

## PROPOSED DESIGN IMPROVEMENT IN PROCESS FLOW AND FORM OF PROCESS CHANGE REQUEST AT PT. ABC

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### ABSTRAK

*PT. ABC merupakan sebuah perusahaan yang bergerak dalam bidang industri manufaktur otomotif. Pada kegiatan produksinya PT. ABC memasok barang-barang dari beberapa pemasok. Manajemen penjaminan mutu terhadap pemasok dan barang pasokan diperlukan oleh PT. ABC untuk memperoleh barang pasokan sesuai dengan standar yang telah ditentukan oleh PT. ABC. Process Change Request (PCR) merupakan proses permohonan yang diperlukan untuk mengubah standar barang pasokan meliputi 4M (man, machine, method, dan material). Alur proses dan formulir Process Change Request telah terstandarisasi dan tercantum pada Supplier Quality Assurance Manual (SQAM). Supplier Quality Assurance Manual (SQAM) merupakan dokumen persyaratan sebagai pedoman untuk mengatur kualitas suku cadang dan komponen, jaminan kualitas internal perusahaan, dan kebijakan untuk pemasok. Pada alur proses dan formulir PCR ditemukan masalah yaitu ketidaksesuaian antara waktu ideal dan waktu aktual tahap approval PCR sehingga menghambat pasokan PT. ABC yang disebabkan oleh pemborosan. Pada penelitian ini, peneliti mengusulkan rancangan perbaikan terhadap alur proses dan formulir PCR dengan menerapkan pendekatan konsep kaizen (perbaikan berkelanjutan) menggunakan tahap "plan" (perencanaan) pada metode siklus PDCA (Plan-Do-Check-Action) dan diagram fishbone.*

### ABSTRACT

*PT. ABC is a corporation in the automotive manufacturing industry. In corporation's production, PT. ABC supplies goods from several suppliers. Quality management of suppliers and supply goods is needed by PT. ABC to obtain supplies according to the standards set by PT. ABC. The Process Change Request (PCR) is a requisite process for the standard change of supply items covering 4M (man, machine, method, and material). The process flow and form of Process Change Request have been standardized and listed on the Supplier Quality Assurance Manual (SQAM). The Supplier Quality Assurance Manual (SQAM) is the requirement document as a guide to the quality of parts and components, a corporation's internal quality assurance, and a policy for suppliers. In the process flow and form of PCR has been found a problem of inconsistency between the ideal time and the actual time of the PCR's approval phase which hampered the supply of PT. ABC caused by waste. In this study, the researcher proposed the improvement design to the process flow and form of PCR by applying the kaizen concept approach (continuous improvement) using the "plan" step of The PDCA cycle method (plan-do-action) and the fishbone diagram.*

**Keywords:** *kaizen; PDCA; Process Change Request (PCR); quality assurance; waste*

### I. Introduction

PT. ABC is a corporation in the automotive manufacturing industry. PT. ABC uses the Toyota Production System (TPS) in their production activities to increase production efficiency, provide the best quality, lowest cost, and lead time of the shortest production through eliminating waste during production such as muda, mura, and muri. Therefore, PT. ABC is apply kaizen or continuous improvements to improve production systems constantly.

PT. ABC supplies goods from several suppliers in corporation's production. Quality management of suppliers and supply goods is needed by PT. ABC to obtain supplies according to the standards set by PT. ABC. In the process flow and form of PCR has been found a problem of inconsistency between the ideal time and the actual time of the PCR's approval phase which hampered the supply of PT. ABC caused by waste.

In this study, the researcher proposed improvements design to the process flow and

form of PCR at PT. ABC by applying the kaizen concept approach (continuous improvement) using the "plan" step of The PDCA cycle method (plan-do-control-action) and the fishbone diagram. The purpose of this study is to propose design improvement of PCR's process flow and form at PT. ABC so that the actual lead time approaches the ideal process time.

1.1. Previous Research

Kaizen concept approach and the PDCA cycle methods are still used in the last three years period of research on industrial quality and productivity management. In the study [1] quality improvements were made to the painting shop using the kaizen principles and the 5 why's to address the causes of dust seed. Another study is carried out by the [2] regarding lean kaizen by PDCA's method of automotive production to enhance productivity line painting. The study gained an 80.5 percent increase in productivity by reducing time loss. [3] doing research on swift run's quality increase by using PDCA and quality control seven tools (check sheets, pareto diagrams, control maps, and fishbone diagrams) and thus reveals the root problem of the swift run shoe quality. Use of the PDCA method is also used in research carried out by [4]. In the study, the PDCA method was one of the methods capable of resolving the problem in the concept of lean improvement and then working to improve the value and value of products or activities.

II. Theory/ basic theory

II.1. Toyota Production System (TPS)

Taiichi Ohno is considered to be the father of the revolutionary Toyota Production System (TPS), which inspired Lean Manufacturing in the United States [5][6]. Taiichi Ohno refers to three key sentences in his book "Toyota production system beyond large scale production "that, when combined, defines the TPS. The three key sentences are "The basis of the Toyota production system is the absolute elimination of waste", "Cost Reduction Is the Goal", and "After World War II, our main concern was how to produce high quality goods and we helped the cooperating firms in this area. After 1955, however, the question became how to make the exact quantity needed." [7]. From the three key sentences, [8] defines the TPS as a production system which is a quantity control system based on a basis of quality with a cost reduction purpose and means to remove absolute waste. The seven wastes identified in the Toyota Production System are overproduction, waiting, transportation, processing itself, inventory, movement, and making defective products [7].

II.2. Process Change Request (PCR)

The Process Change Request (PCR) is a requisite process for the standard change of

supply items covering 4M (man, machine, method, and material). The process flow and form of Process Change Request (PCR) have been standardized and listed on the Supplier Quality Assurance Manual (SQAM). The PCR goal is to ensure that suppliers supply goods according to PT. ABC standards. PCR will have to submit by the supplier to the Quality Control Engineering (QCE) PT. ABC when the supplier is about to conduct a standardized change to components such as 4M (man, machine, method, and material) that will be supplied to PT. ABC [9]. The standardized PCR form listed on SQAM can be seen in figure 1. Whereas the PCR flow process listed in the SQAM can be seen in figure 2. The time for the ideal process in the PCR process flow of the PT. ABC listed in the SQAM is 1-3 months.

Figure 1. PCR's Form at PT. ABC

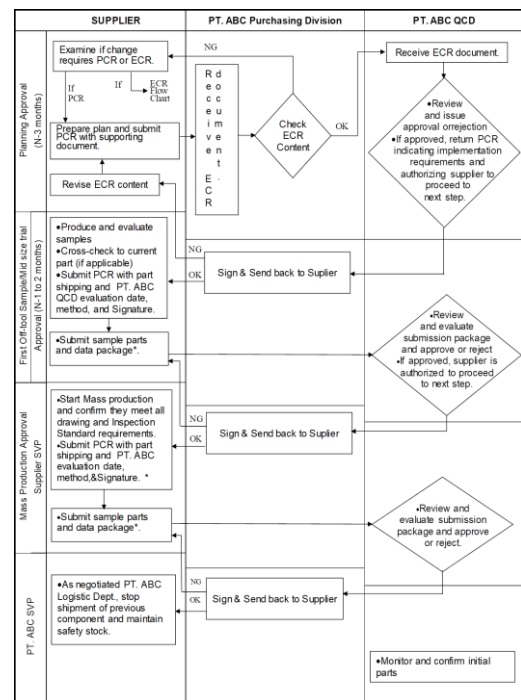


Figure 2. PCR's Flow Process at PT. ABC

II.3. Supplier Quality Assurance Manual

The Supplier Quality Assurance Manual (SQAM) is the requirement document as a guide to the quality of parts and components, a corporation's internal quality assurance, and a policy for suppliers. The Supplier Quality Assurance Manual (SQAM) provides description of PT. ABC quality assurance to

suppliers and communicates the commitments between PT. ABC's and suppliers to ensure the supply product's quality is the best quality for customers. One of the standardized documents on quality compliance with the supplier is the Process Change Request (PCR) [9].

II.4. ISO 9001

The Supplier Quality Assurance Manual (SQAM) is related by ISO 9001:2015 on its quality management and process systems such as quality management and change management. SQAM's relationship with quality management in ISO 9001:2015 is what corporate organizations must do to implement its quality management and process systems. Whereas SQAM's relationship with change management in ISO 9001:2015 is about changing requirements for products and services, design and development changes, control of changes, and input and output management review [10].

II.5. Kaizen

According to [11], waste elimination constitutes one of the essential kaizen. Kaizen (continuous improvement) is the concept of improving the process with a continuous series of steps.

II.6. PDCA (Plan-Do-Check-Action)

The PDCA stands for a "plan-do-check-action" cycle that repeats the repair process that is a characteristic in the kaizen repair process [8]. The PDCA is a method popularized by Edward Deming for a continual improvement process that is often called the Deming cycle [12]. Generally, the PDCA methods in the manufacturing industry are used to reduce waste such as waiting time, idle, failure, fatigue, and so on [13].

II.7. Fishbone Diagram

The fishbone diagram was developed by Kaoru Ishikawa in order to determine and divide the causes of a given problem on main fields of causes [14]. According to Gasperz in article [15], fishbone diagram analysis represents a more detailed structured analysis approach to finding the causes of problems, inconsistencies, and gaps. The fishbone diagram can be applied for the analysis and evaluation of a quality problem in different production activities as well as in the field of services rendered to the beneficiaries [14]. Figure 3 shows an illustration of the fishbone diagram [16].

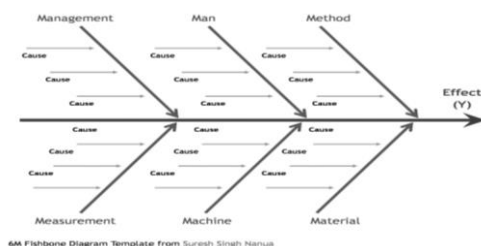


Figure 3. Fishbone Diagram Template

III. Research methodology

The research starts with literature study and field study, then doing problem identification, data collection, data processing, data analysis, making proposed design the improvement, and finally getting a conclusion. The study stages of research are also presented in a flowchart shown in the following figure 4.

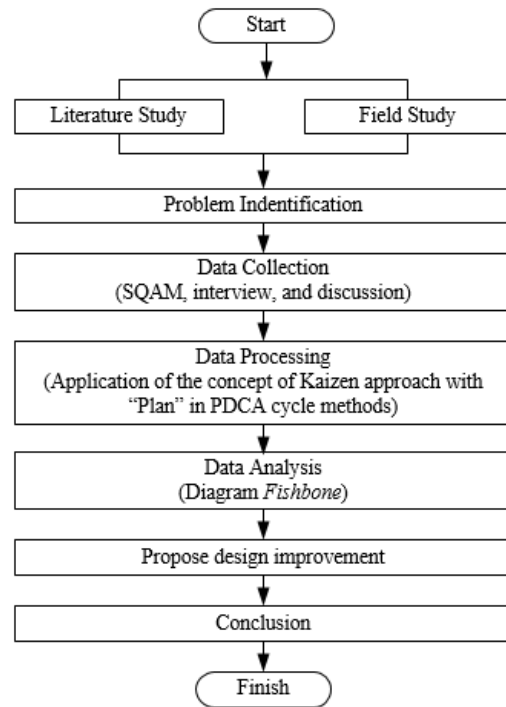


Figure 4. Flowchart of The Research

The data collected on this study is based on Supplier Quality Assurance Manual (SQAM), interviews, and discussions. At the data collecting of this research, SQAM gives information about the current process flow and form of the Process Change Request (PCR). Meanwhile, the interview activities are carried out with the manager and responsible person of the quality assurance and suppliers at PT. ABC, particularly about PCR.

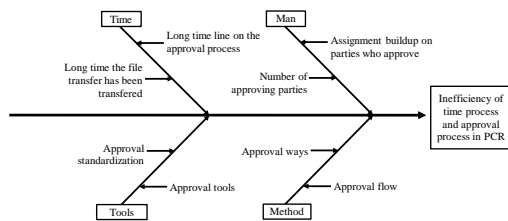
Data processing in this research is done by applying the concept kaizen approach using the "plan" stage of PDCA cycle methods to produce a plan for the PCR improvement proposal at PT. ABC. Data analysis in this research is aimed at identifying the problem factors. The analysis tool used was the fishbone diagram. After the problem factors have been identified, the plan for the PCR improvement proposal at PT. ABC is developed.

IV. Research results and discussions

The PDCA cycle method in kaizen or continuous improvement consists of four stages, including the Plan, the Do, the Check, and the action. This research only carried out the plan. At the plan stage, problem identification, and formulation of a repair plan

to address problems for the Process Change Request (PCR) at PT. ABC.

Supplier Quality Assurance Manual (SQAM) lists the ideal process time standard for PCR processes at PT. ABC as 1-3 months. From the results of the interview and discussion with the manager and responsible person of the quality assurance and suppliers at PT. ABC, it is known that the actual process time of the PCR process flow in PT. ABC can be as much as 6 months, which exceeds the time of the ideal process. Then, analysis of the causes of problem factors uses the fishbone diagram. Furthermore, to determine the cause of the problem, interviews and discussions were carried out with the manager and responsible person of the qa and suppliers at PT. ABC and one of the suppliers at PT. ABC.



**Figure 5.** Fishbone Diagram of The PCR Problem at PT. ABC

Figure 5 shows a fishbone diagram of the analysis about problem cause factors that occur in the Process Change Request (PCR). There are four factors of problems in the process flow and form of PCR at PT. ABC. The four factors are man, method, tools, and time. From the results of interview and discussion with the manager and responsible person of the quality assurance and suppliers at PT. ABC, it is known that the problem is the ineffectiveness of the PCR process that causes the inefficiency of the actual process time in PCR process.

On the man factor, found the waste is overprocessing and waiting time. This is due to the number of approval parties who signed. At the current Process Change Request (PCR) at PT. ABC, the portion on first-off tool and mid-size trial are three approvals signed by suppliers, three approvals signed by PT. ABC Quality Control Division (QCD) Quality Control Engineering (QCE) Department and three approvals signed by PT. ABC's division. Based on the results of interviews and discussions, one of the causes of the actual PCR is due to heap of assignments for the approval parties so that the actual process time can exceed the ideal time.

The problem with the method factor involves the approval sign process. In this factor, we find the waste. The wastes are overprocessing, transportation, and waiting time. Some suppliers acknowledge that there is an actual process time discrepancy with the ideal process time in getting signed. This has

affected the implementation of the production schedule for the goods which will be supplied to PT. ABC by the participants. Production of supplies can be done after Minute of Meeting (MOM) and get three approvals signed by PT. ABC QCD QCE Department and three approvals signed by PT. ABC Purchasing division on PCR. The MOM on the Process Change Request (PCR) is a meeting between the suppliers who filed the PCR with PT. ABC to discuss further developments concerning PCR's supply quality.

The tools factor relates to approval sign. In this factor also found a waste of overprocessing and waiting time. Approval sign on the Process Change Request (PCR) have been standardized by PT. ABC's and attached to the Supplier Quality Assurance Manual (SQAM). From the result of interviews and discussions, the portion on first off tool and mid-size trial of PCR causes PCR's actual time delay. The minute of meeting (MOM) is thought to represent approval sign rather well by attached the result of minute of meeting - generated evidence. Figure 6 is the illustration of the minute of the meeting (MOM) at PT. ABC.

MOM - Process Confirmation for PCR _____				
No.	Concern Item	Result / Action	PIC	Due Date
			(Name)	DD/MM/YYYY
			(Name)	DD/MM/YYYY
			(Name)	DD/MM/YYYY
			(Name)	DD/MM/YYYY
			(Name)	DD/MM/YYYY

Attendance: PT. ABC (Name), Supplier (Name), (Name), (Name)

**Figure 6.** Minute of Meeting (MOM)

Time factors affect the process of Process Change Request (PCR). At Supplier Quality Assurance Manual (SQAM), the ideal time of PCR process at PT. ABC is 1-3 months. From the results of the interviews and discussions, we found the waste on this factor is waiting time. Waiting time in this factor is the waiting time of the approval process and the length of transfer time the files which have been signed. This causes the actual process time of the PCR process at PT. ABC to exceed the ideally timed (about six months) so that leads to the delay in PCR's completion.

**Figure 7.** Proposal Improvement Form of PCR at PT. ABC

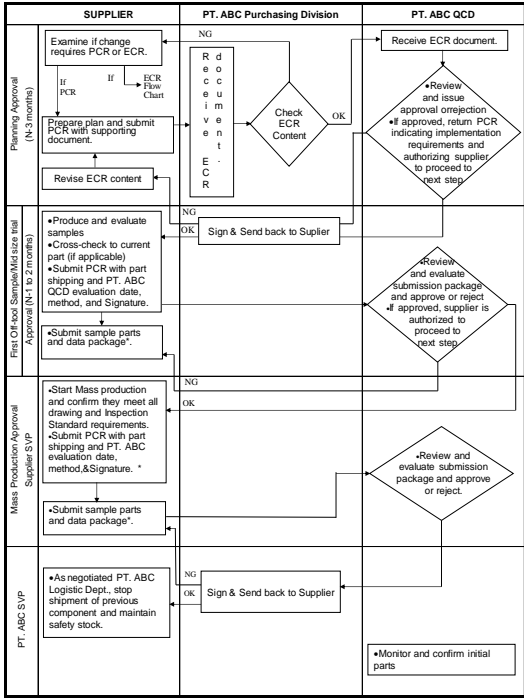


Figure 8. Proposal Improvement Process Flow of PCR at PT. ABC

Based on the factors of problem that have gotten, then propose the improvement design for process flow and form of Process Change Request (PCR) at PT. ABC. Figure 7 shows the proposal improvement form of PCR and Figure 8 shows the proposal improvement process flow proposal of PCR.

The difference between current Process Change Request (PCR) at PT. ABC with PCR improvement proposal is that it minimizes the number of parties who signed the approval on first-off tool and phase b (mid-size trial) by replacing PT. ABC's signature by minute of meeting (MOM). The points of difference in the design of the PCR improvement proposal are useful to shorten the actual PCR process time and thus reach the ideal PCR process time. The difference points for a current PCR form with the PCR proposal are shown in figure 9 and the difference points for current PCR process flow with the PCR proposal indicated in figure 10.

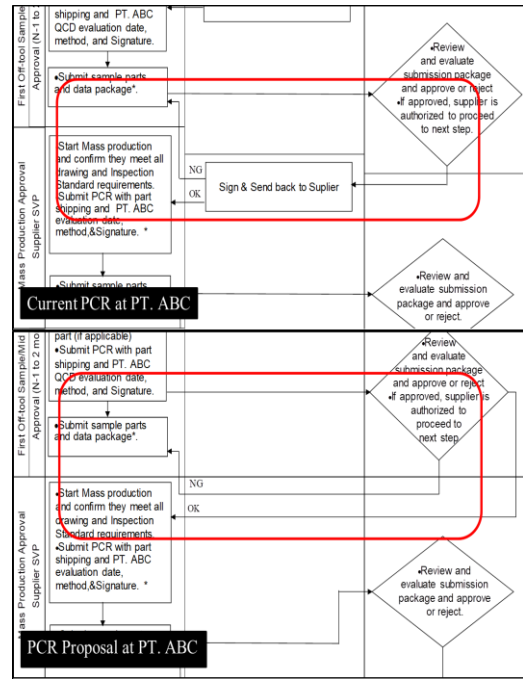
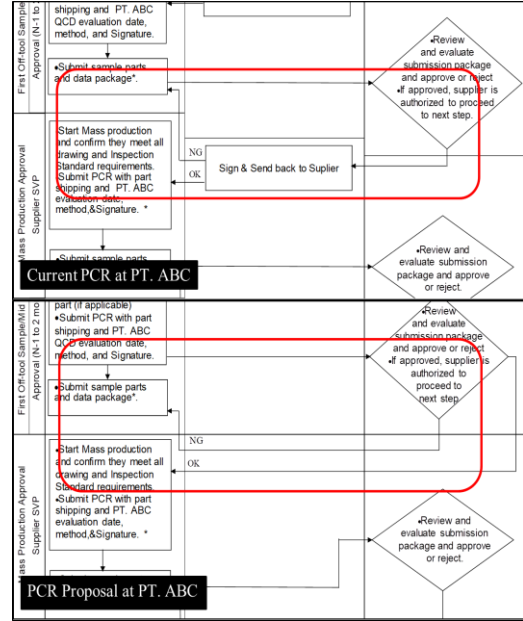


Figure 10. Difference Points between The Current PCR Process Flow and The PCR Proposal at PT. ABC

SECTION	DESCRIPTION	DATE	APPROVED	CHECKED	DRN	PT. ABC PARTNERSHIP	PT. ABC QCD DEPARTMENT
FIRST OFF TOOL (MOM SAMPLE EVALUATION)	DATE: _____	APPROVED: _____	APPROVED FOR MOM: <input type="checkbox"/>	APPROVED FOR MMR PRODUCTION: <input type="checkbox"/>	DATE: _____	MR	MR
	SAMPLE ID: _____	APPROVED: _____	APPROVED FOR MOM: <input type="checkbox"/>	APPROVED FOR MMR PRODUCTION: <input type="checkbox"/>	DATE: _____	MR	MR
MID SIZE TRIAL PRODUCTION	DATE: _____	APPROVED: _____	APPROVED FOR MOM: <input type="checkbox"/>	APPROVED FOR MMR PRODUCTION: <input type="checkbox"/>	DATE: _____	MR	MR
	SAMPLE ID: _____	APPROVED: _____	APPROVED FOR MOM: <input type="checkbox"/>	APPROVED FOR MMR PRODUCTION: <input type="checkbox"/>	DATE: _____	MR	MR
MOM SAMPLE EVALUATION	DATE: _____	APPROVED: _____	APPROVED FOR MOM: <input type="checkbox"/>	APPROVED FOR MMR PRODUCTION: <input type="checkbox"/>	DATE: _____	MR	MR
	SAMPLE ID: _____	APPROVED: _____	APPROVED FOR MOM: <input type="checkbox"/>	APPROVED FOR MMR PRODUCTION: <input type="checkbox"/>	DATE: _____	MR	MR
MOM SAMPLE EVALUATION	DATE: _____	APPROVED: _____	APPROVED FOR MOM: <input type="checkbox"/>	APPROVED FOR MMR PRODUCTION: <input type="checkbox"/>	DATE: _____	MR	MR
	SAMPLE ID: _____	APPROVED: _____	APPROVED FOR MOM: <input type="checkbox"/>	APPROVED FOR MMR PRODUCTION: <input type="checkbox"/>	DATE: _____	MR	MR

Figure 9. Difference Points between The Current PCR Form with The PCR Proposal at PT. ABC

The points of difference between current PCR at PT. ABC with PCR improvement proposal is also shown by table 1 below.

**Table 1.** Difference Points between The Current PCR with The PCR Proposal

Item	PCR PT. ABC	Proposed Improvement of PCR PT. ABC
Lead Time	3 months	3 months
Approval Division	1. Purchasing Division	1. Purchasing Division
	2. QCD QCE Deaprtment	2. QCD QCE Deaprtment
Step Approval	1. Planning	1. Planning
	2. First-Off Tool	
	3. Mid-Size Trial	
	4. Mass Production	2. Mass Production
	5. PT. ABC SVP	3. PT. ABC SVP
Others		Minute of Meeting (MOM) is an alternative of sign approval for First-Off Tool and Mid-Size Trial

The proposal for the PCR improvement is an implementation of the kaizen concept or continuous development at PT. ABC using the plan stage in PDCA cycle methods. Therefore, phase of do, check, and action on the PDCA method must be taken to see if PCR improvement plans are effective and efficient or not when applied. This is because this research only until the making a plan for the PCR as a proposal for improvements to the PT. ABC flow process and form of PCR related with the implementation of the ISO 9001:2015 quality management and change management.

**V. Conclusions**

The problem factors on the Process Change Request (PCR) in this study are the man, the method factor, the tool factor, and the time factor. The waste found on this PCR's research is based on the analysis of the factors. The wastes are overprocessing, waiting time, and transportation. The main point of difference in the PCR improvement proposal from the previous PCR at PT. ABC, which is replacement of approval sign in phase of a (first-off tool) and b (mid-size trial) with a minute of meeting (MOM) in the PCR process. Kaizen or continuous improvements in the study are the proposals for improvements to the flow process and form of PCR form at PT. ABC. This research is only using the plan step of PDCA

(Plan-Do-Check-Action)'s cycle method so that it still needs to take the do, check, and action steps to see if the design is effective and efficient when applied.

**References**

1. Adyatama, A., Handayani, N.U. 2018, "Perbaikan Kualitas Menggunakan Prinsip Kaizen Dan 5 Why Analysis: Studi Kasus Pada Painting Shop Karawang Plant 1, Pt Toyota Motor Manufacturing Indonesia", *J@ti Undip Jurnal Teknik Industri*, 13, 169.
2. Kartika, H. 2020, "Penerapan Lean Kaizen untuk Meningkatkan Produktivitas Line Painting pada Bagian Produksi Automotive dengan Metode PDCA", *Jurnal Sistem Teknik Industri*, 22, 22–32.
3. Fatma, N.F., Ponda, H., Handayani, P. 2020, "Penerapan Metode PDCA Dalam Peningkatan Kualitas Pada Product Swift Run di PT . Panarub Industry", *Jurnal Industri Manufaktur*, 5, 34–45.
4. Khaerudin, D., Rahmatullah, A. 2020, "Implementasi Metode Pdca Dalam Menurunkan Defect Sepatu Type Campus Di Pt. Prima Intereksa Indastri (Pin)", *Jurnal Sains dan Teknologi Jurnal Keilmuan dan Aplikasi Teknologi Industri*, 20, 34.
5. Wikipedia, "Taiichi Ohno", [https://en.wikipedia.org/wiki/Taiichi\\_Ohno](https://en.wikipedia.org/wiki/Taiichi_Ohno), accessed 8 March 2021.
6. Duncan, "Taiichi Ohno - an intro to the father of Lean Manufacturing Title", <https://www.getvetter.com/posts/159-taiichi-ohno-an-intro-to-the-father-of-lean-manufacturing>, accessed 8 March 2021.
7. Ohno, T., 1988, "Toyota Production System Beyond Large Scale Production", Productivity Press, New York.
8. Wilson, L., 2010, "How To Implement Lean Manufacturing", The Mc Graw-Hill Companies.
9. PT. Toyota Motor Manufacturing Indonesia, 2006, "Toyota Supplier Quality Assurance Manual", PT. Toyota Motor Manufacturing Indonesia, Karawang.
10. Badan Standardisasi Nasional, 2015, "SNI ISO 9001:2015 Sistem Manajemen Mutu – Persyaratan", Badan Standardisasi Nasional (BSN).
11. Fitriani. 2018, "Siklus PDCA dan Filosofi Kaizen", *Jurnal Manajemen Pendidikan Islam*, 7, 625–640.
12. Prasetyo, B., Tauhid, R.S. 2019, "Penerapan Budaya Kerja Kaizen Di Pt X Kabupaten Bandung Barat", *At-Tadbir Jurnal Ilmu Manajemen*, 3, 132–146.
13. Isniah, S., Hardi Purba, H., Debora, F. 2020, "Plan do check action (PDCA) method: literature review and research issues", *Jurnal Sistem dan Manajemen Industri*, 4, 72–81.

14. Luca, L., Pasare, M., Ph, L., Stancioiu, A., Brancu, C. 2017, "Study To Determine a New Model of the Ishikawa Diagram for Quality Improvement", *Rliability Durab*, 1, 249–254.
15. Hamidy, F. 2016, "Pendekatan Analisis Fishbone Untuk Mengukur Kinerja Proses Bisnis Informasi E-Koperasi", *Jurnal Teknoinfo*, 10, 11.
16. Lab, T., 47 Great Fishbone Diagram Template & Examples [Word, Excel], <https://templatelab.com/fishbone-diagram-templates/>, accessed 9 March 2021.