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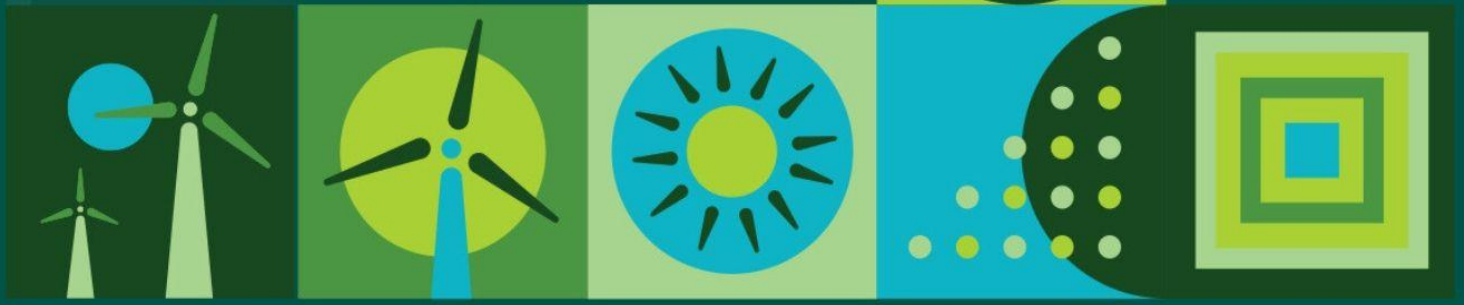
BOOK OF ABSTRACT

Future Horizons:

NAVIGATING SUSTAINABILITY AND FUTURE ECONOMIC CHALLENGES

October 17 - 18, 2024

University of Sarajevo -
School of Economics and Business



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FOREWORD

Following earlier conferences with participants from nearly all over the CEE region as well as from many other countries, the School of Economics and Business in Sarajevo is proud to host the 11th International Conference. This conference aims to bring together academics as well as practitioners to discuss diverse issues in the fields of economics and business with a focus on transition economies. The purpose of this conference is to disseminate high quality research and to promote scientific information interchange between researchers, developers, students and practitioners.

This conference offers a variety of research perspectives from a number of Central and Eastern European countries. This wide-ranging research context forms the basis for studies in different fields: economic development, international economics, business administration, marketing, information technology, insurance and etc.

As was the case in earlier ICES conference it is our pleasure to inform conference participants that selected papers presented at this conference will be considered for publication in a special issue of the South East European Journal of Economics and Business published by the School of Economics and Business.

Also, we would like to invite you to submit your paper for publication in this journal in the future. We strongly believe that the discussions between prominent and experienced researchers at the conference will serve as a solid bases for improving your paper and enriching your further research focusing on transition countries.

We would like to thank all the authors who prepared and submitted their papers to ICES2024.

A special thank is addressed to keynote speaker, Professor Wim Vanhaverbeke, Antwerp Management School, Belgium, editor-in-chief of Technovation and Professor Slavo Radosevic, University College London, UK. We are certainly aware that it has taken time and effort to take part in this Conference, and this is much appreciated.

We would also like to express our gratitude to all participants for their expertise and for sharing their views and ideas which present the most important contribution to the sucess of this Conference.

It was with great pleasure that my colleagues and I had this opportunity to host such a conference.

Sarajevo, October 2024

Amila Pilav - Velic
Editor

CONTENT

DEVELOPING SOLUTIONS FOR THE IMPROVEMENT OF BUSINESS PROCESSES IN THE MACEDONIAN AUTOMOTIVE INDUSTRY

─ ABSTRACT ─

Elizabeta Mitreva
Faculty of Tourism and Business Logistics, Goce Delcev University,
Stip, The Republic of North Macedonia
elizabeta.mitreva@ugd.edu.mk

Pavlinka Todorova
Faculty of Tourism and Business Logistics, Goce Delcev University,
Stip, The Republic of North Macedonia
pavlinka.177032@student.ugd.edu.mk

Dzevat Kicara
Faculty of Tourism and Business Logistics, Goce Delcev University,
Stip, The Republic of North Macedonia
kicara.dzevat@isrsm.gov.mk

This paper presents the research towards developing solutions for the improvement of business processes in the automotive industry in the R. N. Macedonia by implementing the techniques and methods of the Kaizen philosophy. The principal goal of the paper is a comprehensive analysis of the factors that enable the improvement of the entire production process through the application of tools for identifying, monitoring and solving problems. The first part of the methodology is taking the initiative by the management or the management structure of the company to use modern tools and techniques to improve quality towards achieving the planned goals. The implementation of activities preparations implies the formation of teams for improvement, detection of problems and selection of Kaizen technique. Furthermore, it follows the definition of a plan with activities, foresees goal setting and projection of the outcome of the results of the planned corrective measures. After obtaining and analyzing the results, an internal analysis is conducted and the processes in the business process are standardized. As a result of the implemented changes in all production processes in the automotive industry, the responsible persons of each department commence to standardize their daily activities and implement greater coordination in their teams. The introduction of modern tools and techniques of Kaizen aimed to improving business processes in the automotive industry, enabled slow but continuous changes at all levels and in all areas of operation. The awareness of the management and all employees was growing that something should be done on a daily basis in order to obtain a result, improve the work, productivity, efficiency and effectiveness, make the workplace a pleasant working place and of course ultimately to result in increased profits and higher wages.

Keywords: Kaizen philosophy, methods and techniques, continuous improvement, automotive industry

JEL classification: O32, O33

DEVELOPING SOLUTIONS FOR THE IMPROVEMENT OF BUSINESS PROCESSES IN THE MACEDONIAN AUTOMOTIVE INDUSTRY

Elizabeta Mitreva*,
Faculty of Tourism and Business Logistics, Goce Delcev University, Stip, The Republic of North Macedonia
**Correspondence: elizabeta.mitreva@ugd.edu.mk*

Pavlinka Todorova
Faculty of Tourism and Business Logistics, Goce Delcev University, Stip, The Republic of North Macedonia
pavlinka.177032@student.ugd.edu.mk

Dzevat Kicara
Faculty of Tourism and Business Logistics, Goce Delcev University, Stip, The Republic of North Macedonia
kicara.dzevat@isrsm.gov.mk

Abstract

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Keywords: Kaizen philosophy, methods and techniques, continuous improvement, automotive industry

JEL classification: O32 Management of Technological Innovation and R&D; O33 Technological Change: Choices and Consequences

1. Introduction

Kaizen as a philosophy is commonly implemented through a series of small, incremental improvements performed by the employees at all levels of the organization. These improvements are mostly low-cost and low-risk, making them easier to implement and maintain over time (Omotavo et al., 2018). By organizing events or Kaizen workshops, large-scale improvements are facilitated or specific challenges are addressed. In general, Kaizen is not just a set of tools or techniques, but also a way of thinking that encourages continuous learning, experimentation and improvement (Chan & Tay, 2018; Gonzalez-Aleu

et al., 2018). By accepting the principles of Kaizen, the organizations can create a more agile, efficient and innovative environment that will enable them to thrive in an ever-changing world. Continuous improvement is an ongoing process of improving products, services or processes gradually over time. It is a systematic approach for making small, incremental changes that lead to overall improvements in quality, efficiency and effectiveness. Continuous improvement is rooted in the philosophy that there is always a room for improvement and emphasizes the importance of constant evaluation, adaptation and innovation (Singh & Singh, 2018; Iwao, 2017).

This paper presents the research towards developing a solution for the improvement of business processes in the automotive industry in the R.N. Macedonia through the application of tools for identifying, solving and monitoring problems. Kaizen is a Japanese philosophy that represents a set of tools and techniques for improving the quality of business processes, products and services. The Japanese philosophy is based on small and continuous process improvements, which increase the efficiency of the organization and the production and achieve greater results, including all the organizational members, regardless of which hierarchical level they are and without making large capital investments (Suárez Barraza et al., 2018; Kumar, 2019).

The work organization plays a key role in the entire process of improving the business processes and competitiveness of the company Solaimani et al., 2019). The management of the company must reconsider and establish the organizational and business processes under new conditions and on a higher level. It is extremely important to establish a modern management of operations and duality of the managerial and ownership function of operations, to accept new working methods and techniques in which all the employees will be involved (Vo et al., 2019; Vinodh et al., 2021).

Hence arises the need for creation of a concept for complete quality management in all segments of the operation, its planning, control and improvement, all with the aim of creating a product or service of high quality that will meet and exceed the needs and expectations of the market (Kumar et al., 2018; Mitra Debnath, 2019; Jaca et al., 2018).

2. Materials and Methods

The main topic of the research in this paper is to analyze the factors that determine the improvement of the operation of a Macedonian automotive company and its competitiveness through the improvement of business processes in all aspects. The purpose of the research is to determine the benefits and results of adopting the Kaizen philosophy and its methods and techniques, which are of strategic importance for continuous success in the development of business processes (Goyal et al., 2019; Carnerud et al., 2018). The first part of the methodology is taking the initiative by the management or the management structure of the company to use modern tools and techniques to improve quality towards achieving the planned goals. The implementation of activities preparations implies the formation of teams for improvement, detection of problems and selection of Kaizen technique. Furthermore, it follows the definition of a plan with activities, foresees goal setting and projection of the outcome of the results of the planned corrective measures. Quality control tools and techniques are used to set measurements at critical points, where results are monitored and ongoing control is established. After obtaining and analyzing the results, an internal analysis is conducted and the processes in the business process are standardized. Finally, with the self-assessment method, the final evaluation of the results and effects of the designed and applied methodology is provided (Fonseca & Domingues, 2018; Enshassi et al., 2019).

3. Results and Discussion

The company from the automotive industry for the production of car seat covers is the first company in R.N. Macedonia and the eastern region, which has been actively working for 13 years with its headquarters in Shtip in the technological industrial zone. It is a global automotive seat cover manufacturing company for multiple car models and classes for Ford, Mercedes, VW Golf and Volvo. The company has built its own facility with huge plants that are equipped with the most modern ordinary and special machines such as Lectra, Teseo and others. This company produces about 2000 different covers and it is recognized for the high quality of its products that are installed in the cars of the most famous brands in the automotive industry. The automotive industry is one of the most dynamic and influential industries in the world and it adapts to global standards, technologies and innovations to improve the production processes. During these 13 years, this company has succeeded to establish itself in the market and to demonstrate that it is a desirable and caring employer for the employees in R. N. Macedonia. It is a company that brings value on a global level, offers products of the highest quality for customer satisfaction and contributes to the socio-economic development of the country. The implementation of the Kaizen philosophy in the company from the automotive industry is realized through various tools (Carnerud et al., 2018; Chung, 2018).

In order to achieve greater efficiency and effectiveness in the automotive industry, it is established a process in which by layout or schedule of operations by machine, the operator rotates in a chain from operation to operation to produce a finished product. By this concept, the productivity and quality of production is improved, because a complete plan of the process is performed. The space, number of machines, number of required employees and other necessary resources are calculated. According to these analyses, the layout and setting of operations by machines is made according to the specification, necessary guides, shoes, etc. The number of necessary machines amounts to 45, of which 30 machines are for ordinary composition, 5 machines are for sewing a decorative stitch - double-head, 5 machines are for a decorative stitch - iber and 5 machines are for cutting certain operations - edge trimming. During the manufacturing of the product, each operator is obliged to cut the stitch, perform a self-inspection of the piece, put a stamp to verify that the piece is quality-made and approved for the next operation so that the entire cover is handed over for final control. The target that the client is looking for the production of seat covers is 200 sets per day. It takes 35 employees to produce these sets. At the beginning of the project, 40 operators were trained and started with efficiency of 50%. In the first week, it was considered that the team was growing slowly in terms of efficiency and production of sets, because there were more operators than targeted and more time was wasted, because not everyone worked with the same speed and there was no possibility of rotations. After the implemented measurements by the process engineer and the team leader of the cell, the results of the tack time and the real times of the operators were analyzed and a decision was made to be removed 5 operators with weaker performance. Proposals for improvement were also taken into account in the places where it was considered that there was a "bottle neck" by the employees and a small change was made in the schedule of operations for the movement of the pieces, more precisely, production was followed in the flow of one piece (One-piece flow production) to prevent empty steps, loss of time, waiting, but also stock creation. With the allocation of resources, proper training and rotation of operators, the team increased the efficiency by 15% in the second week of the project, i.e., achieved efficiency of 65%. By optimizing the operations and the number of employees, the efficiency improved and the set target of 200 sets for which the client had a request was achieved Alvarado-Ramírez et al., 2018).

In certain projects, due to the problem of the cover design, an alternative solution must be found to detect and prevent certain manufacturing errors, therefore the Poka-Yoke method is applied. In the initial phase of each project, an initial application of the Poka-Yoke

method is considered which is later continuously improved. In this case, this method had to be installed on a special double-head decorative stitch machine, because it was concluded that there is an increased number of scrap pieces, because during the operation, the seam is underneath the piece and the operator does not notice it visually. Therefore, during the actual sewing, the seam kept closing. By implementing the Poka-Yoke method, the scrap of this critical operation was prevented by placing a sensor on the underside of the working table surface of the machine and if it happened to twist the seam, the machine will close (stop) and the operator must set the seam correctly – to open it, so that the sensor can be unblocked and complete the operation accurately and with quality (Al-Hyari et al., 2019).

Besides all these methods and techniques, the JIT (Just In Time) strategy also have an important role, without which an accurate and timely flow of the processes cannot be ensured. A just-in-time (JIT) inventory system is a management strategy that harmonizes the raw material orders - from suppliers - directly with production schedules. Automotive companies use this inventory strategy to increase efficiency and reduce waste by receiving only the goods they need for the production process, thereby reducing inventory costs. This method requires manufacturers to accurately forecast the demand. Instead of storing large stocks of materials and components in warehouses, with this strategy, minimum stock levels are maintained and quantities are obtained from suppliers as much as we need to manufacture pre-planned capacities. For example, the material order is made by the logistics coordinator who, based on the previously received EDI quantities (electronic numbers for capacities), in the CUTMAN system calculates how much material is needed for the production of the sets requested by the customer. If the coordinator does not predict that there is stock, a low reserve of material in case of scrap during tailoring, sewing of the covers or increase in demands can lead to a stoppage of the entire production. The next example is the specific component IZOFIX button (a component that indicates on the back seat where a child seat should be placed) where an order is made to the supplier on a weekly basis with a low stock calculation, but if no quantity is foreseen for a possible scrap or increase in demands, this component will cause a stoppage in the entire production process. In case of a major problem, which means that even the minimum stock is not enough, a backup plan is needed for immediate delivery by the current supplier or another supplier in the shortest time with lower additional delivery costs. In general, JIT helps car manufacturers to operate more efficiently, to minimize costs related to storage space, handling, insurance, obsolescence and respond more quickly to changes in customer demand (Álvarez-García et al., 2018).

The 8D (Eight Disciplines) method is commonly used in the automotive industry to effectively solve the quality problems. An example of the application of this method in the sewing of car seat covers is a recurring problem that has arisen in the production line, which is a stitch on the front side. This finding was also observed on the production line at the customer. Upon request of the buyer, it is necessary 8D report to be made.

Steps in applying the 8D methodology (Eight Disciplines) Enshassi et al., 2019):

- Firstly, a team is formed: The first step is to assemble a cross-functional team that includes representatives from manufacturing, quality control and engineering. This team works together to analyze and solve the problem.
- Defining the problem: A clear definition of the problem and in this specific case it is the stitch on the front side of the car seats. It has been identified that there are frequent defects in the stitching of the seat covers, leading to inconsistencies in appearance and durability.
- Internal emergency actions: Implementing interim actions to contain and prevent further defective covers from reaching customers. This includes more rigorous sorting through selection and inspection of case covers before they leave the production line and warehouse area.

- Identifying the root causes: Techniques such as “5 Why” or Ishikawa diagram are applied to identify the root cause of cover defects. It can be determined that there are problems with the sewing machines, insufficient training of the operators or problems with the quality of the used stitch.
- Defining corrective actions: Based on the findings of the root cause analysis, corrective actions are developed and implemented. This could include replacing sewing machines, providing additional training to operators in proper stitch cutting techniques.
- Confirmation of corrective measures: The identified corrective measures should be applied into practice. This may include retraining operators, installing new equipment or updating standard operating procedures.
- Taking preventive measures: In order to prevent the occurrence of similar problems in the future, preventive measures are established. This may include implementing regular maintenance schedules for sewing machines, conducting ongoing operator training and improving quality control processes to detect potential problems early.
- Recognizing Team Effort: Finally, the team's efforts in solving the problem should be recognized and celebrated. This encourages continuous improvement and collaboration among team members.

The methodology of 8D (Eight Disciplines) is shown in Figure 1.

Figure 1: Application of the eight-discipline-8D methodology in the automotive industry

By applying the 8D (Eight Disciplines) methodology for solving the problems in sewing car seat covers, car manufacturers can effectively identify and solve quality problems, leading to improved product quality, customer satisfaction and operational efficiency.

Pareto analysis is applied to identify the problems that occur during the production of car covers and with the Ishikawa analysis, the causes of the error are determined. The Pareto diagram is applied when analyzing data for frequent problems which appear in the quality process. An example through which these two analyzes will be applied is the finding in a production line. Through the recording of errors by the final control using the Pareto method, it can be concluded that of all the errors that are found internally in the production line, the most common error is a stitch on the front side of the seat, while the other defects are less numerous. Therefore, it is necessary to take corrective measures to reduce or permanently solve this problem, as shown in Figure 2.

Figure 2: Pareto analysis in problem solving in a production line

Based on the Pareto diagram, an Ishikawa analysis was performed to determine the potential causes of this recurring error. After the conducted analysis, it can be determined that the human factor and in this case the operator did not self-control of the operation he/she sewed, as shown in Figure 3.

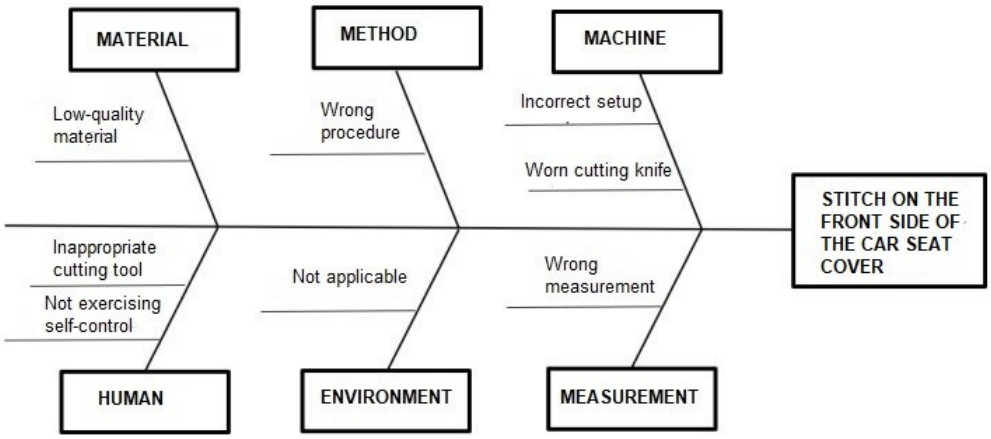

Figure 3: Ishikawa analysis of a production line problem

It should not be omitted the whole procedure to be checked if the machine is set correctly, if the sharpness of the knife of the machine meets the quality criteria and to check the cutting tool, i.e. the sharpness of the scissors to be used by the operator eventually after the operation is completed. After all these steps are completed, a time frame should be set for monitoring the error, whether there will be improvement, i.e., reduction, complete resolution or repetition of the problem.

Problem solving method can be used to solve complex challenges. Through the structured approach, problem solving first begins with defining the problem, gathering relevant information, identifying the symptoms or problems and looking for the root cause of the problem. The "5 Why" technique can also be used to dig deeper into the root causes. An example for which this tool was used is an omitted component in a production line, as shown in Figure 4.

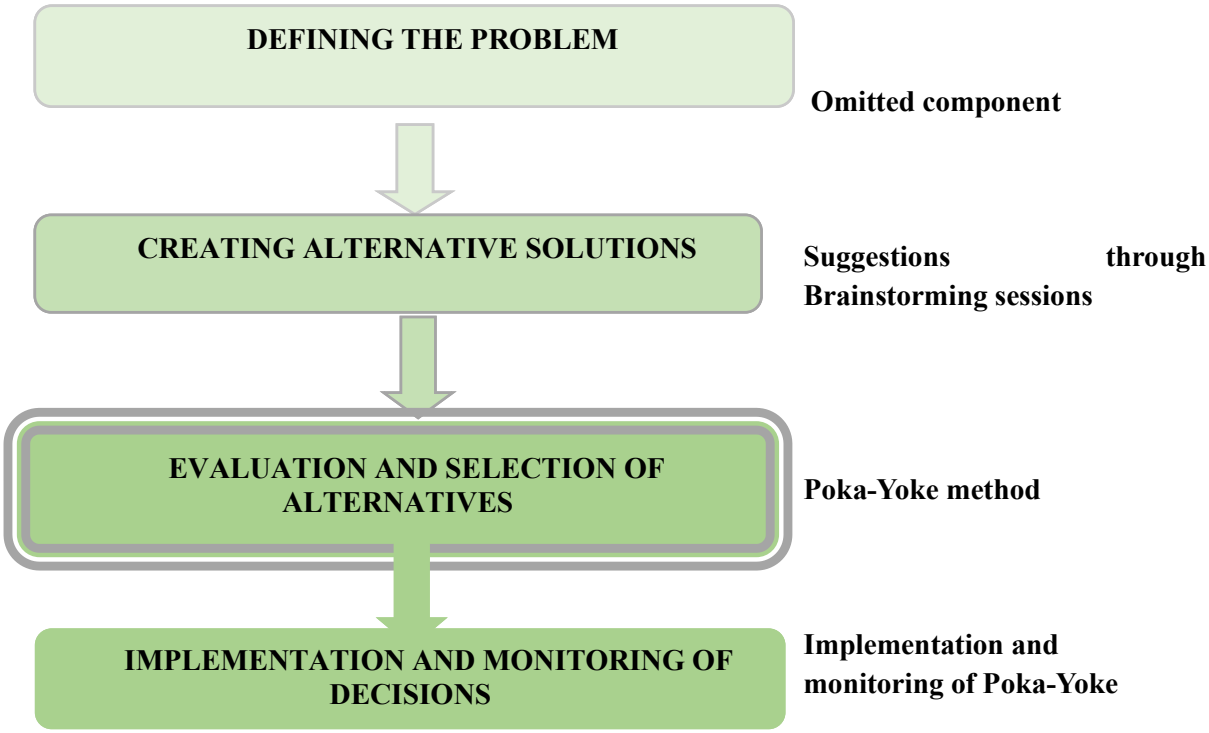

Figure 4: Steps in the problem-solving process

After defining the problem that occurred, which is that the operator omitted the component, the next step is to create an alternative solution. By encouraging creativity through brainstorming sessions from the employees, the idea of choosing a Poka-Yoke method that will bring a long-term solution was reached. After the conducted analyzes and evaluation, this alternative was chosen and the implementation of the chosen solution was carried out. On the machine sensors are placed the boxes marked with part numbers of various components that the operator has to pick up in a predetermined order. If the operator does not follow the order, the sensors block the machine, a sound signal is activated and the operator has no possibility to make a mistake. However, apart from this, a metal holder was placed on the next machine where the semi-finished product should be attached. If there is no component, the operator will not be able to postpone the piece to the next operation. After implementing this method, the results were monitored and it was determined that this error never happened again.

With the "5 Why" method was identified the root cause of the problem for the omitted component. To the question, Why did the problem occur, the answer is that the operator did not respect the work process, because he/she skipped an operation. Why did he/she skip an operation? Because he/she did not have adequate training and did not perform self-control and the process itself was not set to ensure that the piece was made with quality. All of this could have been foreseen when creating the process of movement and making the piece and if it had been implemented Poka-Yoke method at the beginning, it would have prevented this error. Through this method the problem is determined, as shown in Figure 5.

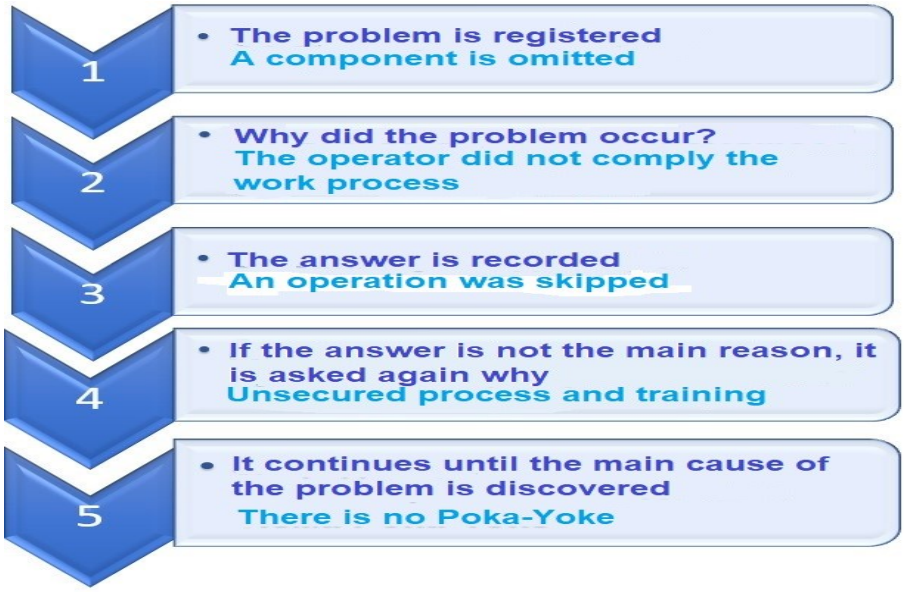

Figure 5: Steps in applying the "5 Why" method

The implementation of the 5S method in a company from the automotive industry contributed to better results in the organization of the working space, because a daily routine was introduced to apply all the steps of the 5S tool. Of course, it would not work permanently if there was no traceability of the daily situation. In the logistics sector, upon receipt of the shipment by the warehouse department, if the materials and components were mixed, with the introduction of 5S, a detailed arrangement is conducted in alphabetical order by shelves and part numbers. And with the introduction of the FIFO (First in First Out) method, effective stock management commence, ensuring that goods are used in the order in which they were purchased. Those who entered the stock first, should be the first to leave. This improves the process of receiving and handing over materials and components because each warehouse operator can more easily arrange them on receipt or find them for issue by FIFO. This reduced the time required for searching, checking, hiring workers and all other non-productive work. From the incoming control, all materials are checked according to the meterage, thickness and shade of the material, where each roll is marked with a colored flag (red, yellow and green) and according to the required specifications, it is issued to the tailoring department. All obsolete materials and components after completion of the projects are placed in a predefined location which are later used in a training cell for training new machine operators. In the production department of the tailoring department, mixed or fallen rolls were often found, but with the introduction of 5S, metal holders-separators were installed to separate the rolls vertically, according to part numbers, colors, dimensions, etc. Thus, when taking the rolls for laying the lectras for tailoring, the process of finding them was facilitated for the operators and the damage to the material from the breakage that happened when the roll fell to the floor was prevented. In the sewing department there are always many points to solve which cause countless problems in the process of making the covers.

The part of the points for which a solution was found through the application of Kaizen, i.e. 5S method, are the following:

Mixed Kanban components

Two similar components were placed on a Kanban next to each other, however when manipulating the components from the boxes there was a mix-up because there is very little difference in design. A brainstorming solution was provided by one of the employees who was the supplier of the material and component, to move one box from the first row on the

left of the Kanban to the second row on the right of the Kanban so that they could be further apart. This small change prevented component mix-ups and saved time, resources and costs for additional repair and scrap covers if the component reached the sewing cell.

Scrap pieces in subline

In the production line, there have been situations when the machine operator made a mistake during the production of a certain piece that could not be repaired and had to throw it away as scrap. When there was no place for putting that piece, it was left on the machine and usually mixed with the quality made pieces and it ended up with a finished product. By considering the problem, it was invented to be placed a red box for scrap pieces. That box was placed at the beginning of the sub-line where it immediately stood out as a scrap and orange boxes were placed in the line that were marked for pieces for repair if an operation went wrong during sewing and it can be repaired.

Messy production lines

One of the frequent findings at the end of a shift was undiscarded waste from pockets, floors and machine dust. With the introduction of a 5-minute cleaning at the end of a shift, each operator has a duty of emptying the waste from the pocket of the machine where the operator worked into a bin by placing several small bins in each sub-line. For maintaing the floor clean, brooms and shovels are provided per cell in a designated location for cleaning tools and at the end of a shift each operator is responsible for removing the waste from the sub-line. Dusters were provided for each machine to remove dust and each employee obligatorily wipes the work surface and leaves the work area tidy and clean for the next shift. All this to be maintained is monitored by the designated captain in the sub-line who performs daily records in a checklist.

Identification of unnecessary parts, tools or materials

Findings of parts, objects, tools, materials and components whose utility status was unknown were constantly observed throughout the workspace. In order to decide whether the objects that have been found are needed or not, a process called Red tag has been introduced. A real-life example from the automotive industry of using this tool is removing components from a completed project from the Kanban. After the project completion, the warehouse operators, according to the directions of the material coordinator from logistics, should remove all the materials and components of the Kanban, but an omission was made by the warehouse operators by not withdrawing all the part numbers that were already obsolete. Therefore, the material handler from the sewing department removes the boxes with components with a red tag and puts them in the marked Red tag zone, where the process of considering whether these components will be returned to the warehouse or thrown into the waste. In order not to repeat this finding after the project completion, a record list was introduced which components should be removed from the Kanban and withdrawn to the warehouse.

4. Conclusions

As a result of the implemented changes in all production processes in the automotive industry, the responsible persons of each department commence to standardize their daily activities and implement greater coordination in their teams. At the same time, continuous corrections were performed to the weaknesses in the teams, by rejecting all the unnecessary activities, which are not in the direction of achieving progress and do not contribute to the creation of new values. The introduction of modern tools and techniques of Kaizen aimed to improving business processes in the automotive industry, enabled slow but continuous changes at all levels and in all areas of operation. The awareness of the management and all employees was growing that something should be done on a daily basis in order to obtain a

result, improve the work, productivity, efficiency and effectiveness, make the workplace a pleasant working place and of course ultimately to result in increased profits and higher wages. The adoption of the Kaizen philosophy in the company has led to a complete orientation towards the customer, which in this industry is a key factor for successful production, gaining reputation and following all current demands and criteria (Álvarez-García et al., 2018). Hence arises the need for continuous progress and changes, small but significant steps in every segment of daily operations. The implementation of the Kaizen philosophy is expected to provide even greater results in the long-term period because over time it becomes a way of working accepted and approved by all the employees and management (Chung, 2018; Solaimani et al., 2019).

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