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# DIFFICULTIES SEEN BY POLISH MANAGERS RELATED TO THE USE OF THE A3 THINKING APPROACH IN THE PROBLEM-SOLVING PROCESS

TRUDNOŚCI DOSTRZEGANE PRZEZ POLSKICH MENEDŻERÓW W ZWIĄZKU ZE STOSOWANIEM PODEJŚCIA A3 THINKING W PROCESIE ROZWIĄZYWANIA PROBLEMÓW - STUDIA PRZYPADKÓW

**Keywords:** A3 Report; A3 Thinking; difficulties; competences; problem owner

**Słowa kluczowe:** Raport A3; Myślenie A3; trudności; kompetencje; właściciel problemu

## Abstract

The practice of management is connected with incessant problem-solving. In the literature and management science practice, you can find many methods of solving problems. However, the A3 Thinking is gaining more and more popularity. Nonetheless, managers list numerous difficulties connected with effective implementation of the steps of A3 Thinking in organizations. The aim of this paper is to show which of the stages of the problem-solving process, implemented in accordance with the A3 Thinking approach, causes the most difficulties for Polish managers, and what sort of difficulties are they. These difficulties may be related to a shortage or lack of specific competences. Therefore, it is important to define what competences are crucial for effective problem-solving using the A3 Thinking approach, and which of them require significant development. The author is also interested in finding how would Polish managers improve the problem-solving process. To answer the research questions raised, the author conducted a literature review and a qualitative research – multiple case studies. As part of the qualitative study, twelve in-depth interviews were made.

## Streszczenie

Praktyka zarządzania związana jest z nieustannym rozwiązywaniem problemów. W literaturze nauk o zarządzaniu można spotkać wiele metod rozwiązywania problemów. Coraz większą popularność zyskuje jednak podejście A3 Thinking, choć menedżerowie wskazują liczne trudności związane ze skutecznym implementowaniem kroków A3 Thinking w organizacjach. Celem niniejszego opracowania jest pokazanie, który z etapów procesu rozwiązywania problemów, realizowany zgodnie z podejściem A3 Thinking, sprawia najwięcej trudności polskim menedżerom i jakie to trudności. Trudności te mogą być związane z niedoborem lub brakiem określonych kompetencji. Istotne jest więc zdefiniowanie jakie kompetencje są kluczowe dla skutecznego rozwiązywania problemów z wykorzystaniem podejścia A3 Thinking oraz które z nich wymagają rozwijania. Autorkę ciekawi również, w jaki sposób polscy menedżerowie usprawniliby proces rozwiązywania problemów. Aby odpowiedzieć na postawione pytania badawcze, autorka dokonała przeglądu literatury oraz przeprowadziła badanie jakościowe – wielokrotne studium przypadku. W ramach badania jakościowego przeprowadzono 12 wywiadów pogłębionych.

## INTRODUCTION

The practice of management is connected with incessant problem-solving. This process is therefore one of the most critical aspects of management in an organization [Marksberry, Bustle and Clevinger, 2011]. Effective problem-solving can increase productivity, reduce the number of defects, improve financial results, or increase employee job satisfaction. Problems create opportunities and an appropriate approach to the process of their resolution allows for improvement of activities in the organization and organizational learning. A structured approach to problem-solving is directly connected with organizational performance and the ability to repeat successful outcomes [Perloff and Carlton, 2004].

A problem is an organizational situation that brings about specific difficulties or constitutes a smaller or larger deviation from the deliberate, optimized state of a system or subsystem [Perlaki, 1974]. According to Shook, the problem is something which turns out to be an obstacle for the organization in attaining its goals (visible problem) and is in some way linked to the way work is designed or performed (work problem) [Shook, 2012]. In the literature and management science practice, you can find many methods of solving problems. However, the A3 Report, derived from the Toyota Production System (TPS), is gaining more and more popularity. This method reflects the PDCA (Plan, Do, Check, Act) cycle and is based on a scientific approach to creating knowledge in an organization [Marksberry, Bustle and Clevinger, 2011]. It is a kind of telling a story about the problem. As highlighted by Liker and Meier, every good story has an introduction, development, and ending, and sometimes also some suggestion for a continuation [Liker and Meier, 2011]. These stages are interrelated and form a single whole. A similar approach to problem-solving is based on the use of the A3 Report steps. The A3 serves as a mechanism for managers to mentor others for root cause analysis and scientific thinking, encouraging productive dialogue, helping people learn from one another [Shook, 2009]. It is an outstanding communication tool with a logical, visual, and standardized structure [Sobek and Smalley, 2008]. The A3 report most often includes the following steps: defining the problem, analysing the current situation, defining goals, identifying root causes, proposing remedial measures, planning their implementation, and implementing further actions [Shook, 2012; Sobek II and Jimmerson, 2004; Sobek, and Smalley, 2008; Dennis, 2015; Liker, Meier, 2011; Koskela et al., 2020]. The A3 Report is a powerful and effective tool for a deep understanding of both the problem itself and the opportunities it creates, and how to solve it [Sobek and Smalley, 2008]. It is a method with a built-in review process, included in teamwork framework [Raudberget and Bjursell, 2014]. Sometimes, however, it is treated as a meaningless A3 sheet of paper, used "only" to record information from individual stages of problem-solving, report the status of work on the problem, and present new solutions [Mann, 2015; Koskela et al., 2020]. However, something more needs to be seen in it, namely the way of thinking about problems and an important element of organizational learning. A3 Thinking is Toyota's approach to using A3 Reports as the standard form of communication throughout the organization throughout all levels [Lloyd, Harris and Blanchard, 2010]. Therefore, the Report is used to document the thinking process and it is supposed to be flexible and adapted to the current problem [Anderson, Morgan and Williams, 2011].

Thinking and reasoning (analysis, evaluation, problem-solving, and decision-making) are skills that can be acquired and refined, they are skills of a higher order than just simple cognition, recalling, or understanding of facts [Butterworth and Thwaites, 2013]. Problem-solving and thinking are inextricably linked [Glatzeder, Goel, and Müller, 2010]. Problem-solving is a process of endless thinking and action [Sobek and Smalley, 2008]. The end result is dependent on the way of thinking of the participants in the problem-solving process. Each tool is only as effective as the user's thinking style and ability to use it are effective. A rigorous approach to action and accuracy and style of communication are also important, and in the case of A3 Thinking, a way of operating based on cooperation and objectivity and focusing on facts [Sobek and Smalley, 2008]. Solving problems using A3 Thinking is looking at a specific problem identified by direct observation or experience "with new eyes" [Lee and Kuo, 2009]. Sobek and Smalley, on the basis of the A3 Report used in the Toyota Production System, proposed seven key elements of A3 Thinking: logical thinking process; objectivity; results and process; synthesis, distillation, and visualization; alignment; coherency within and consistency across and systems' viewpoint [Sobek, Smalley, 2008]. A3 thinking is not just a sequence of actions, but also an appropriate

approach to each and every stage of problem-solving. And in order to do that, it is not enough to know the layout of the A3 Report.

Implementing of A3 Thinking in an organization is connected with many difficulties pointed out by the authors of the publications [Saad et al., 2013a; Tortorella, Viana and Fettermann, 2015; Tortorella, Cauchick-Miguel and Gaiardelli, 2018; Oliveira and Nodari, 2010; Arantes and Giacaglia, 2013; Silva Filho and Calado, 2013; Sobek II and Jimmerson, 2004; Sobek and Smalley 2011; Shook, 2012].

During the cooperation with Polish business organizations operating in the Lean environment, the author often hears from managers what in their opinion has a negative impact on the effectiveness of the problem-solving process. Managers enumerate numerous difficulties, including, among others, competence shortages of employees responsible for solving problems and difficulties related to the lack of objectivity. The discussions held by the author with managers were the motivation to conduct a structured research on the difficulties related to the use of the A3 Thinking approach in the problem-solving process.

In her work, the author posed the following research questions: Which of the stages of the problem-solving process, implemented in accordance with the A3 Thinking approach, causes the most difficulties for Polish managers working in the Lean environment, and what sort of difficulties are they? What competences of problem owners are, in the opinion of Polish managers, crucial for effective problem-solving using the A3 Thinking approach, and which of them require significant development? How would Polish managers improve the problem-solving process?

Problem owners are people who were indicated by the management of the organization to solve a specific problem and are responsible for solving it.

In order to reply to the research questions, the author conducted a literature query aimed at, *inter alia*, indicating the difficulties connected with applying the A3 Thinking approach in the problem-solving process and obtaining information about the competences necessary for problem-solving.

The author also conducted an empirical study, a multiple case study, among Polish managers operating in the Lean environment, conducting twelve partially structured in-depth interviews.

The study results allowed for the collection of information on competencies that, according to Polish managers, are desired in employees responsible for problem-solving. They also allowed for the creation of a list of difficulties that arise at particular stages of the problem-solving process, which affect Polish managers the most. The information obtained can be used as input data for the design of training programs and study programs covering Lean Management and problem-solving. They can also be a guide for managers in the context of developing competencies among employees responsible for problem-solving.

## **A3 THINKING – OVERVIEW OF THE DIFFICULTIES OF USING THE APPROACH AND THE COMPETENCY REQUIREMENTS - LITERATURE REVIEW**

A3 Thinking is Toyota's approach to using A3 Reports as the standard form of communication throughout the organization at all levels [Lloyd, Harris, & Blanchard, 2010]. Thus, the aim of the A3 Report, as already pointed out, is documenting the thinking process and is to be flexible and adapted to the current problem [Anderson, Morgan and Williams, 2011]. The A3 report is a worksheet containing several sections that are filled out when solving a specific problem. It is recommended that it includes data and information in graphic form. Its layout and the way of filling out the sections allows it to be placed among the instruments of visual management [Simons et al., 2014]. The A3 report typically includes the following sections [Sobek II and Jimmerson, 2004; Shook, 2012; Sobek and Smalley, 2008; Dennis, 2015; Liker and Meier, 2011; Koskela et al., 2020]: Theme (problem definition); Background (relevant background information that is necessary to understand the scope and severity of the problem); Current Condition (information about the current results of the process); Target Statement / Future Goal (determining what results are desired and what results are to be achieved), Root Cause Analysis (identifying the causes of the problem, determining what is the essence of the problem); Countermeasures/Target Condition (proposed solutions, methods of counteracting the problem, improvement proposals);

Implementation Plan; Follow-up Action (information on how actions will be reviewed to make sure that the problem has been eliminated; the last stage is drawing conclusions and knowledge sharing).

Sobek and Smalley, on the basis of the A3 Report used in the Toyota Production System, proposed seven key elements of A3 Thinking, based on common sense [Sobek and Smalley, 2008]: logical thinking process; objectivity; results and process; synthesis, distillation, and visualization; alignment; coherency within and consistency across; systems viewpoint. The key to the success of the problem-solving process is the interoperability of these elements.

A3 thinking can be applied to problem-solving in all definable industries. In the literature, however, an increasingly extended use of this method can be observed. In addition to typical problem-solving, A3 Thinking was tested as: a case analysis tool during MBA studies [Anderson, Morgan and Williams, 2011], a scientific method of improving performance in an academic research vivarium [Bassuk and Washington, 2013], an innovative standard of academic communication [Loyd, Harris and Blanchard, 2010], a tool for transferring knowledge from implicit to explicit forms [Raudberget and Bjursell, 2014], or as an instrument for coping with difficulties in the product development process [Saad et al., 2013b]. This is when the basic steps of A3 Thinking are subject to change. Anderson, Morgan and Williams propose: after defining the problem, describe the background and present state, analyse root causes, think about the target state (desired state), define alternative actions and indicate the preferred ones, develop an action plan and a schedule. The last step is planning further activities, evaluation, and success measures [Anderson, Morgan and Williams, 2011]. As part of improving academic communication standards, Loyd, Harris and Blanchard gather student feedback (at the end of the course) according to the following steps: background, current condition (course impressions and expectations), goal (what was the student's goal in the context of the course?), analysis (the student's experience after completing the course, in relation to his/her expectations), what is good (information about the most valuable information, concepts, and the most memorable moments obtained by the student during the course), what is bad (suggestions for improvement actions) [Loyd, Harris and Blanchard, 2010]. Bassuk and Washington propose the following steps in the context of improving the performance in an academic research vivarium: problem definition, background, current state, root cause analysis, target condition, countermeasures, implementation and cost analysis, test, and follow-up/audit [Bassuk and Washington, 2013]. Saad and others in their template proposed a division into two sections. The first section coincides with the steps of the traditional A3 Report. The second section, inspired by Borton's reflection model [Borton, 1970], deals with reflection: reflection of What (to define the knowledge), reflection of So-what (to formulate and standardize the knowledge to be applied), reflection of Now-what (to identify where is the knowledge needed) [Saad et al., 2013a].

Regardless of the purposes for which we use A3 Thinking, the implementation of individual steps is connected with overcoming many difficulties. The management sciences literature indicates difficulties related to the effective implementation of A3 Thinking. Selected examples of these difficulties are presented in Tab. 1.

**Table 1. Difficulties related to the effective implementation of A3 Thinking indicated in the literature**

DIFFICULTY	AUTHORS
difficulty with completing a multidisciplinary team; difficulty in filling out the A3 report due to the very dynamic pace in the meetings	Lorenzi and Ferreira, 2018
tendency to skip the stages of problem analysis, incorrect identification of the problem to be solved, inadequate collection of information related to the situation in which the problem occurs, capturing and sharing the knowledge acquired	Saad et al., 2013a; Tortorella, Viana and Fettermann, 2015; Tortorella, Cauchick-Miguel and Gaiardelli, 2018; Oliveira and Nodari, 2010

difficulties also arise from the fact that each person has their own assumptions, which differ depending on their education, culture, and knowledge, which makes it difficult to reach consensus on possible causes	Oliveira and Nodari, 2010; Arantes and Giacaglia, 2013; Silva Filho and Calado, 2013; Tortorella, Viana and Fettermann, 2015; Tortorella, Cauchick-Miguel and Gaiardelli, 2018
insufficient understanding of the current condition by the person responsible for solving the problem (team), incompetence, lack of inventiveness, focusing too much on people and connecting the problem with the human, pointing to the guilty ones	Sobek II and Jimmerson, 2004
common mistakes in writing A3 Reports: the scope is too big for initial A3 assignments; the A3 is an answer in search of a problem; no clear depiction of the process or situation; the entire document is in text; no PDCA cycle for improvement; the problem statement is vague or missing; the analysis is superficial and does not get to cause and effect; the Goal Statements are fuzzy or action items in disguise; there are no clear assignments regarding who does what by when; the check part of the equation lacks and relevant before and after comparison of effect; the countermeasures don't really address the root causes; there is no plan for reflection, standardization, or follow up at the end	Sobek and Smalley, 2011
bias in data collection, bias, rigid approach to problems, fundamental attribution related errors and other cognitive biases, making decisions based on opinion rather than evidence	Shook, 2012

**Source:** Own elaboration based on Lorenzi, Espindola Ferreira, 2018; Saad, Al-Ashaab, Shehab and Maksimovic, 2013a; Tortorella, Viana, Fettermann, 2015; Tortorella, Cauchick-Miguel, Gaiardelli, 2018; Oliveira i Nodari, 2010; Arantes i Giacaglia, 2013; Silva Filho and Calado, 2013; Art Smalley, <http://a3thinking.com> (15.01.2021); Shook, 2012

What can we do to eliminate the difficulties connected with effective implementation of the A3 Thinking approach? Tortorella, Viana, and Fettermann propose to supplement the problem-solving process with a method based on triangulation techniques that utilize focus groups for a qualitative data survey and the approach presented by Ward called Look – Ask – Model – Discuss – Act (LAMDA), which was originally designed for cycles of knowledge creation applied in development of products or processes [Tortorella, Viana and Fettermann, 2015]. However, each of the methods of collecting data, their analysis and generating valuable ideas for improvement requires the development of specific skills. Abazov believes that a problem solver should have the following skills: the ability to identify the problem's nature, deconstruct it (break it down) and develop an effective set of actions to meet the challenges associated with it [Abazov, 2016]. Butterworth and Thwaites point to critical thinking and creative thinking, and thus the ability to select and interpret information and generate unconventional ideas, as basic competencies in problem-solving [Butterworth and Thwaites, 2013]. Effective problem-solving leads to organizational learning, and as Akbar and Kusnendi argue, especially in the world of education and learning, critical thinking competences bring great benefits and are needed in a global era [Akbar and Kusnendi, 2019].

The authors point to the following competences necessary for effective problem-solving using the A3 Thinking approach [Shook, 2012; Sobek and Smalley, 2008]: the ability to apply different ways of thinking and reject opinions and use facts; the ability to analyse data, investigate the situation, detective work; ability to define problems; the ability to observe, ask questions, listen and draw conclusions, and reflect; ability to think independently, initiative; responsibility; the ability to see opportunities in emerging problems, openness to different possibilities, the ability to generate unconventional solutions; the ability to tell stories; the ability to think contextually, identify and analyse coexisting factors related to something; the ability to create standards; the ability to achieve a consensus, agreement; the ability

to admit mistakes and ignorance; the ability to involve other people in activities; the ability to look to the future; teamwork skills; the ability to present data and information in a graphical way.

The aforementioned competences are largely connected with the ability to think critically and creatively. Therefore, it can be assumed that the shortage of these competences will make it difficult to effectively apply the A3 Thinking approach. After all, the literature query shows that the problem-solving process is associated with the constant dealing with the lack of objectivity and bias of the people responsible for solving the problem, cognitive errors and patterns of human reasoning, reluctance to share knowledge, inadequate definition of problems, insufficient understanding of the current state and sources of the problem, biased and superficial data analysis, bias in data collection, lack of creativity and reflection, connecting people with problems, or making decisions based on opinions rather than facts.

Critical thinking and problem-solving are very broad skills and not a set of knowledge that must be learned and repeated. A competent thinker is one who is able to cope with both the unexpected and the expected [Butterworth and Thwaites, 2013]. Most often we are unable to solve problems using only our existing knowledge, we must change the way of thinking, which will allow us to identify the source of the problem more effectively, define the essence of the problem, define organizational difficulties and design solutions. Regardless of which method of problem-solving we apply, problem-solving involves constant juggling between different ways of thinking, learning, and developing competences.

Taking into account the results of the literature query and her own professional experience, the author decided to conduct a qualitative case study among Polish managers, formulating the following research hypotheses: H1. The stages of analysing the current situation and proposing remedial measures cause the most difficulties in the problem-solving process for Polish managers working in the Lean environment; H2. Polish managers indicate the specific competencies of problem owners which, in their opinion, are crucial for effective problem-solving applying the A3 Thinking approach, and those competences that require significant development; H3. Polish managers indicate specific proposals for ways to improve the problem-solving process in line with the A3 Thinking approach.

In point 4 of this publication, the author presents the results of a qualitative research conducted among Polish managers working in the Lean environment.

## METHODOLOGY

Polish managers working in the Lean environment are more and more willing to use the A3 Thinking approach in the problem-solving process. However, these managers see many difficulties that affect the effectiveness of the problem-solving process. What are these difficulties? The deficiency of which competences (owned by the problem owner, i.e., the person responsible for solving a given problem) affect these difficulties? And which competences are critical from the point of view of the problem-solving process? How to improve the problem-solving process?

In order to answer the research questions posed by the author, a literature study and an empirical study were conducted. Considering the fact that research questions begin with the question: "how?" and "what?" the author chose qualitative research, multiple case studies with the use of in-depth interviews as the most appropriate research method. Owing to case analysis, it is possible to confront one's own reasoning with the conduct of real participants of events and processes [Sławińska and Witczak, 2008, p. 121]. The case study is empirical in nature, it is reliable collection and processing of data that can be compared with each other [Yin, 1994, p. 23].

The research method adopted by the author consists of three stages:

1. Stage I – a literature query, aimed at, inter alia, indicating the difficulties related to the use of the A3 Thinking approach in the problem-solving process, and obtaining information about the competences necessary for problem-solving. The information obtained was to be used, inter alia, to construct an interview sheet.
2. Stage II - empirical research - multiple case studies with the use of partially structured in-depth interviews, carried out among Polish managers working in the Lean environment.
3. Stage III is the preparation of results as well as conclusions and proposals for further research.

Information on in-depth interviews:

- the author conducted 12 in-depth interviews, based on partially structured interview questionnaires, where the respondents were Polish managers working in the Lean environment, in various industries; the interview questionnaire consisted of 72 questions (open and closed), divided into five groups of questions,
- twelve Polish managers participated in the study (8 senior managers and 4 middle managers), including 2 women and 10 men, representing a total of eight industries,
- the study's participants have many years of experience in implementing and supervising Lean projects (from 4 to 16 years),
- the invitation to participate in the study was posted on 1 October, 2020 on LinkedIn, and the study was conducted in October and November 2020 (8 telephone interviews, 4 video calls using Internet connection),
- 15 people expressed their willingness to take part in the study, of whom, in line with the assumptions, the author selected twelve people who applied first, agreed to conduct a remote interview with them as part of the study, and were available in the period planned for conducting the study.

One of the limitations of the study is the possibility of participating in the study of people who are aware of the difficulties, limitations, and competency shortcomings of employees (including their own) as regards problem-solving. Managers who are not aware of this may have deliberately not wished to participate in the study.

This study aims to fill the research gap in terms of creating a list of specific difficulties faced by Polish managers when solving problems in the spirit of A3 Thinking, and a list of competency shortcomings among Polish employees responsible for problem-solving, as well as a list of desired competencies. The survey can be a road sign for managers, informing about the competences that should be developed among employees responsible for solving problems (the so-called problem owners or authors of the A3 report) in order to effectively solve problems applying the A3 Thinking approach. The study results may also be a guide for authors of training programs and studies in the field of Lean and problem-solving. This will allow the programs to be supplemented with competency issues preoccupying Polish managers.

## **DIFFICULTIES WITH THE APPLICATION OF THE A3 THINKING APPROACH AND RELATED COMPETENCE SHORTCOMINGS - CASE STUDIES**

The interview questionnaire contained 72 questions, both open-ended and closed, divided into 5 groups: group I (general information about the problem-solving process, information about the problem owner; noticing/reporting problems and errors); group II (team work in the problem-solving process); group III (analysis of individual steps of the A3 Thinking approach, including: problem definition and analysis of the current situation; defining goals and analysing data leading to the definition of a set of root causes; proposed remedial measures; planned and further activities); group IV (supplementary questions; questions about improving the problem-solving process); group V (additional comments from the research participant).

In each of the organizations represented by the study participants, process owners, i.e., people responsible for solving the problem, are designated. Managers were asked questions, some of whom (7/12) are both problem owners and supervisors of problem owners, while others (5/12) only supervise the problem owners. The status of the problem owner usually depends on the problem's severity. The problem owner is usually (9/12) directly, functionally related to the problem.

For the purposes of this study, the problems in the organization were divided (classified) into three groups: group I: a problem of minute importance – minor, with a low level of difficulty of solutions, with a scope usually limited to one job position, to search for root causes it is enough to ask a few in-depth questions, e.g., using the 5 Why method; group II: a problem of medium importance – average level of complexity and difficulty, a problem covering several job positions, group, department,

impossible to solve immediately, it is more difficult to identify the root causes, most it often requires the use of at least the method of in-depth questioning (5 Why) and a cause-and-effect diagram; group III: a problem of great importance and a complex problem – a problem covering at least a few job positions, organizational units, or its importance for the organization is large, in order to detect the root causes it is not enough to ask a few in-depth questions, e.g., using the 5 Why method or an analysis with the use of the cause-and-effect diagram; it requires a structured approach to the problem-solving process (e.g., using the A3 Thinking approach).

In all organizations represented by managers taking part in the survey, the A3 Thinking approach to problem-solving is applied, and the above division (in a similar form) applies to 7 out of 12 organizations. The respondents indicated that the A3 approach is also applied by them in: R&D, competency analysis, designing new products or solutions, prototyping, and strategic planning. A3 reports in most cases (7/12) are filled out by hand, in other cases electronically or in a mixed manner.

During the interviews, the managers described the difficulties they perceive in solving problems. According to the survey participants, these difficulties often result from the lack of competences of the problem owners, organizational culture that is not conducive to effective problem-solving, and people's general attitude to problems. Tab. 2 shows examples of difficulties pointed out by managers (along with a breakdown into the stages of the problem-solving process), regardless of their number indicated by the survey's participants. Such a list allows for a more extensive look at the discussed issues and can be a basis for improving the problem-solving processes in a given organization.

**Table 2. A summary list of difficulties identified by managers related to the effective implementation of the problem-solving process**

PROBLEM-SOLVING PROCESS STAGE	DIFFICULTIES AFFECTING THE EFFECTIVENESS OF THE PROBLEM-SOLVING PROCESS AS INDICATED BY MANAGERS
Noticing / reporting problems and errors	<ul style="list-style-type: none"> <li>• ineffective communication and manufacturing-office, and interdepartmental collaboration; time pressure; inadequate incentive systems               <ul style="list-style-type: none"> <li>• organizational culture not conducive to admitting mistakes</li> </ul> </li> <li>• hiding problems, passivity in the face of problems, often associated with the need to fill out numerous documents after detecting a problem               <ul style="list-style-type: none"> <li>• observation skills requiring improvement</li> </ul> </li> <li>• difficulties with clearly formulating the problem, especially when there is time pressure; thinking in the category of „problem creates problem“, not „problem creates opportunities“               <ul style="list-style-type: none"> <li>• work overload, formalization, in relation to trivial problems</li> <li>• respect for people who „successfully put out fires“</li> </ul> </li> </ul>
Defining the problem and analysis of the current situation	<ul style="list-style-type: none"> <li>• lack of objectivity/bias; no time for observations, gathering facts               <ul style="list-style-type: none"> <li>• work “from behind the desk”; reluctance to share data and information</li> </ul> </li> <li>• the ability to observe, listen actively and ask questions, requiring improvement               <ul style="list-style-type: none"> <li>• attempting to formulate solutions at the stage of problem definition</li> </ul> </li> <li>• matching reality to the first idea that comes to mind at the problem definition stage, searching for data confirming the employee's way of thinking               <ul style="list-style-type: none"> <li>• doubt that the data really come from the <i>gemba</i> (place of value creation)</li> </ul> </li> <li>• presenting information starting with the words „it seems to me“, „I heard“, „probably“, „supposedly“ - instead of giving facts</li> <li>• negative attitude towards the person from whom the data and information are obtained, problems in the communication process               <ul style="list-style-type: none"> <li>• the presented data is selective, manipulated; excess data</li> <li>• problem with the application of statistics and computational thinking                   <ul style="list-style-type: none"> <li>• too much attachment to IT systems and uncritical approach to data downloaded from these systems; failure to relate data and information to the context, lack of a broader perspective, mindless operation of data</li> </ul> </li> </ul> </li> <li>• excessive and fruitless discussions and meetings, the so-called „belabouring the problem“</li> </ul>



Defining goals and analysing data leading to the definition of a set of root causes	<ul style="list-style-type: none"> <li>• lack of objectivity / bias; failure to relate data and information to the context of the problem, lack of a broader perspective</li> <li>• the ability to observe, listen actively and ask questions, requiring improvement <ul style="list-style-type: none"> <li>• problems in the communication process; the presented data is selective; excess data</li> <li>• problem with the application of statistics and computational thinking <ul style="list-style-type: none"> <li>• attachment to one's own beliefs; incompetent definition of goals</li> <li>• indication of one cause instead of a set of causes; mutual blame</li> </ul> </li> </ul> </li> </ul>
Proposed remedial measures	<ul style="list-style-type: none"> <li>• failure to relate data and information to the context of the problem, lack of a broader perspective; attachment to one's own beliefs</li> <li>• prompting problem owners by other managers about solutions that are convenient for them; problem with searching for solutions that go beyond the approach that the problem owner has developed through experience, difficulties with looking at the problem from different perspectives, openness to new solutions</li> <li>• matching reality to the first idea that comes to mind at the problem definition stage, looking for data confirming the employee's way of thinking <ul style="list-style-type: none"> <li>• coming up with solutions by „dashing off“, in a hurry, without further reflection</li> </ul> </li> <li>• inappropriate work environment in which the team is working on solving the problem: too cramped rooms, no ventilation, noise, temperature</li> <li>• rejection of proposals, information with which the immediate superior does not agree; not approving testing of the solutions</li> </ul>
Planning and further actions	<ul style="list-style-type: none"> <li>• tendency to exaggerated prolongation of deadlines in the planning process <ul style="list-style-type: none"> <li>• proposing unequal distribution of duties; procrastination</li> <li>• reluctance to inform about the stage of work implementation</li> <li>• excessive optimism among the problem owners at the stage of analysing potential difficulties related to the implementation („Why would it go wrong?“) <ul style="list-style-type: none"> <li>• reluctance to update plans („Why do we have to go back to it?“)</li> </ul> </li> </ul> </li> <li>• re-examining the problem related to a faulty approach to the previous steps</li> <li>• selective, „insular“ treatment of problems, not combining them, lack of an analysis of the connections and mutual influence of problems on each other</li> <li>• learning from mistakes works in the short term; conflict situations within the team <ul style="list-style-type: none"> <li>• reluctance to change, defending the status quo</li> </ul> </li> </ul>

**Source:** Own elaboration

According to the respondents, the most difficulties to the problem-solving process are caused by activities carried out as part of the stage of proposing remedial measures (11/12), analysing the current condition (10/12), and defining the problem (8/12).

Managers also assessed what, in their opinion, is the average level of acquisition and use of a given competence by problem owners on the organization scale. A low-level means that a given competence requires significant development. Medium level – the competence requires improvement. High level – according to the respondents, this is a sufficient level of acquiring and using a given competence. None of the managers mentioned a complete lack of any of the indicated competences. The respondents also noted that the organization employs people who have already “come to the company” with the competences of, for example, creative or critical thinking mastered at a high level. However, these are individual cases. However, having these competencies is not appreciated. The employee appraisal system does not cover this type of competency.

The competences of people responsible for solving problems that require significant development, rated the lowest by managers are: the ability to think creatively, imaginatively, innovativeness; the ability to listen actively; the ability to select and interpret information; the ability to think critically, objectively, argue, conclude, prepare summaries, and reflect. The highest rated competences, the level of mastery of which is mentioned as sufficient, are: knowledge of the steps (stages) of the problem-solving process in the A3 Thinking approach; expertise (including knowledge of processes and

responsibilities); teamwork and cooperation skills; ability to use visual management instruments; the ability to standardize work; digital competences.

According to the survey participants, the most desirable competences of problem owners are: knowledge of the problem-solving process' stages in the A3 Thinking approach (12/12); knowledge of the principles of simplifying and minimizing waste (12/12); the ability to use visual management instruments (12/12); expertise and knowledge of processes in the organization (12/12); teamwork and cooperation skills (12/12); the ability to listen actively, ask questions, observe (11/12); the ability to think creatively (10/12); ability to think critically, objectively, argue, make conclusions, summarize, and reflect (10/12); analytical and computational thinking skills (9/12); the ability to see problems and define them (9/12); the ability to think in a comprehensive, holistic, interactive, and contextual way (9/12); digital competences (8/12); the ability to standardize work (8/12); the ability to reach consensus and agreement (8/12).

Regardless of the set of competences included in the interview sheet, managers also indicated the following desirable competences: empathy, honesty, respect, equal treatment of colleagues, the ability to use metaphors and tell stories.

To the question – “What would you supplement your competences with as a mentor in the field of problem solving?” – the managers replied – with: instruments of creative thinking (11/12); assumptions of critical thinking (10/12); coping with stress (8/12).

The managers additionally indicated that:

- in order to exclude the lack of objectivity, additional electronic measurement systems (devices and software) are introduced in the organization, which in fact is a waste,
- in the process of generating new ideas as part of proposing remedial measures, brainstorming is used most often (12/12), less often Design Thinking (2/12), forced adjustment techniques (1/12) and Reversed Thinking (1/12); other tools for creative problem-solving were unknown to managers,
- problem owners have difficulty with going beyond the “silos”, they think “insularly”, forgetting about interactions, and excessively extensive standards, introduced in organizations, intensify this way of thinking,
- usually, one does not go back to problems that were solved to recall what they were about, forgets about the situation (problem with organizational learning),
- the problem in the organization is forcing employees to fill out an A3 report for each, even a trivial problem, which discourages employees from this method
- employees put too much trust in IT systems, they do not refer the data to the situational context, they do not verify the data, they explain everything with the obtained data, e.g. “This is how it is in the system”, “This is how I received these data”,
- the organization does not discuss what mental processes should be developed among employees, which thought processes lead to success in the context of problem-solving, no training to improve reasoning is organized,
- there is too much focus on numbers, forgetting about the human being,
- excessive formalization makes work difficult (e.g., A3 reports with an indication of specific tools), but it is justified at the early stage of implementing the A3 Thinking principles; the more mature the system, the more flexible the tools should be,
- improper approach to training in the field of A3 Thinking causes that the A3 report is treated as a regular sheet of paper, it is only a tool for sharing and communicating of information,
- filling in the boxes is more important than the way of thinking,
- employees, especially managers, do not like to admit that they do not know something,
- the whole problem-solving process is adversely affected by the attempt by the problem owner to prove that he/she can cope on their own,
- some managers are bothered by inquisitiveness when collecting data and analysing the sources of problems, inquisitive people are not appreciated,
- it happens that reports hold a lot of finely written content, instead of using data and information visualization instruments; the report is then illegible, understandable only to the author.

According to the respondents, the problem-solving process in the organization they represent could be improved in the following way: supplementing the plan of improving the employee

competences (especially problem owners) with training in creative and critical thinking and the ability to ask questions, actively listen, select and interpret information in order to discover the true nature of problems; focusing on thinking, developing different ways of reasoning, reflecting, instead of relying on plain that are detached from the context; simplifying the A3 report printouts, without indicating specific instruments, ready-made boxes in the printout, so as not to adapt the problem to the report, but rather the way of thinking to the existing problem; implementation of inter-faculty meetings as internal training in the field of problem-solving rules and instruments (on the basis of knowledge sharing); introducing a mentor who will provide advice and treat problems in the organization in a comprehensive way, "look after" this important process from the point of view of improving the organization; developing a culture of dialogue, respect, and cooperation; introduction of an electronic system for problem reporting, e.g., via a mobile phone; ensuring that problem owners are empowered to make decisions, obtain data and information.

Interestingly enough, managers reported that they had not yet paid attention to the value and ability to develop critical or creative thinking skills ("I had no idea there such a thing as critical thinking existed," "I've never trained creativity, I thought it couldn't be trained"). Eight out of twelve of the managers surveyed were also unaware of the existence of patterns of reasoning and cognitive errors and their impact on the quality of inference and decoding of reality. As they stated, after the in-depth interview was conducted with them, their awareness of the value of this type of competence and their impact on the problem-solving process had increased. Therefore, the development of different ways of thinking (including critical, creative, holistic, and contextual thinking) will be reflected in their organizations in the employee competency improvement plans. Only one manager stated that in the organization represented by him he had organized training for managers in developing creativity, but none of the organizations had received training in developing critical thinking.

In the opinion of the managers, developing the said competences will allow for the elimination or minimization of the difficulties that they face when supervising problem-solving processes in their organizations.

## CONCLUSIONS

One of the most critical aspects of management in an organization is effective problem-solving. It not only allows to eliminate constantly appearing obstacles, but also to increase productivity, reduce the number of defects, improve financial results, increase employee job satisfaction, or develop organizational learning. Managers try to overcome the difficulties that arise when solving problems on an everyday basis. In order to do this more effectively, they need to be aware of what these difficulties are and what causes them.

The conducted literature analysis and case studies were aimed at obtaining answers to the research questions posed in the introduction and verifying the formulated hypotheses. The study's assumptions were based on previously conducted, numerous interviews with managers. The study confirmed the initial assumptions. According to the study, the following stages of the problem-solving process, in line with the A3 Thinking approach, cause the most difficulties for Polish managers: proposing remedial measures, analysing the current situation, and defining the problem. The difficulties most frequently indicated by the research participants include: lack of objectivity in collecting and analysing data and information; thinking in terms of "problem creates problem" rather than "problem creates opportunity"; no time for observations, gathering facts; problem with searching for solutions that go beyond the employee's experience, problem with creative thinking (other difficulties are presented in Table II). The H1 hypothesis was confirmed.

In the case study, managers identified specific competencies of the problem owners which, in their opinion, are crucial for effective problem-solving using the A3 Thinking approach. These include, inter alia: knowledge of the stages of the problem-solving process in the A3 Thinking approach; knowledge of the principles of simplifying and minimizing waste; ability to use visual management instruments; expertise and knowledge of processes in the organization; ability to work in a team, cooperation; the ability to listen actively, ask questions, observe; the ability to think creatively; the ability to think critically,

objectively, argue, make conclusions, draw up summaries, reflect (other competences are described in point 4). The study's participants also indicated specific competences that require development. These include, inter alia: the ability to think creatively, imaginatively, innovation; the ability to listen actively; the ability to select and interpret information; the ability to think critically, objectively, argue, make conclusions, prepare summaries, and reflect. The above confirms hypothesis H2.

The case study also allowed for obtaining information on proposals for improving the problem-solving process. For example, managers pointed to the need to supplement employee competence improvement plans (especially problem owners) with training in creative and critical thinking and the ability to ask questions, actively listen, select and interpret information in order to discover the true nature of problems. It also turned out to be important for managers to focus on thinking, developing various ways of thinking and reflecting, instead of relying on plain, out of context data. They pointed out the necessity make the A3 reports simpler, the implementation of inter-departmental meetings on the basis of knowledge sharing, introducing a mentor or holist to support the problem owners, or developing a culture of dialogue, respect, and cooperation (other proposals are described in point 4). The H3 hypothesis was confirmed.

It is worth highlighting that managers defined the set of desired competencies in one of the study's last stages. Thus, the previously asked questions about specific competences could have influenced the list of key competences indicated by them. Managers believe that most often, already at the stage of hiring an employee, they are expected to have the indicated competences and the ability to use them in practice. The recruitment and selection process, however, is associated with limitations and allows for a selective assessment of competences. Managers emphasize, however, that after accepting an employee to the organization, many of the competences they indicate are not developed. Training is most often related to management systems or expertise.

Summarizing, Polish managers see numerous difficulties connected with effective problem-solving in organizations. They stem from both the competence shortages of the problem owners and the unfavourable organizational culture or the general attitude of employees to problems. The competences pointed out in the literature, considered important from the point of view of problem-solving, are rarely developed among employees, while in the process of employee recruitment and selection, they are time-consuming and difficult to verify. Therefore, managers pointed to the need to analyse competence matrices and competence development plans and to supplement them. The lack of objectivity, adjusting the facts to the needs, or a narrow view of the data, without reference to the situational context, can be minimized by making employees aware of the importance of reasoning patterns and cognitive errors, and their impact on the quality of inference and decoding of reality. Developing critical thinking skills will help here. In order to eliminate the difficulties related to the search for innovative, unconventional solutions, it is necessary to focus on developing creative thinking skills. At the interview stage, the managers stated that the mere participation in the survey raised their awareness of the selected competencies. So, the first step should be to realize what the problem owner needs to act efficiently. This elaboration provides information on competencies that support effective problem-solving. It also lists the difficulties faced by Polish managers and indicates which competencies could be insufficiently developed. The above can be used as input data for designing of training programs in the field of problem-solving and study programs covering the issues of Lean Management. This will educate and develop effective problem owners.

## REFERENCES

Abazov, R. [2016]. *How to Improve Your Problem-Solving Skills*. 2016 QS Top universities (UK)RA. Available at: [https://www.researchgate.net/publication/305062877\\_How\\_to\\_Improve\\_Your\\_Problem-Solving\\_Skills](https://www.researchgate.net/publication/305062877_How_to_Improve_Your_Problem-Solving_Skills) (Accessed 12 Dec. 2020).

Akbar, A. and Kusnendi, D. [2019] The Role of Problem Solving, Problem-Based Learning, and Critical Thinking in the Era of Globalization. In: *International Conference on Educational Psychology and Pedagogy - "Diversity in Education" (ICEPP 2019)*, Universitas Pendidikan Indonesia: Atlantis Press, Advan-

ces in Social Science, Education and Humanities Research, 399, pp. 15-17. Available at: <https://www.atlantis-press.com/proceedings/icepp-19/125933643> (Accessed 12 Dec. 2020).

Anderson, J.S., Morgan, J.N. and Williams, S.K. [2011]. Using Toyota's A3 Thinking for Analyzing MBA Business Cases. *Decision Sciences Journal of Innovative Education*, 9(2), pp. 275-285. doi: 10.1111/j.1540-4609.2011.00308.x.

Arantes, A. and Giacaglia, G. [2013]. Melhoria de resultados de confiabilidade dos equipamentos, pela aplicação do Hoshin Kanri, associado ao Relatório A3. In: *IX Congresso Nacional de Excelência em Gestão*, Rio de Janeiro: Universidade Federal Fluminense, pp. 1-22. Available at: [https://www.inovarse.org/artigos-por-edicoes/IX-CNEG-2013/T13\\_0628\\_3463.pdf](https://www.inovarse.org/artigos-por-edicoes/IX-CNEG-2013/T13_0628_3463.pdf) (Accessed 8 Jan. 2021).

Bassuk, J.A. and Washington, I.M. [2013]. The A3 problem solving report: a 10-step scientific method to execute performance improvements in an academic research vivarium. *PLOS ONE*, 8(10), p. e76833. doi: 10.1371/journal.pone.0076833

Borton, T. [1970]. *Reach, touch and teach: Student concerns and process education*. New York: McGraw Hill.

Butterworth, J. and Thwaites, G. [2013]. *Thinking Skills: Critical Thinking and Problem Solving*. 2nd ed. Cambridge: Cambridge University Press. pp. 1-12.

Dennis, P. [2015]. *Lean Production Simplified: A Plain-Language Guide to The World's Most Powerful Production System*. 3rd ed. New York: Productivity Press. doi: 10.1201/b18961.

Glatzeder, B., Goel, V. and Müller, A. [2010]. *Towards a Theory of Thinking, On Thinking*, Berlin Heidelberg: Springer-Verlag, pp. 3-21. doi:10.1007/978-3-642-03129-8\_1.

Koskela, L., Broft, R.D., Pikas, E. and Tezel, A. [2020]. Comparing the Methods of A3 and Canvas. In: Tommelein, I.D. and Daniel, E. (eds.). *Proc. 28th Annual Conference of the International Group for Lean Construction (IGLC28)* (online). Berkeley: IGLC28, pp. 13-24. Available at: <https://iglc.net/Papers/Details/1838> (Accessed 11 Jan. 2021). doi.org/10.24928/2020/0136.

Lee, TS. and Kuo, MH. [2009] Toyota A3 report: A tool for process improvement in healthcare. *Studies in Health Technology and Informatics*, 143, pp. 235-240. doi: 10.3233/978-1-58603-979-0-235.

Liker, J.K. and Meier, D.P. [2011]. *Droga Toyoty. Fieldbook*. Warszawa: MT Biznes, pp. 465-481.

Lorenzi, C.I. and Ferreira, J.C.E. [2018], Failure mapping using FMEA and A3 in engineering to order product development: A case study in the industrial automation sector, *International Journal of Quality & Reliability Management*, 35(7), pp. 1399-1422. <https://doi.org/10.1108/IJQRM-10-2016-0179>.

Loyd, N., Harris, G.A. and Blanchard L. [2010]. Integration of A3 Thinking as an Academic Communication Standard. In: A. Johnson and J. Miller (eds.). *Proc. the 2010 Industrial Engineering Research Conference* (online). The University of Alabama, pp. 1-6. Available at: <https://uahcmr.com/wp-content/uploads/2010/11/FINAL-Integration-of-A3-Thinking-as-an-Academic-Communication-Standard.pdf> (Accessed 10 Jan. 2021).

Mann, D. [2015]. *Creating A Lean Culture: Tools to Sustain Lean Conversions*. 3rd ed. New York: Productivity Press. doi: 10.1201/b17563.

Marksberry, P., Bustle, J. and Clevinger, J. [2011]. Problem solving for managers: a mathematical investigation of Toyota's 8-step process. *Journal of Manufacturing Technology Management*, 22(7), pp. 837-852. doi: 10.1108/17410381111160924.

Oliveira, N. and Nodari, C. [2010]. *Metodologia do Relatório A3 para solução de problemas* (online). Universidade Federal do Rio Grande do Sul, Porto Alegre. Available at: <https://www.lume.ufrgs.br/handle/10183/32228> (Accessed 8 Jan. 2021).

Perlaki, I. [1974]. Metody i etapy rozwiązywania problemów w praktyce zarządzania. *Organizacja i Kierownictwo*, 1974, 12, p. 21.

Perloff, J. and Carlton, D. [2004]. *Modern Industrial Organization*. Englewood Cliffs: Prentice-Hall.

Raudberget, D. and Bjursell, C. [2014]. A3 reports for knowledge codification, transfer and creation in research and development organisations. *International Journal of Product Development*, 19(5-6), pp. 413-431. doi: 10.1504/IJPD.2014.064885.

Saad, N., Al-Ashaab, A., Maksimovic, M., Zhu, L., Shehab, E., Ewers, O. and Kassam, A. [2013a]. A3 thinking approach to support knowledge-driven design, *The International Journal of Advanced Manufacturing Technology*. 68(5-8), pp. 1371-1386. doi: 10.1007/s00170-013-4928-7.

Saad, N., Al-Ashaab, A., Shehab, E. and Maksimovic, M. [2013b]. A3 Thinking Approach to Support Problem Solving in Lean Product and Process Development. In: Stjepandić J., Rock G., Bil C. ed., *Concurrent Engineering Approaches for Sustainable Product Development in a Multi-Disciplinary Environment*, pp. 871–882. doi:10.1007/978-1-4471-4426-7\_74.

Shook, J. [2009]. Toyota's Secret: The A3 Report. *MIT Sloan Management Review*, 50(4), pp. 30-33.

Shook, J. [2012]. *Zarządzać znaczy uczyć. Rozwiązywanie problemów i rozwój pracowników z wykorzystaniem metody A3*. 2nd ed. Wrocław: Wydawnictwo Lean Enterprise Institute Polska.

Silva Filho, O. and Calado, R. [2013]. Learning supply chain management by PBL with A3 report suport. In: 6th IFAC Conference on Management and Control of Production and Logistics, Fortaleza: IFAC Proceedings Volumes, 46(24), pp. 471-477. doi:10.3182/20130911-3-br-3021.00115.

Simons, F.E., Aij, K.H., Widdershoven, G.A.M. and Visse M. [2014]. Patient safety in the operating theatre: How A3 thinking can help reduce door movement. *International Journal for Quality in Health Care*, 26(4), pp. 366-371. doi:10.1093/intqhc/mzu033.

Sławińska, M. and Witczak, H. [2008]. *Methodological basis of doctoral theses in economic sciences*, PWE, Warsaw, p. 121.

Sobek, D.K. II and Jimmerson, C. [2004], A3 reports: tool for process improvement. In: *Proceedings of the Industrial Engineering Research Conference*. Houston, pp.: 1-6. Available at: <https://www.lean.org/Search/Documents/133.pdf> (Accessed 10 Feb. 2021).

Sobek, D.K. and Smalley, A. [2008]. *Understanding A3 Thinking: A Critical Component of Toyota's PDCA Management System*. New York: CRC Press. doi: 10.4324/9781439814055.

Sobek, D.K. and Smalley, A. [2011]. *Common Mistakes in A3 Report Writing*. (Blog) A3 Thinking at: <http://a3thinking.com/blog/?p=153> (Accessed 12 Dec. 2020).

Tortorella, G., Cauchick-Miguel, P.A. and Gaiardelli, P. [2018]. Hoshin Kanri and A3: a proposal for integrating variability into the policy deployment proces. *The TQM Journal*, 31(2), pp. 118-135. doi:10.1108/TQM-06-2018-0076.

Tortorella, G., Viana, S. and Fettermann, D. [2015]. Learning cycles and focus groups: A complementary approach to the A3 thinking methodology. *The Learning Organization*, 22(4), pp. 229-240. doi:10.1108/TLO-02-2015-0008.

Yin R.K., *Case Study Research. Design and Methods*, Sage Publication, Newbury Park 1994, p. 23.