liabilities of the organization as they look to the future.

SWOT stands for the strengths, weaknesses, opportunities, and threats facing your company. The strengths and weaknesses are usually considered to be internal, while the opportunities and threats are generally external to the company. This analysis helps you ask yourself, “Where are you now?” This is really your situation analysis or inventory, and it gives you an opportunity to take stock of the overall situation right now before planning any future changes.

You can use this matrix to help you lay out your analysis:

	<i>INTERNAL</i>	<i>EXTERNAL</i>
<i>P O S I T I V E</i>	Strengths	Opportunities
<i>N E G A T I V E</i>	Weaknesses	Threats



A SWOT analysis should consider:

- Your company and its strengths and its weaknesses
- Your products and/or services and their strengths and weaknesses
- The community and what is currently going on that may affect future planning
- Your primary and secondary target markets and what they want/need
- The competition and what they are doing
- The external forces that will affect your business
- Opportunities that are available to you and your company
- Environment and market factors that could threaten your business

Individual Analysis

Complete a SWOT analysis of your organization or your team at work.

	<i>INTERNAL</i>	<i>EXTERNAL</i>
<i>P O S I T I V E</i>	Strengths	Opportunities
<i>N E G A T I V E</i>	Weaknesses	Threats



Further Reading:

- ✓ Davenport, Thomas, Brook Manville, and Laurence Prusak. *Judgment Calls*. Harvard Business Review Press, 2012.
- ✓ Michalko, Michael. *Thinkertoys: A Handbook of Creative-Thinking Techniques*. Ten Speed Press, 2006.