Training Fiche

Title	**Complex problem solving. Tools and practical examples**
Keywords	The complexity of problems, categorization of issues, the basis and consequences of problems, tools and methods of effective problem solving
Provided by	University of Information Technology and Management in Rzeszow, Poland
Language	English
Objectives	The purpose of this training material is to educate the recipients of the skills to identify problems, as well as to correctly categorize them due to the degree of complexity, and to set out activities aimed at solving them. In addition to the content that builds the proper foundations for the development of skills in solving complex problems, the course is equipped with tools for their identification, as well as tools to help solve them. Additionally, the course is completed with case studies, a self-assessment tool and a glossary of keywords. The course creates a comprehensive material for both building knowledge on how to solve complex problems and its practical application.
Learning outcomes	After completing the course, the student will have knowledge of defining problem phenomena and categorizing identified problems in terms of their complexity. Implementation of the course will also allow you to build knowledge in the field of methods and tools for identifying and solving problems. As a result of the completed training, the participant will have comprehensive knowledge to solve complex problems, and due to the tools included in the course, he will also acquire the ability to use the learned tools and methods in practice. As a result, the outcome of learning will be the development of cognitive and application competences related to complex problem-solving.
Training Area	Complex problem solving

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Content index

Content development

1. What is a complex problem?

1.1. Differences between simple, complicated and complex problems.

The starting point for developing complex problem-solving skills is to explain the differences between simple, complicated and complex problems. For this purpose, we will use the example proposed by S. Glouberman and B. Zimmerman (2016), which is illustrated in Table 1 below.

Table 1. Simple, complicated and complex problems

Following the recipe	Sending a rocket to the moon	Raising a child
1. Recipe (instruction) is necessary. 2. Recipes are tested to ensure easy replication. 3. No specific specialist	1. Formula is crucial and necessary. 2. Sending one rocket increases the confidence that sending the next one	1. Formula has limited use. 2. Raising one child gives experience, but it is not a guarantee of success with next

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knowledge is required, although cooking experience increases the success rate. 4. Recipes produce standardized products. 5. The best recipes give good results every time. 6. Possible optimistic approach to the problem.	will be flawless. 3. To be successful, a high level of expertise in a variety of fields is essential. 4. Rockets are similar in many ways. 5. There is a high degree of certainty in the result. 6. Possible optimistic approach to the problem.	one. 3. Knowledge can contribute to success, but is neither necessary nor sufficient for it. 4. Each child is unique and must be understood as an individual. 5. The uncertainty of the result remains. 6. Possible optimistic approach to the problem.

Source: Glouberman, S., & Zimmerman, B. (2016). 1 Complicated and Complex Systems: What Would Successful Reform of Medicare Look Like? University of Toronto Press, p. 2.

What do the examples above mean and how should the contents of Table 1 be interpreted? In response, their content allows to easily explain the difference between the categories of problems indicated in the table.

A **simple problem** can be compared to baking a cake from ready-made ingredients. The recipe itself may cover the basic elements of a technique and terminology, but once you have mastered these, you can be sure of success with it.

A **complicated problem** is illustrated by the example describing sending of rocket to the moon. Complicated problems contain subsets of simple problems, but are not exclusively reducible to them. Their complicated nature is often related not only to the scale of the problem. Achieving success relatively often depends on the involvement of many people, sometimes many teams, as well as highly specialized knowledge. Moreover, unforeseen difficulties often happen with these kinds of problems. In addition, time and coordination are becoming significant obstacles. As a result, complicated problems, although they can be generalized, are not a set of simple components.

A **complex problem** best illustrates the upbringing of a child. While in the previous example, after mastering the entire procedure of flying to the moon, this process can be repeated and improved, the example presented does not apply to raising a child. Each child is unique. Thus, it should be viewed individually. This is because, although bringing up one child provides a number of valuable experiences, it does not guarantee educational success with another child. Hence, professional knowledge (although extremely valuable), is not sufficient. The next child may require a completely different approach than the

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previous one, and this indicates a feature of complexity of the problem. The results of measures taken to solve them remain highly uncertain. At the same time, despite the uncertainty, complex problems can also be approached with a certain degree of optimism: we are looking forward to raising a child despite the complexity of the problems involved in this process.

Complex problems can range from complicated to simple support problems. However, they cannot be reduced to any of them. This is because they have special requirements, including understanding of unique local conditions, interdependence with an additional nonlinearity attribute and the ability to adapt as conditions change.

1.1.1. Complication versus complexity

In practice, we use the terms "complicated" and "complex" interchangeably. This is due to misunderstanding of both concepts. As a result, discussions about the complexity of problems are not the simplest, and the resulting misunderstandings affect the ability to solve them effectively.

Complication means that a given (analyzed) element contains many precisely interconnected parts. Complication describes a problem that is difficult to resolve. As a result, one cannot be sure that solving a complicated problem is tantamount to a guarantee that all the elements co-creating it have been matched with each other in a rationally justified manner.

Complexity, in turn, occurs when something acts like a system and exhibits systemic properties that are not obvious at first glance. Complexity is more than the simple sum of parts of a larger whole. There may be many or few parts, and the result of combining them is "something" obscure that in some way begins to live a life of its own.

To emphasize the differences between complication and complexity, it is enough to provide a few examples taken from the surrounding reality. The Airbus A380 is complicated, while the jellyfish is complex. The Paris metro network is complicated and the way people use it is complex. Your skeleton is complicated, but you as a human are complex. The building you live in is complicated, but the city it is built in is complex.

2. Steps to solve complex problems

2.1. Identification of the problem and its causes.

This part of the material is dedicated to the differences between simple, complicated and complex problems, as well as how to

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identify them.

Table 2. Simple problem versus complex problem

Simple problem	Complex problem
A simple problem has a clear cause and effect that are easy to identify and fix.	A complex problem has many causes. Some of them may be easily identifiable while others may be hidden. There may be causes that are a consequence of other causes, just as a team member's poor performance may be a consequence of his or her lack of skills (which itself is a consequence of recruiting and introducing processes within the organization).
Example	**Example**
Your organization's business proposal has been rejected by the customer. The reason was that your proposal was too expensive. As a consequence, the client chose to cooperate with one of your competitors. This consequence resulted directly from the way your proposal was priced (and perhaps from the approach you took).	A consulting firm aims to improve its ability to independently enter the market and build its brand. He needs to develop a culture of self-expression and quick response to emerging opportunities. Staff must acquire information skills (e.g. copywriting), use new technologies (e.g. content management systems, social media) and some organizational processes need to be developed or redesigned. Change management is also required as the organization develops new habits and overcomes inertia. In addition, there are many stakeholders that need to be managed (web designers, PR firms, academic partners, etc.).
Solution	**Solution**
In this example, the solution is quite simple: you should pay more attention to understanding the client's needs and pricing your proposal.	Solving complex problems requires a deep understanding of the problem and a multi-faceted strategy that is refined as it is implemented.

Source: https://www.marcuscoetzee.co.za/identifying-simple-complex-and-wicked-problems/ (Access 2021 10 01).

Sometimes complex problems are called "wicked" because many of their characteristics cannot be reduced to simple component parts. However, this issue is much more complex. The following is an explanation of why complex problems and "wicked" problems should be considered separately.

In the case of wicked problem, the symptoms also became its causes. This makes them much more difficult to understand and solve. These kinds of problems are spirals where any wrong

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solution makes the problem worse. H.W. Rittel and M.M. Webber (1973) formulated the "concept of wicked problems" in reference to the complexity of designing and implementing social policy, and their specificity is reflected in the following characteristics:

- Difficulty in defining the problem;
- Difficulty in determining whether the problem has been fully resolved. Sometimes a permanent solution is not possible;
- No clear-cut right or wrong solutions;
- Limited possibilities of using the acquired knowledge from previous successes to solve new problems;
- Each problem is unique and previous or similar attempts to solve the problem may not be successful;
- There are too many possible solutions to list and compare them in a rational way.

The above description of the wicked problems is complemented by an example illustrating the situation inside the organization. Its entity is a non-profit entity with low bargaining power in dealing with clients and donors. The organization concludes contracts to raise funds for its activities, but the funds received are not sufficient to cover the costs of the work performed by it. This situation led to problems with the cash flow, which forced the organization to offer new customers and donors even more favorable contractual conditions that, from the organisation's perspective, covered even less overhead costs. As this cycle went on, the organization was forced to pay lower wages and its employees felt burned out. The quality of work inside the organization and its reputation began to be threatened, which further changed the perception of the brand among its stakeholders and put even more pressure on it. Key personnel began to leave which weakened the team even further, exacerbating the crisis. As a result of the situation, it was very difficult to clearly indicate where and how to intervene to solve the problem. The presented example perfectly reflects the formula of "wicked problems".

How should we deal with the real causes of problems? Understanding various problems, their causes and symptoms becomes much more necessary and more difficult when dealing with complex and wicked problems. Hence, sometimes misdiagnosing a symptom can only make the problem worse. Consider such an example. Suppose an industry is in crisis. We know that providing it with additional funds could help alleviate this problem, unless its main reason is the ineffectiveness of the use of public funds provided so far. In such a case, increasing funding will not only not heal the situation (which is due to the

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ineffectiveness of attempts to solve this problem through financial support to date), but will significantly worsen the problem, possibly leading to the need for stronger, much more far-reaching interventions. As this simple example shows, if the causes and symptoms of a problem are misunderstood, it is very difficult to fix. Moreover, it should be remembered that an incorrectly chosen solution may worsen this problem.

The information presented shows how important it is to correctly define the nature of the problem we are facing. The simplified, and therefore mistaken, belief that a wicked problem is a complex problem and a complex problem is a simple problem is proof that we do not really understand its full complexity. However, this situation creates a risk that our approach to solving the problem will be not only short-sighted but also ineffective. As a result, it can either contribute to or exacerbate the cycle of problems.

2.2. Considering the effects of a defined problem.

With the knowledge of identifying problems and their categorization, we can move on towards analyzing the effects of the defined problem (s). A very simple, yet effective technique can be used for this, which includes the following three steps.

1. For each identified problem, create a table with three columns. Their headings should be as follows: causes, consequences (effects) and solutions.
2. Begin by identifying the causes of the problem. Write each cause in the first column of the table.
3. Repeat the process to determine consequences, and then solutions.

Remember that there are sometimes no clear cause-effect relationships between the causes and consequences of problems. Therefore, the cause, consequences, and solutions will not always be related or horizontal. An example of corruption in the poor south countries is given below, illustrated using the technique described previously.

Table 3. Corruption in the countries of the poor south: causes, consequences (effects) and solutions

Causes	Consequences (effects)	Solutions
– Widespread poverty – Greed and profit orientation – Competition – Lack of transparency – Desire for power and	– Increase in poverty and marginalization of the poor, the powerless and minorities – Loss of people's trust in the system	– More transparency and accountability – Increased community participation in decision-making at all levels of government – Civic education

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domination – Failure to respect the principle of „check and balance" – No laws needed to punish – Willingness to manipulate the system – Distribution of moral values – Peer pressure – Inherited inappropriate systems	– Unbalanced debt burden – Poor social services – Distribution of moral values – Growth and domination of those in power – The dependence of the recipient on the giver of bribes – The emergence of a dictatorship – Wasteful spending on the so-called „white elephants"	– Severe punishment of perpetrators – Political awareness – Increased media involvement – Advocacy of non-governmental organizations

Source: VeneKlasen, L., & Miller, V., (2002) Causes, consequences, and solutions. PLA Notes, 43: ss. 18-19 oraz VeneKlasen, L. & Miller, V. (2002) A New Weave of Power, People & Politics: The Action Guide for Advocacy and Citizen Participation, World Neighbors, Oklahoma City, OK: Ch.9.

The example presented is key to understanding the idea of correct problem solving. Identification of the causes should go hand in hand with the diagnosis of potential effects, and these, when combined with each other, should result in the identification of solutions.

The area of purest faults is distinguishing the causes of problems from their effects. Cause and effect represent the relationship between two things in which the action of one translates to the other. For example, an insufficient grade (effect) is caused by the student's unpreparedness for classes (cause). There can be many causes and effects. Therefore, looking for the reason why something happens (cause / effect) is a basic human motivation.

Logical separation between cause and effect. Occasionally, the materials contain words or phrases that signal cause-and-effect relationships. The following terms are used to describe the causes: because, if, due to (…). In turn, the effects are heralded by phrases such as: because of this, as a result, respectively (...). Depending on the examined issue, the subject of analysis may be to find one of the three categories of cause-effect relationships.

1. Established cause-effect relationships, i.e. those in which the tested relationship is clearly defined.
2. Unspecified cause-effect relationships, i.e. those in which the relationship should be established or identified by „reading between related".
3. Cause-effect reciprocal relationships, the effects of which can be part of the chain. In this type of structure, one effect produces second effect, second effect produces third one, and

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so on.

While the established cause-effect relationships are easy to establish, undefined relationships pose problems. Let's focus a little more on them. Solving the issue of undefined problems can be reduced to proceeding in accordance with the scheme provided.

Step 1: Identify undefined cause and effect relationships.

- To find the effect, ask the question, "What happened?"
- To find the cause, ask "Why did this happen?"

Example. The Barrier Reef is under threat from global warming. The rising water temperature causes the reef to fade, making it less colorful and more susceptible to disease. Reef whitening is the result, and the cause is global warming and rising temperatures.

Step 2: Search for signal words in the analyzed text, showing cause-effect relationships.

Step 3: Determine the effects that are also causes. Effects can form a chain in which one effect causes another, which can then trigger a third, and so on.

Example. When people cut down trees to clear the land, they destroy bird habitats. This reduces the number of nesting sites. As a result, fewer chicks hatch and the bird population is declining.

- Cause 1: People are cutting trees.
- Effect 1: Bird habitats destroyed.
- Effect 2: Reduced number of nests.
- Effect 3: Fewer chicks hatch.
- Effect 4: The bird population is declining.

2.3. Solutions based on Brainstorming

After identifying the problem and its potential consequences, decision makers prepare a set of alternatives/solutions (based on brainstorming), from which should be chosen the one that will be the most optimal in relation to the identified problem.

Implement in practice principle: the more complex the problem, the more creative and unconventional alternatives should be considered. A set of factors that may realistically limit a given alternative and its further implementation should be considered. Such limitations include legal, ethical or moral norms, as well as technology, economic factors or informal social norms. Creative thinking is necessary because, as practice shows, new and unique solutions are rarely proposed. In addition, new areas are rarely

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searched, but most often we are limited to the closest neighborhood of the currently used solution.

In practice, we limit ourselves too quickly to considering already existing alternatives that narrow the field of view. We should be willing to seek new alternatives. Of course, careful exploration of the various possibilities is time-consuming and energy-consuming, but it is inevitable. Searching for solutions based on brainstorming seems to be an ideal solution.

Brainstorming is a bridge between a less formal approach to problem solving and lateral thinking. This means that the purpose of brainstorming is to make people want to create ideas that may seem absurd at first glance. Some of these ideas offer the opportunity to create original and creative solutions to problems, while other concepts can drive a spiral of even more ideas. It is a chain of creating solutions in creative thinking.

There are many modifications to the classic brainstorming (the selected ones are described later in the module), but all of them are based on a similar procedure. The brainstorming scenario should look like this: defining the problems and its consequences, choosing a leader (moderator) who oversees the correct course of the brainstorming, and a group of people involved in the creative process. The brainstorming procedure can be expressed in the following scheme: introduction - creating ideas/solutions - analysis and evaluation of proposed solutions. A group of people interested in looking for solutions sit down in a circle. Each of the people involved in turn presents his ideas. The more the better.

The role of the moderator is to collect all ideas in a place that is generally accessible and visible to all members of the group. The list of ideas can be created on the board or using a flipchart, preferably using keywords or short phrases to show ideas. Anyone can take the floor and the leader watches over the agenda and, importantly, we do not note the author of the idea. All participants of the brainstorming add their own ideas (even the most unrealistic ones). These ideas can become the seed for new, even more creative ideas.

An example: Two students are going to set up a start-up.
Young students struggle with the problem of financing the new economic activity. As a result of the brainstorming, the students developed the following ways to finance a business.

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Source: own elaboration.

During the brainstorming session, participants should let go of criticism or reward and evaluate the proposed ideas. Assessment of the proposed solutions at this stage of the brainstorming process is a destimulant for the generated ideas and causes intimidation of the other group members and limitation of creativity. A good time to evaluate ideas is the end of the session or the second evaluation meeting - then you should look for tools and solutions, already using conventional approaches. Group brainstorming offers the opportunity to encourage group collaboration by eliminating judgment.

After collecting the ideas, it is time to evaluate the collected material. Duplicates should be eliminated first. Other ideas should be discussed, assessed and analyzed with respect for all team members. What matters is the constructive evaluation and criticism of the collected material. It is worth preparing a transparent evaluation system, e.g. each participant receives a certain number of stickers, which he can assign to the best ideas.

Another idea is to award points. Each participant chooses 5 best ideas according to him and assigns them the appropriate number of points, i.e. 5 points - the best solution, 4 points - next, etc. Another method of making a selection is that each participant receives a certain number of points (usually a number from 5 to 10) and then gives points to those ideas that he likes best. He can distribute the points freely, i.e. he can, for example, award one point to many ideas, a few points to several ideas, or all points to one idea.

It is important that each participant has the same tool and

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awards the same number of points. After you have ranked the best ideas, you can move on to the summary. Describe the chosen solutions and define its implementation plan. A standard brainstorming session can take anywhere from 1 to 2 hours.

Brainstorming isn't just for the group. Individual brainstorming can be carried out. Identify the problem and write it down as a question. Then, for a specified period of time (20-30 minutes), you should write down ideas for solving the problem. A good way, as with group brainstorming, is to jot down key words and short phrases. You should not judge any solution in your mind. Then it's time to put together and evaluate your ideas. Finally, the core of the solution must be found.

Based on:
https://www.lynskysolutions.pl/baza-wiedzy/burza-mozgow-i-jej-rodzaje-generuj-pomysly-na-rozne-sposoby/, Access 2021 10 21).

2.4. Verification of the impact of the proposed solutions

Once a solution has been selected, it should be assessed in terms of its feasibility, but also the consequences associated with each of it. When making the assessment, it is necessary to answer a few questions: is the option at all feasible? What are the consequences of the alternative being considered? Is the alternative satisfactory from the point of view of the goals set?

The consequences can be of two types: explicit and hidden. Explicit consequences are those that can usually be predicted when making a specific decision. The hidden consequences are not even comparable to the same degree, or even possible, and can be forgiven to the most intelligent man for failing to foresee the devastating effects of the complicated chain of events caused by the decision being made. Of course, the emergence of obvious consequences entails the need to make further decisions and solve new problems. Each solution is also the seed of a new problem.

The answer to these problems is usually very difficult, as the information will not be complete in almost every situation, and obtaining it may require considerable time and money. Therefore, there is a risk of oversimplifying the analysis, the more so as we follow what Herbert Simon described as limited rationality. This means that instead of searching for optimal solutions, we are satisfied with those solutions that can satisfy us only to a sufficient degree.

Each alternative should be checked in terms of its feasibility, satisfaction and anticipated consequences of its implementation. This diagram is illustrated in the figure below, indicating the

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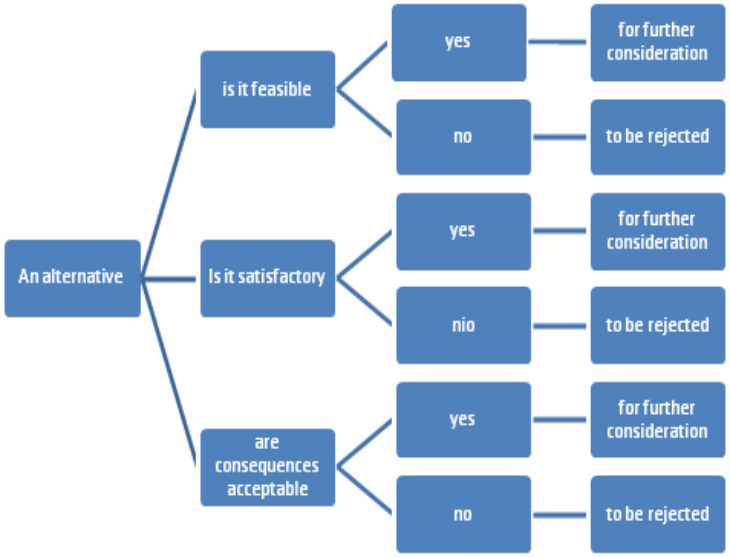
course of action for the decision maker.



Source: own elaboration.

According to the theory of complex problem solving, three types of factors verifying the impact of the proposed solutions should be mentioned:

- unstable environmental factors (factors beyond the control of the decision maker),
- non-permanent decision factors,
- results.

An environmental stimulant is a limitation of "space" that is beyond the control of decision makers. Variable decision factors are all spheres of "space" that are under the control of decision makers within their range of influence. The results depend both on the influence of variable environmental and decision-making factors.

The variable environmental factors include the weather, which we have no influence on but can only adapt to. We cannot "order: sunny weather." On the other hand, the choice of clothing belongs to the category of decision variables. Weather cannot be booked, but clothing can be adapted. In order to achieve the result of "frost-free and water-resistant", after leaving the house, you should wear a warm sweater, footwear or a waterproof jacket. So, when making decisions about how to dress on a cloudy, cold and rainy day, we must consider both changing environmental and decision-making factors.

In order to achieve the assumed goal or the desired state, it is necessary to set limits and how to deal with them. Therefore, it is indispensable in making decisions, in addition to determining the present and future state, the desired state, setting the limits

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within which the entity operates or will operate in the future. The people make decisions and the measures they choose are often the result of assumed constraints. These constraints appear in the planning process as "unforeseen accidents" - factors that may or may not change, but are not subject to the arbitrary control of an individual or organization.

Decision assumptions. According to Thompson (1967), decision issues always have two main dimensions: (1) beliefs about cause-effect relationships and (2) preferences regarding possible outcomes. These are the primary decision variables. Different decision-making strategies are appropriate when considering the state of these two variables. Preferences on outcomes (goals), e.g. may be clear or unclear. Likewise, the cause and effect actions that affect the outcome can be either certain or uncertain. A person may know exactly what he wants but, for example, he is not sure what to do to get it. The other person may be sure what types of actions are shaping the situation, but he does not know which direction to go in.

Based on:
https://mikroporady.pl/instrukcje-i-regulaminy/instrukcje/czy-znasz-3-elementy-podejmowania-skutecznej-decyzji (Access 2021 10 20).

2.5. Choosing optimal alternative solution

Based on the analyses made in the previous step, the decision maker has to choose the most optimal variant from the point of view of the organization's interests. This step is at the heart of the solving problem process. One solution is to choose an alternative that is feasible, satisfactory, and has consequences that are acceptable. In order to make it easier for the manager to choose from among all the options considered, a set of subjective factors and weights can be prepared.

A wrong decision means a wrong choice, i.e. ineffective management, and effective management is the most important for any organization. It means choosing the right things to do. Ineffectiveness cannot be offset by any level of fitness, which means doing things the right way. It follows that each decision-maker should make the best use of the opportunity to multiply the benefits of the company and build its good image in the environment (Penc, 2003).

As already mentioned, we have a set of decision variants from which we choose the best one from the point of view of a specific criterion (Wojtas-Klima, 2014). The word "best" or "most advantageous" alternative makes it effective. Effective decision-making and selection of the optimal solution forces the decision maker to understand the reasons that lead him to make

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a given decision. It should be assumed that an effective decision should optimize the adopted set of factors from the company's point of view, and this set includes: profit, employee welfare, sales, but also: minimizing losses or limiting employee rotation. The decision-making process concerns both problem areas of the enterprise and touches the sphere related to the identification of new opportunities or development prospects.

It should also be mentioned that the choice of the best alternative can be made based on two basic types of managerial decisions: programmed and non-programmed. A programmed decision is defined as one that is fairly complete in structure and / or returns to the manager at certain intervals. An excellent example of a programmed decision is the process of replenishing packaging in a factory. The factory manager knows that he must have a five-day supply of packaging and has information that the supplier needs two days to complete the delivery. Therefore, the manager makes a cyclical decision to replenish the inventory when they fall below the seven-day requirement. In the presented case, the manager may introduce a system that automatically registers shortages in stocks and at the same time issues an instruction for their immediate replenishment.

On the other hand, non-programmed decisions are decisions with a rather not clearly defined structure; they are made much less frequently than programmed decisions. Managers facing such decisions must always treat them as unique, consuming an enormous amount of time, energy and resources necessary for a comprehensive examination of the decision-making situation. The main factors in non-programmed decisions are intuition and experience. Most of the decisions made by top managers regarding strategy (including mergers, acquisitions, and acquisitions) and organizational design are non-programmed decisions. Decisions about new plants, new products, collective agreements and legal problems are of a similar nature (Griffin, 2006).

In addition to different types of decisions, the existence of different conditions under which decisions are made should also be noted. Thus, a manager can make decisions under conditions of certainty, risk and uncertainty. When a decision maker knows with reasonable certainty the options available and the conditions attached to each of them, there is a state of certainty (Griffin, 2006). In this case, the decision-maker knows all the possibilities of making a decision, the degree of ambiguity is low and it can be concluded that there is little risk of making a wrong decision. It should be noted, however, that in the conditions of turbulent economic life, a negligible percentage of organizational

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decisions is made with certainty.

Nowadays, decisions are made under risky conditions much more often. According to R. W. Griffin (2006) , the state of risk is a situation in which the availability of individual opportunities and the potential benefits and costs associated with each of them are known with a certain estimated probability. When making decisions, every manager must accurately diagnose the probability associated with each of the possibilities. When making a decision under risky conditions, one should take into account the fact that the decision maker has moderate uncertainty and there is a moderate risk of making a wrong decision.

In a dynamically changing economic environment, we can meet an increasing number of decisions made under conditions of uncertainty. If the decision-making process is accompanied by uncertainty, it means that the manager does not know all the alternatives and the risks associated with them, as well as the possible consequences. Operating in conditions of uncertainty requires continuous decision making. Permanent uncertainty forces us to constantly decide which option of action is more certain and beneficial. A person in a decision-making situation feels uncertain because he does not know which of the considered variants of action will bring the expected result. Each decision is therefore a solution to the problem of uncertainty in operation. As a result of the decision, the uncertainty is completely eliminated or significantly reduced - it becomes controlled uncertainty, which is influenced by managers (Nosal, 2001).

The different conditions in which a choice is made requires the use of different strategies as follows:

1. A computational strategy should be used when there is certainty about both the causes and the preferences of the results. Its result is a programmed decision.
2. When the output preferences are clear, but the cause-effect relationships are uncertain, a judgmental strategy should be used. Its result is a planned decision - considering unforeseen accidents.
3. Where there is certainty about the cause-effect relationship but lack of clarity about the preferences of the outcomes, the situation requires a compromise strategy. The result is a compromise decision.
4. When there is uncertainty about both cause-effect relationships and outcome preferences, the situation requires focusing on a higher level of values and vision (inspiration) and making comparisons with external points of

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reference (other people who were once in a similar position). Its result is a dynamic decision made through mutual matching.

Based on:
https://mikroporady.pl/instrukcje-i-regulaminy/instrukcje/czy-znasz-3-elementy-podejmowania-skutecznej-decyzji (Access 2021 10 20).

2.6. Plan implementation. PDCA cycle (i.e. Deming cycle)

The step following the selection of the optimal solution to the problem is its implementation. The Deming Cycle, also known as the PDCA (Plan, Do, Check and Act) cycle, will be used to discuss this issue. It is a method that helps to solve problems in an orderly and systematic manner. PDCA is a four-tier management model related to Lean Management, Kaizen, as well as Problem Solving and Continuous Improvement.

P-Plan. Document the current state of the problem, then define the target state with measurable goals to be achieved, identify solutions or improvements and develop an action plan.

D-Do. Execute the plan, monitor the process during implementation. Document problems and unforeseen events.

C-Check. Analyze the results against the goals set in the Plan phase. Check if the state after implementation is consistent with the planned future state.

A-Act. If the new method turned out to be effective (results of the Check phase), then adopt and standardize it, otherwise identify the changes to be implemented and start a new PDCA cycle.

Phase A makes it possible to correct the developed plan in phase P, which shows that the Deming cycle is a continuous cycle that never ends and each subsequent repetition brings the organization closer to achieving the goal set in phase P. As a result, PDCA is also called the cycle of continuous improvement.

Below is an extended workflow for implementing a solution to a previously identified problem in accordance with the PDCA cycle (see Figure 1).

PLAN
Q1: Define the problem.
Q2: Document the current status of the problem.
Q3: Define a target state with measurable goals to be achieved.
Q4: Identify solutions or process improvements.
Q5: Develop an action plan.

DO
D1: Implement the action plan in a real process.

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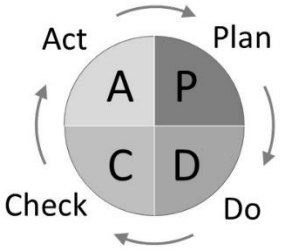
CHECK

C1: Analyze the results against the goals set in the Plan phase. Check if the state after implementation is consistent with the planned future state.

ACT

A1: Document changes to a standard process.
A2: Explore the progress of the learning process (what the team has learned).
A3: Define the gaps between the Check and Plan phases.
A4: If there are gaps in "A3" then define another PDCA cycle.
A5: Document improvement and share best practices.

Figure 1. PDCA cycle



Source: https://leanjestdlaludzi.pl/pdca-planuj-wykonuj-sprawdzaj-dzialaj-cykl-deminga-ciagle-doskonalenie/ (Access 2021 10 09).

Solving problems should not be a matter of just going through one cycle. In practice, this would diminish our vigilance and expose the organization to unnecessary costs. It often turns out that a solution that we feel is effective enough can be improved, just as the approaches to identifying solutions and assessing their effects can (and even need to) be improved. If we solved the problem, checked that the introduced solution works correctly and we started to use this solution permanently (by introducing the standard), then the next step is to improve it. For this purpose, the PDCA cycle is restarted. Subsequent iterations (repeating the same sequence of activities in a loop) lead to an improvement of the work system, the achieved result, and, consequently, the improvement of the entire organization (see Figure 2).

Figure 2. Self-improvement in solving organizational problems

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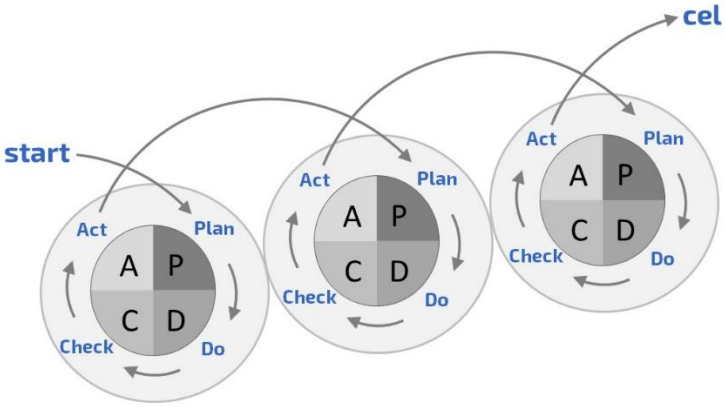

Source: https://leanjestdlaludzi.pl/pdca-planuj-wykonuj-sprawdzaj-dzialaj-cykl-deminga-ciagle-doskonalenie/ (Access 2021 10 09).

Some problem-solving methods are time-consuming and resource-intensive, not like the PDCA cycle which is flexible enough to be used in any situation. If the goal of the organization is to make systematic improvements, then PDCA is the right choice. However, the methodical and cyclical nature of PDCA means that changes are gradual. Hence, the method may not work if the organization faces a sudden problem. A similar situation occurs when the problem concerns the need to quickly improve efficiency and results. Then the PDCA may also not work. The unquestionable advantage of the PDCA cycle is that it enables constant identification of problems and methods of their optimal solution. However, it should be remembered that a complete solution to the problems and improvement in efficiency after the first iteration is unlikely.

2.7. Preparation for changes

A change in the organization (as a consequence of solving a problem) is often equated with a disturbance of the existing patterns of behavior and expectations. Therefore, it justifies the need to make a balance of profits and losses resulting from the implemented change. It is carried out by employees who are directly affected by these changes. The response to changes depends on many psychosocial factors and external conditions. Moreover, the same change can cause different reactions in different people. T. Walker (1969) claims that from the perspective of an employee who adopts a shift, there are two stages, i.e. "initiating" and "putting changes into action". G. Zaltman, R. Duncan, J. Holbek (1973) claim, in turn, that the stages of absorbing the change are as follows.

Stage no. 1. Initiating the change, includes:

- knowledge stage aimed at instilling awareness of the need for change and the possibility of its application,

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- creating attitudes towards change – at this stage coalitions of supporters and opponents of change are formed,
- the decision-making stage depends on the determination of the management, employees' approval and pressure from the environment.

Stage no. 2. Introducing changes to the act, includes:

- an initiation phase in which the actual assimilation of change is put to the test,
- the follow-up phase, in which decision-makers define strategies for introducing changes, taking into account the actions of the spokesman for this change and the implementation of the prepared change adaptation plan (E. Więcek-Janka, 2006).

The change management process in every organization is designed to prepare employees for it. This role is played by the managers of the organization. On the one hand, they should help employees understand the legitimacy of introducing a change, and on the other, make them aware of the anticipated benefits of the new division of labor in connection with the planned change. This goal can be achieved through both internal notifications and group meetings, and finally also through individual conversations (if the situation requires it). The point here is to make employees aware of the extent to which the introduced changes will directly affect their work (Wiśniewska, 2013).

The second step in preparing employees for change is stimulating their adaptation to new working conditions, creating an atmosphere of openness to the introduced change, and thus a new division of roles, functions and duties. It is also important to provide adequate support for employees by solving problems related to the introduced organizational changes.

In the last phase of the organization's activities, when employees perceive the changes as positive (beneficial both for the organization and for themselves), the implementation of the change begins, which initiates the process of general involvement in its implementation (Wiśniewska, 2013).

What are the sources of resistance to the implemented changes? In the case of managerial staff, their basis is the fear of the difficulties associated with their implementation, as well as the fear that they will change the current model of the organization's operation. the sources of workers' resistance to change are much more varied. The most common reasons for the reluctance to change include:

- non-compliance of the introduced changes with the current

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system of norms and values,
- ignorance of the purposefulness of changes, as well as their consequences for the company and its employees,
- lack of trust in management and introduced changes,
- forced nature of changes (employees' non-participation in their creation and implementation),
- fear of losing cherished social ties,
- fear of dismissal or worsening of earnings,
- habits, and sometimes defiance,
- too fast pace of changes (S. Stachowska, 2015).

Reducing resistance to change involves the use of techniques to express concerns about the state after the implementation of planned changes. Practice proves that the level of resistance to change will be lower when:
- responsibility for implementing the changes will rest with the authors,
- draft of the change will be presented to the public by management who has the authority among employees,
- employees will receive a reliable explanation of the necessity to introduce the change,
- there will be a belief among employees that the change will reduce their work-related effort,
- implemented change will not limit the employees' autonomy so far,
- in the process of implementing changes, it will be possible to systematically exchange information between employees and management (S. Stachowska, 2015).

Due to the fact that any change in the organization affects people, you should be aware that they affect not only the work, but also the non-work life of employees. At the same time, human resources affect the organization's ability to change as well as their effectiveness. Emerging human resource challenges in this regard cover two issues. On the one hand (due to the arguments presented so far), the introduction of these changes should be facilitated, and on the other hand, the social responsibility of organizations managing change should be strengthened. The key challenges in this area include:
- shaping the attitude of openness to changes among employees, as well as initiating and creating changes by them (which will allow them to overcome resistance to change).
- development of group cooperation between employees and external stakeholders, facilitating the understanding of the legitimacy of changes as an effect of adjusting the

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organization to the expectations of stakeholders,
- investing in the development of employees' competences, important from the point of view of implementation of tasks resulting from the company's strategy and in line with its culture,
- creating space for employee participation in organization management processes, including change management,
- an efficient information and communication system improving the knowledge of the company's strategy, understanding the needs and directions of changes and their consequences, as well as joining the process of changes, sharing knowledge, etc.,
- shaping change leaders within the organization's structures,
- creating and applying internal social responsibility programs, conditioning the harmonization of the interests of employees and the employer,
- improvement of services provided by HR, facilitating the achievement and improvement of the company's competitive position (the quality of these services determines effective change management), (see S. Stachowska, 2015 and J.P. Kotter & L. Schlesinger, 1979 and 2008).

The best methods of overcoming barriers to organizational changes are:
1) information policy,
2) effective communication,
3) training activity.

Information activity prevents the spread of rumors within the organization, which, by providing distorted and/or false information, could hinder the effective implementation of planned changes. **Active and open communication** is considered an antidote to the uncertainty associated with change. Without active communication, the transfer of values and knowledge essential from the point of view of the organization is impossible. Finally, **properly selected and conducted trainings** ensure that people are prepared to function in new conditions. For this purpose, it is required to guarantee participation in the necessary training for both the managerial staff and employees (M. Centkowska, 2015; S. Nowosielski, 2017).

3. Tools helpful for identifying the problem and its cause.

3.1. What is it about "Einstein's Problem-Solving Formula"?

The outstanding scientist Albert Einstein used a trivial, but by

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many forgotten activity in the process of searching for solutions. Einstein reportedly used to say, "If I have 60 minutes to fix the problem. I spend 55 minutes thinking about a problem and 5 minutes solving it. " (alternate versions duplicated online: "If I had an hour to save the world, I would spend 55 minutes defining the problem and only 5 minutes finding a solution"). Interesting? This is confirmed by the materials collected above - the most important thing in the process of solving problems is their proper identification and definition. Nowadays, we strive to define the solution as quickly as possible, which often brings different results than assumed. Paradoxically, the biggest problem is understanding the problem. Before we move on to finding solutions, we need to step back, set aside time to understand and identify the problem. In this single sentence, Einstein shows how to deal with problems to make them simpler to solve. The most difficult stage in the process of solving problems is their identification (including their causes), it is the definition of the problem that is most important - a wrongly defined problem leads to wrong solutions (long-term or not at all). A correctly defined problem improves the process of finding solutions.

So what should be done in 90% of the time we spend on solving the problem? Don't waste your time and start analyzing the case / task / event thoroughly. You can apply other techniques to go deeper into the essence of the problem described in this module. Remember that the quality of the solution depends on the quality of the problem description - **do not spare the time for its analysis, if you really want to solve a complex problem, it will save you time for the next stage - looking for solutions.**

One of the tools that is helpful in identifying and defining problems is to look at the problem from different perspectives.

A. Redefine the problem - verify if you perceive it correctly? Words have power. Sometimes the exchange of words completely changes the understanding of the problem and its further analysis. Paraphrase!
   For example:
   Instead of asking about "ways to increase efficiency" ask about "ways to make your job easier".
   Instead of "increasing" use the words "improve", "expand", "extend"...
   Changing the word does not make the original problem cease to exist, on the contrary - the problem remains the same, but our feelings / opinions about it may differ.

B. Broaden your perspective - sometimes the problem is just part of something bigger (this is often the case with complex

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problems). Expanding the perspective allows you to look at the problem from other aspects, to see it on different levels.
What is a perspective extension about ?
Let our problem be related to the "chair" (illustrative example) - the chair is in a room, the room may be in an apartment - an apartment in a block of flats - the block is part of a housing estate.... etc. A simple chair suddenly became part of the estate.
Questions to help you find a broader perspective: "What is it part of?" "What is the purpose of it?"

C. Challenge assumptions - assumptions are a natural thing when defining a problem, but many of them may be inaccurate and interfere with problem solving. Be critical of assumptions made. Check each of them in terms of truthfulness and reality.

D. Break down the problem into smaller parts.
Many problems (especially complex ones) can be broken down into several smaller ones. Separating the problem and analyzing its individual components helps in understanding it. This is especially helpful when the problem seems to overwhelm us. This is where the problem redefinition technique becomes useful, from which we can use paraphrases, synonyms, hyponyms (subordinate words, words with a narrower meaning, such as "car" and "limousine").

E. Use effective language constructs and treat the problem as a challenge.
Looking at a problem as a challenge can help make its solution an attractive task. The correct formulation of the problem will allow you to program your brain to look for solutions. The task of "increasing sales" is completely different from "arousing the delight of customers".
What structures are effective?
- "What ways can ..." - points to an endless number of solutions;
- Positive statements - our brain puts less effort into making these kinds of statements;
- Create questions - paradoxically, the human brain loves questions, especially engaging ones, and will do whatever it takes to find answers to them;

F. Collect useful knowledge
In order to identify and properly define a problem, it is necessary to investigate its causes and the circumstances that caused the problem to arise. Oftentimes, trying to find an immediate solution is less productive than spending that

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time delving into the topic. It may also turn out that while looking for the causes of the problem, we will find a solution.

Source:
https://www.jestpozytywnie.pl/genialny-sposob-alberta-einsteina/ (Access 2021 10 09).
https://lifehacking.pl/zadziwiajacy-sekret-rozwiazywania-problemow-wedlug-einsteina-oraz-10-konkretnych-sposobow-na-jego-wykorzystanie/ (Access 2021 10 17).
https://www.fastcompany.com/3007430/einsteins-problem-solving-formula-and-why-youre-doing-it-all-wrong (Access 2021 10 17).

3.2. 5 x Why (source of the problem).

Frequently, a serious mistake made when solving a problem is not thoroughly investigating its causes. Employees do not try to find the real source of the problem, confining themselves to a superficial examination. The purpose of the 5 x Why methodology is to determine the actual cause of a defect, beyond simply recognizing symptoms.

This method is a tool used to search for the causes of the identified errors, but also to detect the sources of emerging problems and in a situation where other analyzes turned out to be ineffective, were too superficial and did not thoroughly investigate the problem. The point is not to approach the problem too superficially, to get to know the circumstances of the problem and discover its place.

The 5 x Why analysis covers two aspects:
Why did the problem arise? - find out the real, root cause of the problem. We should not look at reality superficially, but "drill down" until we get to the bottom of it.
Why was not the problem noticed? - in addition to detecting the real cause of the error, it is also important to discover at what stage the error was noticed. Why did the control and supervision system detect it at this stage, why not earlier?

Knowing the answers to these questions, it is possible to take suited actions to eliminate the error, and additionally, it is possible to improve the monitoring system.

An example of the 5 x Why process is presented below.

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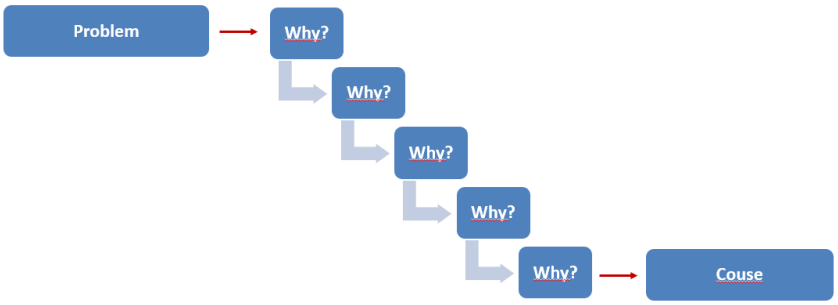


Source: Own elaboration.

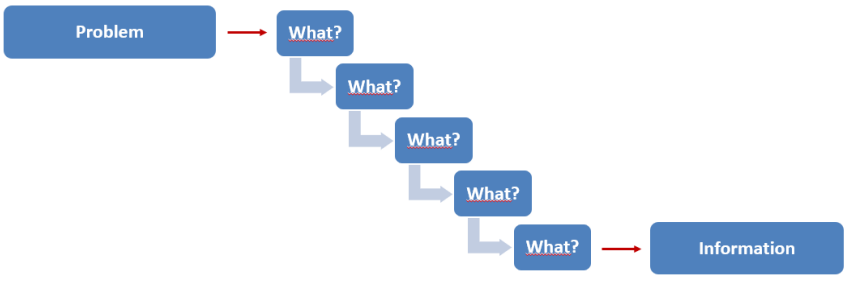
It is a relatively easy-to-use method that consists of asking the question „why" several times, until the root cause of the error is discovered. The method has „five" in its name, but it is simply a number, so ask "why" as many times as you want to complete the process and take appropriate action.

This method works best for problems that have one or several root causes. The more reasons for the occurrence of a given problem, the lower the effectiveness of this method.

Video:
The 5 Whys - An Introduction:
https://www.youtube.com/watch?v=_56GhHgGU2U (Access 2021 10 21);
5 Whys: Root Cause Analysis and Problem Solving:
https://www.youtube.com/watch?v=zAs40EbTPnw (Access 2021 10 21);
What is 5 Why - A Root Cause Analysis Technique:
https://www.youtube.com/watch?v=-_nN_YTDsuk (Access 2021 10 21);
The 5 Whys Explained - Root Cause Analysis:
https://www.youtube.com/watch?v=t7FcK8jV2yA (Access 2021 10 21);
How to Conduct a 5-Why - Titanic Example:
https://www.youtube.com/watch?v=38RlXdr4Np0 (Access 2021 10 21);
Clarifying the '5 Whys' Problem-Solving Method:
https://www.youtube.com/watch?v=SrlYkx41wEE (Access 2021 10 21).

3.3. 5 x What

The method is very similar in its structure and course to 5 x Why, but in this case we ask the question "So what?" The idea is to discover what the possible consequences of this fact are, why this particular fact is important.



Source: Own elaboration.

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The "5 x What" method is about getting as much information as possible from a simple fact or statement.

3.4. Ishikawa diagram.

The creator of this tool is a professor at the University of Tokyo Kaoru Ishikawa, whose diagram was first used in 1962 in Japan at Sumitomo Electric.

The Ishikawa diagram (known as the fishbone diagram due to its characteristic appearance) makes it possible to identify the causes of actual or potential failures of various types of projects.

It is a cause-and-effect diagram in which the analysis begins with the finding of a problem (e.g. missing, failure, or some other undesirable condition) and leads to the identification of all possible causes. It is a graphic presentation of the impact of individual factors and their connections on the emergence of a qualitative problem.

Initially, this diagram was used in the industrial sector, and later, due to the modifications applied, it was successfully used in other industries.

The construction of the diagram begins with drawing the spine of the fish, i.e. a horizontal main arrow with head ending, which describes the problem that has arisen and needs to be solved. Then, bones diverge from the main arrow, that is, they symbolize the main categories of causes that may cause the problem, along with detailed categories that can potentially affect the cause of the problem. With this diagram, the effects are separated from the causes in a graphical way, so it is possible to analyze the issue.

Originally, Kaoru Ishikawa identified the 5 most important causes of the problem, which were:

- people,
- methods,
- machinery,
- materials,
- management.

At a later stage of development, along with the adjustment of the diagram to the needs of specific industries or enterprises, the range of categories that could cause a problem was expanded. Below are some examples of such modifications.

Ishikawa diagram - 5M + 3M, most commonly used in manufacturing companies.

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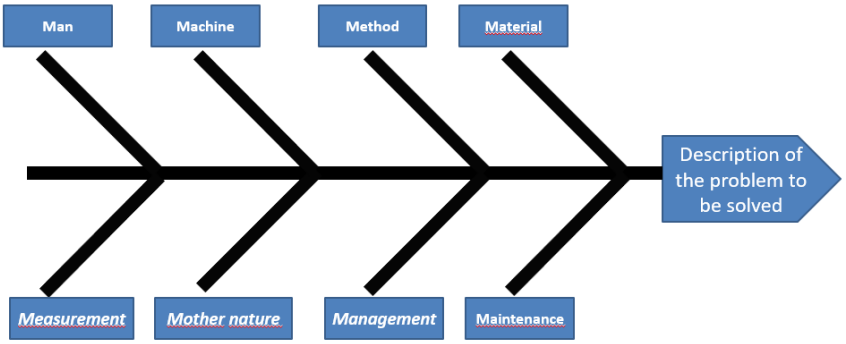
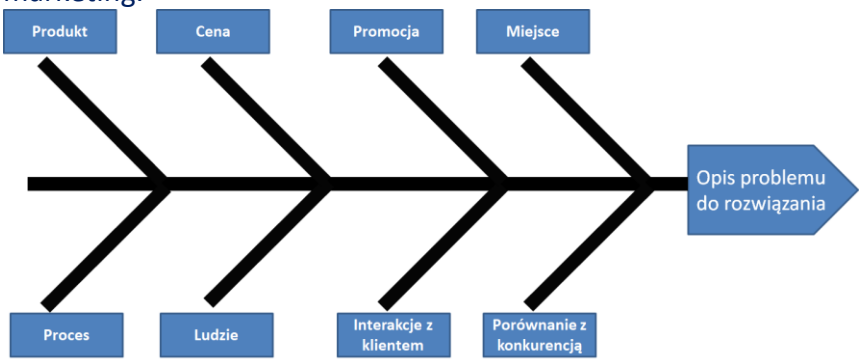


Source: Own elaboration.

This diagram distinguishes eight categories that can influence the occurrence of the problem:

1. **Man** - routine, inexperience, monotony, fatigue - every aspect related to human work,
2. **Machine** - is everything in the machine working at 100% efficiency, is the machine operational, etc.
3. **Method** - is the process of performing activities appropriate, is the sequence of activities optimal, etc.
4. **Material** - hidden, visible material defects, product dimensions, no holes, problems with the supplier, etc.
5. **Measurement** - whether the measurements were made appropriately, whether, for example, everything is good and the measurement system shows any error,
6. **Mother nature** - what is the impact of the environment on the process, i.e. humidity, temperature, but also e.g. noise,
7. **Management** - is the management adequate, are the employees given precise guidelines, etc.
8. **Maintenance** - whether the maintenance of the machine, facility, tools, etc. is neglected.

Ishikawa diagram - 8P modification, most commonly used in marketing.



Source: Own elaboration.

In this case, attention was drawn to slightly different categories that could cause the problem, due to its specific nature. In

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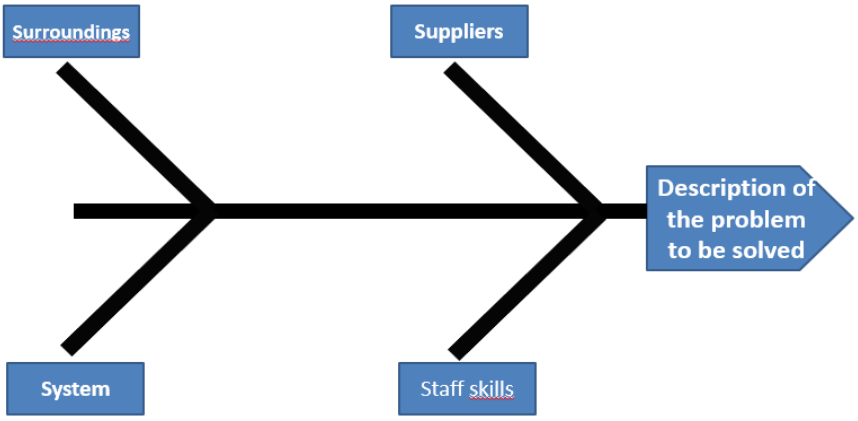
marketing, the following categories that may cause a problem can be identified:

1. **Product** - the physical aspects of the product,
2. **Price**,
3. **Promotion** - type of advertisement,
4. **Place** - location / environment,
5. **Process**,
6. **People**,
7. **Psychical evidence** - physical aspects of the places of interaction with the client,
8. **Performance** - results compared to the competition.

Ishikawa diagram - 4S, most commonly used in manufacturing companies.



Source: Own elaboration.

Another variant may be the following scheme:

1. **Surroundings** – the environment,
2. **Suppliers** – or sub-suppliers,
3. **System** – otherwise, a process,
4. **Skills** - staff skills.

Of course, the catalog of diagrams that can be used is not limited to what was presented above. Depending on various factors, such as the degree of complexity of the problem, industry, place of occurrence and others, it is possible to indicate other categories that may affect the occurrence of the issue. Each organization can create its own template for this diagram.

Due to the fact that the number of problem-causing categories can be large and that they can relate to many spheres of the company's activity, many specialists responsible for various sections of the company's activity should participate in the process of creating a diagram. They should have specialist knowledge, but above all, they should be able to share it and should not be afraid to reveal possible causes of problems.

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This diagram should be used for qualitative, major, few potential causes, and recurring problems.

Video:
How to create cause-and-effect diagrams:
https://www.youtube.com/watch?v=mLvizyDFLQ4 (Access 2021 10 21);
What is Fishbone Diagram? | What is ISHIKAWA diagram? | What is Cause and Effect diagram?:
https://www.youtube.com/watch?v=p-qAON7R06c (Access 2021 10 21);
Fishbone Diagram Explained with Example:
https://www.youtube.com/watch?v=JbRx5pw-efg (Access 2021 10 21);
Fish bone diagram (cause and effect):
https://www.youtube.com/watch?v=r_HWzOnvNnU (Access 2021 10 21);

3.5. G8D (Global 8 Disciplines) report.

The beginnings of the method date back to the seventies of the twentieth century. It was developed by the US Department of Defense and was included in the military standard Mil-Std-1520 titled "Corrective Actions and Placement Systems for Nonconforming Materials" referred to by Ford Motor Company engineers when developing and introducing in 1987 a new approach to problem solving called 8D - Eight Disciplines or TOPS Team-Oriented Problem Solving. Subsequently, this method was taken over and used in many industries.

The 8D method is designed to correctly identify the root cause of the problem and implement measures to prevent it from reoccurring. This method can be used in many industries, as it allows for a standard, systematic approach to solving the problem and its elimination in the future.

The development of this method is Global 8 Disciplines - G8D - (comprehensive 8 disciplines) - it is a method of creative problem solving of a technical nature. The extension consists in adding the preliminary stage D0.

Stages of G8D method:

D0. Preparation for the process.

At this stage, the problem(s) should be identified, systematized from the most important to the least important to be solved, and measures should be taken to prevent the problem from spreading. If it has already caused damage, care should be taken not to increase it.

It should also be decided if Global 8 Disciplines is the best method to solve this particular problem.

D1. Team selection.

An appropriate team of specialists in their fields is appointed and

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trained, the size of which, depending on the specificity of the problem, should not exceed 10 people (7 +/- 3 people). Individual team members should be assigned the appropriate roles and accompanying tasks:

- **Leader** - manages the work of the team, represents it outside,
- **Champion** - the main specialist in the field of the problem to be solved, organizing the work of the team,
- **Record keeper (secretary)** - documents team work,
- **Members** - professionals from various fields related to the problem.

The team should be properly empowered to implement the proposed solution to the problem. Each team member should be interested in solving the issue.

D2. Problem description.

At this stage, the problem and goals to be achieved are defined. The more detailed a problem is defined, the more precise the process of solving it can be.

In order to study the core of the problem well, it is especially important, among other things, to collect and analyze all the necessary data, determine what changed at the time of the problem, indicate the actual cause of the problem and whether it is repeatable. It may be helpful at this stage to gather physical documentation of the problem that has arisen.

After the problem has been properly defined, it is worth presenting it using the available techniques:

- histogram: to identify and analyze the effects (symptoms) of the problem,
- the charts present data related to the occurrence of the problem,
- Pareto chart to hierarchize the data needed to determine the essence of the problem,
- flowchart to present the process in which the problem occurred in a simple form,
- observation cards showing how often or how much the problem has arisen,
- photos, videos presenting the effects of the problem and its surroundings.

D3. Implementation and verification of temporary actions.

Quick, immediate, ad hoc, necessary actions aimed at improving the situation and preventing larger losses.

D4. Defining and verifying the root causes.

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At this stage, the significant (main) causes of the problem are identified. Among other things, it is necessary to distinguish the effects of the problem from its causes, indicate which factors have changed and contributed to the problem, indicate whether there is one main cause of the problem or there are more of them, and analyze how to verify the root cause. It is also necessary to identify major escape points, i.e. places in the process where the effects related to the root cause(s) of the problem should be identified and mastered, but in practice not identified and controlled.

An important part of this stage is also making sure that the control system is adequate and that the control documentation is up-to-date.

At this stage, we can use the following methods to discover the cause of the problem:

1. FMEA - failure cause-and-effect analysis,
2. 5S technique,
3. Six Sigma method,
4. 5 x Why,
5. Ishikawa diagram,
6. Pareto-Lorenz diagram.

D5. Verification of corrective actions.

The purpose of this stage is to select the best possible corrective actions to eliminate the root cause of the problem and escape points.

The first step is to propose as many actions as possible to eliminate the problem, then select the best of them (evaluation of the proposal - effects, costs), then develop an action plan to be implemented (who, what, when, by when), and finally implement it.

It is also important to inform all participants of the process about the actions taken and to introduce interim standards.

D6. Implementation of permanent corrective actions.

At this stage, ad hoc actions taken in stages D0 and D3 are replaced with appropriate actions, the operation of implemented solutions is monitored and effects are verified.

It should be based on real data from the processes. Actions should not be judged solely on the views of those concerned.

When implementing corrective actions, it is also necessary to take care of issues related to the determination of rights and competences in the implementation of improvements. Decisions are made as to whether external participation (customers or

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suppliers) will be needed and that is what it is supposed to be.

The means and resources needed to implement the activities are indicated. The next step is to decide whether, when and how to complete the implementation of corrective actions and to define measures determining effectiveness in the long term. On this basis, it is possible to draw a conclusion whether the intended goals were achieved and whether the problem was permanently resolved?

Systematically document the comparison between the existing states and the target state to determine how close to achieving the goal is.

D7. Protection against repetition.

If taken and implemented solution turned out to be effective and we have evidence of it, gathered at the previous stage, preventive measures should be developed and implemented to prevent the problem from recurring.

These actions are changes in systems, processes, procedures, documentation that will exclude or minimize the risk of the problem repeating itself.

The implementation of the G8D method should provide knowledge on the principles and methods of preventing future problems. Step D7 is to prevent the recurrence of the problem or similar problems.

The idea is to prevent the problem from occurring in the future and to prepare the company so that in the event of a risk of their reappearance, it can react, anticipating the problem before it repeats itself.

In order to properly design preventive actions, the history of the problem should be carefully analyzed.

1. At what point in the process was the problem?
2. Why did the problem arise at this point and why was it not noticed before?
3. What procedures, systems and processes have failed?
4. What should be done to prevent the cause of the problem from repeating itself?
5. Which activities are standardized?
6. How to communicate preventive actions to all concerned parties?
7. Have you identified all the sites and mechanisms that could be causing the problem to reoccur?
8. Were the introduced changes properly documented?
9. Have internal and external measures been revised to ensure that effective action has been taken in all areas

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where this issue could recur?

D8. Recognition of team and/or individual participation.

This is the end of the band's activity. All experiences are documented in the form of an A3 report or a dedicated G8D report. There can be a comparison of the process before and after the problem is resolved.

The leader evaluates the work of the team and draws conclusions for the future.

The G8D method should be used when:

- symptoms of the problem should be defined and measurable,
- people experiencing symptoms of the problem should be identifiable,
- the measures used to quantify the symptoms of the problem show that the priority of the symptom (e.g. urgency, importance for the enterprise, rapid development) justifies the use of this method,
- the causes of the problem are unknown,
- management undertakes to allocate the necessary resources to solve the problem on the basis of ad hoc corrective actions and permanent preventive actions,
- the complexity of the symptoms of the problem excludes the possibility of solving it by one person.

Employees responsible for various sections of the company's operations cooperate in the G8D method, thanks to their knowledge, experience and synergy effect, it is possible to look at the problem from different points of view. Due to all of the above-mentioned, it is possible to work out the right solution to the problem.

Video:
What is 8D Problem solving methodology?: https://www.youtube.com/watch?v=m-1XkPCI204 (Access 2021 10 21);
8D - Problem Solving: https://www.youtube.com/watch?v=DXRX6-b7204 (Access 2021 10 21);
8D Problem Solving Methodology: Introduction: https://www.youtube.com/watch?v=EpK2xan6IrU (Access 2021 10 21);
8D problem solving approach: https://www.youtube.com/watch?v=-9MUBLT0DjI (Access 2021 10 21);

3.7. CATWOE analysis

Business owners have their own vision of the development of an economic entity, a vision that is derived from their personal point of view, from their worldview, from the belief what will be best for a specific entity. Guided by their subjective feelings, changes are proposed that may have an impact not only on the economic

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entity itself, but also on the external environment.

CATWOE analysis is one of the techniques of business analysis, which consists in understanding the perspective of stakeholders and the impact that their view will have on the direction of business changes. Economic entities striving to change, encounter problems consisting in the fact that these changes may affect the company's stakeholders.

This analysis allows to identify problem areas and indicate what impact they may have on both the internal and external environment of the entity. Consequently, this analysis provides a comprehensive identification and understanding of different perspectives and allows for finding solutions that are beneficial from multiple points of view.

Before a specific change is proposed, a solution should be viewed from the perspective of stakeholders, which are:

- **C - Customers –** customers of the organization, users of its products or services; it is necessary to identify current customers and indicate how the planned change, solution to the problem can be perceived by them.
- **A - Actors -** employees of the organization; they are responsible for the production processes, but this may also be a problem for them and they participate in the change process,
- **T - Transformation process** - activities carried out by the enterprise (production, trade or services); it should be indicated how the process is going, what is in, between and out of the production process, what are its stages,
- **W - World view -** beliefs, meaning, wider view of the environment on what is happening in the company,
- **O - Owners -** owner, entrepreneur, investor who wants to make changes,
- **E - Environmental constraints -** the actual environmental elements that may affect the company's operations.

It allows to look at the proposed change, solve the problem from different perspectives and to find a solution that will take into account the point of view of the most important stakeholders for the company.

Before implementing changes, company identifies the point of view of stakeholders and determines what is of key importance to them. It looks at the consequences of the proposed change in a holistic way and thus gives the opportunity to indicate the direction that should be taken in order to expose the company to the smallest possible consequences.

Video:

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What is CATWOE?: https://www.youtube.com/watch?v=lvQYLIzE9gE (Access 2021 10 21);
CATWOE analysis, data collection tool for problem solving: https://www.youtube.com/watch?v=IIFYD05PLr4 (Access 2021 10 21);
CATWOE ANALYSIS: https://www.youtube.com/watch?v=YRqbM6ZpTHI (Access 2021 10 21);

4. Tools helpful for brainstorm solutions.

4.1. Brainstorming

The most popular method of generating ideas, used to solve problems creatively. According to the creator of this technique, the basis for unconventional solutions are ideas of people not related to a given field. Brainstorming allows you to express yourself freely and generate even the most unrealistic solutions to problems, answers, ideas in a very short time.

Brainstorming is carried out when the causes of the problem are not clear or ideas outside the box, the so-called "out of the box".

A properly conducted session should have a moderator whose task is to present the problem and the rules of the session, and then to conduct the discussion skillfully. Brainstorming does not require large investments or effort, which is its great advantage. The main shortcomings of the method include the possibility of being influenced by the participants' statements, as well as the risk of a “dominant” person appearing in the group.

Brainstorming is based on certain principles:

- Quantity, not quality of ideas - the brainstormers provide as many ideas as possible, which are not evaluated in the process of generating them.
- No criticism - ideas cannot be criticized or commented on by other participants (and themselves - self-criticism), because each such comment blocks the creativity and commitment of the session participants. Therefore, you should avoid such terms as: "We have already tried this", "This will not work for us", "This industry is characterized by its specificity", "You are a little rocking in the clouds", "This idea will not work", "The director will respond to it he won't agree". It is openness to bold and/or bizarre ideas that is the greatest engine for creativity.
- Combine, improve, modify emerging ideas - do not get attached to your ideas, they can be an inspiration for each new one, participants build on the ideas already presented, this is the added value of teamwork.
- Appreciate, thank everybody for unique, unusual ideas - thus you will encourage more creativity.

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Traditional brainstorming takes place in groups of 5 to 10 people, larger groups become less effective. It is good for such a team also to include people from outside the given domain / problem area, due to a possibly different perspective / outlook on a given problem. The meeting should take place in a room where it is possible to prepare a board / flip chart with cards (also with post-it notes) for writing down ideas in real time in a place visible to all participants. Each brainstorm should be chaired by the so-called moderator - a person who knows the rules of brainstorming, knows the problem and is able to conduct a discussion with appropriate questions, knows the team, can stimulate the imagination and actively listen, but also does not allow the participants to deviate from the topic.

Traditional brainstorming is divided into 3 stages:

Stage 1: Defining the problem.

Brainstorming begins with the correct definition of the problem. The problem must be able to be solved in many different ways. It cannot be too narrow or too general - e.g .:

The question "How could we increase the supply of fruit to schools?" it is too narrow as it only concerns delivery logistics.

The question "How could we sell more fruit in schools?" it is too broad, it does not indicate the direction of the changes that we would propose.

The best question that gives a chance to find solutions should be: "How could we encourage children in schools to eat more fresh fruit to help build good eating habits?" - thanks to such a structure of the question, we know everything that is our goal (looking for incentives to eat fruit), what is the purpose of introducing the suggested activities (supporting good habits), and what is the target group (children in schools).

Stage 2: Gathering ideas

After presenting the problem, there is a time (5-25 minutes, depending on the needs) to propose solutions. The moderator conducts the session as needed, in accordance with the adopted rules.

Stage 3: Analysis of the ideas presented

According to the principle - first generate, then evaluate! After collecting the material with ideas, we move on to discussing each of the proposed solutions and assessing it. During this time, participants choose the most appropriate idea, assessing the quality of the ideas, also justifying their opinion.

Brainstorm limitations according to S. J. Karau and K. D. Williams

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(1993, based on research):

- fear of someone else's evaluation of their own ideas (especially when the team includes people from higher levels of the corporate hierarchy);
- the larger the group, the stronger the temptation not to engage in activities, as a consequence (A) there will always be someone who will do all the work (so-called social laziness), (B) we will not use the potential of intelligent and creative employees;
- the inability to immediately submit ideas (such actions would cause chaos) extends the working time, discourages, makes people with ideas here and now wait;
- it is difficult to generate ideas and process / be inspired by others at the same time.

The response to such threats are the modifications to the traditional format of brainstorming, for example:
After presenting the problem, participants start work individually. Instead of collecting ideas in groups, each participant gets a chance to write down the solution on their own piece of paper (preferably each idea on a separate piece of paper). After the allotted time, cards with ideas are collected and shuffled, thanks to which each idea becomes anonymous. Then the ideas are read aloud, written down (possibly using post-it cards, stuck on the board). At this point, another session takes place, where the group gets a chance to form new ideas under the influence of inspiration from other team members.

Source:

https://witalni.pl/pojecie/burza-mozgow/ (Access 2021 10 09).
https://witalni.pl/baza_wiedzy/burza-mozgow/ (Access 2021 10 09).
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Karau, S. J. & Kipling D. W. (1993). „Social Loafing: A Meta-Analytic Review and Theoretical Integration". Journal of Personality and Social Psychology, vol. 65, no. 4, ss. 681-706. https://psycnet.apa.org/record/1994-33384-001

4.2. Reverse brainstorming.

Classic brainstorming focuses on finding solutions. Sometimes, however, this type of approach does not work and we find the antidotum in reverse brainstorming. The following technique is based on the belief that a person notices problems faster by nature, what causes a lot of unpleasantness in everyday life, can be great when using this technique and help in solving problems.

Reverse brainstorming is based on the scheme of its classic version, but at the input it has a completely different goal.

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Instead of asking "How can a problem be solved / avoided?" we ask, "What will make this problem occur?"; Instead of: "How to achieve the given goal / results?" we ask, "How could I achieve the opposite of what I intended?"

In traditional brainstorming, decomposing the problem into prime factors may inhibit the creation of new solutions, but in reverse brainstorming it is a great advantage. For example - instead of thinking about how to get loyal customers, the team lists all possible problems that discourage customers from purchasing from a given company. At the same time, it examines all potential problems that customers may encounter during transactions, while investigating the problem, they are able to list all potential obstacles, and ultimately also the cause of failures. Another example of reversing statements:
Primary problem: "How can we improve health center patient satisfaction?"
Inverted statement: "How to make health center patients more dissatisfied?"

You might think that looking for problems is not the goal of brainstorming. Well, reverse brainstorming doesn't end with gathering ideas. The last stage of this technique is to reverse ideas again, and thus indicate the solutions we wanted - the answers to the original challenge. Searching for causes and other potential problems (using the principles of traditional brainstorming - i.e., above all, freedom of expression, awareness that stupid ideas do not exist and no criticism) is just another way to find solutions based on the natural mechanisms of human behavior. And that can be more effective and bring unexpected results.

Source:

https://admonkey.pl/odwrocona-burza-mozgow/ (Access 2021 10 09).
https://coaching4smart.wordpress.com/2013/01/23/odwrocona-burza-mozgow/ (Access 2021 10 09).
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http://creatingminds.org/tools/reverse_brainstorming.htm (Access 2021 10 20).
https://blog.mindmanager.com/blog/2018/06/28/201806solve-business-problem-reverse-brainstorming/ (Access 2021 10 20).

Video:

How To Do Reverse Brainstorming To Generate Ideas:
https://www.youtube.com/watch?v=B5SmSoVuPRA (Access 2021 10 20).
Reverse Brainstorming Activity for Idea Generation:

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https://www.youtube.com/watch?v=AKe75wT90ac (Access 2021 10 20).

4.3. Method 635 (or 6-3-5 Brainwriting)

An alternative to the classic brainstorming is the way of working, completely different from the traditional version - method 635. This technique allows you to generate many solutions during a 30-minute brainstorming session in accordance with the principle "not every loud idea has to be the best".

The name of the method - 635 - refers to the concept of this brainstorm: 6 is the number of participants in the meeting (the most effective team), 3 is the number of ideas / solutions / ideas that are generated in 5 minutes (last digit) by one participant. The technique is based on individual work on a sheet of paper, but allows you to be inspired by solutions (integrating, supplementing, extending) that have already been proposed by the participants, without wasting time on unnecessary discussions or deliberations. After 5 minutes, the participants pass on their card, repeating the activities of generating solutions until each participant receives a card belonging to other people (6 rounds of generating ideas). As you can easily calculate - one such session allows you to generate (assuming that each participant will generate 3 ideas during 5 minutes) over 100 proposed solutions.

One of the advantages of the 635 method is its versatility, which means that the technique is suitable for companies to solve existing problems as well as to develop a new project. In addition, it can also be successfully used to generate ideas about non-business challenges in everyday life situations. Thanks to the written form, the participants show more courage and an open mind, creativity, and the risk of a dominant person is excluded, so all work with the same commitment (which is extremely important in the case of introverts). Unlike traditional brainstorming, technique 635 ensures active participation of all team members and freedom of expression (in writing).

After 6 ideational rounds (i.e. generating ideas) are completed, they are assessed in a similar pattern - each participant chooses the 3 best ideas from the list (e.g. by placing the "+" sign), then passes the sheet on and repeats the process of selecting the most interesting proposals . Further discussions, grouping of ideas and evaluations are already taking place in the team.

Although the 6-3-5 method requires 5-minute ideational sessions, this does not mean that you cannot modify individual elements - as a rule, the last sessions may take a little more time than at the beginning, so the session moderator may extend this time for the

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last stages. Important here is the flexible approach of the facilitator / moderator (although this does not have to be as formalized as in the case of classic brainstorming) to the situation in the group.

Unfortunately, like every method/tool, this one also has some disadvantages. Limited time can cause problems in generating good quality ideas. Working in silence (with a sheet of paper) is associated with the risk of similar ideas emerging due to the lack of immediate discussion, which may lead to the loss of possible innovations / solutions.

Source:
https://www.designmethodsfinder.com/methods/method-635 (Access 2021 10 20).
https://t2informatik.de/en/smartpedia/635-method/ (Access 2021 10 20).
https://podojo.com/how-to-6-3-5-brainwriting/ (Access 2021 10 20).
https://admonkey.pl/brainwriting-635/ (Access 2021 10 20).

Video:
Method 6-3-5 (BrainWriting):
https://www.youtube.com/watch?v=TR1i1PPd8ZU (Access 2021 10 20).

4.4. SCAMPER.

The SCAMPER technique is used to find solutions to specific problems. It is easy to implement, it works well both in group and individual work. SCAMPER enables continuous improvement while solving problems (or coming up with new ideas / improving existing ones). The technique is based on the principles known from traditional brainstorming, however, it gives the context, the starting point, inspires and suggests not limiting, but directing our thinking on the right track. Before starting the process of creating solutions, we carefully define the problem to be worked on and set a goal. It is best to break down the problem into smaller components that will allow you to review its basic features (combining various aspects of the problem) according to the areas proposed in the SCAMPER technique. After defining the topic, we start looking for solutions according to 7 designated areas / ways of thinking.

SCAMPER is an acronym for the English equivalent of the next steps / phases / areas of the invention process that organize and reinforce this process. These are:

1. **S – substitute, replace** - we replace a certain fragment/part of a problem (concept, product/service, process, procedures) with another.
   At this stage, we can ask ourselves the following questions:
   - What parts of the problem can we replace/change?
   - Is there another way we can use?
   - Is there another thing we can introduce?

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- Can we replace some assumptions about the problem (perhaps someone involved in the process)?
- What if you change your feelings/attitude towards the product/process?

2. **C – combine –** we combine the thing we are analyzing with another. Perhaps one solution on its own does not bring the desired results, but when combined with another idea, it will be more efficient.
   At this stage, we can ask ourselves the following questions:
   - What functions known from other solutions would work in our area or create something not obvious?
   - Can we combine certain elements of the problem with others so as to redefine the problem?
3. **A – adapt, adjust -** we copy an existing solution, transfer something that works well in another field to our problem.
   At this stage, we can ask ourselves the following questions:
   - Can we in any way adapt the analyzed problem to the existing process in our industry (or other)?
   - Are there examples of products / services / processes that have similar problems?
   - Is there any context in which our ideas could be useful?
4. **M – modify –** we change shapes, sizes, scale, colors, arrangement, etc., an aspect of a situation or problem, anything that can be modified to see if it gives a new value, insight.
   At this stage, we can ask ourselves the following questions:
   - Are there dimensions of our idea that we can expand, reduce or modify in any other way?
   - (in the context of non-physical modifications) How can we change the way our idea is perceived in terms of shape, history, appearance, style?
5. **P – put to another use, suggest a different use -** we use an existing idea, but in a different way than intended. For example, we modify the target group or the way of using the discussed item (in the context of the discussed problem).
   At this stage, we can ask ourselves the following questions:
   - What applications are we not considering?
   - Who might be interested in our idea?
   - What would happen if we changed the environment?
   - Let's look at the problem from the perspective of a child, an elderly person ...
6. **E – eliminate –** we remove, we subtract some elements, thus creating a new idea, we wonder how we can simplify the process we are analyzing. We give up wastage and ineffective

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processes to ultimately improve them.

At this stage, we can ask ourselves the following questions:

- How we could get rid of certain elements to improve the idea/process.
- What would happen if we subtracted part of the idea, what would it look like, how would other people react?
- What is irrelevant or unnecessary to achieve the intended goal?

7. **R – reverse, change the order** - we change the layout, arrangement, components of the product, we turn the situation upside down, we start from the end, against the original goal.

   At this stage, we can ask ourselves the following questions:

   - How can we reverse an idea / situation so that it is the opposite of our assumptions?
   - Is it possible to change the order / direction in which the idea / process is currently implemented?
   - What roles can you reverse, swap?

Source:

https://klosinski.net/generuj-pomysly-metoda-scamper/ (Access 2021 10 22).
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Video:

Creative Thinking | SCAMPER Technique:
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How can SCAMPER help build & shape ideas?:
https://www.youtube.com/watch?v=qRY-1YAmbY4 (Access 2021 10 22).
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https://www.youtube.com/watch?v=u4hKqgEeWRg (Access 2021 10 22).

4.5. Walt Disney Technique.

Rarely, Walt Disney is associated with the strategy of planning and implementing projects, and yet, although it should be added at the beginning, the name does not indicate the creator of the presented tool, but the observation of its way of working as

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a visionary and entrepreneur (in 1994 the method was developed by Robert Dilts). **The technique, otherwise known as the Three-Chair (or Three-Room) Method**, has been proposed as a universal tool that can be used both individually and in a larger group. When looking for solutions to complex problems, it is very important to take the right perspective. The proposed technique allows you to look at the issue from many perspectives and distance, therefore it is an ideal method for teams (or individuals) dealing with complex problems.

The main assumption of the Walt Disney Method is to find solutions for which we will identify potential threats and create a complete picture of the project.

Using this method, when looking for solutions, we "sit" (according to the alternative name of the tool, "we are") only on this particular chair (or we are in this particular space/room). Each phase has its specific purpose, time and place to take the right perspective - to assume the right role. It is best if the individual roles are played by different people - however, this does not limit the possibility of using this method on your own.

Phase 1: The first chair - the dreamer's/visionary's chair.
At this stage, we come up with abstract solutions that seem impossible to implement. We dream without limits on this chair, which means that the suggestions given do not have to correspond to reality. We write down everything because every idea is good. The given ideas cannot be criticized - we will have time for that in the last phase.

Phase 2: The second chair - realist's chair (also known as gray reality)
At this point, we evaluate our ideas. We translate the proposals into an implementation plan. We determine whether they are to be performed, what resources we need to implement them, what data we have, what we do not have, how the plan should look like, how much its implementation will cost. We analyze step by step - what should happen to make the dreamer's plan a reality (ignoring its weaknesses).

Some support questions:

- What is needed to implement an idea?
- Do we have the resources to make this idea a reality? (or whether we are able to provide them)
- How much work is needed to implement this idea?
- What are the chances of success?
- Is it possible to implement each individual sentence?

Phase 3: Third Chair - Critic's Chair.
This is where it is time to criticize anything that is invented,

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anything that is possible to criticize. Our goal is to find all possible gaps, potential problems, areas that are underdeveloped, the most weak points of our idea. So we wonder what will go wrong as we assume, what will not come out, what will fail - everything possible, the greatest dangers are criticized in order to assess whether it is actually a sensible solution to be put into practice.

Questions to help at this stage:

- What obstacles may arise during the implementation of tasks?
- Which elements can cause the biggest problem during implementation?
- What could potentially go wrong assuming a worst-case scenario?
- What's missing from the plan?

There are also modifications in which “the criticism” and “the realist” phases will be swapped in order to define all the critical elements of the proposed solutions before formulating real plans.

The greatest advantage of this technique is the generation of refined solutions - not only ideas, but also refined actions, often ready for implementation (taking into account the possibilities, threats, needs and methods of implementation). Among the advantages of this technique, it should also be emphasized that it is possible to objectively assess the problem and potential solutions by looking at it from different perspectives that do not mix with each other (which otherwise often leads to hasty decision-making).

A similar approach was proposed by Edward de Bono in the technique of the so-called “six mental hats”, where, on a similar principle as above, the participants play different roles, this time putting on 6 colorful hats (more, among others: https://www.mindtools.com/pages/article/newTED_07.htm; https://www.debonogroup.com/services/core-programs/six-thinking-hats/ (Access 2021 10 21)).

Source:
https://www.projektgamma.pl/strefa-wiedzy/wiki/metoda-walta-disneya (Access 2021 10 21).
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Video:

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Working collaboratively: The Disney Strategy: https://www.youtube.com/watch?v=FyOBk0filqs (Access 2021 10 21).
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The Disney way: inspiration, creativity, and having faith in your team | Tom Craven | TEDxACU: https://www.youtube.com/watch?v=bPFhSWwp-ds (Access 2021 10 21).

4.6. Lorenzo-Pareto diagram.

Italian economist Vilfredo Pareto, studying the distribution of the population's income, found that 20% of the population owns 80% of the wealth. The operation of this principle, called the "Pareto Principle", turned out to be so universal that it was also applied in other areas of life.

One of its modifications is the Lorenzo-Pareto diagram, which can be applied to the hierarchy of factors influencing the analyzed phenomenon.

The Lorenzo-Pareto analysis is created in such a way that the Pareto diagram, which is a graphical representation of the data on a bar chart, overlaps the Lorenzo line, which runs along the vertices of the histogram, in a decreasing manner. A visualization of the application of this method is presented below.

The table below shows the frequency of the problems. The first column lists the problems identified in the enterprise in order of the most common. The frequency of their occurrence is presented in the next column.

The next column shows the number of problems incrementally. In column D, you can read the percentage share of the number of occurrences of a given problem in the total number of occurrences of all problems.

In the last column, the number of occurring problems has been calculated cumulatively.

Category / Problem	Numerical value	Cumulatively	Percentage	Lorenzo curve
Problem 1.	346	346	34,6%	34,6%
Problem 2.	249	595	24,9%	59,5%
Problem 3.	205	800	20,5%	80,0%
Problem 4.	111	911	11,1%	91,1%
Problem 5.	72	983	7,2%	98,3%
Problem 6.	17	1000	1,7%	100,0%

Source: Own elaboration.

The Lorenzo-Pareto diagram is created in such a way that the data from column D is used to prepare a bar graph. This way, we can read which problems occur most frequently. Then we place the data from column E on the same graph.

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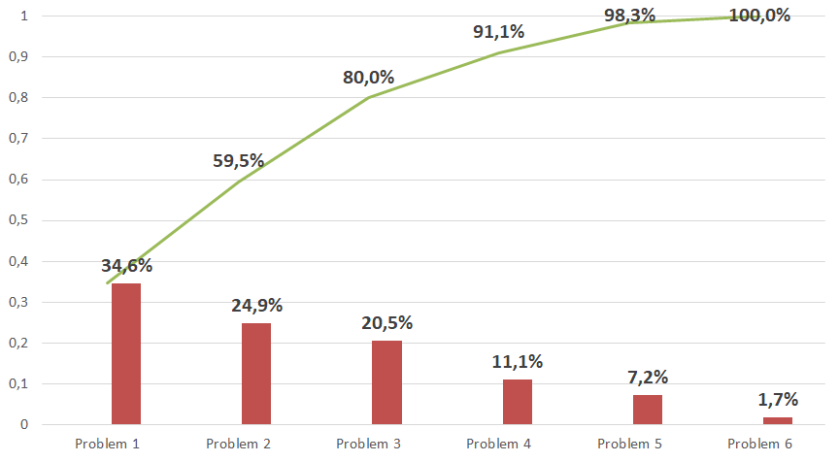

Source: Own elaboration.

Having such data, we are able to determine which problems are responsible for the greatest number of deficiencies and which should be the first to focus on. Looking at the chart above, it should be noted that the elimination of problems 1 to 3 will reduce the number of defects by 80%. In this way, the company knows which problems to tackle first.

The advantages of using the Lorenzo-Pareto diagram include:

- prioritizing problems according to the most important causes,
- indicating the priorities on which to focus in order to reduce the number of problems as much as possible,
- focusing resources on eliminating the most important causes of problems, which allows avoiding the dispersion of resources on eliminating all causes,
- facilitating communication by presenting the essence of action in a simple, graphic way.

By using the Lorenzo-Pareto diagram, companies can focus on taking corrective and preventive actions for a relatively small group of problems that will translate the most into removing the deficiencies. The small scale of activities translates into relatively large effects in terms of improving the effectiveness of activities.

Video:

3 Powerful Ways To Use The 80/20 Rule: https://www.youtube.com/watch?v=nJIJtWuAbBc (Dostęp 2021 10 21);
How to Use the 80/20 Rule - 5 WAYS with Examples | The Pareto Principle: https://www.youtube.com/watch?v=TqI6Axe_ZOk (Dostęp 2021 10 21);
Improve Your Productivity With the 80/20 Rule: https://www.youtube.com/watch?v=zPoA6dzKmtg (Dostęp 2021 10 21).

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Glossary	**Alternative of solving problem -** a variant that allows for solving the situation taking into account future consequences (positive and negative as well). **Brainstorming -** a bridge that connects a less formal approach to problem solving with lateral thinking, focuses on the number of ideas, does not evaluate ideas and allows them to be created in large amount. **Decisional assumptions** - decision-making issues with two main spheres: beliefs about cause-effect relationships and preferences regarding possible outcomes. **Decision making limitations** – legal, ethical, financial or political barriers blocking the implementation of the idea. **Environmental factors** – uncontrolled factors beyond the control of the decision-maker **Complex problem –** this is a difficulty in making decisions that must be considered on an individual basis and the results of actions taken to address this problem can be described as highly uncertain.
Self-evaluation	Below are both single-choice and multiple-choice questions: 1) Complicated problem: a) contains subsets of simple problems b) is unique c) have uncertain results 2) Complex problem is characterised by: a) repeatability b) unique scheme c) contains subsets of simple problems 3) Deming cycle not include term: a) plan b) evaluate c) do 4) In the case of a simple problem, you can: a) in easy way identify consequences b) indicate that there are causes that are consequences of other causes c) not identify consequences 5) Analyzing the results against the goals set in the planning phase is an action: a) do b) check c) evaluate

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6) It does not belong to the rules of brainstorming:
   a) focusing on the quality of ideas in the early stages
   b) creating chain of ideas developing each other
   c) accepting all ideas, even the craziest ones

7) According to the theory of complex problem solving, three types of factors verifying the impact of the proposed solutions should be mentioned:
   a) environmental factors
   b) unstable decisional factors
   c) consequences

8) The best method of overcoming barriers to organizational changes is:
   a) code of ethics policy
   b) selective communication
   c) training activity

9) Among the tools helpful in identifying the problem and its causes, the following are distinguished:
   a) Ishikawa diagram
   b) 5x Why?
   c) PDCA cycle

10) Among the tools helpful in generating solutions to complex problems the following are distinguished:
   a) 635 method
   b) 5x Why?
   c) SCAMPER

Answers: 1a, 2b, 3b, 4a, 5b, 6a, 7b, 8c, 9a,b, 10a,c

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