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## THE FEASIBILITY OF USING A PROBLEM-SOLVING METHODOLOGY USED IN MANUFACTURING IN PUBLIC INTEREST SECTORS

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***Abstract:** The pandemic affected in a variable way both the private and the public sectors. Organizations were forced to adapt due to the logistical problems that arose. Due to the rapid spread of COVID-19, one solution for organizations was for employees to work from home. This aspect led to the need for a specialized and access-protected environment to ensure the productive functioning of organizations. Due to the emergence of difficulties in terms of reporting and solving problems, it was necessary to identify a methodology and apply it. The methodology presented in the paper represents a basic method from Toyota by which a problem can be stated, adjusted and solved through a single A3 page. In this scientific work, we will apply the methodology in order to solve the problems of an organization.*

***Key word:** COVID pandemic, public sector, process improvement, problem-solving tool, report procedure*

### 1. INTRODUCTION

At this time, the most effective approaches are those that are global in scope, can be used by all individuals, can be implemented without the need to reset the system or procedures, and are the easiest to apply. When talking about public services, statements that emphasize achieving high levels of customer satisfaction take on a unique meaning. Everyone wants better service, but conveniently getting results often requires a significant amount of effort. But improving the quality of public services is the way forward [1]. The extension of private sector concepts to public management is when the emphasis on cost reduction and increasing internal efficiency first emerged and has since become an almost universal feature of all interventions involving public service.

More recently, austerity pressures have helped reinforce this focus. The capacity of public service organizations to experiment and develop new and innovative approaches to service delivery, which require genuine learning, management commitment and the release of resources, is often stifled and directed towards concrete, long-term solutions short,

sometimes without the possibility of commercial, financial results. As a result, the ability of public service organizations to experiment and develop new and innovative approaches to service delivery is hindered.

The idea of continuous improvement is important in the public sector because it allows organizations to recognize and focus on developing specific areas where they can perform better [2]. This has the potential to lead to major improvements in the efficiency and effectiveness of government services, ultimately leading to a stronger influence on society.

Continuous improvement (CI) is based on the idea that organizations can achieve greater efficiency and effectiveness by continually making changes to both their processes and products [2].

Typical CI activities include recognizing problems, developing solutions, testing and implementing these ideas, and continuously improving the process. The objective is to create a system where all the people involved work constantly to make improvements. To obtain a solution is important to follow the steps according to figure 1:

- The problem is encountered;

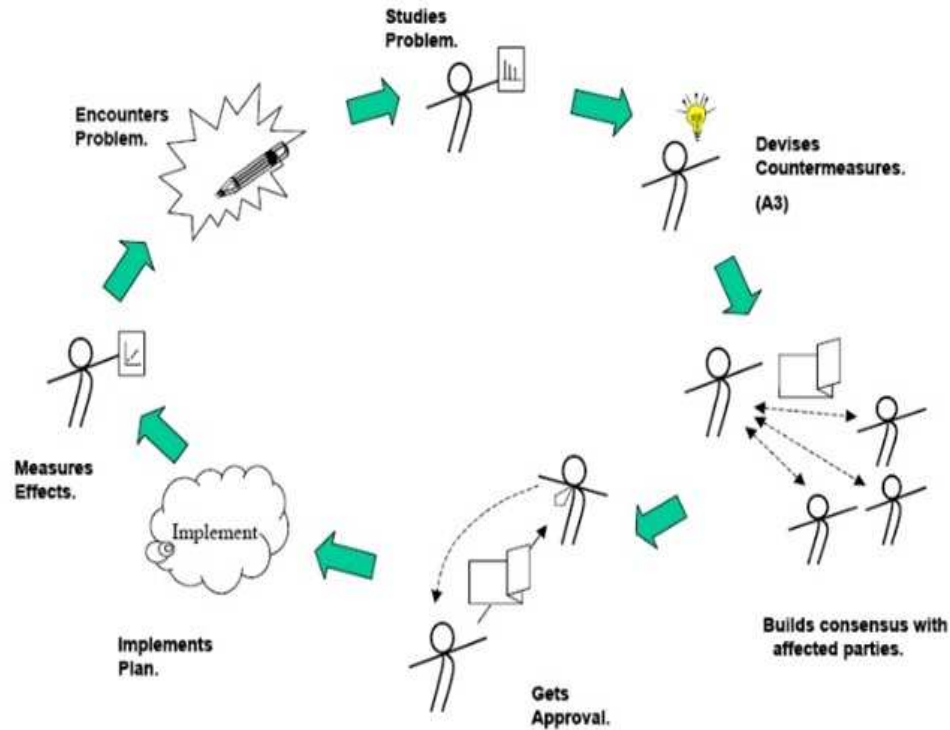


Fig. 1. The cycle of continuous improvements [4].

- The problem is studied with the team through A3 sheet;
- The counter measures are devised according to each root cause using A3 sheet;
- A consensus is built to implement the defined measures together with the affected parties;
- The approval is received from management;
- The counter measurement is applied as defined in A3 sheet;
- The results obtain as an effect of implementing the counter measures are checked;
- The cycle is repeated according to the continuous improvement philosophy.

Although CI has been implemented in a wide variety of business sectors, its importance cannot be overstated in the public sector due to the imperatives of transparency, accountability and responsiveness to the demands of the general public. Organizations operating in the public sector must be able to meet or exceed quality requirements while providing reliable services in a timely and cost-effective manner. Continuous improvement offers these companies the ability to do just that, but some of

it are just now starting to take advantage of this opportunity.

The public sector is significant for many reasons, including the fact that it is a large and significant part of our society and because the services it provides are supported financially by our taxes. It is the country's largest employer, and the provision of these services, which are fundamental to our daily lives, places extreme importance on both openness and profitability. Like older businesses, government departments have legacy difficulties, such as duplication, rework and inefficient processes, as a result of the passage of time and the fact that these things have always been done the same way.

The challenge is that the public sector must constantly evolve and adapt to the needs of the users, while at the same time being under increasing scrutiny and pressure to improve its operations, serve users better and at the same time minimize cost growth. The situation is difficult for the public sector. Continuous improvement is crucial to ensure that the public sector can effectively meet the demands of its customers in the future, whether the economy is doing well or not, and that it can easily adapt to the ever-evolving demands of society.

## 2. THE METHODOLOGY OF PROBLEM-SOLVING USING A3 SHEET

There are many different ways to assess the quality of service. It may be more informative to assess their integration and the extent to which they may be related and mutually beneficial, rather than addressing the specific advantages and disadvantages of each component separately [12]. The purpose of this study is to do exactly that. The number of methods considered will inevitably have to be limited; however, their interdependence will be elucidated and their potential for improvement will be emphasized. The A3 sheet methodology, as well as the implementation of quality tools (QI) turn out to be the specific quality tools that are demonstrated, with process mapping acting as an intermediate tool for QI [4]. The A3 method measures both the external expectations and the perceptions of customers or service providers, as well as the existence or not of (in)formal standards. The QI method translates these results and measurements into organizational solutions for the design of products or services, ensuring it is known that organizational standards provide what is needed and contribute to the definition of a strategic planning process. In the private sector, both quality management tools have been tested and proven to be successful.

Their relevance in the public sector is increasingly well established, and they present a way forward for the challenging and never-ending task of continuous improvement of public services.

The manufacturing analysis method, A3, is developed and used by Toyota Motor Corporation to achieve learning and the transfer of operational knowledge to employees, in the sense that it is described as a problem-solving method that, in addition to producing knowledge, teaches them those who do the work how to learn [7]. The name A3 comes from the international size of the paper it is written on. This methodology has a wide spread also in the other manufacturing automotive organizations.

The A3 format consists of a series of boxes organized in a template.

Within the boxes, the A3 sheet moderator will follow the next steps, according to figure 2:

- (1) to establish the business context and importance of a particular issue or issue;
- (2) to describe the current conditions of the problem;
- (3) to identify the desired outcome;
- (4) to analyze the situation to establish causality;
- (5) to propose countermeasures;
- (6) to prescribe an action plan to achieve it;
- (7) to trace the tracking process.

However, the reports of the A3 methodology, and especially the associated reasoning, have a role that extends beyond the purely practical. They also exemplify a more essential core competency that a learning organization possesses. A3 reports serve as mechanisms by which managers guide employees in root-cause analysis and scientific thinking while aligning the interests of individuals and departments across the organization by fostering productive

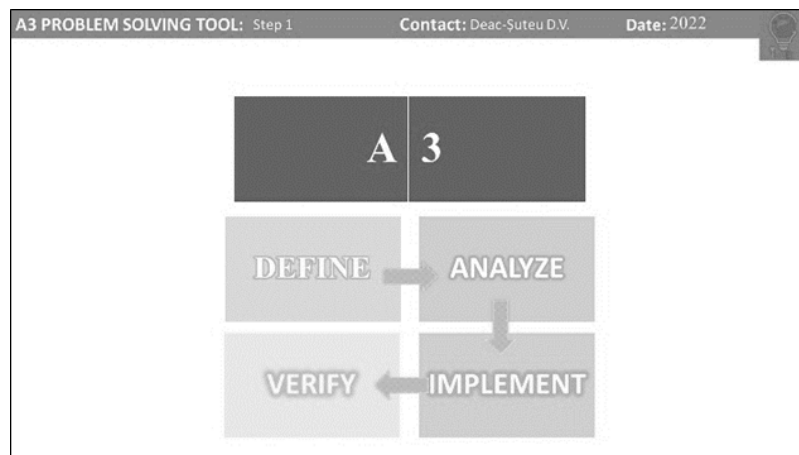


Fig. 2. Steps of the A3 sheet methodology for problem-solving

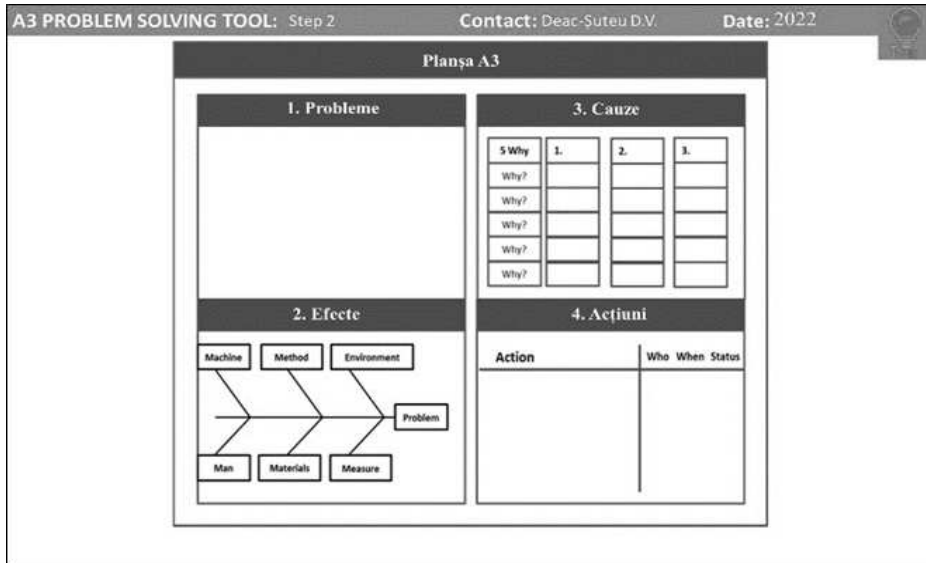


Fig. 3. Example report of A3 sheet for problem-solving [5]

dialogue and helping people learn from one another. In addition, A3 reports serve as mechanisms by which managers guide others in root cause analysis and scientific thinking [13]. This type of report can be observed in figure 3.

A3 Management is a system that is based on the concept of creating structured opportunities for people to learn in the way that is most natural to them, which includes learning from experience, learning from your failures, and learning through trial and error that is guided by a plan.

### 3. CONTINUOUS IMPROVEMENT CONCEPT OF SEASONAL MAINTENANCE ACTIVITIES

Regardless of the form of management chosen, the execution of the specific activities of any public utility service must be carried out following a service regulation and a specification that has been developed and approved by the authorities responsible for local public administration under the regulation - framework and with the specifications-framework of the service [6].

This is true even if the form of management chosen is different. In the case of inter-community development associations whose main objective is the provision of public utility services, the regulations and specifications of the service must be developed within the

association and then submitted for approval to the local public administration authorities in the member administrative-territorial units, following the requirements provided in Law no. 51/2006 regarding community services of public utilities [5]. This is done under the conditions described in the aforementioned law.

Cold season operations can be challenging for an organization aiming to carry out road infrastructure maintenance work for several reasons, including the following:

- the snow removal machines must be prepared to work on the roads, but most of them are adaptations of the machines and equipment used and worked on during the regular season [11];
- machines are usually employed in works outside technological bases and mechanical workshops;
- high fuel costs, with a high degree of unpredictability;
- difficulty processing all the factors that can influence circulation [8].

From an economic point of view, but also for reasons of optimization of the machinery market, they are oriented towards multi-functional machinery solutions. These manufacturers or service operators opt for solutions that can be used for several activities so that they can be transformed into solutions with high reliability in the process of removing, respectively preventing the deposition of snow.

## A. Describe Problem / Issue

### 1. Description & Background / Containment Action

The intervention time of the machines is delayed because the loading time of the equipment with deicing salts and spreading device.  
 The car does not intervene on time because it has different tasks: transport of goods, transport of material, intervention for towing vehicles and transport of equipment.  
 Communication between the car driver and the operative group is not ensured.  
 Every winter, fines are received from various public authorities of the state because the road is not properly cleared of snow. The fine is given to the organizations responsible for snow removal.  
 Only in case of calamity, two cars pass at an interval of 10 minutes. Internal quality control of snow removal is non-existent.  
 Traffic behavior cannot be predicted.  
 Faulty communication: Weather station operator -> Operative group-> Head of command -> Dispatcher -> Driver

### 2. Current Condition

The snow removal of the roads is not done in a timely manner, in an efficient and effective way. Due to this aspect, snow removal companies are fined every winter season.

### 3. Goal Statement / Objectives / Target Conditions

To improve the snow removal process so that it will become: efficient, effective and to eliminate the fines from the local authorities to snow removal companies.

**Fig. 4.** Problem, historic, condition description and objective statement

For example, some machines can be equipped with more than 40 different types of accessories, which gives them a wide range of possibilities for use. Proper gear for the winter months is, of course, an essential component of these items. Ploughs, snow brushes and degreasers are just a few of the reliable accessories that make the snow removal process more efficient and minimize the accumulation of additional snow [6].

To optimize the programming of the machines, the meaning of the above, and the planning of the activities related to the multifunctional machines, we will analyze the possibility of using the A3 sheet methodology.

An aspect to be taken into account when planning interventions can be represented by making a directly proportional correlation between the program carried out in the previous year and meteorological records over longer periods [10].

The problem-solving methodology, A3, is a technique of approaching problem-solving from both a rational and a systematic perspective. It applies to a wide range of problems and can be used throughout the organization. The PDCA

management concept is used here in the form of a four-stage paradigm that is used by this A3 model. This makes the progress made in solving the problem visible to the whole team and helps others to learn from the lessons learned.

## 4. APPLYING THE OF A3 SHEET PROBLEM-SOLVING TO SNOW REMOVAL DESIDERATUM

Due to the mentioned aspects, we decided to use the A3 problem-solving methodology to remedy the problems. The following steps were followed:

1. The problem and the history of the situation were described, according to figure 4;
2. A clear target was set and the objectives that the project must achieve, according to figure 4;
3. To determine the root causes, an analysis was carried out designing an Ishikawa diagram, which can be seen in figure 5;
4. Using the brainstorming technique, ideas were found and a clear action plan was initiated;

## B. Find Root Cause of Problem / Issue

### 4. Root Cause Analyses

Fishbone Diagram

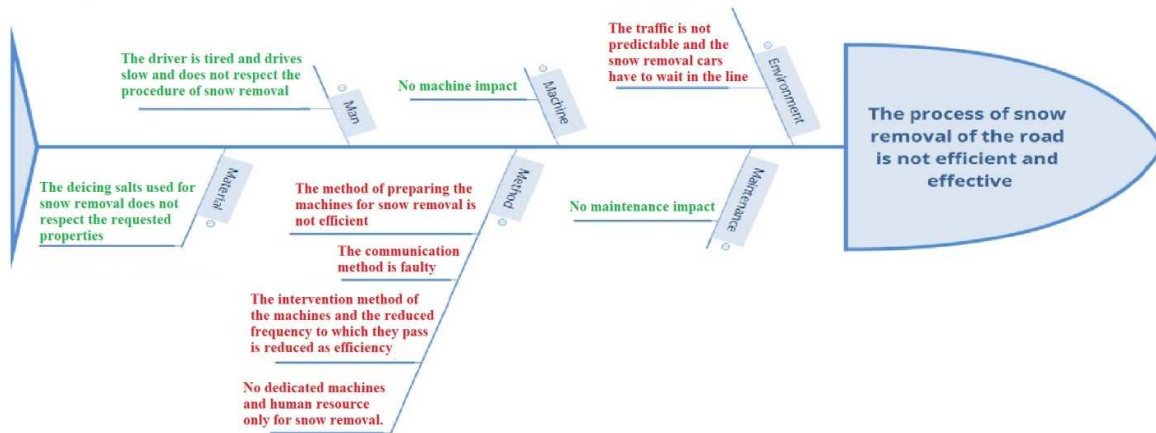


Fig. 5. Applying Ishikawa to find the root cause

5. It was verified what is the effect of the application of these actions, in accordance with figure 6;
6. Additional actions were defined regarding the distribution, documentation and standardization of actions.

The effects can be confirmed by the efficiency and effectiveness of the existing snow removal systems and methods in the European countries that use such systems.

Also, the distribution and documentation of these efforts are done through this scientific work. Each stage presented represents an integrated part of the A3 plan. This is just a brief example of one of the viable existing methods that can be applied to use and determine solutions.

## 5. CONCLUSIONS

### C. Solve Problem / Issue

#### 5. Countermeasures

#	Brainstorming for Solutions
1	Adjusting the driver and the dispatcher work schedule according to peak hours when traffic is congested.
2	Update the organization plan of the activities to facilitate the standardization of the method of preparing the machines.
3	Streamlining the transfer of information so that communication is carried out in the shortest possible time between the driver and the operator of the weather station.
4	The allocation of additional resources in terms of human resources and the addition of the car fleet
5	General plan and daily plan regarding the frequency of intervention of the machines

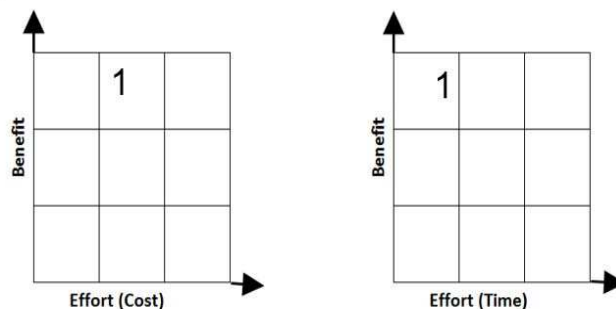


Fig. 6. Applying brainstorming and check the benefit vs cost and effort

When it comes to snow removal, it is important to have a clear communication regarding the snow removal machine position compared to the area affected by the snow. The experience and expertise of the specialists supplying this equipment, so important to the safety and well-being of people, both in traffic and on pavements, driveways, car parks and other areas, is strictly linked to the efficiency of the equipment in a way that cannot be separated from each other. If the customer's specific snow clearance requirements are considered when optimizing the equipment, the result will undoubtedly be an excellent performance at low cost in the medium to long term.

Regardless of how effectively the organization operates, there is always room for improvement in how it performs its overall functions. Or, in some cases, a significant

improvement. To keep things running smoothly in our businesses, we have established procedures, but sometimes, out of inertia or habit, we continue to use those procedures even if they are not the most effective.

In the introduction the process of CI has been briefly presented. Also, a short summary regarding the snow removal process is detailed.

In the second chapter the A3 sheet problem-solving methodology was presented from a theoretic perspective.

Next, the authors presented in third chapter the problems of the snow removal process were presented preparing the way to apply the A3 sheet methodology practically.

In the fourth chapter the authors have applied the A3 sheet methodology in an practical way with the aim to improve the snow removal process. Applying this methodology, the authors created a clear plan regarding the countermeasures which must be implemented to solve the detected root causes together with the problems presented in the scientific paper.

Even though the A3 sheet methodology for solving problems was developed by Toyota, it is widely used in the automotive industry. This methodology is used and applied, in general, predominantly in the manufacturing area.

Continuous process improvement is a technique of codifying efforts within the organization to eliminate inefficiencies and to always look for better solutions, to make the organization work more efficiently. CI initiatives that have used public-private partnerships will enable continuous improvement in both the quality of operations and the level of satisfaction of end users. However, the immediate satisfaction rate of citizens is likely to increase at a much slower pace, but the implications for everyday life will generate a sense of security that the necessary conditions will be provided to carry out activities even in times of crisis.

This provides a viable strategy for achieving long-term structural reforms while managing CI activities in public sector organizations, originality and possible value. This paper is part of a wider study on public-private partnerships in the EU to implement the recommendations of the Charter for Public Services. It illustrates a

systems approach to analyzing the challenges of implementing CI initiatives in public sector organizations. In addition to the benefits mentioned above it is considered continuous improvement promotes the following:

(a) efforts to improve the living conditions of residents and to protect the health of the population in general;

b) orientation towards citizens and a sense of duty towards them;

(c) the protection and preservation of the environment and the rights and legitimate interests of individuals;

d) Ensuring quality and continuity of services;

e) Ensuring the security of the service.

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## FEZABILITATEA UTILIZĂRII UNEI METODOLOGII DE REZOLVERARE A PROBLEMELOR DIN PRODUCTIE ÎN SECTORELE DE INTERES PUBLIC

*Pandemia a afectat într-un mod variabil atât sectoarele private cât și cele publice. Organizațiile au fost forțate să se adapteze datorită problemelor de logistică apărute. Datorită răspândirii alerte a COVID-19, o soluție a organizațiilor a fost ca angajații să lucreze de acasă. Acest aspect a condus la necesitatea unui mediu specializat și protejat de acces pentru asigurarea funcționării productive a organizațiilor. Datorită apariției dificultăților în ceea ce privește raportarea și rezolvarea problemelor, a fost necesară identificarea unei metodologii și aplicarea acesteia. Metodologia prezentată în lucrare reprezintă o metodă de bază de la Toyota prin care o problemă poate fi enunțată, ajustată și rezolvată printr-o singură pagină A3. În această lucrare științifică vom aplica metodologia în vederea rezolvării problemelor unei organizații.*

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