The impact of Kaizen Events on improving the performance of automotive components' first-tier suppliers

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Abstract: *Purpose* – The aim of this paper is to explore the possibility of improving production indicators by implementing Kaizen Events. The teams are composed of both managers and operators with the aim of developing and/or implementing improvements in three to five days.

Methodology – The empirical research will consists of the description of the results obtained in 11 industrial companies from the automotive components industry. In each company, we have followed up different interventions over a 9–12-month period.

Findings – We shall present the initial situation, the activities carried out by the companies and the evolution of manufacturing performance approximately three months after the activities were finished and qualitative conclusions on the carrying out of Kaizen Events.

Value – There has been little empirical research to establish the degree of improvement of the production indicators in companies advancing towards lean production. The paper tries to fill this gap.

Keywords: automotive; production efficiency; performance; Kaizen Event; continuous improvement.

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1 Introduction

Currently, most automobile manufacturers have transformed their production philosophy in favour of the lean production paradigm. By doing so, they hope to improve efficiency and obtain better results in the markets in which they operate. This transformation must occur not only in plants, but it seems important that first-tier suppliers should also modify their production systems in line with the lean production philosophy (Liker and Wu, 2000). In the future, the effects of this wave will probably also reach second-level suppliers, with the result that one integrated supply chain can be built.

Nevertheless, in the interventions that we have carried out in recent years in the automobile auxiliary industry, we have been able to observe that suppliers are still not convinced of the profitability of lean systems, despite the favourable opinions expressed in scientific publications. One of the main reasons is that they lack information and clear examples related to their activities. For the supplier companies' managers, the fact that lean production is a success with automobile manufacturers does not guarantee from the outset that they will also have this success.

Moreover, for the supplier companies, there is no question that the advance towards lean production requires investments not just in facilities, but also in worker training and time to develop improvements. They are also aware that the way is not free of risks, such as the loss of the buffer provided by stocks or the greater pressure on workers, among others. Some of these risks have been discussed in recent research (Cooney, 2002; Fairris, 2002).

With the aim of solving this problem, one of Spain's largest car manufacturers carried out a suppliers' development programme between 1999 and 2001. This consisted of a team of consultants who visited the plants under study and provided them with support in the form of a Kaizen Event.

On the other hand, in the academic world, it is considered that certain management actions in human resources (such as training, teamwork and continuous improvement) are undoubtedly important factors, particularly when organisations face a change in how they operate (Power and Sohal, 2000; Taira, 1996).

In this paper, we are interested in showing the possibilities for the enhancement of the industrial processes offered by the implementation of Kaizen Events in companies supplying automobile manufacturers. The success of improvement proposals shall be measured on the basis of the variation of specific production indicators. With the aim of isolating the effects that could be produced by the type of process followed to put lean production into action, all companies were submitted to the same treatment, which consists of the creation of task forces made up of managers and workers who developed improvement proposals after receiving specific training.

As proposed by Shah and Ward (2003), there has been little empirical research to establish the degree of improvement of the production indicators in the companies advancing towards lean production.

In this paper, we aim to fill part of this gap in the empirical research, with special attention to the evolution and development of these indicators after the implementation of Kaizen Event work teams. Qualitative conclusions will also be presented on the implementation process in different supply companies.

Section 2 deals with an analysis of the existing literature on Kaizen Events, their definition and impact. This will be followed by a description of the methodology applied to carry out the research and the measurements used. The obtained results (both quantitative and qualitative) are then presented, followed by a discussion of their repercussions both at a practical level and in terms of research.

2 Review of the literature

Kaizen is a Japanese term invented by Imai (1986) to describe a continuous improvement (Cuscela, 1998). The aim is to achieve continuous improvement in costs, quality, flexibility (Bessant *et al.*, 1993) and productivity (Choi *et al.*, 1997). One of the characteristics of kaizen is that improvements result in lower costs (Choi *et al.*, 1997); these costs are certainly much lower than those obtained with other techniques such as process reengineering or similar methods (de Lange-Ros and Boer, 2001; Rijnders and Boer, 2004).

The words *kaizen* and *event* were joined to give the term the connotation of a pre-determined duration in which the advantages of continuous improvement could be obtained within a limited period of time.

The Kaizen Event teams, as task forces, are teams that do not form a permanent part of the organisational structure and are involved in a secondary task for their members (Bradford and Bradford, 1981; Lawler, 1996). This task is superimposed upon the habitual obligations of the group members within the company (Lawler *et al.*, 2001).

The main difference with other group suggestion systems such as quality circles is the time needed. Kaizen Events normally last from four to five days, while quality circles and similar systems can be active for months or years.

Moreover, Kaizen Event teams are externally managed groups: they only have the responsibility of achieving specific improvements in specific areas and management designs the group task, selects the components, sets out the basic rules to achieve the objectives, *etc*. Management also guides the group task and supervises group results, as well as designs the organisational context the group is to work in and sets up the reward system and training or information that the group is to receive (Hackman, 1990; Montabon, 2005; Rees, 1997).

Kaizen Events are also known in the literature as Accelerated Improvement Workshops (Alexander and Williams, 2005), Kaizen Project (Bradley and Willett, 2004), Process Improvement or Industry Forum Master Class (Bateman and Brander, 2000), Kaizen Blitz (Cuscela, 1998; Gray *et al.*, 2005; Minton, 1998) and continuous process improvements (Componation and Farrington, 2000). The term *Kaizen Event* is used by Vasilash (2000).

2.1 Repercussions of Kaizen Event practices on business performance in lean production environments

In the bibliographical revision carried out, we found several papers on the effect of the use of Kaizen Event on companies' results. Many of these refer to production indicators and consider that kaizen contributes to improving physical productivity (measured as number of pieces per worker or the reduction of cycle time), the quality of products made or the amount of stock necessary in the company.

The following is a list of authors who have published articles on Kaizen Events, together with the type of industry/service and the areas in which improvements were achieved:

- Alexander and Williams (2005): *Library* – flow, work-in-process, Dock-to-Dock (DTD), cycle time
- Bradley and Willett (2004): *Transportation products industry* – cost, inventory level, DTD, set-up times
- Bateman and Brander (2000): *Automotive industry* – cost, DTD, quality, productivity
- Cuscela (1998): *Automotive industry* – flow, quality, productivity, security
- Gray *et al.* (2005): *Laboratory* – work-in-process, employee morale and decrease in the amount of documentation
- Componation and Farrington (2000): *Automotive industry* – cycle time
- Bateman and David (2002): *Automotive industry* – cycle time, productivity
- Sheridan (1997): *Jet engines industry* – DTD, quality, productivity, cash flow improvement
- Minton (1998): *Electronic assembly industry* – flow, cost, work-in-process, cycle time.

It can be seen from the list that not a great deal has been written about the impact of Kaizen Events on production indicators. Also, most cases dealing with the automotive industry include few of these indicators and, except for a limited number of studies (Bateman and David, 2002; Bateman and Brander, 2000), focus on a single company. Therefore, the aim of the present study is to evaluate the impact on a greater number of indicators, as well as on a group of suppliers with varying characteristics. In the sample, there are multinational companies with a strong global presence in the automotive industry and national companies with plants in different provinces. Also, not all companies have the same production systems: there are manufacturers of plastic parts for injection, metal parts and assemblies. The authors studied some companies with highly automated production processes and other companies with manual processes. Additionally, in some cases, companies had complex logistic schemes such as the delivery in sequence to the customer. It should also be pointed out that the obtained improvements include not only those mentioned above, but also all those associated with any improvement team involved in continuous improvement.

Finally, there are some publications where the joint application of lean production and work teams was evaluated. In these publications, it was considered that the use of techniques associated with the lean production system (just-in-time, Total Productive Maintenance or TPM or total quality management) substantially enhanced operational performance, while the effects deriving from the participation of workers in the deployment of that system, rather than following more directly managerial procedures (by the unilateral decisions of managers or consultants), are much less pronounced (Lowe *et al.*, 1997; Shah and Ward, 2003). Nevertheless, the aim of our research is not so ambitious as those researches. We do not attempt to isolate the effect produced by the application of certain lean production techniques from the effect due to the use of *ad hoc* groups, but we do aim to quantify the joint effect of developing the implementation of a lean system through groups that allow workers' involvement.

3 Research method

3.1 Sample procedures

For the empirical research, data were compiled from 11 first-tier suppliers of one automobile manufacturer located in Spain. These companies were selected either for their importance by volume of purchase (having achieved cost reductions in recent years) or because they had recently encountered problems relating to the quality of deliveries.

The Kaizen Events were led by external consultants (the lean managers of the main client), whose roles were to select lines of action in conjunction with the company's engineers and to collaborate in the training and implantation stages.

These companies, located in the main Spanish cities, belong to different industries and manufacture various products, among which are sound proofing, metal stamping, welded parts, nuts and bolts, plastics (injection and moulded), mechanical sets and electrical products (see Table 1).

Table 1 A description of the studied companies

Case	*Processes*	*Turnover (million €)*	*Industry*
1	Injection and assembly	28	Plastics
2	Pressing, mechanising, injection and welding	29	Metal-mechanical
3	Pressing and welding	80	Metal-mechanical
4	Mechanising, pressing and injection	27	Metal-mechanical
5	Injection	24	Plastics
6	Mechanising and assembly	60	Assembly
7	Assembly	85	Assembly
8	Injection and assembly	178	Chemistry
9	Injection	125	Chemistry
10	Injection and assembly	166	Plastics
11	Injection and assembly	85	Electronic products

Although this set of companies does not provide a representative sample of the population, the manufactured product or the employed process varies from plant to plant, providing some test of the generalisation of the results.

The entire data-obtaining process took place between March 1999 and July 2001. All companies were observed over a period of 9 to 12 months and the following activities were carried out (Montabon, 2005):

Step 1 Selecting the line or process to be observed in the plant.

Step 2 Initial diagnosis of the situation of the selected line. This diagnostic period usually lasted two days, with the collaboration of a group of four or five managers from different departments. During the visit, the measurements of the production indicators published in the lines and their dates of publication were also noted where present. For occasional aspects, the head of quality control or maintenance was consulted for comparison with the opinion of the head of production.

Step 3 Development of the Kaizen Blitz activities and actions. A workshop dynamic with a duration of four to five days was used under the guidance of consultants. Groups of 5 to 14 people participated in the workshops, half of whom were workers. The contents were selected in line with the needs detected in the diagnosis. The workshops started off by explaining the theory of the tools that were used in the event and making sure that everybody understood them. These tools ranged from 5S tools, Visual Factory and Redesign of Layouts for less developed plants in lean manufacturing to Kanban or TPM techniques for those in which the technique had already been introduced. The workshop participants were in charge of taking samples of the production indicator measurements, accompanying them with photos or video recordings when it was considered necessary. These data served to set out the initial value of the indicators prior to the intervention of the *ad hoc* group. At the end of the week, the group had implemented the chosen improvements and proposed an immediate action plan for further improvements that would require management's approval. Finally, a date was agreed for the follow-up on the evolution of the productive efficiency indicators. These data served to establish the final value of the indicators after the group's intervention.

This process was repeated two or three times in each company during a nine-month period until the objectives specified in the initial diagnosis were fulfilled. In other words, two or three Kaizen Blitzes were carried out in each company.

Step 4 Drafting a report to reflect a summary of the activities, to be added to the research database.

All the companies received the same intervention, summarised in the four steps described above in the data-gathering process, with allowances made for the particular circumstances of each company.

To create our dependent variables, we selected only the production efficiency indicators gathered by objective measures. We considered that for the proposed research aims, objective performance measures provide a more robust comparison, as they are less prone to short-term fluctuations (Lowe *et al.*, 1997). As our interest was centred on evaluating the impact on the production process, no financial indicators or indicators of the human resources-related aspects were registered.

The five operational measures utilised to assess the efficiency of the productive process were:

1. Quality (Q) (de Toni and Tonchia, 1996; Giffi *et al.*, 1990; Gunn, 1992; Maskell, 1995) – percentage of the correct pieces, compared with the total number of pieces processed
2. Overall Equipment Efficiency (OEE) (Dal *et al.*, 2000; Giffi *et al.*, 1990; Maskell, 1995) – the time in which the machine is working according to specifications producing correct pieces, compared with the total net time available
3. DTD time (de Toni and Tonchia, 1996; Giffi *et al.*, 1990; Gunn, 1992; Maskell, 1995) – the average production time invested in raw materials, work-in-process and finished goods of a product
4. Workforce productivity (de Toni and Tonchia, 1996; Giffi *et al.*, 1990; Lowe *et al.*, 1997) – the units produced per hour
5. Changeover time (Giffi *et al.*, 1990; Gunn, 1992; Maskell, 1995; Schonberger, 1996) – the time that a machine is stopped to make the necessary adjustments so that it can manufacture a different reference.

The absolute values of these operational measures can depend, among other factors, on the volume of production of the company, the capacity used, the type of process or the differences due to the complexity of products or the time required to make them (Banker *et al.*, 1996; Cua *et al.*, 2001; Ichniowski and Shaw, 1999; Lowe *et al.*, 1997). We should stress that none of these factors changed substantially in any of the companies during the observation period. To be able to compare the degree of improvement between the different companies, we selected as dependent variables of our research the percentage that represents the improvement of the value of an indicator over the initial situation.

4 Results

Before discussing the overall results of the analysed companies, we shall describe the state of the companies at the outset. We will begin by relating the production system in the different companies to subsequently show the value of the operational measures in each company before initiating the intervention of the Kaizen Blitz teams.

The production system in each plant was established on the basis of the data compiled during the interview and visits to the production facilities. We considered that most companies would either be at an initial early stage, which could be associated with a traditional point of view of mass production (Cases 3 and 6), or an initial stage in the development process towards lean production (Cases 2, 4, 5, 7, 8, 9 and 11). Company 1 was at an intermediate stage of development and only Company 10 seemed to have advanced to any degree in the lean production implementation process.

Regarding the initial situation of the production indicators of each company (Table 2), in Q, most of the companies were below the recommended standards for world-class manufacturing (Dal *et al.*, 2000). The lowest were Cases 9 and 10 due to the complexity of their processes.

Table 2 Operational performance at start-up

Indicator	*Q*	*OEE*	*DTD time*	*Workforce productivity*	*Batch changeover time*
Measure	*%*	*%*	*Days*	*Units/WF hours worked*	*Minutes*
Case 1	91.2	53	6.9	6.4	18
Case 2	82	67	13	19.6	35.5
Case 3	78.3	66	8.2	69	
Case 4	93.2	59	23	4166	357
Case 5	97	70	14.5	43.7	89
Case 6			9	29.0	40
Case 7				3.5	
Case 8	76	61	17.8	16.7	
Case 9	55	77.2	10.6		75
Case 10	71	79	39	4.3	17
Case 11	90	60	37.6	13	180
Mean	81.5	65.8	19.2	437.0	101.0

As for OEE, only Company 10 had a level close to 80%, which may be considered a benchmark of world-class manufacturing (Dal *et al.*, 2000), whereas the other companies were below the threshold that would be considered acceptable (60%–75%).

More than half of the companies have a DTD time of more than ten manufacturing days, thanks to which they are able to offset the possible inefficiencies of their production lines. Companies 10, 11 and 4 had the highest DTD rate.

Apparently, the workforce productivity is acceptable and the variations are due to the different complexity of the products that they manufacture (from screws or trims to complete car cop-pick).

As for the changeover time, only two companies (10 and 1) achieved reduced values. In the first case, the values reached are very close to the technological limit, as they were obtained after several Single Minute Exchange of Die (SMED) interventions. The remaining companies have a lot of room for improvement, particularly when we consider the high figures of Companies 4 and 11.

The empty boxes correspond to the indicators that were calculated in the companies in a way different to ours and we were unable to reconstruct the data in a reliable manner. Also, in certain cases, these data correspond to indicators which, due to the particular characteristics of the company, were not considered important and were not taken into account (*e.g.*, the OEE of oversized machinery or the First Time Through (FTT) of cheap products also in oversized machinery).

Table 3 shows how production indicators have improved in the studied cases.

Table 3 Improvement in operational performance

Indicator	*Q (%)*	*OEE (%)*	*DTD time (%)*	*Workforce productivity (%)*	*Batch changeover time (%)*
Case 1	8	36		11	–33
Case 2	5	13	–41	14+	–72
Case 3	11	30	–48	17+	–75*
Case 4	6	6	–22	8	–40
Case 5	1	11	–7		–71
Case 6			–64	34	
Case 7				60	
Case 8	1	4	–21	23	–54*
Case 9				9+	–48
Case 10				21	
Case 11	5,60	25	–60	14+	–87
Mean	5	18	–38	22	–60

Note: The percentage of improvement was calculated as: (value at end-value at start)/value at start.

+ measured as the direct workforce variation for a specific production instead of units per hour worked.

* estimated as the machine stop time reduction.

All the production indicators, on which interventions were made, were favoured by the use of lean production techniques derived from the activities developed by the *ad hoc* groups.

The main results obtained in the 11 analysed cases are summarised by a notable improvement in the efficiency of machines (approximately 18%), mainly obtained due to a radical improvement in the changeover time (reductions of almost 60% of the original time), an improvement in the quality rate of nearly 5% (setting out from levels over 90%), the reduction of inventory levels by almost 40% and an increase in productivity between 9% and 60%. We also detected important improvements in the use of the space in the plants, a reduction in the number of containers and the distance travelled by products.

The quality indicator showed less gains, although it must be noted that almost all of the companies have already engaged in some sort of action to enhance their processes to assure acceptable quality levels. In fact, all of them were ISO 9000 certificate holders; moreover, they had certification from customers, with annual audits and (even in some cases) with more demanding criteria than ISO 9000.

If we compare the quality levels of the studied companies with those of the companies supplying US automobile plants, it may be seen that the quality rating of almost all the observed companies was initially below 98%, which is the average for North American companies (Liker and Wu, 2000). However, after the interventions, half the studied companies reached a quality level of over 98%. In addition, compared with the data of Lowe *et al.* (1997), the difference between the quality of the high-performance companies and low-performance ones is very small. In view of all the above, we considered that 5% of the improvement obtained on average in the observed companies is a significant figure.

Regarding the productivity indicator, the measurement used by Lowe *et al.* (1997) is not the same as ours, which is why we cannot directly compare their data with ours. Nevertheless, it is highly illustrative to verify the broad margin of variation in the productivity values between companies making different products, a factor that may also be observed in our cases.

Unfortunately, we were unable to find any published material with data that would allow us to compare the values obtained for the rest of the indicators studied in our research.

Finally, we must take into account that the presented measures are not independent. For example, an improvement of quality in automated processes will affect the efficiency of the machines. Efficiency is also affected by a reduction in the changeover time because more machine manufacturing time can be obtained depending on the extent of the reduction. Nevertheless, this is not a direct relationship because the company can take advantage of the fact that changeover is faster to make more changes instead of increasing the number of production hours. In this case, machine use will not be improved, but the indicator that would be enhanced is DTD, since the work-in-progress would be less when working with smaller batches. As an example, we can see that in the case of Company 4 (Table 3), a 6% improvement in OEE is due to the improved quality of the products, while the 40% reduction in the changeover time did not improve efficiency, as the company policy was to cut the size of the batches. What did improve in this case was the DTD indicator (22%), which meant that on average, the products were in the plant for one week less (falling from 23 days to 18 days).

5 Discussion and conclusions

Our work aimed to identify the possibilities for improvement of the production indicators when a company puts Kaizen Event activities in action. The studied companies belonging to different sectors and production processes were medium to large and their main clients are automobile assembly plants.

All the studied companies have initiated measures to improve performance and, in the light of the obtained results, they appear to have fulfilled this objective, at least as far as production indicators are concerned.

One important aspect for the smooth running of interventions was the support shown by the managers in the *ad hoc* group meetings and the presence of the CEO at the closing session of each workshop. In addition, the workshops gave rise to a structure that facilitates communication between the group and management, while training acts as a means to reduce resistance to change (Power and Sohal, 2000).

On the other hand, cooperation between external and internal teams was considered highly satisfactory by both sides. One of the fundamental reasons for this good working relationship was the use of standard lean production tools (5S, SMED, TPM, balanced worklines, *etc.*) whose existence and utility were already known to all the directors involved, including the least experienced ones.

Here, it should be mentioned that the client was able to benefit from the obtained results by lowering the prices of the products that had benefited from improvements. This was one of the primary aims of the external consultants, although it was met with some resistance on the part of the companies, even if they benefited from the rest of the improvements. This resistance was basically due to the existence of other clients' products that would be negatively affected by the improvements, but the client insisted on partially improving this component and then reducing the price of the part.

In some cases, operations were extended to other departments after the initial operation was over. This happened mostly in the case of multinationals who have already experienced this type of practice. Other companies confined themselves to maintaining the implemented improvements and showed limited interest in extending them to other areas, despite being aware of the benefits involved. The reasons given in the interviews were the classic "resistance to change" and/or "right now we haven't time" or that they were more interested in growing than improving, even though they admitted that this attitude was an error.

At the same time, it must be recognised that without the presence of outside consultants, *i.e.*, without the obligation of the client, approximately 80% of the companies would not have implemented this type of improvements for the same reason that they were not interested in later extending them to other areas. We can say that the experience is repeatable, but only with the direct support of management for this type of improvement team. For the reasons cited above, this support is not always forthcoming.

As limitations of this work, the fact that 16 (29%) of the boxes of Table 3 are blank may be significant. The main cause of this was the cost to the company of providing the data that enabled us to calculate the indicators or, as in the case of Company 7, policies of confidentiality that prevented our access to the data. On the other hand, in some companies, inconsistent data appeared, depending on the source that provided them (production department, quality or maintenance). For this reason, during our intervention in the initial workshop, we had to trace the necessary data. This was carried out together with the components of the *ad hoc* group, under the supervision of the training consultants. These data were compared with diverse sources or were directly taken in plants when divergences arose. This process took up almost two days of work in each company and required the participation of several managers, usually those occupying key positions in maintenance, quality and production. Therefore, to avoid resistance, in each factory, we limited ourselves to obtaining the measures of the indicators that were of immediate practical use to them, taking into account the needs detected in the initial diagnosis, the implemented training actions and the changes introduced in the production lines.

Another limitation of this study is the issue of generalisation of the findings. In some sense, we have tried to overcome this limitation by analysing a number of production lines that varied in terms of the manufactured product, size, annual turnover, used production process and starting level of lean deployment. However, the study should be complemented taking other sectors into account, where the companies supply a high number of clients with fluctuating and not very predictable demands. On the other hand, since all companies received the same intervention consisting of lean deployment through workshops, we cannot compare the results that would be obtained with another type of intervention. The lack of such data prevents us from making a definitive causal attribution.

An important advantage of our work was obtaining data from multiple sources (interviews, observations and documentation analysis), giving a certain degree of confidence in the results (Yin, 1994). The interviews were carried out formally in the diagnostic sessions and the production managers took part. The line observation was done in the initial diagnosis and during workshop development. The records of the production, quality and maintenance departments were also consulted to compare them with the line observations made during the workshops. With the selected data-sampling methodology, this task was laborious and demanded great dedication from the researchers. For this reason, adapting to the available resources, in our research design, we chose to observe a limited number of cases.

6 Implications for research and practice

The issue approached in this paper is important for company and production managers because it shows the potential gains that can be obtained by means of Kaizen Events like those described in this research.

We consider that the use of training-intervention dynamics of a short duration attended by people from different hierarchic levels and different departments and related to a production line or process could contribute to improving the productive results. The sessions should incorporate both ice-breaker dynamics to create an atmosphere that encourages problem-solving in groups and the philosophy and methodology of the lean tools to be implemented. During the sessions, it is also necessary to set aside time to 'capture' the necessary data, analyse them and propose alternatives for improvement. It is recommended that these sessions be guided by experts in the application of the tools and that they supervise the data gathering and activities of the group.

It is advisable that at the end of the week, a plan be agreed upon and, if possible, that the participants should make a presentation of it to the company management to corroborate their acceptance and obtain a commitment for the dates from everyone involved.

Our paper may also be interesting for the people involved in consulting tasks. These can justify the investment made by the company to start up the interventions, with the gains expected from the application of their services.

To continue the research, we propose the following actions that would complement our work:

- increasing the number of companies receiving the treatment to have several firms at every level of the control variables (sector, production process, product, lean production development stage prior to the intervention)

- incorporating companies that have not received treatment (Kaizen Event), both those that have never received it at all and those that have at one time, but have not received treatment for some time
- incorporating as variables the levels of safety and hygiene, stress or the workload of line workers to find out if the increase in productivity is due to the worsening of these conditions, as diverse authors proposed (Fairris, 2002).

For future studies and to complete the work already carried out, a study should be made on whether or not Kaizen Events are an appropriate tool to introduce continuous improvement and new working methods in a sustainable form in the long term. This would involve an analysis of the participating firms to find out whether or not they implemented new work methods and extended them to all other areas of the plant or, on the other hand, the reasons why they neglected to implement improvements to determine whether or not sustained improvement is possible.

In conclusion, the results obtained in our research underline the effectiveness of the use of Kaizen Events in the automotive industry. We are confident that this study provides proof that may encourage other companies to start similar processes that facilitate the improvement of their results.

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