Crash Course in Creative Problem Solving

Academic Year 2016-2017

Universiteit Maastricht

Zuyd University of Applied Sciences

Tutor Manual Crash Course in Creative Problem Solving
Academic Year 2016-2017
Maastricht University, Hogeschool Zuyd
A partnership between ROA, AE2, EDLAB, FHML, iArts.

INTRODUCTION

In our work and daily life we are constantly faced with situations in which we have to find a solution for a problem, opportunity or challenge which we have never encountered before. Many of these problems are relatively easy to solve, providing a concise and interesting challenge. These problems come with complete information about their solution strategy and can typically be solved in a repetitive or routine manner. However, some of the problems we encounter are more difficult to solve as the problem and/or the solution strategy is not concise and clear. These problems are often ill-defined or open-ended and the path to be followed for the solution is ambiguous. Moreover, the solution possibilities for this type of problems appear to be infinite. This is where Creative Problem Solving (CPS) comes in handy: a process that can help us with problems, opportunities and challenges asking for a creative solution such as:

- How can we attract more students for our master program?
- How can I investigate the effectiveness of my learning method?
- How can we design a medicine for Asthma without any side effects?
- How can we design the next generation of automobiles?

CPS is a structured process that involves breaking down a problem into several pieces to understand it, generating ideas to solve it, and evaluating the generated ideas to find the most effective solution. Highly creative people tend to follow this process without thinking about it. Less naturally creative people, however, simply have to learn to use this process. Creative solutions are characterized by being (1) new: a solution is not creative unless it is new; (2) useful: the solution has to solve the problem; and (3) feasible: the solution has to be implementable in practice (Treffinger et al., 2006).

INTENDED LEARNING OUTCOMES

Upon completion of the training, you are able to…

- ✓ Apply different methods and thinking skills that foster creative problem solving at the right moment in the creative problem solving process;
- ✓ Solve a scientific problem in a creative and innovative way;
- ✓ Analyse and reflect on how his or her own personal, team and environmental factors can promote or inhibit creativity;
- ✓ Implement the acquired knowledge and skills on creative problem solving in different settings and courses.

CRASH COURSE COORDINATOR

- Dr. Barbara Belfi (b.belfi@maastrichtuniversity.nl)

For any questions relating to the course, first consult your tutor. For remaining questions, you can contact the course coordinator Barbara Belfi.

TUTORS

- Dr. Barbara Belfi
- Kim Van Broekhoven, Msc.
- Dr. Roy Erkens
- Dr. Arie van der Lugt

The four stages in the CPS process

The process of CPS was first introduced by Osborn (1955). He distinguished three key stages in the process of CPS: (1) fact finding, (2) idea finding, and (3) solution finding. In 1987, Isaksen and Treffinger further developed the model and reframed the stages into (1) understanding the problem, (2) generating ideas, and (3) planning for action. Since then, the CPS model has been refined and modified by many others in a quest to further optimize it (Baer & Kaufman, 2005; Buys et al., 2009; Puccio et al., 2005). As such, CPS can best be seen as an umbrella term that covers the notion of creative processes and stages needed for creative behaviour. Individuals often have to go through the separate CPS stages in an iterative manner, in order to yield the desired solution.

Although the various CPS models that have been developed distinguish different sequences of CPS stages, there are a number of central features that have remained constant in these stages. These central features can be captured in four stages:

1. The first stage –the problem definition stage- includes a systematic effort to define, construct, and focus on the problem to be solved. It includes three processes: constructing opportunities, exploring data, and framing problems. These three processes are crucial for finding out what the real problem is and why it occurs

2. The second stage is the idea generation stage. After it is established what the problem is, ideas need to be generated about how to deal with it. The goal of the idea generation stage is come up with as many original ideas as possible.

3. This third stage is called the idea evaluation stage. Once lots of creative ideas have been generated, it has to be evaluated which ideas are the good ones. The goal of the idea evaluation stage is to evaluate and select the most promising ideas

4. The final stage is the idea implementation stage. When the best idea is selected, there have to be found ways in which other people can be made enthusiastic about the idea as well. The goal of the idea implementation stage is to convince other people of the solution.

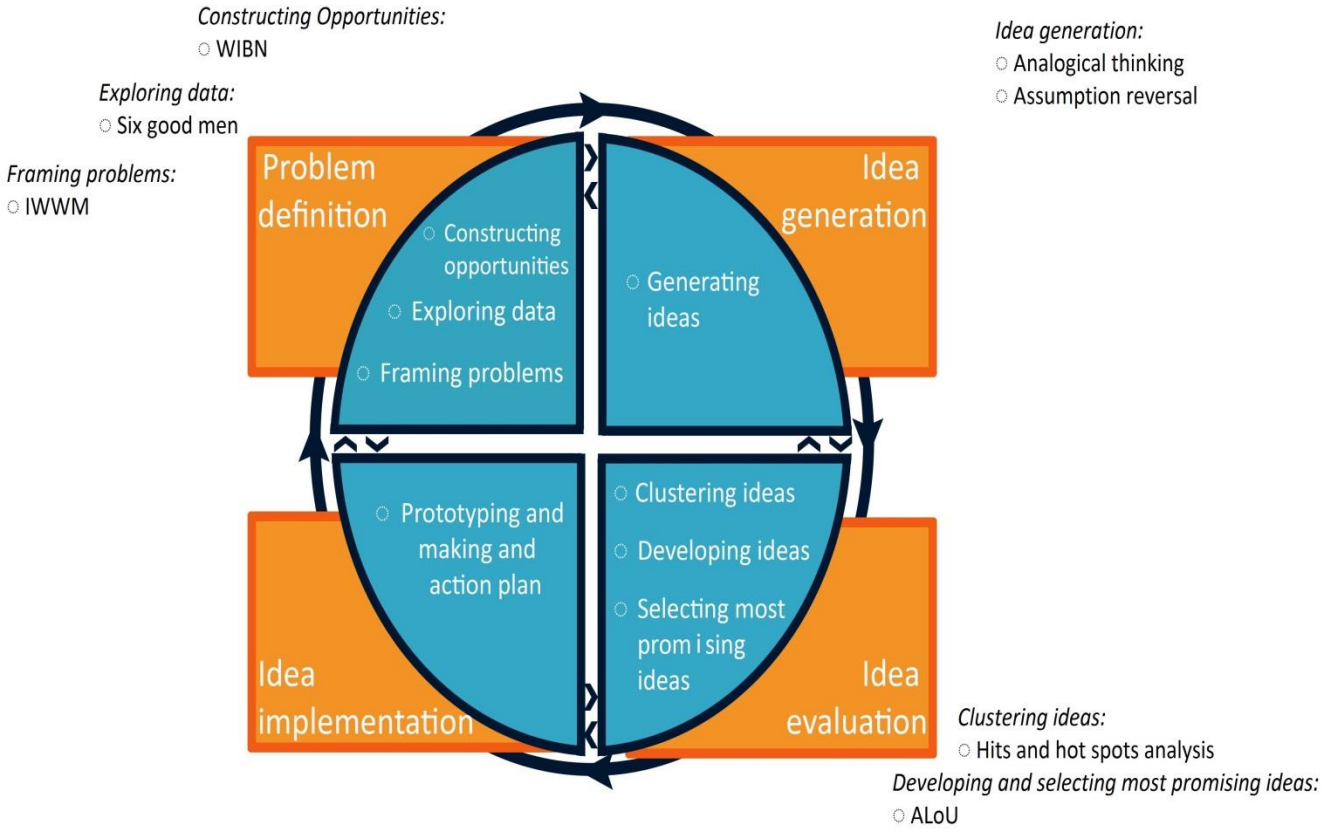


Figure 1. The Creative Problem Solving Framework and accompanying Creativity Tools

Why is creative problem solving important?

One of the major concerns of today is how education can best prepare students for participation in the current knowledge society. The knowledge and skills of today's students are evolving rapidly as new technologies compete for their attention. At the same time, our current organizations and institutions are stretched to their limits to keep up with the changing demands of the time. In order to create solutions for the new, complex and varied problems today's organizations are encountered with, a new set of tools, perspectives and approaches is necessary. As Einstein once famously said: "We cannot solve problems by using the same kind of thinking we used when we created them".

Political and business leaders therefore call on educational institutions to pay attention to creativity and innovation in their educational programs. The European Commission even designated 2009 as "the European Year of Creativity and Innovation" claiming that creativity and innovation contribute to economic prosperity and social wellbeing, and urging that these skills should be developed in education. Research has further shown that worldwide, organization executives consider creativity to be a top priority for their organizations (IBM, 2010). While a plethora of definitions of creativity and innovation exist, researchers came to

agree that innovation subsumes the process of the production and implementation of original and useful ideas for open-ended problems in any domain, while creativity refers to the idea production phase only. Stanford University was one of the first major league universities to develop a creativity course in which students have to find creative solutions for major world problems. This course is so popular, that students have to fight for a spot. Likewise, the certifications of this course are greatly appreciated by today's leading companies and organizations.

Cognitive processes needed in creative problem solving

The ability to progress through the different stages of the CPS-process has been theorized to be influenced by three types of factors. Amabile (1983) has put forward a model for creative problem solving that contains three components. According to her Componential Theory of Creativity, creativity is the result of three components:

1. Domain-relevant skills (expertise in the relevant domain or domains)
2. Creativity-relevant skills (cognitive processes conducive to novel thinking)
3. Task motivation (the intrinsic motivation to engage in the activity out of interest)

The creativity-relevant skills can be further divided into (a) a cognitive style that involves coping with complexities one encounters in problem solving; (b) a work style that is characterized by concentrated effort and high energy, and (c) knowledge of tools or heuristics that are needed for creative problem solving.

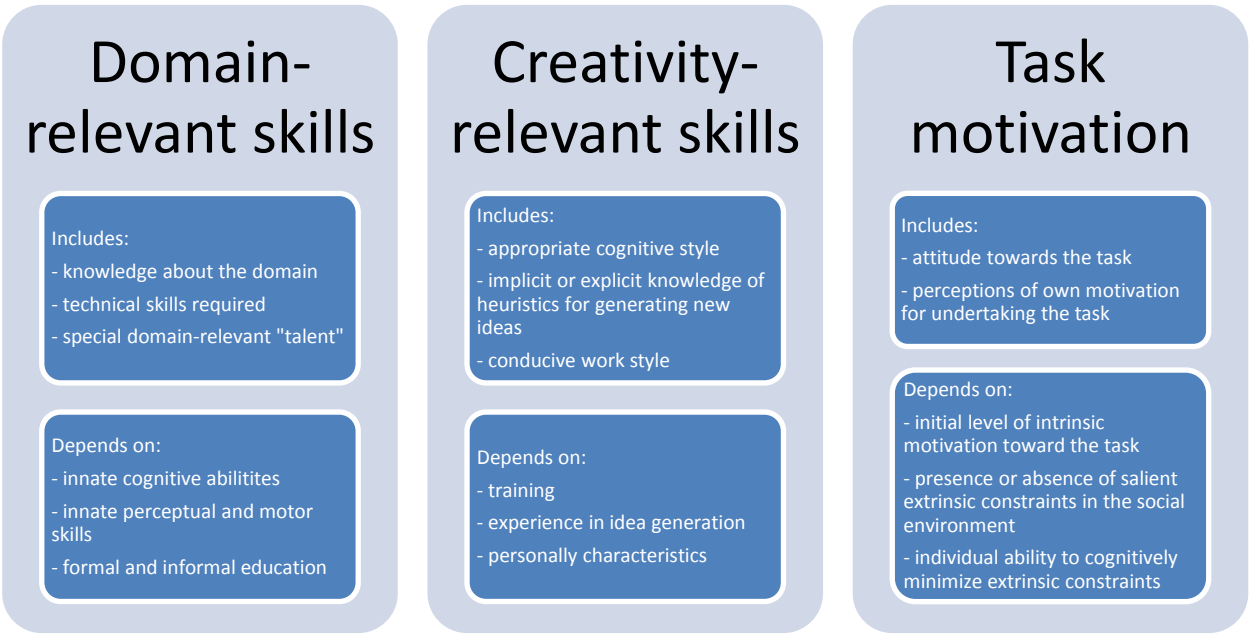


Figure 2. Componential Theory of Creativity (Amabile, 1983)

Creativity tools

The terms creativity tools and heuristics have been used compatibly in the CPS literature to refer to a set of basic problem solving strategies that can help to structure and organize the creative problem solving processes needed in the four CPS stages. In the present course, we specifically focus on a set of concrete stand-alone tools which have been found to be effective in fostering the CPS process by a large base of empirical research. While there are many creativity tools, in this course students are presented with only a few of them. Each of these tools has its own benefits. For example, the use of a particular tool may either improve the number of ideas (fluency), the variety of ideas (flexibility), or the unusualness of ideas (originality) or a combination of these qualities. This emphasizes the importance of using a variety of tools for the same CPS stage. There are also many ways in which tools can be used, for example individually or collectively. There is no "right or wrong" way.

Creative and critical thinking

Creative and critical thinking are often seen as opposites. While creative thinking (or analytical thinking) involves encountering challenges and then searching for meaningful new relationships by means of generating many original possibilities, critical thinking involves carefully examining possibilities and then organizing, ranking and choosing possibilities. According to Treffinger et al. (2006) both thinking processes are needed for creative problem solving. A balanced use of creative and critical thinking is also referred to as the heartbeat of CPS as it represents the "rhythmic pulse on which the CPS process builds".

Solving creative problems individually and in teams

Creative products are often the results of team efforts. For example, creative inventions such as steaming machines, the structure of DNA or the iPad are the result of CPS by teams. Team creativity is also referred to as synergistic creativity. It has been found to be fostered by group compositions which include individuals with different backgrounds in knowledge, skills, and perspectives. A much used method to create synergistic creativity is brainstorming. However, research has shown that group brainstorms often lead to less creativity then individual brainstorms. This is because in groups, people are often socially anxious about being ridiculed for their ideas, or less motivated because the end result is not only product of their input (i.e. free-riding). It has also been found that in group brainstorms people often forget their ideas because they have to wait on each other (i.e., coordination loss). For these reasons, it is important that creative problem solving not only takes place in groups, but is also performed individually (De Dreu & Sligte, 2016).

Course schedule

This crash course is integrated within the Honours+ program in the following way:

- Students will partake in two workshops of three hours (in Dec-Feb) in which they will be trained in applying Creative Problem Solving Techniques to a real life problem;
- Students will partake in four meetings of two hours with their research team (in Jan-Apr) in which they will apply the Creative Problem Solving Techniques according the four phases to your Honours+ assignment;
- Supervisors will receive one workshop of three hours (in January) with the specific purpose to support the students in applying Creative Problem Solving Techniques.

Role of supervisors

Students and supervisors will get familiar with the creative problem solving framing and its accompanying tools in one (tutors)/two (students) introductory workshops. Next, students will apply these tools to their academic problem they will be working on with their team, during four sessions of two hours each. Their own supervisors will guide them through these sessions. In this tutor manual, a workshop guide is provided for tutors to use as a guide for these four sessions. Also, an overview is given of the content of the creativity tools that will be applied in these sessions.

Participation policy

The workshop sessions are compulsory and highly experiential, requiring each student to participate actively. Participation in all training sessions is indispensable for a good understanding of the training material. Students who miss a session will have to write an extra assignment in order to still pass attendance. Students who miss more than two sessions automatically fail attendance. In case of illness or another valid reason to miss as session, please contact the training coordinator. Barbara Belfi (PhD) b.belfi@maastrichtuniversity.nl

Examination

During the Honours+ Closing Event (May 18th) an award will be conferred to the student team with the most creative academic idea. The creative academic idea as expressed in your academic report or video will be rated on the following criteria:

Originality	1	2	3	4	5
1a Novelty *An idea that had not been previously expressed*	☐	☐	☐	☐	☐
1b Non-obviousness *An idea that was previously unknown even by people who are knowledgeable in the field*	☐	☐	☐	☐	☐
Feasibility or Usefulness	1	2	3	4	5

1a Relevance *The degree to which the idea actually applies to the specific problem domain (does it satisfies the goals set by the problem solver?)*	☐	☐	☐	☐	☐
1b Workability *The ability to implement the idea. An idea is workable if it does not violate known constraints*	☐	☐	☐	☐	☐
1c Thoroughness *The extent to which ideas are fleshed out in detail in terms of being clear, concise, and exact*	☐	☐	☐	☐	☐

Training material

Workshop Guide

In the Workshop Guide, tips and tricks are given for supervisors to guide their students through the creative problem solving framework.

Energizers

Energizers are short and powerful exercises of maximum 15 minutes that help to warm-up or renew your energy level. In this tutor manual, examples of energizers are provided.

Summary of tools

In the Summary of tools an overview is given of the Creative Problem Solving Techniques according the four phases.

Supplies

Creative problem solving is a visual, tactile, and experimental experience. You will often have to create an overview that is visible for everyone in the team or come up with a quick drawing to show their idea. Most of the tools presented will therefore require supplies such as post-it notes, flip charts, scissors, tape and markers. These supplies are taken care of by the tutor.

Space

The sessions will take place in a large space with movable chairs and tables, so that everybody can move around freely. A devoted wall full of previous work and posters with important reminders will give the team a physical reminder of their work and goal. It allows them to put up inspiring materials or notes from their research and helps them to stay focussed on the challenge.

MORE ABOUT THE SESSIONS

A number of factors have been identified which contribute to fruitful CPS sessions. These are: (1) warm-up activities (2) basic ground rules of CPS; (3) logistic arrangements; (4) reflection moments; and (5) constructive group dynamics (Seelig, 2012; Treffinger et al., 2006).

1. Warming-up activities

Before you want to apply CPS, you have to get yourself ready to think creatively. People have to switch gears from their everyday work mode, where the main focus is on routine like tasks, to a more flexible mind-set, where there is no clear destination to reach. Warming-up activities (also called energizers) can help participants to get 'in the mood for creativity'. During the session you will become familiar with a number of such warming-up activities.

2. Basic ground rules of CPS

Each session should start with a brief review of the ground rules of CPS. A strong willingness of all group members to follow these basic guidelines helps to create and maintain a productive atmosphere for creative problem solving.

Basic ground rules for creativity sessions

1. All ideas are welcome
The golden rule of creative problem solving is: all ideas are welcome. All ideas are welcome, whether they are logical or illogical, vague or concrete. Every form of judgement (including self-judgement) kills creativity. Judgements such as "but we have already tried that", "this is impossible" or "that is too expensive" kill the generation of new ideas. The key is to embrace all ideas that are generated and to work with them for a while.
2. Be open
Be open within the creative session and respect the privacy of other group members. Everything that comes up within the group should stay within the group. Everybody should feel free to express what comes to mind.
3. Give extra attention to naïve ideas
It is also important to encourage wild and crazy ideas. Even though they may seem strange, there may be a hidden gem inside. It's important to remember that each idea is a seed that has the potential to grow into something special.
4. Strive for quantity
Search for lots of ideas. The more ideas you generate, the greater the possibility that at least some of them will be original and promising. Just like seeds, you need a large number in order to find the ones that have the greatest promise.
5. No hierarchy of arrogance is allowed
Everyone is equal, and everyone has the right to share his or her ideas.
6. Jump further on the ideas of others
It is important to build on other people's ideas. A perfect creativity session feels like a dance. Someone comes up with an idea, and several people build on it for a while.

3. Logistic arrangements

Treffinger and Firestine (1989) have offered a number of practical suggestions for creating an environment that supports creative thinking.

- Number and label each sheet as you begin to write on it. This will make it easier to review the ideas after the session.
- Number each idea as you go along. This will make it easier to identify hotspots when focussing.
- Throughout the sessions, keep the previous work and sheets in sight. You may want look back from time to time to review previous thoughts.
- Record all ideas as accurately as possible.
- Arrange the chairs in a U-shape so that everybody can see the wall with the sheets. It is also possible that no chairs are used but that everybody stands or sits on the ground.

4. Reflection moments

At the end of each session, new insights will be gained. Students will find that they will learn new things every time they work on a different stage of CPS. For example, they will find themselves experimenting with methods that they have never tried before, and will learn something from this experience – whether it was successful or not. For this reason, it is important to end each session by sitting down and reviewing the session. During this debriefing moment, questions will be addressed such as:

- What went well? What were the best parts that took place?
- Why did certain things happen during the session? What were the reactions in the group on these events?
- What could have been handled more effectively?
- How could the session have been made more productive?
- Were there moments when the collaboration didn't work well? Or worked really well? How was everyone prepared?
- Where there anything interesting things in this session that we have never thought of before? What were they? How might they best be incorporated in future efforts?

5. Constructive group dynamics

The effectiveness of the sessions can be considerably enhanced when the group members are aware of the need for team work, the need for equality among team members, and the personal style differences within the group. Everyone in the group shares the responsibility for a successful session. The effectiveness of the sessions can further be enhanced by the willingness of the group members to try out and apply different creativity tools. Group sessions should be take place in an atmosphere that is playful in behaviour but serious in ambition.

LIST OF ENERGIZERS

Energizers are short and powerful exercises of maximum 15 minutes that help to warm-up or renew your energy level. They are very helpful to get you 'in a creative mood' at the beginning of a creative session, but they can also be applied in the middle of a sessions when you are in need of extra energy. Energizers often contain a physical element so that participants come in motion again. Energizing activities contribute to a relaxing and unconstrained atmosphere.

TUTOR TIPS

- How to get more energy? Choose a physical energizer or go outside for a few minutes.
- How to get in the right mood? Choose an energizer that fits the stage of the creativity process you are in.
- Most important: choose an energizer you feel comfortable with! There are many more available. Look at: http://www.werkvormen.info/werkvorm/overzicht.php?search=true&tijd=5

3Energizers for getting to know each other

3.1. All in a row

This is a nice energizer to do in the first sessions when group members don't know each other well. Ask participants to line up according to their age - without any talking.
You can vary the topics of lining up:

- Shoe size
- First letter of name
- Distance to location
- Experience with creativity

This activity is not only fun to do, but also increases the creativity level of the participants. It stimulates them to think of a solution which seems to be impossible at first sight. How can you get information about each other if cannot speak? However, when they start thinking about it deeper they will discover that there are still many other alternatives for finding out information, when the most obvious method (talking) is forbidden. For example: by means of writing, drawing, singing, showing driver's licence…By asking participants to do this exercise several times by using another solution each time, they will learn that the first solution is not always the best one. By pushing yourself one step further, you will find out that there are better solutions waiting to be discovered.

3.2. Toss the duck

The goal of this exercise is to get to know the group (including tutors). The tutor starts with a strange but funny story of the curiosity of the duck. The tutor throws the duck to a student in which the student has to reply with her or his name and favourite food (or favourite activity during the weekend). The student has to throw the duck to another student after her or his turn. However, there are some limitations:

- The duck cannot be thrown to the person standing next to you;
- The duck have to end with the tutor again.

This will result in a discovery of the students that they actually need to plan something as a group to make sure the duck ends again by the tutor.

3.3. People Bingo

The purpose of the game is to get to know other students in an informal way. Students will receive a form with different descriptions (e.g. likes spiders, has already visited Paris, has a dog, doesn't like coffee, speaks 3 languages, kills house plants, loves to dance, hates to clean the bathroom, can play a musical instrument, likes to cook, has eaten something strange, has a younger sister). The students have to find different students that matcht the description by talking with each other. When all of the boxes are signed, the student can call BINGO!

Energizers for problem definition

3.4. Oh Oh Matisse

This energizer is nice to do at the beginning of a problem-definition session. It helps to increase the attention of group members. It is very simple: show a picture painting of Matisse to the group members for 15 seconds. Then put the picture away and ask them to write down as many as possible details of the painting during one minute.

3.5. What's different?

This is another energizer which is fun to do at the beginning of a problem-definition session, as it stimulates participants' observation skills. It goes as follows. Two students have to stand on opposite sides and have to carefully observe each other. Then, after 30 seconds have to leave the room and change something about their selves. Next, they have to discover what has been changed.

Energizers for idea generation

3.6. Association necklace

This energizer is nice to do before an idea-generation session. It helps you to get in an associative mind-set. An association necklace consists of a series of associations, wherein you start with one term and think about the associations in brings to mind.
For example:

Tom: water
Katy: drinking
Mark: soda
Julia: summer
Kim: beach
Variation: speed it up, try to double the number of words from the first association necklace (2 minutes)

3.7. Association contest

This is another enjoyable energizer which is nice to do before an idea-generation session. During one minute, every group member has to write as many associations as possible with the word “mushroom”.

3.8. Commonality contest

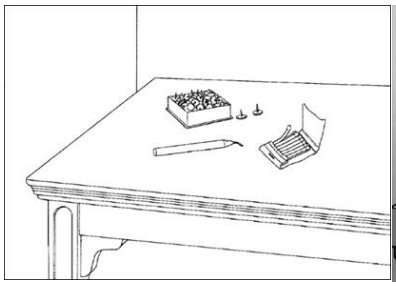
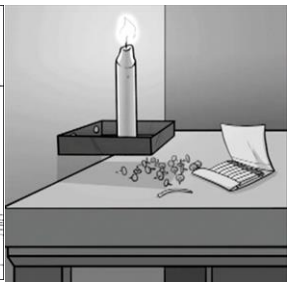
This energizer is similar to the previous one, but focusses on communalities of two seemingly totally different subjects. In this energizer, every group member has to write down as many as possible communalities between the words “sunflower” and “a fried egg” during one minute.

Additional energizers

3.9. The Candle Problem

This creative puzzle is also known as Duncker's candle problem, as it was designed by Gestalt psychologist Karl Duncker in 1945. It measures the influence of functional fixedness on a participant's problem solving skills.
The puzzle presents the participant with the following task: how to fix and light a candle on a wall (a cork board) in a way so the candle wax won't drip onto the table below. To do so, one may only use the following along with the candle:

- a book of matches
- a box of thumbtacks

3.10. Give me the feeling

A final energizer that is fun to do when everybody is out of energy is “Give me the feeling”,

In this energizer, the group members have to stand in a circle. One member makes a certain movement and passes this movement on to the person standing next to him. This second person then alters something about this movement and passes it over to next person. This exercise has to be performed faster and faster.

3.11. Balloon flying

This is a fun energizer to do at the beginning of the session. The tutor takes a balloon and asks the participants to throw it as fast as possible to each other during 1 minute. After this minute students get 5 minutes the time to find a method through which they can pass the balloon through as many hands as possible through 1 minute. It fosters their creative thinking.

3.12. Knots of people

This energizer is advisable to apply when the group is out of energy and in need of getting out their heads for a moment. It stimulates participants to come in motion again. One student has to wait outside the room. The other students are standing in a circle and put their hands in the air. Every student takes two different hands. In this way, a living button arises. The student who has been waiting outside has to disentangle the knot.

3.13. Murder spikelet

This energizer is nice to do in the middle of a session, when everybody is out of energy. All students have to pick a card. There is only one card with a cross signed on it. Next, students receive a bandage, so that they cannot see anything. They have to walk through the room randomly. The murder spikelet has to pinch someone twice to 'murder' the others. When some is 'murdered' they have to scream AAHH and leave the game.[6]

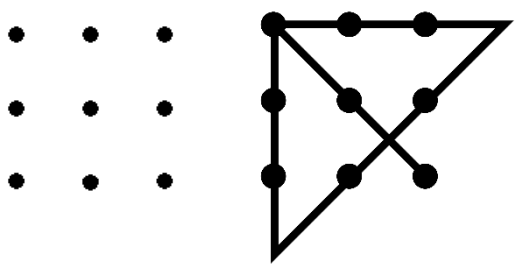
3.14. Peanut game

This is another fun energizer to do in the middle of a session and involves an entertaining search for a creative solution. It goes as follows. Everybody receives 10 peanuts and three empty cups. They have to put an uneven amount of peanuts in all three cups.[2]
Solution: In order to achieve this, students will have to do the following:

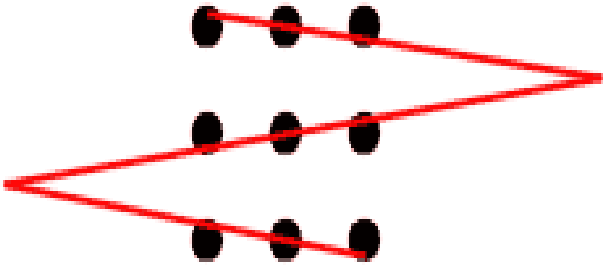
- They have to put 2 peanuts in the first cup
- Then they have to place the second cup in the first cup and put 3 peanuts in this cup
- In the first cup there are now: 2+3=5 peanuts
- The remaining 5 peanuts are put in the third cup

3.15. The nine dots

This is a creative thinking puzzle. The nine dot problem requires you "to think out of the box". The challenge is to draw four straight lines which go through the middle of all of the dots without taking the pencil off the paper. You can start from any position..



Answer 1



Possible answer 2

WORKSHOP GUIDE

Session 1: DEFINING THE PROBLEM

In this session, the following topics are discussed:

1. Energizer (5 minutes)
2. Discuss the problem definition stage (10 minutes)
3. WBNI (35 minutes)
4. Six good men (35 minutes)
5. Energizer (5 minutes)
6. Define the problem using IWWM (20 minutes)
7. Reflection moment (10 minutes)

1. Energizer

2. Discuss the problem definition stage

What are we going to do today and why is it important? We are going to explore the academic case. From the case and maybe other sources we gather data to give us a clear understanding of the challenge. Sometimes what we believe to be the problem or question is not the real problem or goal. After exploring we will focus our attention and create a question that invites us to find creative solutions. The result of this session will be a clearly defined question on which the other stages will based.

Give some examples of problems and challenges that can, or cannot, be solved creatively. What are you own experiences?

You can use the video of a TED talk by Derek Sivers: "Weird or just different" https://www.youtube.com/watch?v=1K5SycZjGhI (3 minutes)

This video shows how we are used to think that the way we are doing things in the one right way. It shows the power of changing your frame of reference.

3. WIBNI

Wouldn't it be nice if…

Use the academic case as a starting point.

What alternatives come up? What are the different points of view? What are the differences and what are the similarities. What are the essential elements? For which questions are new ideas most helpful? What aspects do we want to explore?

Let the students put the pieces together and formulate a focused and inviting problem or challenge (sounds more interesting) in the form of a question.

4. Six good men

Go to the next level and further focus on the problem by using the six questions: who, what, when, where, why and how. Other elements may pop up. The problem may be defined in another way.

5. Energizer

6. IWWM

In what way might we or someone else…

Use all the previous work as input and formulate the problem, or challenge, you will work on during the rest of this training. Try to make it focused, exciting and inviting!

Write this on a sheet of paper and put it on the wall in the next sessions to keep you on track.

7. Reflection moment

During this debriefing moment, questions will be addressed such as:

- What went well? What were the best parts that took place?
- Why did certain things happen during the session? What were the reactions in the group on these events?

- What could have been handled more effectively?
- How could the session have been made more productive?
- Where there anything interesting things in this session that we have never thought of before? What were they? How might they best be incorporated in future efforts**?**

TUTOR TIPS

- The students have to do the work. The facilitator is just there for guidance when they get stuck. Don't go up to the board!

- Make sure there is only one conversation at the time happening: all ideas need to be heard, so that may be built upon.

- Equip everyone for participation: gather everyone near the flip-chart or wall. Give everyone a post-it pad and a marker. Encourage people to draw and be visual. Remind them to write in large letters and to note only one idea per post-it.

- If you don't have enough time to use all tools, choose one or two that fit the situation best. Involve students in your decision.

- Create a **VISUAL REMINDER** of the challenge that the team is going to work on so that they keep on being reminded of the main point of focus throughout the process. Bring this reminder with you every session and put it on the wall.

Session 2: LET'S COME UP WITH SOME NEW SOLUTIONS

In this session, the following topics are discussed:

1. Energizer (5 minutes)
2. Discuss the idea generation stage (10 minutes)
3. Dump of first ideas (10 minutes)
4. Analogical thinking (40 minutes)
5. Energizer (5 minutes)
6. Assumption reversal (40 minutes)
7. Reflection moment (10 minutes)

1. Energizer

2. Discuss the idea generation stage

What are we going to do today and why is it important? We are going to generate as many ideas as possible through the use of some creative tools and put them all on the wall. Build on these ideas, combine them and develop them further.

NB in this session we are not going to select or evaluate ideas. That will be the focus in the next session.

The ideas generated during this session have to be recorded, preferably visualised so that they can be taken to the next session!

Before you start let the students go through the basic rules for a creative session (see table 2 in chapter 2 of this manual).

You can use a video from Instragram founders: Kevin Systrom and Mike Krieger “Combine and share ideas” https://www.youtube.com/watch?v=vKTnEvxv4H0 (2.33 minutes)
This video is a great example of the power of diverging. It explains how combining and sharing ideas had led to the creation of Instagram.

3. Idea generation: Dump of first ideas

Research has shown that when people continue with the generation of ideas after the most accessible and least creative ideas have been generated and ‘dumped’, their subsequent ideas will be more original. Let the students write down the ideas that first come to mind. Do this silently, each idea on a post-it with one or two words or a drawing. Put them on the wall and let students briefly discuss them.

4. Idea generation: analogical thinking tool

With this tool we can force ourselves out of the obvious. By making analogies we can stimulate the generation of more and different ideas.

5. Energizer

6. Idea generation: assumption reversal tool

This is another tool to stimulate us to think “outside the box”. By looking at the problem from a totally other point of view we are forced to come up with other ideas.

7. Reflection moment

During this debriefing moment, take time to discuss the personal learning goals. What have students learned? How is the cooperation in the team? What are important things to do in the next sessions?

After this also take some time to evaluate this session, using the following questions:

- What went well? What were the best parts that took place?
- Why did certain things happen during the session? What were the reactions in the group on these events?
- What could have been handled more effectively?
- How could the session have been made more productive?
- Where there anything interesting things in this session that we have never thought of before? What were they? How might they best be incorporated in future efforts?

TUTOR TIPS

- Create a visual reminder of the challenge that the team is going to work on so that they keep on being reminded of the main point of focus throughout the process.

- Select a leader: One person has to lead the others through the brainstorm. The participants have to do the work., the facilitator is just there for guidance when participants get stuck

- Make sure there is only one conversation at the time happening: all ideas need to be heard, so that may be built upon.

- Make sure many ideas are generated: set an outrageous goal (50 ideas in 10 minutes) and try to surpass it.

- Equip everyone for participation: gather everyone near the flip-chart or wall. Give everyone a post-it pad and a marker. Encourage people to draw and be visual. Remind them to write in large letters and to note only one idea per post-it.

- Don’t evaluate the ideas yet, we will do that in the next session. To be able to do that the ideas have to be recorded, preferable visualized, and be taken to the next session!

- Keep the energy level high: Throw in some wild ideas yourself. Remind the team about the ground rules for creative sessions.

- If you don’t have enough time to use all tools, choose one or two that fit the situation best. Involve students in your decision.

- If there are too many ideas the process can become chaotic. If this happens you can get the students back on track by pointing at the challenge.

- If they have difficulty getting started stimulate them by complimenting ideas, you can also be more firm and say: “is that all you can think of?”

Session 3: LET'S SELECT THE MOST PROMISING IDEA(S)

WORKSHOP GUIDE

In this session, the following topics are discussed:

1. Energizer (5 minutes)
2. Discuss the evaluation stage (10 minutes)
3. Hits and hotspot analysis for sorting ideas (50 minutes)
4. Energizer (5 minutes)
5. ALoU tool (40 minutes)
6. Reflection moment (10 minutes)

1. Energizer

2. Discuss the evaluation stage

What are we going to do today and why is it important? The students have generated many ideas in the previous session. We will put them back on the wall and start from there. By using two tools we are going to organize the ideas and finally select the most promising one. We move from ideas to solutions. NB we are used to make "sensible" decisions and tempted to throw out "strange" ideas that "will not work". By using tools we can choose the most promising idea in another way, giving them all a fair chance.

3. Hits and Hotspots analysis

This tool is directed at finding the hits and hotspots by using post-it notes. In t
his way students can organize the ideas.

4. Energizer

5. ALoU tool

This tool helps students in further exploring the hotspots to be able to select an idea.

6. Reflection moment

During this debriefing moment, questions will be addressed such as:

- What went well? What were the best parts that took place?
- Why did certain things happen during the session? What were the reactions in the group on these events?
- What could have been handled more effectively?
- How could the session have been made more productive?
- Were there anything interesting things in this session that we have never thought of before? What were they? How might they best be incorporated in future efforts?

TUTOR TIPS

- During the idea selection stage, ask the group questions such as:
  - What ideas offer the most unusual and fresh perspectives?
  - What ideas take things into an entirely new direction?
  - What ideas offer the best chance to do something?
  - What ideas are most attractive? Why?

- You can use different colours to code the different qualities of an idea, or make lists. Use all the space you have!

Session 4: LET'S THINK OF WAYS TO IMPLEMENT OUR IDEA

In this session, the following topics are discussed:

1. Energizer (5 minutes)
2. Discuss the implementation stage (10 minutes)
3. Building a feedback questionnaire (20 minutes)
4. Prototyping (50 minutes)
5. Reflection moment (35 minutes)

1. Energizer

2. Discuss the implementation stage

What are we going to do today and why is it important? Students have worked hard the previous sessions. Lots of ideas have been generated and organized. One or two were chosen as solutions. Now it is time to get the solution(s) into the world by making it tangible in a way people can interact with it.

3. Building a feedback questionnaire

The students have to discuss what feedback they are looking for, what do they want to learn from the panel? On the basis of this they can prepare a questionnaire for the feedback panel in session 7.

4. Prototyping

You can use a video from the head of Creative Agency Development at Google, Tom Chi, talk about the use of prototyping while developing one of Google's innovations. (8 minutes) https://www.youtube.com/watch?v=d5_h1VuwD6g.

5. Reflection moment

There will probably be a lot of energy in the room. Students will be hard to stop building their prototype! But this is the time to evaluate the personal experiences of students during this training. What did they expect and think at the start? What were their experiences during the sessions? Which ones were particularly interesting for them and which were not? How did this training help them develop their personal learning goals? For the next session they will have to fill out the four creativity assessments again and hand in a copy to the tutor.

TUTOR TIPS

- During the idea implementation stage, emphasize that:
  - Prototyping is not about getting it right the first time
  - The best prototypes change over time
  - Feedback is one of the most valuable things in idea development
  - Sharing prototypes helps to find out what really matters to people

- Take different materials to facilitate and stimulate the development of prototypes.

- Some students may need some encouragement, but making something is FUN!

- Keep track of time! Be strict on how long students can work on the different assignments. You can decide this together.

- Take enough time to evaluate the personal learning goals. There will be no time for that during the last session.

- It is possible/likely students will not be able to finish their prototype; they can do that at home.

- Remind students to fill out the assessments and hand in a copy next session.

SUMMARY OF TOOLS

1. Tools for defining a creative problem

"If I had an hour to solve a problem and my life depended on the solution, I would spend the first 55 minutes determining the proper question to ask, for once I know the proper question; I could solve the problem in less than 5 minutes".

-- Albert Einstein

The first stage in creative problem solving process is all about getting more insight in what the problem really is about. People are often in such a hurry to solve their problem, that they don't analyse enough what the problem is really about. Often, after a lot of time, they realize that they have been asking the wrong questions or working on the wrong problem, and can start all over again. By applying the following CPS tools for problem definition, the chance for this to happen significantly decreases. The first stage in the CPS process, problem definition, includes three processes: constructing opportunities, exploring data, and framing problems. These three processes are crucial for finding out what the real problem is and why it occurs. In what follows, three tools are presented which can help you with these processes:

- WIBNI (for constructing opportunities)
- Six good men (for exploring the data)
- IWWM (for framing the problem)

Tool 1. WIBNI

If you work on a very global and ill-defined problem, there may be many opportunities you might concentrate on. There may very well be different areas of opportunity in a certain problem be of concern to you, and perhaps several of them need your attention. However, it is impossible to work on all of them on the same time. Therefore, you need to decide which opportunities are in need of attention first, and which ones you can set aside for another time.For example: if you looking for a solution to have a more exciting career, opportunities may be:

- Increasing your income
- Choosing another career direction
- Enhancing your productivity
- Choosing another company

An opportunity is not a problem statement; it is a broad challenge on which you want to work. These challenges are too ill-defined to solve.

The WBNI tool helps you too reframe the problem you work on as an opportunity rather than a problem. WBNI stands for: Wouldn't it Be Nice IF…
For example, a negative statement such as: "I am feeling really lousy and out of shape" can be positively reframed by means of WBNI in: "Wouldn't it be nice if I could get into a better physical shape and get healthier?"

You can find opportunities by asking the following questions:

1. What do I (we) find interesting?
2. What would I (we) like to do better in this situation?
3. About what in this situation am (are) I (we) really excited about?
4. What about this situation really demands my (our attention)?

Next, choose one opportunity to further focus on. You can do this by asking the following questions:

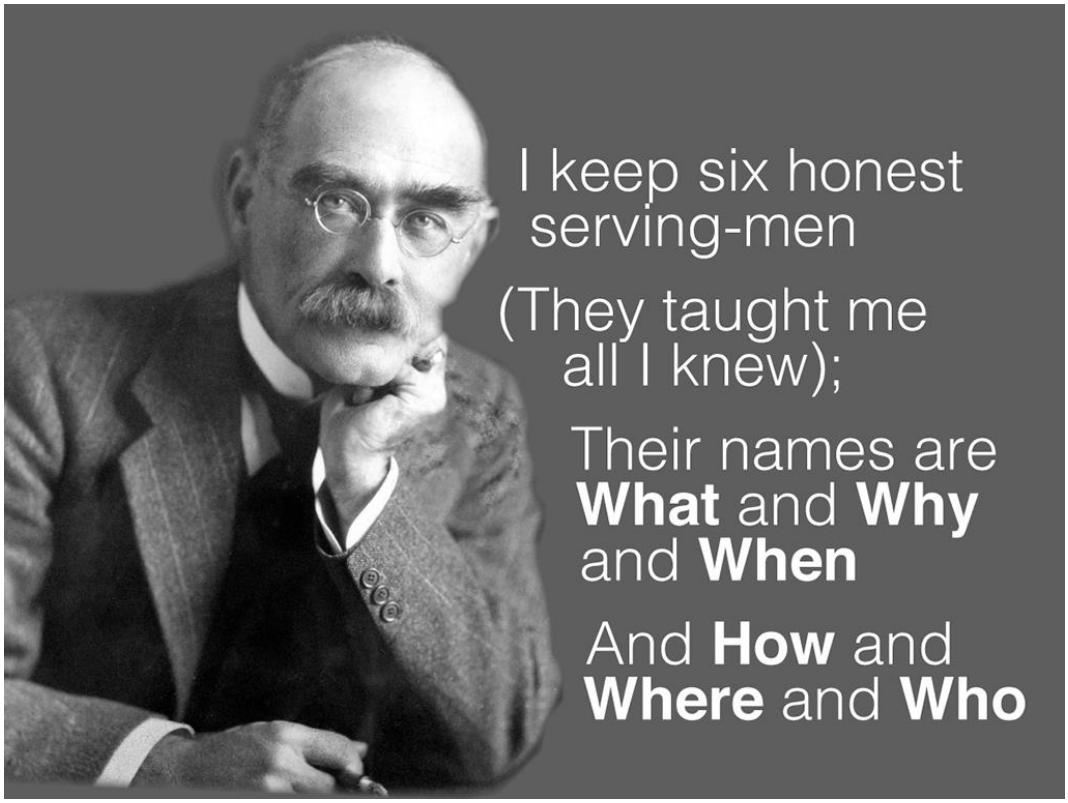
1. What concerns are most pressing or demanding?
2. What will happen if we don't deal with this?
3. What do we most hope to achieve?
4. What do we most try to enhance?

Tool 2. Six good men

This tool for exploring the data helps you to un-cluster multiple clusters of concern that might be stuck within one opportunity. For example, the problem: "Wouldn't it be nice if I could get into a better physical shape and get healthier?" can be un-clustered into clusters such as:

- Eating healthier
- Exercising more
- Flying less
- Stop smoking
- Stop consuming alcohol

Each of these sub-clusters may lead you to view the opportunity in a different way. During the Exploring Data process, you will examine an opportunity from different viewpoints, gathering information, impressions, and feelings about it.
By gathering information on the internet, in books or magazines, prior knowledge, or by doing interviews, you can unlock the most productive insights which will help you in discovering the six good men. The six good men refer to a famous poem by Rudyard Kipling in which he used a set of six questions to help spark ideas and solve problems. These six questions help you to dig in deeply into your problem and look further than the obvious information at the surface.



1. Who: Who is involved? Who is concerned about the problem? Who will help to solve the problem?
2. What? What is the problem? What has been done before? What recourses do we need? What do we like to see changed?
3. When? When is the problem happening? When must action be taken?
4. Where? Where does the problem take place? Where else has anyone dealt with this problem?
5. Why? Why is the problem happening? What hasn't it been dealt with? Why do we want to deal with this problem?
6. How? How can we overcome this problem? How do people look at this problem? How would our ideal be different from the present?

Next, choose one opportunity to focus on. You can do this by asking the following questions:

1. What data is most important to consider?
2. Which parts of the data might be clustered together?
3. What patterns do I see in these data?
4. What additional data might be gathered before we proceed?

Tool 3. IWWM

A problem statement should be positive, constructive, and invite good thinking. A good problem statement should meet the following criteria:

- Question: a good problem statement would pose a question
- Invites ideas: It should invite you to generate rich ideas
- Free of limiting criteria: it should be worded as broad as possible so that many ideas can be produced
- Concisely stated: It should be brief and to the point so that can be used right away for generating ideas

The tools IWWM or “In What Ways Might …”makes it possible to reframe a problem by using invitational stems.

The IWWM-tool further clarifies the ownership and the responsibility of the problem. It indicates who owns the problem.

Both tools should be followed by an action that should happen.

For example:

- IWWM we increase changes of success for all students?
- IWWM John increase the motivation of his students?
- IWWM I create a productive team?

2. Tools for generating ideas

"Genius is one percent inspiration and ninety-nine percent perspiration".

-- Thomas Edison

The idea generation stage is all about producing as many new, varied, and unusual ideas as possible. This stage begins with reviewing your problem statement in IWWM-form. There are many tools that can help you in generating ideas. For example, the use of a particular tool may either improve the number of ideas (fluency), the variety of ideas (flexibility), or the unusualness of ideas (originality) or a combination of these qualities. The tools presented here focus on all these three aspects.

Tool 1. Analogical thinking

Analogies can stimulate new ideas and connections by taking you away from the familiar characteristics and assumptions that you impose on your problem. Research has consistently shown that use of analogical thinking can benefit creative problem solving. Many famous scientists (e.g., Albert Einstein) have reported using analogical thinking to come up with explanations about scientific phenomena in order to make sense of theoretical and experimental results. It works as follows.

Step 1: Choose a crucial term out of the problem statement

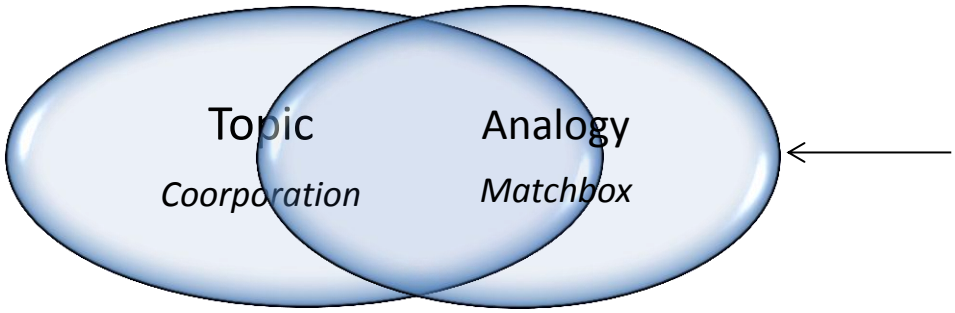
It is important to choose a concrete term from the problem statement. If there is no crucial term that is rather concrete, you can choose an abstract crucial term. In this case, it is necessary to translate the abstract term to a more concrete term. For instance, financial could be a crucial term in a problem statement but is rather abstract. To work with this thinking technique "financial" could become money or cash.

Step 2: Make up an analogy that inspires you

Analogies can be anything, for example countries (China), animals (squid), sport or hobby (keeping bees), vehicles (Ferrari), etc. Although analogical reasoning may be difficult, it has been suggested that using many types of analogies could work better than restricting the focus to only one type (Christensen & Schunn, 2009).

Step 3: Describe the main characteristics of the analogy

EXAMPLE: In this example, the problem statement is to examine corporate organisation structure. As an analogy, a match box is chosen.



What are characteristics that are specific for this analogy (a matchbox)?

1) It has six sides
2) It is made of cardboard
3) It has a sliding centre section
4) It has a striking surface on two sides

Step 4: Re-associate the characteristics of the analogy with ideas for the crucial term

Re-associations between characteristics of the analogy (matchbox) with the crucial term (corporation):

1) A corporation can have six essential organisational divisions
2) Inexpensive method of structure – disposable
3) The heart of the organisation should be slidable or flexible
4) The protection an organisation needs against strikes

Tool 2. Assumption Reversal

Whenever you are faced with a problem you invariably make a number of assumptions about the problem. This tool helps you to detect existing suppositions, and to break free from the conventions that they entail. The reversal tool consists of three steps:

Step 1: Select the most crucial terms of the problem statement

EXAMPLE: In this example, the problem statement is: "How can we shorten the cash desk queues in super markets".

In this problem statement there are 3 crucial terms: cash desk, queues, and super markets

Step 2: Then look for dispositions that are related to these terms

For example, dispositions for queues are:

- Customers standing in line
- People are standing behind their shopping cart

- There is certain order: first the first customer, then the second etc.
- People are waiting
- People are quiet

Step 3: Take each disposition and ask the question: "What if this disposition is untrue or what if we switch this disposition to its reversal? What new ideas do we get then?

For example, reversals of dispositions could be:

- Customers are not standing in line. For instance, they just walk through the shop until there number is called for. Or they are not lined up in straight line (such as in entertainment parks)
- People are not standing behind their shopping cart. Only the shopping carts are lined up and people can keep walking in the shop.
- There could also be a 'surprise queue' where there the order is determined by a lottery
- People can be asked to actively help the customers who stand before them. Then the line sooner becomes shorter.
- Make sure people have something to talk about when are standing in line.

3. Tools for evaluating/selecting ideas

"An idea that is not dangerous is unworthy of being called an idea at all."

-- Oscar Wilde

After you have generated many ideas, you will need to sort them out and decide which one you want to carry forward. Judging ideas (i.e., good or bad? Useful or not? Realistic or unrealistic?) often is the first thing people do when they have a look at their idea generation results. However, this type of judging forces you into an either/or mind-set which is unproductive. Ideas are not just good or bad. All ideas have their strengths and weaknesses. So the main goal of the idea evaluation stage is to identify all possibilities of all ideas, thereby choose the most promising idea that will have the best possible chance for success.

The idea evaluation stage consists of two processes: organizing the ideas and selecting an idea). In what follows, two tools are presented which can help you with these processes:

- Hits and hot spots analysis (for organizing the ideas)
- ALoU (for selecting an idea)

Tool 1. Hits and hotspots analysis

This tool helps you organize and narrow down the ideas you have produced during the idea generation stage.

Step 1: Select the hits

Have look at all your ideas and ask yourself: “Which ideas are the most interesting to work on”? In Table 4 a number of key words are presented that can help you in identifying hits.

Table 4. Tips for Hits

An idea may be a hit for these reasons…	
• Relevant	• Solves problem
• Exciting	• Sparkling
• Intriguing	• Interesting
• Feels right	• Moves forward

Step 2: Select the hotspots

After you have identified the hits, it is time to investigate what the 'hotspots' are. Hotspots are clusters of several hots (two or more) that all address or encompass a common theme, issue or dimension. You may have not been aware of these themes before, and hotspots can help you to identify the themes that are most essential for your problem. By identifying them, your ideas become more manageable and focused. In order to find hotspots it can help to ask questions such as: "what we really wish or hope for is…"or "If we had a magic wand…".

Tool 2. ALoU

ALoU stands for Advantages, Limitations (o-overcome) Unique Qualities

Sometimes you have two or more important hotspots that are difficult to choose between. The ALoU tool can to strengthen the different hotspots, by making them more complete or polished, so that it becomes easier to choose one. When using the ALoU tool, it is important to make a list of criteria that can help you recognize the advantages, limitations, and unique qualities.

Step 1: List the advantages of the hotspot

It is important to start with the advantages so that you can construct an affirmative approach.

Step 2: List the limitations of the hotspot

Next, potential weaknesses need to be considered. After you have identified the main limitations, it is important to think about how these can be overcome.

Step 3: Unique Qualities

Finally, you'll need to explore the unique qualities of each hotspot. These are the potential long-term benefits of the hotspot, or the aspects that make the hotspot unique and appealing.

4. Tools for implementing ideas

"Get it down. Take chances. It may be bad, but it's the only way you can do anything really good."

- - William Faulkner

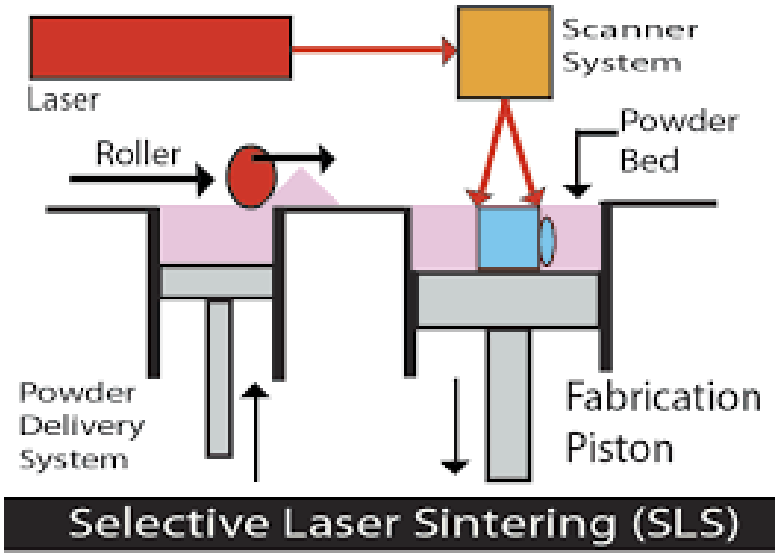
The idea implementation stage is all about transforming your idea into action. New ideas are not of much value unless you can convince others that they will lead to success. In order to make this clear, you need to show when this idea can be applied, what will happen when you use it, and what you get as a result. One way by which you can show this, is by constructing prototypes.

Tool 1. Prototyping

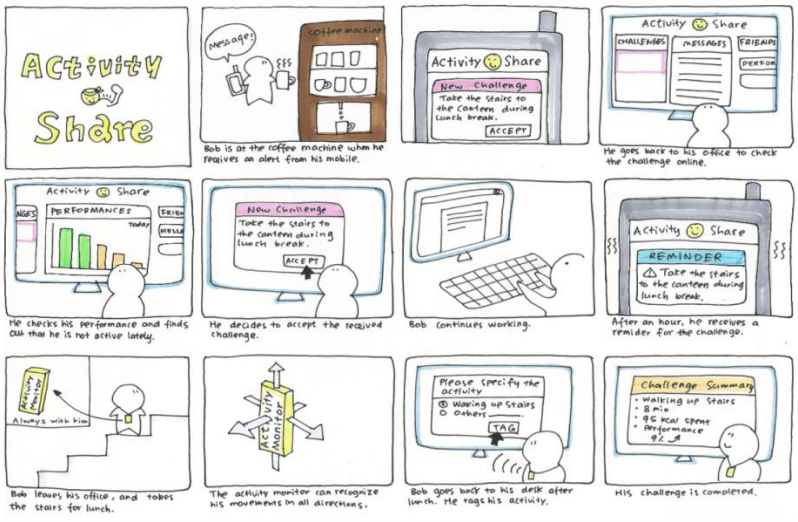
Prototypes enable you to share your ideas with other people and to discuss how it can be improved. Prototyping is not about getting it right at the first time, you can keep on changing them on the basis of the feedback that you receive from you test panel.

Examples of prototypes are:

- Diagrams: By means of a diagram you can map out the structure, network, relationships or process of your idea.



- Storyboard: Visualize the experience of your idea over time by means of pictures, sketches, drawings or even just text blocks. You can use post-it notes to easily rearrange the order of events.



- Model: You can also make a simple 3-dimensional representation of your idea.

- Roleplay: Act out the experience of your idea. Play the roles of the people that are part of the problem situation and show the questions they have.

In order to gain as much information as possible from your prototype presentations, you can do the following:

1. Think about which people you want include in your jury. To which people do you want to show the prototype: is the prototype intended for them? What will they appreciate about your idea?
2. What criteria will make the prototype successful for you?
3. Plan how you will track these criteria. Observe and take notes of the jury's feedback.
4. Revise the prototype accordingly.

Tool 2. Gathering feedback on your prototype

"We all need people who will give us feedback. That's how we improve"
--Bill Gates

When designing a prototype, it is important to already think about the feedback that you would like to receive on it from your feedback panel so that you can learn how to further improve and refine the idea. Feedback is one of the most valuable tools in developing an idea. Sharing prototypes with others helps you to see what really matters to people and which aspects still need improvement. A good feedback session represents a mix of spontaneous reactions to your prototype as well as structured questions designed to compare various people's opinions.

Step 1: Think about who you want to include in your expert panel

Create a list of people you want like to engage in the feedback process. From whom will you learn the most? Include experts as well people you think will benefit from your idea. Consider which perspectives are the most important for the further development of your porotype.

Step 2: Think about the type of feedback that you are looking for

Think about the feedback you want to receive and create a list of topics that you would like to receive comments on. On the basis of this list you can prepare a question guide Formulate the questions in such way that they lead to constructive feedback en encourage participants to share their thoughts about your prototype. For example: "Can you describe what excites you the most about this idea and why?" And "If you could change one thing about this prototype, what would it be?" Avoid yes/no questions and invite people to think of improvements.

Step 3: Prepare a questionnaire for yourself to capture the feedback learnings

Feedback sessions are rich in information and the impressions of the participants are important to remember. For this reason it is important to prepare a questionnaire for yourself to capture what you have learned. Include questions such as: "What did participants value the most?", "What got them excited?", "What did not work?", and "What needs further investigation?"

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