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Implementing Key Performance Indicators and Designing Dashboard Solutions in an Automotive Components Company: A Case Study

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Abstract: In the context of highly competitive markets, organizations face dynamic challenges, requiring effective solutions to maintain and enhance their competitive standing. Performance measurement, supported by advanced information systems, is critical for organizational improvement. This study involves the implementation of key performance indicators (KPIs) within an automotive components company. Insights from employees across various departments were gathered for the development and deployment of 22 new KPIs across the Purchasing, Sales, Logistics, Quality, Human Resources, Occupational Health and Safety, Research and Development, and Finance departments of the company. The new indicators implemented were applied to all the group's companies and standardized throughout the companies' group. As a result, the implementation of new indicators and the consultation of graphs and visual elements present in the dashboards developed using Power BI enabled senior managers to make detailed and precise analyses, which led to faster and more considered decisions. It also enabled senior managers to make comparisons between the results of the group's different companies by looking at dynamic, interactive graphs. The methodologies and tools discussed (KPIs and dashboards) have broader applications across different industries, highlighting the relevance and versatility of KPIs and dashboards in organizational performance management.

Keywords: key performance indicators (KPIs); surveys; dashboards; Power BI; organizational performance; operations design

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1. Introduction

The implementation of key performance indicators (KPIs) and the development of dashboards have been critical challenges for organizations looking to optimize their processes and achieve greater efficiency.

Throughout this case study, we endeavored to implement new indicators for each department of the automotive components companies' group, since measuring performance through KPIs is essential for companies to make informed and strategic decisions. Today, in an increasingly evolved context, where digitalization and automation predominate, the ability to monitor and analyze data in real time is increasingly important (Cruz Villazón et al. 2020; Schrage et al. 2024). Thus, solving this problem is vital for companies' competitiveness, since KPIs that are well-defined and displayed on dashboards allow for a dynamic and proactive approach, which is essential for adjusting and improving a company's departments (Kaganski et al. 2018).

Several studies have shown that the application of methodologies such as AHP, Lean, and machine learning are effective for implementing new indicators, but they are often complex and require advanced technical knowledge (Kodali and Chandra 2001).

In this context, the solution proposed in this study was based on carrying out surveys since this methodology offers a practical and accessible alternative, where the surveys were distributed among the heads of departments and some of the companies' employees, ensuring that the responses were useful in meeting the proposed challenge.

This method stands out for the fact that it involves employees in the process of defining the KPIs, thus promoting greater acceptance and commitment to the indicators implemented. It also allows KPIs to be customized according to a company's characteristics, an aspect that many other approaches are not always able to offer.

Compared to other approaches, the use of surveys provides a more flexible and less technical solution that can be adapted quickly to the specific needs of each organization.

The active participation of employees in the choice of KPIs also promotes a culture of continuous improvement and responsibility, aspects that are crucial to the long-term success of companies.

From an academic point of view, this study contributes to the development of knowledge around performance management by demonstrating a practical and participatory approach related to the implementation of KPIs in an industrial context.

This case study provides empirical evidence to support the involvement of employees in the process of defining KPIs, improving employee acceptance and commitment.

Furthermore, this study addresses a gap in the current literature by integrating emerging technologies such as Power BI to facilitate real-time data analysis and visualization, thus offering a modern perspective on how digital transformations can impact the management of organizations.

Professionally, the results of this study are highly relevant to managers and decision makers in both the automotive and other industries.

In this way, this study offers a viable solution for companies looking to improve their performance measurement systems without the need to resort to complex and technically demanding methodologies. This approach consists of using surveys to gather the perspectives of employees from various departments, thus ensuring that KPIs are adjusted to a company's needs and characteristics, promoting a spirit of responsibility and collaboration among all those involved.

As such, this proposal aims to ensure that all participants feel valued and involved in defining KPIs. In addition, the research work also explores the integration of emerging technologies, such as the Power BI tool, to create data visualization solutions that promote more efficient and virtual business management. It is, therefore, recognized that this approach provides senior managers with a cohesive basis for making informed, strategic decisions based on the analysis of data presented via dashboards.

Thus, this study makes an academic and professional contribution by providing a participatory and integrated approach with new technologies for implementing KPIs. In this way, this approach not only improves the performance and competitiveness of organizations but also promotes a culture of continuous improvement.

2. Literature Review

This section of the article includes a review of the literature about key performance indicators (KPIs). During this review, some definitions of KPIs are given, and the four types of performance measures that exist are presented. In addition, the importance of performance measurement for organizations is presented, and some common mistakes that are made when using KPIs are highlighted. Finally, some practices and techniques that allow for the successful implementation of key performance indicators in a real-world context are discussed.

2.1. Key Performance Indicators

Globalization and the intense competition that organizations face today have created a different business environment for companies (Koh et al. 2007). Organizations are forced to work in the face of high and fierce competition, with reduced budgets and, above

all, under strong pressure in terms of the prices they charge. All of this means that companies have to deal successively with various indicators across different business areas (Shahin and Mahbod 2007).

As a result, different companies and organizations measure a variety of elements. This measurement is carried out by institutions to keep them on the right track and, above all, to realize where they can improve, always in line with the strategy they have defined (Keyte 2018). In this way, KPIs are referred to as quantifiable and strategic measures that reflect a company's success (Zhu et al. 2017). KPIs can be defined as quantifiable or qualifiable measures that enable organizations to assess their effectiveness, with a focus on achieving strategic and operational objectives. These indicators are commonly used by managers and executives to determine whether they are complying with the previously defined strategic plan (Hedvičáková and Král 2019). In a way, these indicators can also be used by industry to evaluate an individual's success and effort concerning the work they do (Bishop 2018).

There is, therefore, a great need today on the part of organizations to understand what key performance indicators are, as it is common for companies to have aggregate KPIs with ill-defined tasks and metrics that make it difficult to understand what an indicator is (Keyte 2018).

To remedy the incorrect use of these indicators, Parmenter (2010) presented four types of performance measures. There are, thus, four types of performance measures:

- Key Result Indicators (KRIs): responsible for demonstrating the results achieved by an organization and, in this way, showing how the organization has met its challenges;
- Result Indicators (RIs): These indicators report on what has been achieved;
- Performance Indicators (PIs): fundamental for indicating what the organization needs to do;
- Key Performance Indicators (KPIs): show the company what it needs to do to increase performance. In this way, it is possible to distinguish between the different performance measures, given the different information that each one conveys.

2.2. The Importance of Performance Measurement

In this day and age, measurement must be timely, since a key performance indicator provided to senior management a few days late can become useless (Parmenter 2010).

In this way, KPIs not only support the execution of the organization's strategy but also make it clearer and make it possible to correct any deviations that may arise concerning what has been outlined by monitoring data (Matos 2021). In this way, indicators make it easier to manage companies and are responsible for identifying and aligning strategy with initiatives and ultimately realizing it.

In short, organizations do not rely solely on financial information to make decisions so KPIs become an essential monitoring tool.

In other words, from these indicators, companies can not only observe the financial component but also another set of factors that may or may not lead to success.

Therefore, a correct collection of indicators allows organizations to steer their path toward success (Matos 2021).

2.3. Mistakes Made with KPIs

It sometimes takes organizations a while to realize that many of their problems related to performance measurement stem from some harmful habits, and so it is essential to lose them if organizations are to stay on the right track (Kerzner 2017).

In this way, seven bad habits related to KPIs have been highlighted. The first relates to the fact that companies use vague words to articulate the organization's objectives.

That is, many organizations resort to a fusion of words such as "effective", "efficient" and "sustainable" to describe their strategies.

Although these words convey some degree of importance, they are not important because they do not communicate something that can be verified in a real context. It is,

therefore, essential to define goals clearly and simply, which allows people to visualize the idea of what is required, thus allowing them to be measured. The second habit is linked to brainstorming to achieve indicators. Although brainstorming generates a lot of ideas, it rarely produces good measures as it does not require much knowledge on the part of all those taking part. Another recurring bad habit with KPIs has to do with people's acceptance of the indicators. This habit is quite common, as many people associate indicators with a boring data collection routine and are often afraid of the comparisons that might be made. It is, therefore, essential that this process is seen as a natural activity at work and that all these data are only used to obtain feedback.

One of the other undesirable behaviors associated with KPIs is the assumption that everyone is familiar with how to implement the measures.

Thus, it is important to define performance indicators that are enlightening and, above all, avoid wasting time and misinformation.

The fifth behavior relates to the use of performance reports. Performance reports are crucial when they provide content that matters to managers, but this is not always the case because the layout of the reports is often unorganized, thus diverting the manager's interest.

The penultimate habit is associated with the performance comparisons that are commonly made in organizations, namely comparing the current month's performance with that of the previous month.

According to the author, performance is something that is constantly varying so comparing performances will always result in a difference, which does not allow concrete conclusions to be drawn. The last habit is that organizations often deal with performance reports in isolation from planning and defined strategies.

This process is recurrent and wrong since performance measurement is connected to management processes (Kerzner 2017).

Still along these lines, Marr (2021d) pointed out some common mistakes that organizations make with key performance indicators. According to Marr (2021d), the lack of alignment between KPIs and organizational strategies is one of the main problems. It is also pointed out that there is often a trend to measure everything easy to measure, leading to a practice of evaluating only what "moves and moves". Another error identified is the selection of measures that are used by other organizations, without considering the context of the organization itself. In addition, Marr (2021d) mentions that not separating strategic KPIs from other data and linking KPIs to incentives are common mistakes when defining indicators. Thus, it is also highlighted that useful knowledge is not extracted from KPIs and that KPIs are often neither updated nor questioned. Finally, a significant error usually occurs because action is often not taken based on the data provided by the KPIs.

2.4. Implementing Key Performance Indicators

The process of selecting KPIs involves identifying them to see which ones are most appropriate and relevant and, above all, identifying those that meet the interests of organizations in the various areas that make up industries today.

There are several methods adopted by companies to identify KPIs, such as literature reviews, interviews, and questionnaires.

Many scientific publications, particularly review articles, present some examples of indicators for different business areas, obtained by reviewing the literature. Interviews are a common technique for identifying indicators to be used in a specific company or area. The use of this method is common because it provides a better understanding of solutions to a particular problem (Andersson and Thollander 2019). In addition to literature reviews and interviews, questionnaires are also another indispensable tool for identifying KPIs.

The use of questionnaires at the same time as interviews makes it possible to obtain a broader view, i.e., both quantitative and qualitative information that is fundamental to the indicators (Andersson and Thollander 2019). Therefore, to effectively implement key performance indicators, it is essential to adopt methodologies that ensure significant results. Given the importance of KPIs, Marr (2021b) also presented ten steps to consider guaran-

teeing the successful implementation of key performance indicators. The first step begins with defining the strategy. In this initial phase, it is important to define the company's strategy clearly so that it is understood by everyone involved. In the second stage, the author stresses the importance of identifying the questions to which the organization needs answers, which Marr (2021b) defines as KPQs (Key Performance Questions).

In this way, a KPQ can be understood as a management question that captures what managers need to know when it comes to strategic objectives.

KPQs are, thus, fundamental, as they direct the attention of those involved to what needs to be analyzed (Marr 2021e). In this way, KPQs are in some ways more important than the KPIs, since it is through these questions that the information and data needed to answer them are identified, thus helping to select the most appropriate indicators (Marr 2021e). Having said this, Marr (2021a) presented six steps for constructing effective Key Performance Questions.

The steps are as follows (Marr 2021a):

- Start the process taking into account the organization's strategy;
- Involve the people linked to the strategic objectives in the development of KPQs;
- Define the KPQs as open questions to obtain more detailed answers;
- Focus KPQs on the present and future;
- Develop clear KPQs, i.e., do not make them difficult to understand;
- Improve the KPQs as they are used.

In this way, the process proves to be fundamental since these questions will force the people involved to realize what data they will need to collect to obtain the answers and consequently help identify the KPIs that are needed. Next, in the third step, the author advises realizing and identifying the data that will be needed to define the KPIs and metrics that will be used to answer the questions (KPQs) selected earlier. The fourth step consists of checking what data and methods are already being used in the organization to improve them so that they can deliver what is desired.

The fifth step is to collect and select the right data, i.e., only the data that have the potential to provide information relevant to the organization's strategy.

The sixth stage, defined by Marr (2021a) as "Determining the appropriate measurement methodology and frequency", consists of realizing which measurement methodology is the right one. For this reason, the author stresses that it is always appropriate to decide on the frequency of measurement concerning how and when the data are used within the organization since all data have an expiry date. It can, therefore, be concluded that data must be collected and consequently presented at the right time so that they do not lose their impact. The seventh step consists of assigning responsibilities to the KPIs. In other words, you need to define a person responsible for interpreting the meaning of each KPI and managing it. Another responsibility is linked to data collection. In this way, the person responsible for transferring data from one database to another or even collecting them manually should always be defined. Although this data collection process can be done by hand, nowadays, some technologies make it possible to automate this process, making it more reliable. In the eighth phase, the author stresses that everyone within the organization must understand the importance of the KPIs and, above all, feel involved so that everyone is on the same path and the objectives set are achieved.

The penultimate stage centers on understanding the best way to communicate KPIs. Often, KPIs are reported in lengthy reports made up of various numbers, tables, and graphs, which, in a way, make the process of analyzing difficult and those responsible lose interest. It is, therefore, essential to create a way of presenting the KPIs in such a way that the interested parties clearly understand what you want to convey. The final step focuses on reviewing the key performance indicators. The author argues that it is essential to frequently review the KPIs being used to ensure that they are useful and not a waste of time for organizations.

3. Methodology

To apply the knowledge described above, this study was carried out in a companies' group, the Automotive Compounding Industry (ACI). This organization is responsible for the production of various polymeric compounds, such as Polyvinyl Chloride (PVC), Polyethylene (PE), Polypropylene (PP), and Silicone, which are then used in the coating of electrical cables that are subsequently used in the automotive sector. The ACI group is currently made up of five companies, which are based in various countries, such as Portugal, México, Tunisia, Romania, and China. For this study, the company in China was not considered, focusing only on the other group companies. The aim was to define and implement key performance indicators (KPIs) in all the departments of the companies' group and to use Business Intelligence (BI) solutions, specifically Power BI, to monitor and visualize company performance. Based on a review of the literature on KPIs, it reveals their importance in industrial environments and so a method was identified, developed by Oliveira (2017), based on the assumptions of Marr and Parmenter. This method included the selection of indicators, involving the opinion of employees. The method involved carrying out surveys with Key Performance Questions (KPQs), which were ranked from 1 to 5 according to the importance each person attached to having answers to the questions presented. Several KPQs were presented which contained associated KPIs and, in this way, the indicators whose KPQs obtained the highest ratings were implemented. After analyzing this method, it was concluded that it could be adjusted to ACI, thus enabling the established objectives to be achieved. The next section describes the application of this method in detail.

In addition to carrying out the surveys, this case study sought to develop dashboards, using the Power BI tool, which would make it possible to see the indicators already used by the companies and, above all, the new indicators implemented. So, a way of displaying the indicators was developed, since, until now, there had been no way of presenting the indicators that provided a detailed and quick interpretation and analysis of the data.

Thus, carrying out the surveys was essential to identify and implement new indicators. This process was crucial for creating the visualization panels, as these were built based on the indicators already in use and on the new indicators.

In addition to the surveys, this case study focused on the development of dashboards in all the group's companies, using graphs and visual elements that are essential for decision makers to be able to consult the indicators at any time and in any place and, thus, make more considered and fact-based decisions.

4. Case Study

During this case study, the method identified above was placed into practice to implement new indicators and standardize them across the group. Initially, 10 meetings were held with the heads of each department in the companies' group to identify the indicators currently used by the company in Portugal, as well as other information related to the frequency of measurement and the display of the indicators. For the other companies in the group, all this information was collected via email. After an initial analysis, it was realized that only the numerical values of the KPIs were presented on Excel sheets, and there were also differences between the indicators used by the companies in the group, which made it difficult to analyze and interpret them. Thus, all the companies in the group were divided into departments, without hierarchization, as there was no number of employees to justify this division. The division into departments is the same for all the factories except for the Research and Development department, which only exists at ACI Portugal. Thus, the division of departments is represented in Figure 1.

In the context of this study, KPQs were developed, which were associated with indicators that are normally used throughout the departments that make up the companies in this group. To give an idea of the type of questions that were asked, below are some examples of the KPQs presented. In the Quality department, questions were asked: "How are we coping with product returns?" and "How has the product rejection rate evolved

over time?". An example of these questions asked in the logistics department includes the following: "How has supplier performance been?" and "What efforts have been made to reduce order cycle time?".

Concerning the purchasing and sales department, some of the KPQs presented were as follows: "What has been the sales behavior of the company as a whole?" and "What has been customer satisfaction with our products?". Thus, each of the KPQs was then rated by the employees using surveys using Microsoft Forms to ease the answering process and collecting the data. The surveys took place during March 2024, and 54 responses were obtained out of the 60 that were sent, resulting in a high participation rate.

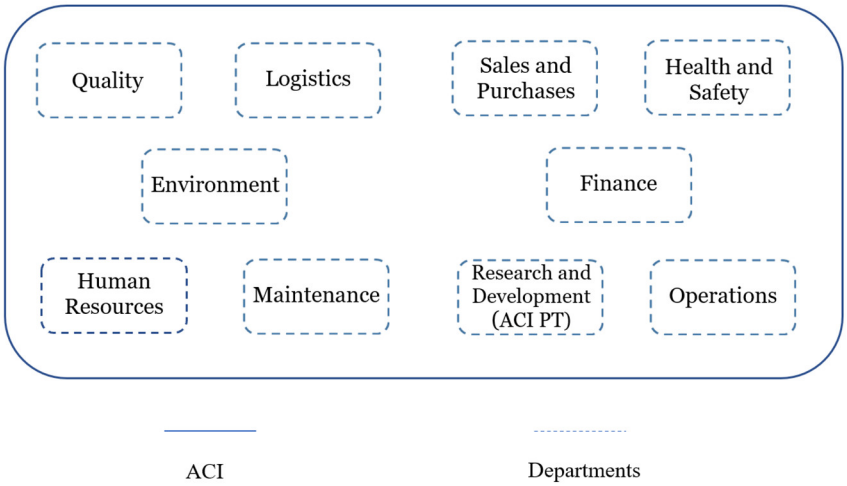

Figure 1. Division by departments.

This study, thus, had a total of 54 respondents. This number is because the questionnaires were specifically targeted only at people whose answers were considered essential to the topic in question, in this case, KPIs, and therefore required an appropriate level of knowledge. The respondents selected were mainly the heads of the departments of each company in the group, as well as other employees in those same departments; in this case, engineers and people with relevant positions throughout the companies were selected.

The limitation to 54 respondents across the four companies studied is due to their organizational structure, where, in some cases, the departments are made up of just one or two people, and in other cases, the same person takes responsibility for more than one department. Also, concerning the selection of respondents, it should be emphasized that the choice was made in conjunction with the company´s general manager, due to his in-depth knowledge of the employees, thus enabling him to identify those who could make a significant contribution to the study.

After carrying out the surveys, it was decided that the indicators whose KPQs had obtained an overall average rating of more than 4 would be implemented whenever possible. All the results obtained are presented and analyzed in the next section.

5. Results

Throughout this section, the answers obtained in the surveys are presented, and the results are analyzed to identify the KPIs that received higher ratings, in this case, higher than 4. From this analysis, it was possible to define new KPIs. Since, in some cases, some KPQs had KPIs associated with them, which were already used by companies, the fact that they obtained a high rating reinforced the importance of continuing to measure these same indicators.

Regarding the responses to the surveys, all the answers were collated in an Excel sheet. In this Excel sheet, the ratings obtained for each of the questions were entered for each department of the companies in the group, and then the average of the ratings obtained for each question was calculated for each department. This process was carried out for

each company in the group, and then the overall average was calculated for each question, i.e., considering the averages for each company and, thus, obtaining an overall average of the ratings obtained for each of the questions. The entire data analysis process was carried out in Excel, and all the questions that obtained an overall average of more than 4 were considered. The overall average ratings obtained throughout each department are represented in Figure 2, with questions that obtained an overall average higher than 4 in green.

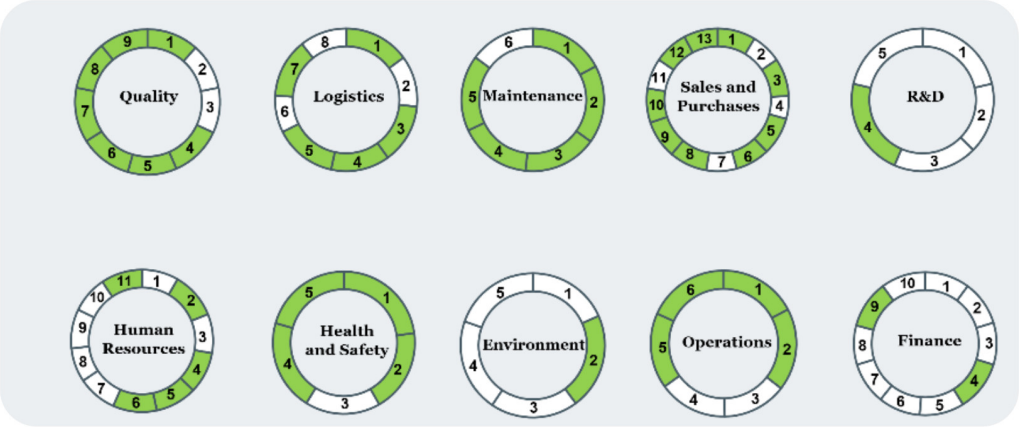

Figure 2. Results obtained from the surveys.

Analyzing the average scores of the questions, it was found that most questions obtained scores close to 5. Since the objective was to select just a few indicators, the results were discussed with the general manager so that the most accurate KPIs could be implemented. Therefore, it was decided to implement indicators that were easy to calculate and interpret to motivate employees and ensure that the indicators were understandable to anyone analyzing them. In general, many questions throughout each department obtained an average rating above 4. However, there are some exceptions, such as the R&D department and the Environment department, where only one question had an overall average higher than 4.

In the case of the R&D department, a meeting was held with the head of the department, where it was communicated that many of the KPQs presented in the research referred to KPIs that, in their view, did not make much sense to be measured, since some of them addressed issues that the company has no control over and, therefore, would not even be possible to measure and address. This situation was, thus, highlighted by Neely et al. (2005), where they both emphasized that the relevance of indicators is crucial to ensure that they truly reflect the areas that need to be monitored and improved. According to the authors, the lack of alignment between the indicators and the department's specific objectives can lead to their rejection, as was partly observed in the R&D department. Concerning the Environment department, many of the KPQs presented referred to indicators that were already used by the companies. Thus, it was interpreted that there may not have been a correct understanding on the part of employees about what was intended with the inquiries, and, therefore, only one question received an overall average rating above 4.

Regarding the Logistics department, as mentioned, in addition to the classifications obtained, a suggestion for a KPI to be measured was also obtained. This KPI was not presented during the research and was suggested by one of the collaborators. This indicator was entitled "Deliveries planned vs. Realized" and was considered quite relevant to the area. Thus, it was also implemented to convey to respondents that their opinions were considered and, in this way, were involved in the company decisions.

As Parmenter (2010) mentioned, it is important to involve employees in defining KPIs, as this process can increase employee commitment and ensure that the indicators are perceived as relevant and valuable. The KPI "Deliveries Planned Vs Realized" exem-

plifies the effectiveness of involving employees in creating metrics that really meet the department's needs.

Although, in the literature, it is not advisable to measure many indicators but rather those indicators that are relevant, the Sales and Purchases department was treated differently compared to other departments. After a meeting with the general manager, it was realized that in the case of the Sales and Purchases department, another type of information and more information would be needed. Therefore, after analyzing the data from this department, it was observed that almost all issues were seen as important, and, thus, eight different indicators were implemented throughout this department.

This is in line with Stephen Denning (2018), who state that, in some contexts, the inclusion of multiple indicators can be beneficial to capture the complexity of operations and provide a comprehensive view of performance.

As for the other departments, as previously mentioned, some questions associated with indicators already used were presented, and there were examples of indicators that were only maintained; that is, they also obtained a high rating, meaning that it would be important to continue measuring these same indicators. This situation occurred predominantly in the Maintenance and Environment department.

After this analysis, 22 new indicators were implemented across seven departments, including Quality, Logistics, Sales and Purchases, Human Resources, Occupational Health and Safety, Research and Development, and Finance.

In summary, Table 1 presents the new indicators implemented in each department of the companies' group.

Table 1. New KPIs implemented in ACI.

Department	KPI
Quality	% quantity of rejected product Non- quality costs (returns)
Logistics	OTIF (On Time In Full) Supplier Performance Planned vs Realized deliveries
Sales and Purchases	Total sales by product family Gross Margin by product family Costs savings Conversion rate of potential customers into actual customers Customer satisfaction Business Opportunities Customer visits Participation in fairs
Human Resources	Efficiency of the recruitment process Qualification level Number of collaborators by gender
Occupational Health and Safety	Frequency index Severity index Average time between accidents PPE utilization rate
Research and Development	Average development time for new products
Finance	Revenue growth rate

Thus, it was also essential to define how to calculate each of them. As for new indicators, it is crucial that everyone understands what each conveys so that it can be useful for the organization and, in this case, for each department. Table 2 includes the formulas that allow for the calculation of the implemented KPIs.

Table 2. Calculation formulas for the new KPIs.

KPI	Formula
(1)	$\frac{Defective\ product\ (ton)}{Total\ Produced\ (ton)} \times 100$
(2)	Sum of all costs
(3)	$\frac{N\ orders\ OTIF}{N\ Total\ deliveries} \times 100$
(4)	$\frac{products\ delivered\ on\ time}{Total\ product\ received} \times 100$
(5)	$\frac{N\ of\ deliveries\ made}{N\ of\ planned\ deliveries} \times 100$
(6)	Total sales sum in euros
(7)	$\frac{Total\ revenue - cost\ of\ goods\ sold}{Total\ revenue} \times 100$
(8)	$\frac{Current\ price - initial\ price}{initial\ price}$
(9)	$\frac{actual\ customers}{potential\ customers}$
(10)	Conducting customer surveys
(11)	Recording number of business opportunities
(12)	Recording number of visits
(13)	Recording number of participations
(14)	$\frac{N\ of\ hires}{N\ of\ candidates} \times 100$
(15)	$\frac{N\ of\ qualified\ employees}{Total\ number\ of\ employees} \times 100$ (considering at least a bachelor's degree)
(16)	Indicate only the number
(17)	$\frac{N\ of\ lost-time\ accidents \times 10^6}{N\ of\ man-hours\ worked}$
(18)	$\frac{N\ of\ lost\ business\ days \times 10^3}{N\ of\ man-hours\ worked}$
(19)	Record the dates of all accidents that occurred and subtract the days between accidents.
(20)	$\frac{N\ of\ workers\ using\ PPE}{Total\ number\ of\ workers} \times 100$
(21)	$\frac{Total\ time\ involved\ in\ new\ products}{Total\ number\ of\ products\ developed} \times 100$
(22)	$\frac{Current\ month\ revenue - Previous\ month\ revenue}{Previous\ month\ revenue}$

Difficulties Encountered with the Implementation of KPIs

This study, as mentioned throughout this work, aimed to identify new KPIs for the companies' group, essential for monitoring organizational progress. However, the task proved challenging, as the group's companies already measured several important indicators. As a result, the search for new indicators required careful attention to avoid disruptive changes and keep employees motivated. Through the literature, it was possible to identify some indicators that are frequently used throughout each identified department.

However, the implementation of each of them was difficult, as many KPIs suggested in the literature are general and do not adapt to the specific context of an organization, as mentioned by Marr (2021d). One of the most common mistakes in implementing new indicators is selecting the same measures that other organizations measure.

Another aspect to highlight that caused some difficulty was the fact that, in some departments, there was a lack of different perspectives because they were made up of just one person and, in this way, limited the analysis that was carried out. The lack of suggestions was also an issue, but it is understood that questions, KPQs, were presented instead of KPIs throughout the surveys, also meaning that not many suggestions were obtained, and, in this way, it would have been easier to have asked about those which directly indicate the KPI.

Another major difficulty was the fact that some employees did not understand exactly what was intended with the surveys and did not answer as required. However, although these difficulties were witnessed and although not all departments implemented new

indicators, dashboards were developed for all of them, optimizing the visualization and interpretation of indicators.

6. Developing Dashboards for Each Department

6.1. The Importance of Dashboards and Their Advantages in Monitoring KPIs

Over time, dashboards have emerged as a solution for displaying indicators due to their effectiveness in visually presenting critical data. One of the main advantages of visualization dashboards is the clear and integrated data visualization they provide.

According to Jack G. Zheng (2017), dashboards provide an efficient way of consolidating and presenting complex data intuitively, allowing managers to identify errors. This ability to summarize data visually is essential for quick and accurate decision making. In addition, dashboards offer real-time updates, which are crucial in an increasingly dynamic business environment. According to Fernandes et al. (2021), the ability to access up-to-date data instantly allows managers to respond quickly to changes and operational challenges. Thus, dashboards that integrate data from different sources ensure that information is always up to date and accurate. On the other hand, dashboards have another strong point related to personalization. A study by M. Elias (2012) showed that it is possible to adapt dashboard visualizations according to a company's specific needs, increasing the relevance of the information presented and improving the efficiency of data interpretation.

According to a study developed by Yigitbasioglu and Velcu (2012), interactive dashboards allow users to explore data in greater depth, applying filters and adjusting visualizations as necessary. This interactivity makes it easier to analyze and discover valuable insights that would not be possible with static reports.

Another aspect of visualization dashboards is that they integrate with other tools and business systems. Fernandes et al. (2021) pointed out that modern dashboards can be integrated with a wide variety of management platforms, providing a holistic view of organizational performance.

Finally, the mobile accessibility of dashboards, as discussed by Merendino et al. (2018), ensures that managers can monitor indicators at any time and from anywhere, this flexibility being fundamental in an increasingly dynamic and interactive world.

6.2. Development of Dashboards in the Companies' Group

Once the KPIs had been defined for all departments, Power BI was used to build visualization panels that would allow the indicators to be better understood and monitored. In this way, what was envisioned was the creation of dashboards that presented the KPIs clearly and appealingly and where senior managers could consult the performance of each organization in the group in real time, anywhere, and using their devices. Therefore, Excel tables were developed for each department to be filled in with the respective KPI values. The new tables developed underwent only a few necessary changes concerning the previous tables that were already being used by the company in Guarda, but they were not disruptive so that those responsible for filling in the data would not feel a really big change, thus preventing them from no longer being filled in. In this way, files were implemented so that all the necessary information could be filled out in Excel and then transferred to Power BI correctly.

Thus, a connection was set up between Power BI and the new Excel sheets developed for filling in KPIs, so that the collection of Power BI data from Excel was carried out automatically, i.e., whenever the data in Power BI were constantly up to date. Since the indicators have been standardized across the group´s companies, the dashboards are similar, with only a few differences between some of them. These differences occur particularly in the Operations (Production) and Maintenance departments, because the group´s companies do not all produce the same polymer compounds, nor do they have the same number of machines/lines.

The following three figures show three examples of the dashboards developed. In this particular case, Figure 3 represents the dashboard for the Maintenance department, Figure 4 represents the Logistics dashboard, and Figure 5 represents the Operations dashboard.

To create each of the dashboards, graphics were used that were deemed appropriate for each indicator, and, above all, they were organized in such a way as to make them easier to understand. In this way, the visualization panels developed for ACI Portugal are represented, but it is important to stress that in the following figures, the values shown are hypothetical, i.e., they are fictitious values that were assigned to each indicator so that it would be possible to present the dashboards developed, thus safeguarding the information of the company in question.

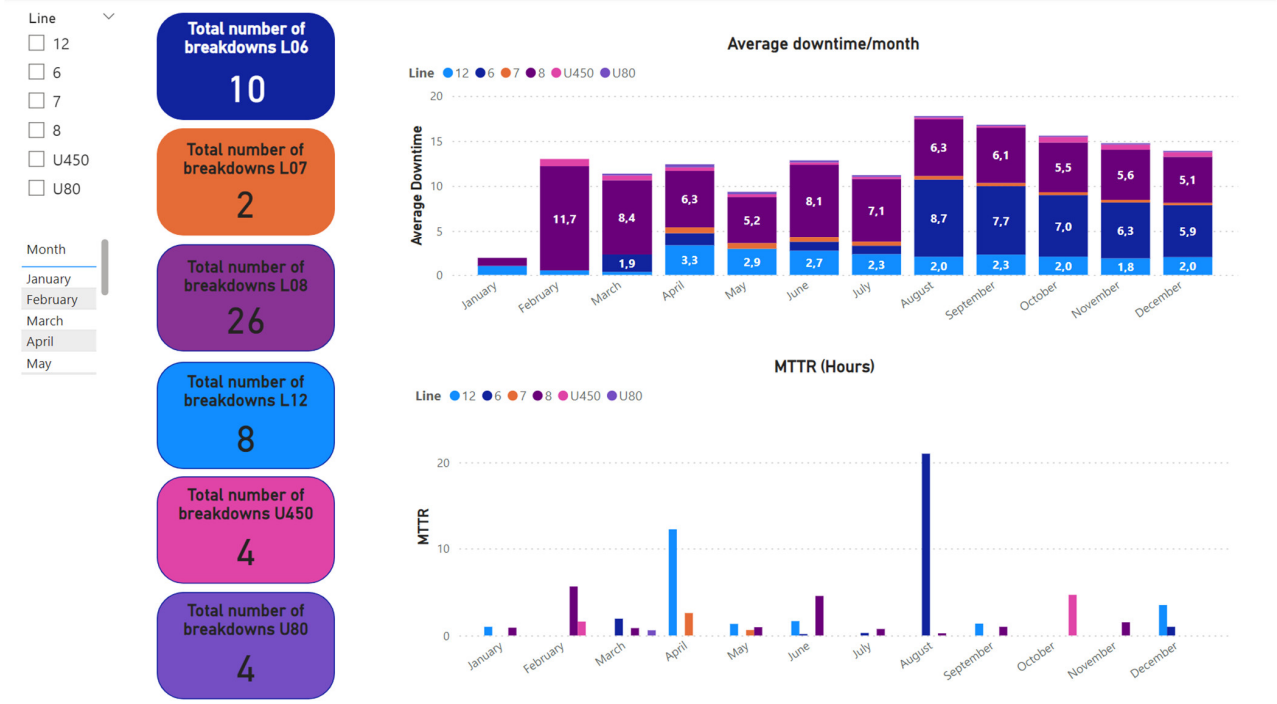

Figure 3. Dashboard developed for the Maintenance department.

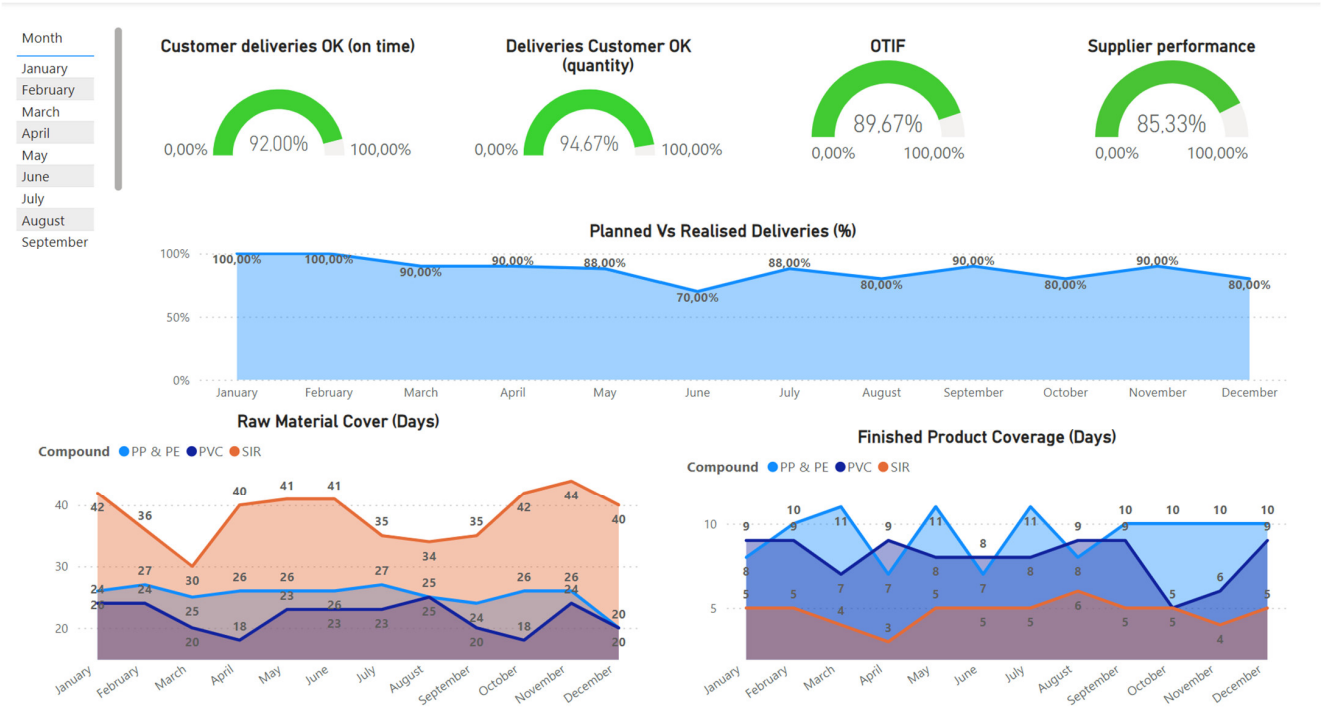

Figure 4. Dashboard developed for the Logistics department.

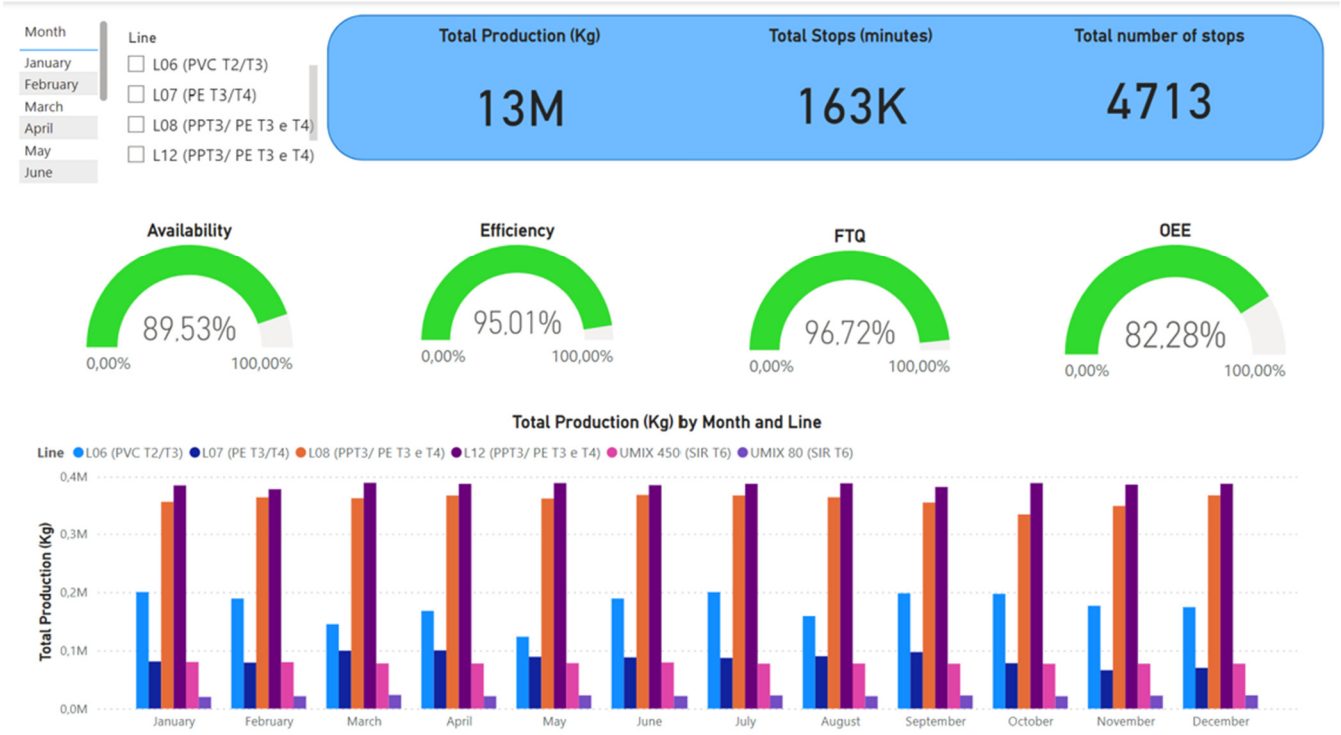

Figure 5. Dashboard developed for the Operations (Production) department.

7. Discussion

The results of this study showed that the implementation of new KPIs across several departments was successful. Most of the KPIs evaluated received high ratings, indicating that they were considered relevant and effective. Common indicators such as MTBF, MTTR, and OEE received high ratings, thus reinforcing their importance in measuring performance. In addition, the new KPIs that were implemented were also evaluated, with other less common indicators receiving high ratings, suggesting that all the new KPIs that were implemented were seen as an asset.

The results indicate that the introduction and positive evaluation of the new KPIs corroborate the idea that adapting and continually updating indicators are crucial for organizational effectiveness. The high ratings obtained for the indicators already measured by the companies show that these indicators are effective in terms of the information they provide, thus going against what is advocated by Marr (2021c), where the author defends the continuity of indicators that ensure operational stability. On the other hand, the introduction of new KPIs demonstrates a positive response to needs, in line with the literature, which emphasizes the importance of adapting indicators to the specific conditions and challenges of each area (Neely and Haines).

In this way, analyzing the results of this study demonstrated the importance of aligning indicators with the overall strategy of companies. The theory highlights that KPIs should reflect and support an organization's strategic and operational objectives, and this study reinforces this perspective by showing that the clarity and relevance of KPIs are crucial to ensuring that these indicators do not just measure performance but contribute to achieving objectives.

The inclusion of KPIs suggested by employees, as observed in the Logistics department, reinforces (Parmenter 2010) the idea regarding employee involvement in the creation of metrics. This study, thus, contributes to the literature by demonstrating that the active participation of employees can increase their commitment to the indicators implemented.

On a more practical level, applying a structured process for defining KPIs, including analyzing feedback and considering the needs of each department, has resulted in more

effective metrics aligned with company objectives. So, this approach can serve as a model for other organizations looking to optimize their measurement systems.

The development of dashboards was also a significant practical contribution. The creation of visual tools for monitoring performance enables indicators to be analyzed more quickly and more comprehensibly, facilitating decision making. Thus, this practical aspect exemplifies how technology can be used to improve performance management.

In conclusion, this study makes valuable theoretical and practical contributions to performance management. Theoretically, it reinforces the importance of aligning KPIs with the organizational strategy and involving employees. On a practical level, it offers a model for defining and implementing indicators, as well as examples of personalized dashboards, which are essential for performance management. All these contributions can, therefore, guide other organizations in improving their performance and implementing effective management practices.

8. Conclusions

The search for better management and monitoring of organizational performance has gained substantial interest given the technological advances that have taken place in an increasingly demanding world. Thus, the implementation of KPIs combined with the development of visualization dashboards has been a crucial strategy to respond to this interest. This study was carried out in the automotive industry, focusing on the implementation of new indicators for the departments of a companies' group and the development of dashboards using Power BI. Initially, meetings were held, and the data collected were analyzed to assess the situation of the KPIs in the group's organizations. It was found that there were departments with a lack of indicators, so there was a significant gap in the presentation of data.

Studies such as those by Stephen Denning (2018) have highlighted the importance of data visualization in making quick and informed decisions, and so the companies' group felt the need to improve this aspect.

To involve all employees in choosing the new indicators, surveys were carried out, a practice recommended by Fernandes et al. (2021), to ensure that the KPIs are relevant and well understood by all levels of the organization. The collection of responses allows one to implement of new indicators across the Sales and Purchase, Logistics, Quality, Human Resources, Occupational Health and Safety, Research and Development, and Finance departments. Additionally, it was possible to standardize the indicators across the companies' group, in line with M. Elias (2012) recommendations, which state that standardizing indicators allows for better consistency and comparability.

The design of visualization panels across all departments allowed for a better presentation and understanding of the indicators, in line with the conclusions drawn by Yigitbasioglu and Velcu (2012) regarding the importance of dashboards in the clarity with which data are transmitted. The dashboards developed in Power BI eased consultation regarding the indicators, through the availability of all kinds of data anywhere and at any time. They are crucial for managers to monitor performance continuously and effectively. Therefore, the implementation of new KPIs in seven different departments aligned with the development of dashboards throughout the companies' group, promoting continuous monitoring of operations and a clearer understanding of the information by decision makers.

9. Recommendations for Future Research

Although this study has made important progress in implementing new KPIs and creating dashboards in this specific companies' group, several areas can be explored in future research to deepen and broaden the results obtained.

One specific recommendation is to carry out questionnaires in which KPIs are presented directly, rather than KPQs, to obtain more precise and relevant suggestions from employees. This process can facilitate the identification of indicators.

Furthermore, it is suggested that a longitudinal study be carried out to monitor the impact of the implementation of new KPIs and dashboards over time. This approach will help assess the effectiveness of the indicators and identify opportunities for improvement.

Integrating a system of continuous employee feedback related to the usefulness and clarity of KPIs could also be an important study. On the other hand, investigating the use of advanced data visualization technologies such as artificial intelligence and augmented reality could also be pertinent, in that new ways of presenting and analyzing KPIs could emerge, making the information even more accessible and understandable.

Finally, it may be important to explore how the introduction of KPIs and dashboards impacts organizational culture and employee commitment. Qualitative studies can be beneficial in gaining valuable insights into the perception and acceptance of these tools, helping to ensure that their implementation not only improves organizational performance but also strengthens employee commitment and motivation. All these recommendations can, thus, contribute to the existing knowledge, offering new perspectives and approaches to managing and monitoring organizational performance.

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