Benefits of visual management in the automotive industry

Benefícios do gerenciamento visual na indústria automotiva

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Abstract

With the aim of providing adequate information for efficient decision-making, as well as clear instructions to speed up understanding of the status of processes and enable tasks to be carried out correctly, helping to improve the work performance of employees, a technique known as visual management has been developed. Its main objective is to improve quality and productivity at work by optimizing internal operational routines and helping to make companies more competitive. In this context, the purpose of this paper is to highlight the benefits that the adoption of visual management has brought to a heavy vehicle automotive industry. By applying concepts related to visual management, with a focus on meeting the...
deadlines involved in vehicle updating and modernization projects, the aim was to improve results by developing and integrating the model's own instruments into the production sector responsible. Para isso, foram adaptadas técnicas e ferramentas, sob a abordagem da gestão visual, de maneira a se obter redução nos prazos de produção e, como consequência, a melhoria da produtividade no trabalho. The results achieved showed an improvement in the management of operational activities in the sector, as well as greater compliance with the production deadlines set by the company, helping to increase the sustainability and competitiveness of its industrial operations.

Keywords: Gestão Visual. Prazos de Produção. Processos de Trabalho. Indústria Automobilística.

Resumo
Com o objetivo de fornecer informações adequadas para uma tomada de decisões eficiente, bem como instruções claras para acelerar a compreensão do estado dos processos e permitir que as tarefas sejam realizadas corretamente, ajudando a melhorar o desempenho do trabalho dos funcionários, foi desenvolvida uma técnica conhecida como gestão visual. O seu principal objetivo é melhorar a qualidade e a produtividade no trabalho, otimizando as rotinas operacionais internas e ajudando a tornar as empresas mais competitivas. Neste contexto, o objetivo deste documento é destacar os benefícios que a adoção da gestão visual trouxe para a indústria automotiva de veículos pesados. Ao aplicar conceitos relacionados à gestão visual, com foco no cumprimento dos prazos envolvidos em projetos de atualização e modernização de veículos, o objetivo foi melhorar os resultados, desenvolvendo e integrando os próprios instrumentos do modelo no setor de produção responsável. Para, foram adaptadas técnicas e ferramentas, isso sob a abordagem da gestão visual, de maneira a se reduzir nos prazos de produção e, como consequência, a da satisfação no trabalho. Os resultados obtidos mostraram uma melhora na gestão das atividades operacionais do setor, bem como um maior cumprimento dos prazos de produção estabelecidos pela empresa, ajudando a aumentar a sustentabilidade e a competitividade de suas operações industriais.

Introduction

One of the biggest competitive challenges faced by companies in general is to integrate and adapt production deadlines and costs to the quality of what is produced, thus favoring the sustainability of the business. At the same time, consumers who are more demanding in terms of the quality of products and services and more sensitive to socio-economic and environmental issues tend to demand changes in production processes from companies in order to achieve more sustainable production methods (Ammar et al., 2021; Sales et al., 2022; van de Vrande et al., 2009).

In a general context, business organizations establish their strategic goals, based on which they define the markets in which they will operate. With the goals and markets defined, strategic business plans are developed, which include defining the techniques and tools to be used to reach the desired market niche. In increasingly competitive markets, the decision-making process needs to be quick and efficient if the company is to remain competitive. This can be a major challenge, considering that many production operations are highly complex, making it difficult to deal with different processes and the varied availability of information (Chau et al., 2021; Reis et al., 2023; H. de O. G. da Silva et al., 2021). In this sense, in order for an organization to be successful, outperforming its competitors in meeting the demands of clients or consumers, it is essential that the performance criteria established by the market in which it operates are met, showing competitiveness on the part of the organization (Barbosa et al., 2020; Garza-Reyes et al., 2018; Jin & Oriaku, 2013).

The company that is the subject of this study is a large multinational that produces heavy vehicles in the southeast of the country. In the company’s production process, due to the amount of information inherent in the production stages, it was identified that there were situations in which it did not flow properly and with the necessary clarity for those who needed to use it. This occurred both on the part of those receiving the information and those sending it, sometimes resulting in information being lost along the production "path". As a result, there were frequent delays in production or projects, where the lack or delay of information slowed down production management decisions by the employees involved. With the recurrence of such situations, it was observed that, for a given sector of the company, the most relevant information for production and its control was not adequately available or exposed to everyone who needed it. In many cases, only a few people knew about the problems that were occurring at certain stages of the production process, and everything became even more difficult when you saw how close the production deadlines were for that sector.
Many of the vehicles manufactured underwent modifications and upgrades, as defined in the engineering projects, where various parts were modified or changed on different types of heavy vehicles. Teams that didn't work on modifying the same vehicle all the time often couldn't identify what had been or was being changed, nor did they have information about the date and time these vehicles entered and left the work area (here called the workshop). As the vehicles entering the workshop had a set deadline for these modifications and updates to be carried out, according to project and engineering planning, this situation led to serious difficulties in meeting deadlines, generating economic losses and stress in the workplace.

**Theoretical Referential**

Visual management uses various types of communication devices, considering work environments, to quickly and clearly inform how work should be carried out and if there are any deviations from the established standard (Knop, 2020; Kurpjuweit et al., 2019). Visual management or visual control is a technique increasingly used by managers, among other professionals, especially in industry, with the aim of obtaining a quick understanding of how processes are working and how they are performing in relation to the established performance parameters. For this purpose, panels, signs, indicator lights, cards and graphics are used (Kurdve et al., 2019; Lin & Golparvar-Fard, 2021).

There are many processes in our daily lives where visual management techniques can be used. A practical example is how our road traffic system works. In it, we use traffic lights, signs, strips marked on the ground, among other devices, which allow us to obtain immediate information that is essential for our safety and that of the community (Kurdve et al., 2019; Kurpjuweit et al., 2019). Particularly within large companies or organizations, visual management is the predominant mode of communication. This system favors employee autonomy and aims to create an environment in which information flows freely and independently. For the author, information must be incorporated into processes and be as close as possible to the employees involved. This information must be made readily available by visual management in order to achieve active communication, ensuring that the established standards are followed by everyone (Bascoul et al., 2020; El Manti & El Abbadi, 2022; Murata, 2019).

Strongly associated with the Lean production philosophy, where clear understanding of processes and inherent problems are part of the system, visual management enables agile and objective communication between people, contributing to improved product quality and...
process productivity, often with cost savings (Baber, 2018; Sahoo & Yadav, 2018; A. C. P. da Silva et al., 2023). It is of fundamental importance that the problems associated with production are evident to everyone involved, because when the problem becomes visible it is easier and quicker to act and create solutions together with the work teams. In this respect, visual management can be of great help (Ammar et al., 2021; Kurdve et al., 2019). Toyota, the Japanese company that developed and applied the principles and tools of what we now call Lean Manufacturing, recognizes that, when it comes to processes, "evil is in the details". In other words, small deviations in processes can have serious consequences, so visual management must be applied to ensure compliance with established work standards (Baber, 2018; Harolds, 2023; Lu et al., 2022; Rubert et al., 2023).

**Scientific Method**

In the present research the approach used was exploratory study with the purpose of understanding the context, analyzing and creating familiarity with the identified problems (Espuny et al., 2022; Kothari & Garg, 2019; Rocha et al., 2022). By studying the concepts and approaches of visual management, it was possible to build a methodological framework that enabled losses to be reduced and the deadlines set for industrial operations at the automobile company to be met. The work carried out was based on the problems identified in one of the production areas of an automobile manufacturer during the process of modernizing or updating vehicles in the design phase. The research is therefore classified as a case study (Miguel, 2018; Yin, 2017).

As a starting point for carrying out the work, it was necessary to obtain the awareness and authorization of the management responsible for the sector, without which nothing could be done. To this end, meetings were held to detail the proposal to introduce visual management and its relevance to the environment in which the work was to be carried out. During these awareness-raising meetings, successful cases of the implementation of visual management in other industrial companies were shown, highlighting the advantages and benefits of its introduction, as well as explaining the stages in the process of implementing and maintaining visual management.

Once there was full understanding and receptiveness on the part of the sector's management, we moved on to the stage of forming a working group that would be responsible for disseminating the information and training the employees involved in the work processes.
Employees were explained how visual management would work in the sector and the mechanisms and tools for providing information and instruction for work routines.

The availability in the company of documents showing how each work process was carried out in the workshop sector helped speed up the introduction of visual management. Using this information, it was possible to complement the process mapping by checking how the workshop should carry out its operations in the light of the visual information/instructions to be introduced into the sector's work routines. To this end, a tool was developed to help monitor operational activities, including highlighting the problems contained in these projects. This tool should provide quick and easy access to information so that the people involved could solve the problems within the established deadlines.

In this way, it would be possible to highlight the objectives of each stage of the project, in each type of vehicle, as well as the delays and those responsible for this situation. By visually identifying the deadlines involved, selecting possible solutions to the problems encountered, targeting criticality and prioritizing actions, the aim was to reduce delays in operations by quickly resolving problems when they occurred, while maintaining product quality. Due to the lack of criteria for prioritizing problems with overdue vehicles, resulting in missed deadlines for delivery of finished vehicles, the proposed solution was based on a card system, integrated with visual management, with the support of a board for monitoring work activities in the workshop, as described below.

A visual management system was created based on compliance with the deadlines and objectives set by the sector's management. Initially, a monitoring board (Figure 1) was created as a test and then adopted as definitive, with the most relevant information that could guide the prioritization of vehicles according to needs and completion deadlines. In this sense, the device should highlight to the employees involved the need for greater attention to be paid to overdue vehicles in the workshop, showing unequivocally which vehicles should be monitored and prioritized.
As can be seen in Figure 1, the table contains the days of the week for monitoring each vehicle and the people responsible for this work. The column containing D-3 represents the cars (vehicles) that have completion deadlines of up to 3 days, thus drawing attention to these vehicles as the deadline for their completion approaches. The vehicle registered as "overdue" (in red in Figure 1) indicates that a greater effort should be made by everyone involved to complete it as quickly as possible, as the deadline for its release has not been met, showing that that overdue vehicle is the workshop's priority. At the same time, in addition to drawing up the vehicle tracking chart already presented, a card was also created to record the actions that would be taken, with a description of those responsible and the deadlines involved, as illustrated in Figure 2. This card has a green side for daily tracking when the car is on schedule and a red side when the car is overdue. This card shows the history of what has been done, as well as the actions taken and those responsible, and is updated daily in the workshop with the mandatory presence of the parties involved.

<table>
<thead>
<tr>
<th>Week</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>D-3</th>
<th>Late</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resp 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Resp 2</td>
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<td></td>
</tr>
<tr>
<td>Resp 3</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Resp 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

Figure 1 – Accompanying vehicles in the workshop.
Source: Authors (2023).
Each vehicle entering the workshop receives a card, as shown in Figure 2, and is monitored daily by the person in charge to monitor work operations and avoid delays or non-compliance with established deadlines, favoring more assertive decision-making. The application of these devices, based on the principles of visual management, makes it easier to identify and manage the problems inherent in work activities, especially the risks of delays in completing vehicles, making those involved responsible for the actions taken and the team accountable for meeting deadlines.

![Vehicle tracking card](source: Authors (2023))

Therefore, with the creation of the cards for each vehicle being updated, as shown in Figure 2, it is possible to launch (describe) the actions that will be taken with the identification of those responsible and the deadlines involved. With the creation and implementation of the board for monitoring vehicles in the workshop and the monitoring cards for use on this board, as shown in Figure 3, the next stage consisted of training the staff involved, explaining how to use the tools designed for visual process management. Training on how to carry out the dynamic daily animation of the monitoring board, by size and type of vehicle being transformed, and defining the actions to be taken and the deadlines for each vehicle.
After creating and implementing the tools (cards and board) for monitoring the vehicles being updated in the workshop, work routines were defined together with those responsible. It was therefore decided that there would be a daily meeting (whenever possible at 9am) to update the information, and all those responsible had to be present: programmer, workshop manager, engineering staff, logistics, tooling, and the area supervisor. The information to be updated daily should involve the deadlines and actions to be taken (described on the cards and allocated on the monitoring board) by type and size of each of the vehicles. Among other things, these meetings aimed to monitor the vehicles in the process of being modified, with a record on the card, for each vehicle, of the history of what had already been done, in others words the actions taken, being updated daily as planned.

To analyze the results of implementing the visual management process in the company's workshop, a comparison was made of the sector's performance over time, in terms of meeting deadlines, before and after the system went live. To do this, the number of vehicles that suffered delays in their updates/modifications in the workshop were counted to find out the effect of the visual management system on meeting the deadlines set by the company for operations within the sector. Considering that the visual management system started operating in the company's workshop sector in 2022, we then proceeded to analyze the evolution of the results considering the period of 12 months in 2022 and 6 months up to June 2023. Naturally,
this comparison must consider the time proportionality between the periods considered. Based on the recorded numbers of vehicles with overdue operations in the workshop and those that met the established deadlines, a percentage calculation was made of their evolution, showing the results achieved.

Results and Discussions

By applying the methodology proposed above, it was possible to reorganize the sector's operations, which enabled the results presented below to be achieved.

4.1 Recording of Execution Times of Activities per Vehicle

With the visual management system working on a day-to-day basis, within the workshop's work routines, the time taken to deliver each completed vehicle was checked to analyze the evolution of this indicator over a given period. To do this, information was sought on the times taken in the workshop for each vehicle modified, to analyze whether the established deadlines had been met. The times recorded that were late in relation to the established deadlines were referred to in the company as "late Timeline", as shown in Figure 4.

Figure 4 shows the Timeline of the weeks of the year in CW (Cut Week), planned and realized, when the vehicle entered the workshop in CW04, with the deadline for leaving in week CW14. This vehicle had a deadline of 10 weeks in the workshop to undergo the modifications proposed by design engineering. After 10 weeks, the vehicle still hadn't undergone all the modifications proposed in the design, as shown in Figure 4, and in week CW14 the indicator started to turn red, showing everyone involved that the vehicle was overdue in the workshop. Despite the use of a "tracking Timeline", there was no place to animate the vehicles with the people responsible for them and the employees involved in solving the problems.
With the implementation of visual management and the use of the tracking board (Figure 3), it was found that most of the times obtained were now within the deadlines set in compliance with the company's regulatory requirements. Thus, as illustrated in Figure 5, the new time records showed compliance with the deadlines set for the sector and were called "Timeline with deadline met". In Figure 5, you can see the record of a vehicle that entered in week CW14 and left in week CW15, meeting the targets set in compliance with the deadlines, since the deadline for leaving was week CW16.

These positive results, recorded regularly in the work routines, have brought stability and production reliability to the workshop sector. As a result, there has been less stress and a more harmonious working environment for the staff involved, contributing to improved productivity in carrying out the activities developed in the projects.
4.2 Evolution of Results

To show the possible gains from implementing the visual management system in the company's workshop sector, confirming or not the accuracy of decision-making, vehicles were counted according to whether they met the established completion deadlines. Considering that the system went into operation in 2022, there was then, proportionally, a reduction in late cars (vehicles) or, on the other hand, an increase in meeting the deadlines set by the company for the workshop sector, as can be seen in Figure 6, corroborating the achievement of the objectives proposed for the work.

![VEHICLES IN THE WORKSHOP](image)

**Figure 6 – Deadlines correct: 2022 x 2023.**
Source: Authors (2023).

Considering the absolute values described in Figure 6, an analysis was carried out in percentage terms to show the gains obtained by the company's workshop sector from adopting visual management. Figure 7 shows the percentage gains obtained in the execution of vehicle updating/modernization activities because of meeting the deadlines set for the period from January 2022 to June 2023. As can be seen in Figure 7, there was a proportional increase of 12.53% in meeting the deadlines for completing the vehicles in the workshop, in other words after the implementation of visual management there was a clear improvement in the sector's performance with the delivery of vehicles that began to better meet the deadlines set in the project.
Analysis of the results showed that the work carried out to adopt visual management in the company's workshop sector brought significant gains. These results show that the system, when implemented properly, can bring benefits. To do this, the characteristics and needs of the processes involved must be considered when implementing the system, providing clear and objective information that allows quick action to be taken to solve problems. Functional teams must be prepared (trained) to work on the processes, preventing a "breakdown" in performance and failure to achieve the targets set, thereby improving the company's results.

Conclusion

With the implementation of visual management in the workshop sector, there was a significant reduction in delays of 12.53% between 2022 and June 2023, relating to vehicle modifications/upgrades in the company. The visual information allowed for better identification of problems, as well as a clearer interpretation of their causes and clearer, faster, and more effective decision-making to solve or minimize these problems. With the reduction in operational difficulties encountered within the workshop, along with the reduction in delays, new criteria were integrated and established for prioritizing vehicles in the sector. The visual information board and the cards developed, now individualized for each of the vehicles,
provided essential information for solving problems, helping to improve the productivity of processes and the quality of products, favoring better performance from the work and support teams. The increase in workshop productivity was considered, as there was an improvement in vehicle delivery times and, most of the time, the deadlines set by the company were respected. With more precise information available to the employees involved, the identification and solution of problems was speeded up, reducing the response time for each item or vehicle being processed. The visual management method, proposed to deal with the flow of information in the sector, was well accepted by the employees involved as its practical operation soon showed positive results. On the other hand, the low cost of implementing and maintaining the visual management system, in relation to the economic losses resulting from delays in the process of modifying or updating vehicles, amply justified the permanent adoption of this system in the company. In this way, the sector began to show better results, increasing employee confidence in the type of approach chosen (visual management), making the work environment more pleasant and productive for the benefit of everyone who works there and the company.

References


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