# IDENTIFYING WASTE WITHIN CONTINUOUS IMPROVEMENT IN THE SERVICE PROCESSES

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**Abstract**

A high standard of aftersales service is a prerequisite for the competitiveness and long-term prosperity of the global automotive industry. However, to achieve a high level of service processes, the right conditions must be created, and a number of tasks must be successfully resolved. One of the most important tasks is to identify waste and process bottlenecks that hinder the ability to perform all service processes flawlessly, flexibly and effectively. In addition, the current global situation, which creates uncertainty about the availability of resources, be they material, human or energy, makes the issue of waste and its elimination even more important. The authors of this article have decided to use their practical experience to propose a conceptual framework for the identification and subsequent elimination of waste, with the possibility of using it as a standard tool in continuous improvement processes.

**Keywords:** Automotive industry, lean, service processes, waste identification, process bottlenecks, conceptual framework, continuous improvement

## 1. INTRODUCTION

Waste in production processes, whether tangible or intangible, is one of the most common and significant obstacles to optimising the performance of these processes. The ability to identify different types of waste early and correctly is therefore becoming a very valuable skill in all industries and service provision. Since the second half of the 20th century, the issue of waste identification has been inextricably linked to the concept of lean production or lean management, as the continuous effort to identify and eliminate waste is often presented as one of the main pillars of the lean philosophy [1]. Activities related to the elimination of waste are fully in line with the popular mission of the Lean philosophy, which is a persistent effort to optimise performance by eliminating all activities that do not create added value for the customer [2-4]. Thanks to the principles of Lean, once implemented and followed, organisations can minimise waste and therefore unnecessary costs, which is the way to greater efficiency, ensuring higher levels of customer satisfaction and competitiveness [5-9]. In the concepts of Lean and KAIZEN, the concept of waste is also often referred to by the Japanese term "MUDA", or waste in operations [2]. The authors of the article address the issue of identifying waste in service processes to ensure aftersales service in the automotive industry. The aim of the paper was to design a conceptual framework of the procedure for identification and subsequent elimination of waste, based on the experience of projects implemented in practice.

## 2. THEORETICAL AND METHODOLOGICAL BASIS

### 2.1 Types of waste

The original seven types of waste, namely waste in overproduction, waiting, unnecessary transportation, excessive processing, in inventory, unnecessary movement and defects [10], have expanded over time and as needs have evolved to the current eight types of waste [11]. Specifically, these eight types of waste include defects and rework, overproduction, waiting, unutilised talent, transportation, inventory, motion and extra processing [12]. More detailed characteristics of typical waste categories of lean management are given below [2,13,14]:

W1 - Waste of overproduction: Producing more than required leading to overstaffing, storage and transportation costs. Causes a significant amount of resource to be tied up, which otherwise could be used for value-adding operations.

W2 - Waste of available time (waiting): All the time which is not spent for value-adding activities.

W3 - Waste in transportation: Carrying works which does not add value to final product for customer.

W4 - Waste of processing itself (overprocessing): Unnecessary transactions involved in the process.

W5 - Waste of movement: Any unnecessary movement performed by sources.

W6 - Waste of available stock (inventory excess): Excessive amount of supply stored with respect to customer needs and value.

W7 - Waste of making defective products: Deviation of products from customer requires or specification.

W8 - Unused Employee Creativity: This is a situation of not using the potential efficiently, which makes an organization to benefit less than possible.

### 2.2 Waste identification

The basic tools used to identify waste include random observation, structured interviews, questionnaire surveys or gemba walks. More sophisticated tools we can use to identify waste are Value Stream Mapping (VSM) and Time Study. Value Stream Mapping is a key tool for initiating process analysis and is generally recognized as a best practice in process improvement [15]. Taking into account the scope and nature of the processes studied, the authors of the article chose the time study as the most effective tool. It is true that a time study is not a direct tool for improving processes, but it is an important tool for identifying waste and indicators that can be used in choosing the best strategy [16]. As a standard, 7 steps are used to structure time studies:

I. Identify the objectives and define the process for the study.
II. Determine the duration of the study and the number/cycles of measurements and observations.
III. Select appropriate observers and provide all necessary resources.
IV. Explain the details of the time study to the observers and members of the research team.
V. Clarify and standardize all rules for measuring and recording observations.
VI. Carry out the time study.
VII. Data processing and presentation of study results.

### 2.3 Waste assessment

Different types of waste have varying impacts on processes within an organization. Additionally, these waste types are interrelated, with relationships that are not equally weighted [17]. It is important to assess the significance of each identified waste's impact in order to properly evaluate them.

### 2.4 A case study process

The proposed framework for identifying and eliminating waste is presented in the paper using purposely selected and distorted examples as a case study. The authors rooted their work in their own project implementation experiences. The case study product selection relied on comprehensive data collected by the researchers during their professional activities in service processes for after-sales service in the automotive industry. This data was gathered over a three-month period.

## 3. CONCEPTUAL FRAMEWORK PROPOSAL

As described in Chapter 2.2 in relation to the time study methodology, at the beginning of any analytical process it is necessary to clarify the aim, purpose, scope and depth of the research activities. As mentioned above, the authors of the paper chose to use the time study to identify waste. Due to the limited capabilities of the observers, it will not be possible to carry out this analysis on a broad scale and at the same time on all company processes. Therefore, in this initial phase, it is necessary to realise what is a priority for the company, what the impulses were for our activity and whether the section or object of research we have chosen is really the most important one we should start with. **Figure 1** shows a schematic of the proposed approach. The presented procedure includes a situation where we will use time study to identify waste.

In the given schematic procedure, all successive steps are divided into four phases, namely the preparation phase, the implementation phase, the evaluation phase and the realisation phase. After collecting the data and identifying the shortcomings that may cause waste, the important steps of classification follow. Specifically, it is the classification of identified shortcomings according to their significance, how they affect the effectiveness of the process and according to their nature, which is important to determine the most significant waste. The following is a classification of identified shortcomings by type of waste, which is important to find the root causes and appropriate measures to eliminate them.

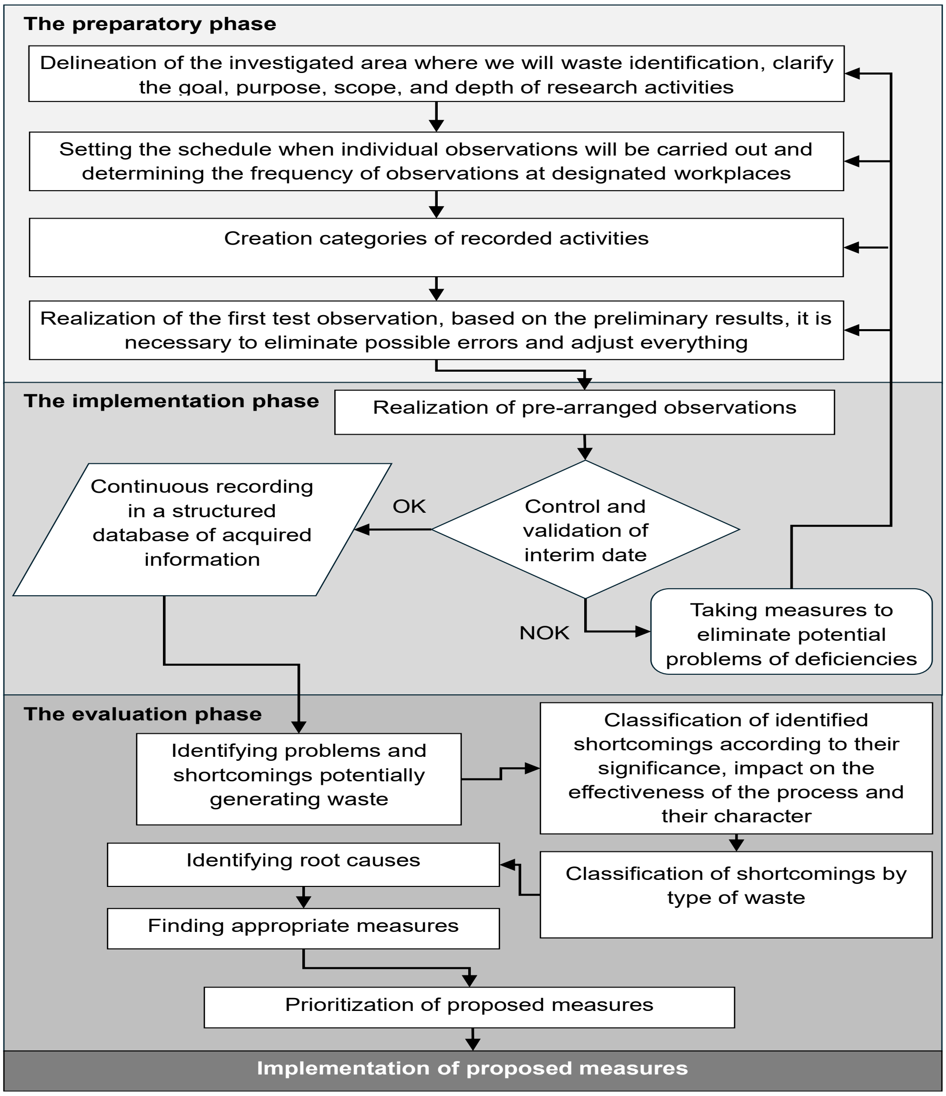


**Figure 1** Schema of procedure of the proposed concept

## 4. CASE STUDY

This chapter shows an example of the application of the proposed conceptual framework in the form of a case study.

### 4.1 Time study focused on identification shortcomings

During processing and when interpreting the results of time study, the following facts must be considered.

In order to accurately distinguish between productive and waste-generating activities, it would be necessary to clearly define the so-called acceptable waste and the waste hidden in productive times:

- Acceptable waste - verify and agree whether the waste that has been identified from the point of view of Lean principles is acceptable for the company for other reasons, for example customer service. Identified waste thus represents potential sources of waste = potential for improvement.
- Hidden waste - the elimination of identified deficiencies should not only reduce waste, but also shorten the duration of activities that have so far been presented as productive, for example too laborious and lengthy invoices due to low-quality documents from mechanics.

The measurement and monitoring methodology was developed and refined during the gradual identification of problems. In order to draw definitive conclusions and take corrective measures, is necessary to carry out more extensive data collection within the measurement. In **Table 1** the recorded activities are presented examples of categories of recorded activities.

**Table 1** Examples of categories of recorded activities

| Category name | Examples of activities |
|---|---|
| Communication with a customer | Receiving the car, handing over the car, arranging repairs, determining the extent of repairs, information on the status of repairs, information on SA prices, prices for work... |
| Communication with the mechanic | Organizing repairs, information on repair status, consultation on operational status of SA... |
| Invoicing | Rewriting and writing out documents, additional data and information gathering, consultation and problem solving, usually missing information, activities to finalize invoices... |
| Operative | Representation of other workers, random tasks (extraordinary questionnaires, for example coffee for the driver), consultations with management, consultations not related to repairs... |
| Pause | Lunch, snack, toilet, personal items... |

In **Figure 2** are shown examples of the time study activities of the service advisor, where it is possible to see potential waste in addition to productive activities.

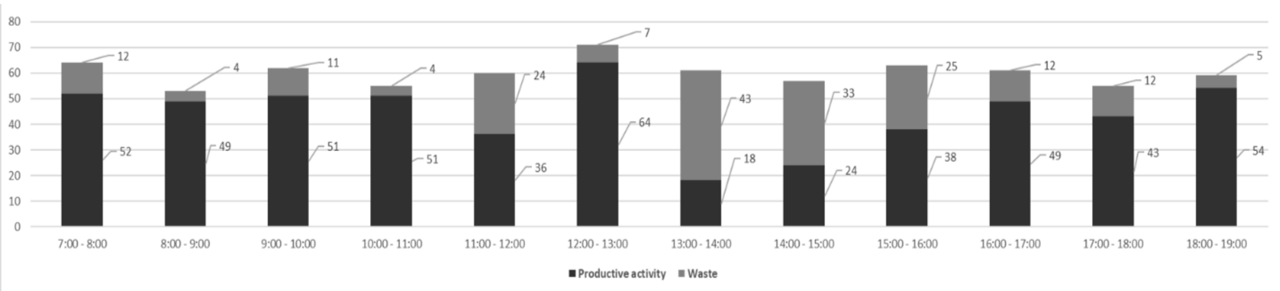


**Figure 2** Examples of the time study activities of the service advisor

Important relevant aspects must be considered when interpreting the graph in **Figure 2**. Waste: This is not a typical waste; these are activity times that have been identified as potential sources of waste = potential for improvement. On the contrary productive activity may contain hidden waste.

### 4.2 Identified shortcomings and wastes

Let's say that 10 specific waste generating shortcomings (Identified shortcomings - IS) have been identified. A five-point scale has been chosen according to the importance of the impact on the process under investigation:

5 – high significance 2 – small significance
4 – significant 1 – very small significance
3 – medium significance

Nature of identified shortcomings can be divided into two groups:

- Specific – their origin can be assigned to a specific sub-process.
- General – Intertwines throughout the process.

Classification of identified shortcomings according to their significance, impact on the effectiveness of the process and their character is presented in **Table 2**.

**Table 2** Classification of identified shortcomings according to their importance and nature

| **Character** | **Significance** | | | | |
|---|---|---|---|---|---|
| | **5** | **4** | **3** | **2** | **1** |
| Specific | IS1, IS3 | IS7 | IS8 | IS10 | |
| General | IS2, IS4 | IS5, IS6 | IS9 | | |

Classification of shortcomings by type of waste presented in **Table 3.** Sample case of identified shortcomings:

IS1 - Inefficient system for preparation of daily plan
IS2 - Not updating daily plans
IS3 - Non-systematic determination of the order execution sequence during the day
IS4 - Inefficient system of historical data collections
IS5 - Exchange of information between shifts about orders
IS6 - There is no deputy for the workshop manager
IS7 - Non-standardized planning of repair times - depending on the experience of each worker
IS8 - Reserves in scheduling work for mechanics
IS9 - Duplication of effort due to the need to use two software tools
IS10 - Bad information flow between service advisor and warehouse operator

**Table 3** Classification of shortcomings by type of waste

| **Category of waste** | **Identified shortcomings potentially generating waste** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | IS1 | IS2 | IS3 | IS4 | IS5 | IS6 | IS7 | IS8 | IS9 | IS10 |
| W1 | x | x | x | x | x | x | x | x | | x |
| W2 | x | x | x | x | x | x | x | x | x | x |
| W3 | | x | x | | x | x | | | | x |
| W4 | x | x | x | x | x | x | x | x | x | x |
| W5 | x | x | x | | | x | x | x | | x |
| W6 | x | x | | x | x | x | | | | x |
| W7 | x | x | x | | | x | x | x | x | x |
| W8 | | x | | | | | | x | x | x |

### 4.3 Prioritization of proposed measures

24 measures were identified to address the root causes of the ten identified shortcomings (proposed measures -PM). While for some shortcomings only one measure was found (IS1 proposed measure PM1-1), for others five measures were found (IS6 proposed measure PM8-1 to PM8-5). A Significance matrix was used as a simple tool for system prioritization of the proposed measures, as shown in **Table 4**. Two criteria were used for prioritization, namely significance (impact) and requirements for implementation. Priority measures for implementation are those that have a high impact and yet have a low implementation requirements.

**Table 4** Significance matrix showing prioritization of proposed measures

<table>
<tr><th colspan="4">Summary of measures</th></tr>
<tr><td rowspan="2">Significance (impact)</td><td>5, 4 - High</td><td>PM1-1, PM2-1, PM3-1, PM4-1, PM4-2, PM6-1, PM6-3, PM8-1, PM8-2, PM9-2, PM10-1</td><td>PM5-1, PM7-1, PM8-4, PM9-1, PM10-2</td></tr>
<tr><td>1, 2, 3 - Low</td><td>PM3-2, PM5-2, PM6-2, PM8-3, PM8-5, PM10-3</td><td>PM3-2, PM5-1</td></tr>
<tr><td colspan="2">Requirements for implementation:</td><td>1 - Low</td><td>2 - High</td></tr>
</table>

## 5. CONCLUSION

The paper proposed a conceptual framework for the process of identification and subsequent elimination of waste in service processes. A sample case of the application of this conceptual framework was presented through a case study that reflected the real situation of after-sales service processes in the global automotive company. When using the proposed framework in practice, considerable variability must be expected, as in practice there are a number of objective factors that can significantly affect this process. If the identification and elimination of waste process becomes part of the company's continuous improvement strategy, another important issue will be the correct setting of the cycles, how often the waste identification procedure should be performed in the investigated processes.

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