CHEAT-SHEET: CREATIVE PROBLEM SOLVING

MOTIVATION & CHALLENGES

Change is inevitable in the current almost chaotic business environment, and some long-established rules seem no longer valid and must be adopted or even replaced. In this situation, it is tempting to focus on short-term actions.

But complex problems with many variables and possible solutions still need a systematic approach to minimize the risk of making wrong and costly choices. Therefore, creativity is required to come up with new and different viewpoints on a subject.

A practical problem-solving procedure must be easy to understand and adaptable depending on the complexity of the problem. But it must be insisted here that the creativity and feasibility of the solutions rely entirely on the motivation and skills of the actors involved.

In summary, a sound solution-finding procedure

1) also helps non-participants to understand the solution-finding process,
2) increases the probability of finding acceptable solutions also in less favorable environments,
3) helps remove blocks and barriers to creative thinking,
4) helps to remove biased thinking that excludes some possible solutions, and
5) promotes team building, communication, and coordination between the different actors and parts of the organization.

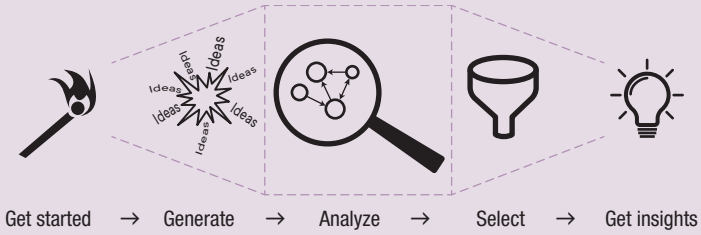
OVERALL PROCESS

Steps	Description	Essential questions
Step 1: Discovering the problem	**Naming the problem:** The problem statement is derived from a discrepancy between the current and the target situation. Problems requiring creative thinking have many possible solutions and cannot be solved analytically.	• Why is it necessary to solve the problem? • Do you have defined a target situation and objectives for the problem? • What benefits will you receive by solving the problem? • Is it worth using a formal problem-solving process?
Step 2: Understanding the problem	**Causes and effects of the problem:** The precise definition of the problem is the most challenging task. Every complex problem has a unique structure, and it is impossible to provide a universally applicable methodology. The problem definition must be adjusted if too many critical root causes emerge.	• What is the information you have? • Is the information sufficient? Or is it insufficient? Or redundant? Or contradictory? • What is the unknown, and what do you not understand yet? • Have you considered all essential aspects of the problem? • Are all people concerned by the problem consulted and integrated early in the problem-solving process?
Step 3: Finding and selecting solutions	**Developing feasible solutions for the problem:** Solutions are developed by imposing only a minimal number of constraints. It is crucial that creativity is given free rein and that all possibilities are explored. Then, based on criteria representing the target situation, the best and most feasible solutions are selected.	• Suppose you find a problem related to yours that has already been solved. Can you use its solutions? • Are you sure all barriers have been removed to find all possible ideas? • Have you developed at least two options? • Can you solve the whole problem or only a part of it? • Have you defined adequate criteria for selecting the best solutions? Do they represent the objectives correctly?
Step 4: Implementing chosen solutions	**Building acceptance for the solutions and implementing them correctly:** Implementing new ideas is always a challenging task with many pitfalls. Good communication and planning of the implementation process are essential to maximizing the probability of success.	• Have you communicated and explained the chosen solution to the concerned people? • What should be done, and how? Who will be responsible for what? • Can you measure the impact of the solutions? • Can you use this problem to solve some other problem?

GENERAL CONCEPTS

The basic idea-generating process

The basic idea-generating process is divided into the steps Get started, Generate, Analyze, Select and Get Insights. This process corresponds to the underlying concept of virtually every problem-solving process, but it can also be applied in each problem-solving step. *Examples: What are the most critical decision criteria? How to implement the chosen solution?*



Get started: Initiating the process with a fundamental question about the issue to analyze.
Generate: Ideas about the issue are generated creatively. Crucial in this step is postponing judgment and analysis until you have covered a wide range of options.
Analyze: The ideas are grouped and analyzed by finding relationships between them.
Select: The best ideas are selected to solve the problem.
Get insights: The idea-generating process provides insights into a problem or issue. These insights may lead to the development of solutions or to further questions.

Heuristic principles

Heuristic principles are rules of thumb and help to simplify complex problems.
Problem factorization: This principle states that an initial complex problem can be divided into more manageable sub-problems. This concept is particularly beneficial when the problem statement is defined. Solving the smaller sub-problems first is safer than starting the analysis directly with the complete problem.
Example: How to increase the profitability of a product line? → How to reduce the development time for new products? How to improve the life-cycle management of the products?
Pareto's law: Pareto's law corresponds to the famous 80/20 rule that states that 80% of the consequences come from 20% of causes. This concept is typically used when the critical root causes for a problem have to be selected.
Theory of Constraints: The Theory of Constraints states that the performance of a system is limited by at least one limiting factor (constraint). Consequently, if the problem corresponds to a process, it is essential to focus the problem-solving effort on the constraints.

PROCESS STEPS

Several tools and options exist for every step of the problem-solving procedure. Some of these options are essential (✓) and can be used for simple problems. Other options like Decision Matrix are more adapted for complex problems (🔧).

Step1: Problem discovery

How a problem is stated substantially impacts its ability to stimulate ideas for solving it.
Problem statement: A good problem statement should have the following elements: 1) An Invitational stem, 2) an owner, 3) an action verb, and 4) an objective: *Examples: How can we reduce the waiting times for our customers? How can I improve the meeting schedule for my team? How to improve the reliability of the assembly machine?*
🔧 **Context of the problem**: A picture of a problem is sometimes worth thousands of words, and flow diagrams are powerful tools to visualize the context of the problem. Typical tools for visualizing the problem are Service Blueprints for administrative processes and the Value Stream Mapping or Process flow diagrams for operations.

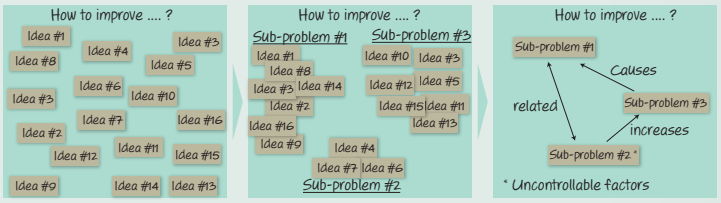
Step 2: Understanding the problem

Feasible and valuable solutions can only be found if the solution-finding process is based on a profound understanding of the causes and effects of the problem. It is also essential to distinguish between controllable and uncontrollable problem causes. For the controllable problem causes, solutions can be found. The uncontrollable problem causes are considered when the benefits of the chosen solutions are estimated (see S.W.O.T. Analysis and Decision Matrix). If too many uncontrollable factors exist, it has to be considered to reformulate the problem. *Examples of uncontrollable or external factors: Evolution of energy costs, Evolution of market prices, etc.*

✓ **Brainstorming & Network Mapping (5 to 10 people, ± 60 minutes)**: The session starts by asking the group to generate ideas related to the main problem.

1) Every actor writes down one idea per sticky note;
2) Every actor presents each idea shortly and puts the sticky note on a white-board;
3) The group sorts the ideas based on their relationship;
4) The group attributes names to the groups (sub-problems);
5) The group identifies relationships between the sub-problems (increases, reduces, causes, related, etc.)

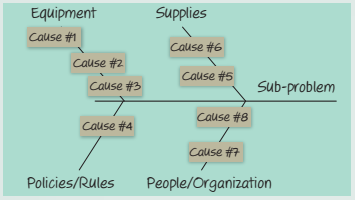
The identification of the root causes completes the analysis of the problem.



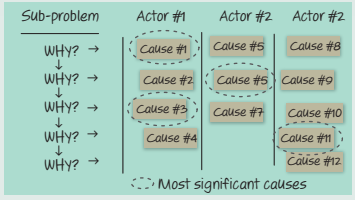
✓ **Fishbone Diagram (3 to 5 people, ± 30 minutes)**: The Fishbone Diagram (or Ishikawa diagram) is used to force the actors to identify all relevant aspects of the analyzed system.
1) Define the problem statement (head of the fish);
2) The group defines all categories of possible causes of the problem (fish bones): Typical categories are people/staff, organization, (IT-) tools/equipment/supplies, policy/rules/procedures, environmental factors, etc.
3) The group brainstorms all the possible causes and defines the essential ideas.

🔧 **Why method (3 to 5 people, ± 30 minutes)**: This technique helps to identify the root causes of a problem by asking as many times as necessary why a problem occurred (usually five why's are enough).
1) In the first round, every actor writes on a sticky note the main reason why the problem happened;
2) In the second round, every actor writes on a second sticky note why the main reason given in the previous round is correct;
3) Continue asking questions about the reasons given in the previous rounds until no more meaningful insights are found;

4) The group compares all the answers found by the actors and selects the most significant causes of the problem.



Fishbone Diagram



WHY method

Step 3: Finding and selecting solutions

Finding solutions:

Solutions can be found with the Brainstorming method or with the following techniques that help to stimulate the solution-finding process.

✓ **The ideal solution method (3 to 5 people, ± 60 minutes)**: A typical technique for stimulating the development of solutions is to start the process by defining a perfect solution to the problem. This solution should be achievable under ideal conditions, too unrealistic solutions should be avoided.

Brainwriting (5 people, ± 60 minutes): Brainwriting is the perfect method to provide privacy for participants, and ideas can be developed comfortably. Each actor starts with a sheet of paper that has been divided into usually 15 blocks. Each actor writes three ideas (solutions) on their sheet and places then the sheet in the center of the group. The actors exchange the sheets, reading what has already been written and adding three new ideas. Typically, this is repeated five times. In the end, the group evaluates the ideas and selects the best ones.

Brain writing 6-3-5: 6 people, 3 ideas each, 5 times

Problem	Round 1	Round 2	Round 3	Round 4	Round 5
Idea 1					
Idea 2					
Idea 3					

🔎 **Scamper (3 to 5 people, ± 60 minutes)**: The Scamper method corresponds to questions that help question new or existing solutions.

1) **S**ubstitute? Can other, more efficient solutions replace some solutions?
2) **C**ombine? Can the solutions be combined with existing or new solutions?
3) **A**dapt? Can the solutions be adapted to improve their impact?
4) **M**odify? Can the solutions be modified to improve their impact?
5) **P**ut to other uses? Can the solutions be used for other problems?
6) **E**liminate? Is the solution beneficial? Can it be eliminated?
7) **R**earrange? Can the solutions be rearranged if implemented in a specific sequence?

Evaluating & Selecting solutions:

✓ **Dot voting (3 to 10 people, ± 10 minutes)**: This technique is the classical technique to prioritize or select the best ideas or solutions. Every actor is given a certain number of sticky dots that they can use a vote depending on their personal opinion (see Impact & Effort matrix).

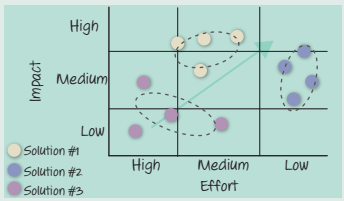
Forced ranking (3 to 5 people, ± 30 minutes): This simple technique forces the actors to make difficult decisions about the relative value of each solution. This method aims to define a ranking of the proposed solutions, from the best to the worst.

✓ **Impact & Effort matrix (3 to 6 people, ± 30 minutes)**: The simplest method for choosing the best ideas is to classify them based on the two factors: Effort (or costs) to implement and estimated impact. Each actor is given a sticky dot per solution that they can put on the matrix depending on their personal opinion. After the vote, the group discusses the result and selects the most valuable solutions.

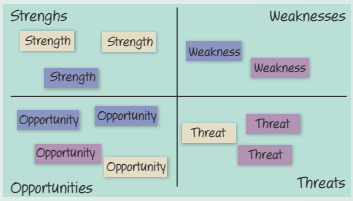
🔎 **S.W.O.T. Analysis (3 to 5 people, ± 90 minutes)**: A classical method for evaluating the value of an idea is to analyze it based on the following four criteria.

1) **S**trengths: Positive elements that can be controlled;
2) **W**eaknesses: Negative elements that can be controlled and improved;
3) **O**pportunities: Positive elements that are controlled by external forces;
4) **T**hreats: Negative elements that cannot be controlled.

Each actor evaluates the proposed solutions based on the four criteria by focusing only on the essential characteristics. In the next step, all the ideas are presented and put on the whiteboard. After the analysis, the group discusses the results and selects the ideas with the most strengths and opportunities.



Impact & Effort Matrix



SWOT analysis

🔎 **Decision matrix (3 to 5 people, ± 90 minutes)**: A decision matrix must be used if several decision criteria exist (costs, efficiency, etc.) and some are uncontrollable.

1) The decision criteria (quantitative of qualitative) are defined;
2) Scenarios are developed for uncontrollable factors (external factors);
3) The estimated outcomes are defined for all criteria and scenarios;
4) The best (↑), the weakest (↓), and the critical (!) outcomes are determined. Critical outcomes are in conflict with the objectives
5) Depending on the results and the weighting of the different criteria, the group decides the best solution (Dot voting, Secret voting, etc.).

Decision Matrix

	Criteria 1	Criteria 2	Critera 3 High	Critera 3 Medium	Critera 3 Low	Criteria 4
Solution 1	50'000.-	Excellent ↑	8%	5% ↑	2% ↑	7%
Solution 2	20'000.- ↑	Satisfactory ↓	5% ↓	2%	0%	2% ↓
Criteria 3	100'000.- ↓	Good	40% ↑	0%	-15% ↓ ⚠	9% ↑

↑ Best outcome
↓ Weakest outcome
⚠ Critical outcome

Step 4: Implementation chosen solutions

Project organization: A simple tool for organizing and following the implementation phase is the Who/What/When matrix (✓). An A3 report (🔎) is more adapted for complex projects since it allows to summarize all essential elements of the problem-solving process.

WHO?	WHAT?	WHEN?	STATUS?
Actor 1	Action #1	2/4/22	OK
Actor 2	Action #2	18/4/22	OK
Actor 3	Action #3	20/5/22	Ongoing
Actor 2	Action #4	20/5/22	

Who/What/When Matrix

A3 Report

✓ **Prototype**: Acceptance for new solutions is assured if they can be tested in a limited environment. Such prototypes also help to verify the assumptions of the chosen solution.

🔎 **Measuring the impact of the chosen solutions**: The effect of the selected solutions has to be verified with the help of key performance indicators if the implementation costs are high. Ideally, the required indicators are in place before the implementation of the selected solutions has started. A complete set of key performance indicators may also serve as an early warning system for potential problems.

AUDIT

The following audit helps to verify the actual level of achievement of the problem-solving process.

	People	Process	Tools
Level 4 Robust	The management is asking for a structured problem-solving approach for all significant problems. Enough people are available with particular skills for animating problem-solving sessions. Training programs are available and promoted to train people in basic problem-solving techniques.	It is easy for non-participants to understand the problem-solving process, all data is available, and assumptions are clearly explained. Essential insights learned from the problem-solving process are communicated organization-wide and reused if possible. Most problems are found with the help of problem-discovering tools, such as KPIs, process analyzing tools, and the continuous improvement process (Lean, Six Sigma, etc.).	Space is available for exposing posters summarizing the insights of finished or ongoing problem-solving sessions. This information serves as inspiration for forthcoming problem-solving sessions. Meeting rooms are available, equipped with all required tools (whiteboards, stickers, markers, etc.). The available KPIs serve as an early warning system, and critical problems can be anticipated.
Level 3 Essential	All relevant people are involved in the creative problem-solving process and know and follow the basic rules of this process. All parts of the organization are participating actively in the problem-solving process.	A brochure explaining the essential problem-solving process is distributed to all employees. Training material (books, presentations, websites, etc.) about basic problem-solving techniques are available.	The impact of implemented solutions can be measured organization-wide by general goal indicators (profitability, sales, etc.) and operational cause indicators (quality issues, market share, employee satisfaction, service and inventory levels, etc.).
Level 2 Minimal	When critical problems occur, creative problem-solving is used in some parts of the organization. People directly concerned by the problem are participating in the problem-solving process.	A standard exists for basic creative problem-solving techniques and is available for everybody (process description, document templates, etc.).	Equipment for brainstorming sessions is available (whiteboards, stickers, etc.). Operational cause indicators exist in some areas of the organization (operations).
Level 1 Insignificant	A limited number of people analyze and solve complex problems, and there is no coordination between the different parts of the organization.	No guidelines or standards exist for the problem-solving process. Problems are treated on an ad hoc basis. The decision-finding process is not transparent for non-participants.	Some general goal indicators exist (sales, etc.), but they don't allow identification of potential causes of problems. No specific material is available for facilitating brainstorming sessions.

TO GO FURTHER...

Campbell J. C. **The phoenix checklist: Turning complex problems into simple solutions**, Campbell & Company Publishing: A helpful list of questions for assuring the coherence of your problem-solving process.

Cordoba Rubino S., M. Huisman, and W. Hazenberg. **75 Tools to be creative**, BIS Publishers: A handy collection of cards illustrating many good ideas for all the steps of your problem-solving process.

Gray D., S. Brown, and J. Macanufo. **Game storming: A playbook for innovators, rulebreakers, and changemakers**, O'Reilly Media: A playful collection of concepts and tools helping improve your creativity.

Grünig R., and R. Kühn. **Successful decision-making: A systematic approach to complex problems**, Springer: A classic book about the decision-making process.

Isaksen S. G, K. B. Dorval, and D.J. Treffinger. **Creative approaches to problem-solving: A framework for innovation and change**, SAGE Publications: A detailed description of an innovative problem-solving framework adapted for highly complex issues with high ambiguity.

Proctor T., **Creative problem solving for managers**, Routledge Publications: A classic book about problem-solving, with some scientific background about creativity and innovation.