

PDCA Cycle Method implementation in Industries: A Systematic Literature Review

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The industry's development increasingly makes businesses competitive by increasing technical knowledge and improving systems, both internally and externally. The PDCA (Plan, Do, Check, Action) cycle is a quality management system used as a continuous improvement tool widely used in industries. The PDCA is a continuous improvement tool that is widely used in industries. The PDCA cycle begins with small to check possible effects on systems and eventually progresses to larger and more specific improvements. The implementation of the PDCA method results in solving the problems of qualitative and quantitative data problems that have been widely applied in industries for continuous improvement and as a work pattern in improving a process or system in an organization and increasing productivity. The methodology used in this research is the literature review research paper was published in 2010-2020. The literature review describes the relationship between thinking and gaps in theoretical and practical thinking about applying the PDCA method and the successful implementation in industries as a contribution to further research.

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1. INTRODUCTION

The industry's development is currently significantly increased and makes business people improve technical knowledge and improve the system internally and externally. The PDCA is also known as the by Dr. Edwards Deming, an American quality management expert in 1950. The PDCA method is useful for making continuous improvements without stopping, which is more future-oriented, flexible, logical,

and reasonable to describe all plan elements drawn up.

The PDCA method for controlling and improving the management process its habits consists of the PDCA cycle (Fig. 1). There are four phases used to pay attention, adjust deviations, and occur with the business process's main goal. The PDCA process of repetitive problem solving: (1) **Plan**-Plan consists of setting goals and strategies to

achieve specific results, (2) **Do**-This step was previously created, (3) **Check**-The inspection process stages have been monitored and evaluated according to specifications, and (4) **Action**- To correct any problems or improve performance. In the four steps, actions are taken to improve results and meet or exceed specifications. In general, the manufacturing industry's PDCA is applied to reduce waste (waiting time, idle, failure, defects). In this study, only a literature review on the implementation of the PDCA method in the industry. This is found in the study frame Fig. 2.

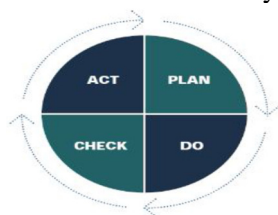


Fig. 1. The PDCA cycle

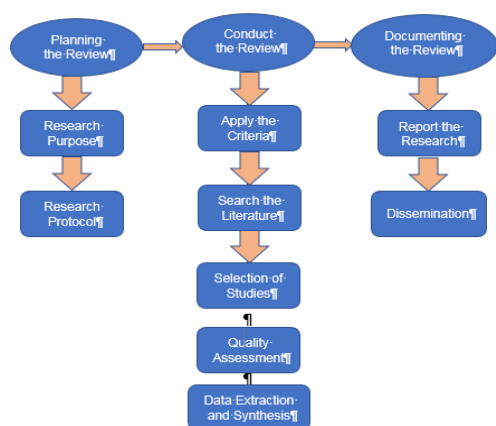


Fig. 2. Study framework

2. RESEARCH METHOD

The PDCA method to be used for this study is the study of review literature. The 50 journal data obtained are compiled, analyzed, and concluded to obtain conclusions regarding the literature study. Research journal with literature studies is also research and can be categorized as a scientific work because it does data collection in the research PDCA method.

An effective and well conduct review as a research methodology creates a firm foundation for advancing the implementation of theory development. The implementation literature review methodology can compare several journals using the settlement method with the PDCA cycle. Comparisons of several 50 journals have been carried out to find common objects, methods, and problem-solving. Also, this can highlight the features of the PDCA method. The method used is to review the 2010-2020 research papers that consistently apply the PDCA cycle and have been published. Using the 2010-2020 research paper, to determine the PDCA method's development in recent years and the level of success after applying the PDCA methodology. The implementation literature review method. A comparison of several 50 journals has been carried out to find object similarities, methods, and problem-solving (Table 1).

3. RESULT AND DISCUSSION

In the grouping to get the results of several journals that have been selected in this paper, it looks as follows in table 2.

Table 1. Existing literature review of PDCA

Research. approach	Research object	No. of research object	No. of references	Sum of references	%
A. Quantitative Reduce	Implementation	[2], [22], [36], [3], [23], [37], [6], [25], [39], [8], [27], [44], [10], [28], [45], [12], [30], [46], [14], [31], [47] [19], [33], [50], [21], [34],	26	52	
	Method	[11], [29], [42], [15], [32], [43], [17], [38], [48], [18], [40], [49], [26], [41]	14	28	
B. Qualitative	Qualitative Analysis	[1], [9], [24], [4], [13], [35], [5], [16], [7], [20]	10	2	

Table 2. Literature review journal of PDCA

No	Paper Identify	Research Object	Result
1	Chandrakanth (2016)	PDCA Improving quality	The PDCA cycle is implemented effectively by each individual through a PDCA daily goal chart.
2	Sokovic & Pavletic (2010)	PDCA cycle	This study provides general information and observations on four presented methodologies.
3	Fitriani (2010)	Cycle PDCA and Philosophies kaizen	There are various ways and methods of improvement, including the PDCA / PDSA cycle and then integrating it with the Kaizen philosophy.
4	Parkash (2011)	Monitoring and improving PDCA	The analysis to process associated with supplier performance monitoring and improvement (SPMI).
5	Walasek & Kucharczyk (2011)	e-learning project through the PDCA approach	The PDCA based model for managing the e-learning project has been presented.
6	D (2012)	Applying the PDCA Cycle	Therefore, the rubric's ability as a measuring device is almost 35% of the range of possible scores to be administered (from 0 to 100).
7	Lodgaard et al. (2013)	PDCA as a Continuous Improvement Method	The brainwriting workshop results show that the entire organization must have performed education in the PDCA method and further practical use training.
8	Sidhu et al. (2013)	The "5S" Strategy by Using PDCA Cycle for Continuous improvement	That 5'S Implementation in small scale industry with the help of PDCA Cycle.
9	Ligade & Thalange (2013)	Management PDCA.	Thus it saves increased cost up to 4% of the total project.
10	Gidey et al. (2014)	The PDCA Cycle of Value Addition	As specified in previous deliberations, this paper attempts to devise a continuous value addition framework that incorporates previously unnoticed functions using the PDCA cycle.
11	Meiling et al. (2014)	A study of the PDCA method used in less industrialized activities:	To conclude, the cases showed that the PDCA method could work for less industrialized processes. However, finding root causes and embarking on permanent process actions is likely to resource-demanding.
12	Mahmud et al. (2015)	PDCA cycle	PDCA is critical for consistent implementation.
13	Alshahrani & Alsulaibaikh (2015)	Focus PDCA	This performance improvement project was achieved significant improvement (P =0.030).
14	Ahmed (2016)	PDCA cycle	PDCA cycle is the heart of the Hoshin - Kanri and continuous improvement.
15	Rani & Mulyana (2016)	PDCA Method	There is a savings of USD 634 for each TBHQ product change.
16	Salunke et al. (2016)	Using the 5s system PDCA	PDCA cycle and designing an assembling disassembly trolley for material purpose.
17	Smith (2016)	PDCA method	The PDCA methodology used in this research is mixed and involves a combination of literature reviews.

Table 2. Literature review journal of PDCA (continued)

No	Paper Identify	Research Object	Result
18	Kurniawan et al. (2017)	PDCA method	Based on the data for defective units in April and July 2016 above, there was a decrease in the defective units produced in the Die attach area, namely as many as 13656 units or 74.89%.
19	Handoko (2017)	Implementation with quality control using the PDCA and seven tools approve	That the types of defects that often occur are cracked or broken defects, namely as many as 55 with a percentage of 34.810% during August - November 2016.
20	Pratiwi (2017)	Deming's PDCA cycle approach.	Based on the results of observations on application of the Contractor Safety Management System (CSMS), which is implemented, needs some improvements to conform to the PDCA principles.
21	Neyestani & Juanzon (2017)	PDCA cycle	The previous empirical studies' results were unearthed that on the implementation of quality management systems, the effects of ISO 9001.
22	Mohammed & Khayum (2017)	VSM and PDCA cycle	When we want to improve, we have to find a problem, waste, or other points of view opportunity. One very good systematic tool for finding opportunities is value stream mapping (VSM).
23	Silva et al. (2017)	PDCA cycle	According to the factory target, this loss's annual value should be a maximum of 0.60%. However, this value became un-reachable during the project.
24	Soesilo (2017)	SMART	Based on the assembly process's observation data, the reject rate was quite high, namely 15.6%.
25	Matsuo (2017)	The effects of the PDCA cycle and OJT on workplace learning	These estimates met the recommended index of > 0.7 (George 1990), reflecting a high agreement in the work units' variables.
26	Azwir & Setyanto (2017)	PDCA Method	It was found that the percentage of feed roll product defects decreased from October 2016 to 0.00% in January 2017.
27	Sylvia et al. (2017)	PDCA cycle	According to the criteria, we assigned a grade from 1 to 5 to each alternative to using this tool. The higher the result, the higher the execution priority of the activity.
28	Jagtap & Teli (2017)	PDCA Cycle	Implementing the PDCA cycle has been found more effective than adopting the "the right-first-time" strategy.
29	Deshpande (2017)	PDCA method	The PDCA methodology because is a model for continuous improvement process.
30	Patel & Deshpande (2017)	PDCA Cycle	The PDCA cycle is continuous improvement processes embedded in the organization's culture

Table 2. Literature review journal of PDCA (continued)

No	Paper Identify	Research Object	Result
31	Realyv et al. (2018)	The tool of the PDCA cycle	Concerning the objectives proposed in this project, it is concluded that the objective of reducing.
32	Kurniawan et al. (2018)	PDCA method	The coating is the process of covering a tablet with a thin layer of a substance, which is generally of very little effect.
33	Arredondo-soto (2018)	PDCA cycle.	This can be further simplified by applying support tools, as in this case study were the Pareto charts and the flowchart.
34	Kholif et al. (2018)	PDCA-cycle	This maintains the quality of service and reliability.
35	Rahman et al. (2018)	Using 5S & PDCA	The Pareto chart shows that the major cumulative defects are others (19%), broken stitch (36%), slip stitch (48%), the open seam (59%), etc.
36	Darmawan et al. (2018)	The PDCA of Kaizen Concept with 8 Steps PDCA	Japanese companies' success in improving productivity and quality is because they have a culture and a high work ethic to apply the KAIZEN management system.
37	Hasan & Hossain (2018)	Applying PDCA Cycle	They found that people who are interested in our study are greatly adapted to their working environment and efficiently handle any challenging situation.
38	Pratiwi et al. (2018)	PDCA method	Standardization is an effort to prevent the occurrence of the same problem in the future, with improvements.
39	Hasan & Hossain (2018)	PDCA Cycle	This "PDCA" cycle is a part of KAIZEN. The main target of KAIZEN is to achieve a sub-sustainable result with very small investments.
40	Realyv et al. (2018)	PDCA method	In our case study, results indicated a reduction of defects by 65%, 79%, and 77% in the three models analyzed.
41	Tage (2018)	PDCA method	The trial results also found that the trial process only reached 75% in the inpatient room when filling in documents even though they only continued the discharge planning process carried out from the IGD.
42	Amin et al. (2018)	The PDCA method	Suggestions to work on the case study to illustrate the proposed framework's implementation in the simple system that may impact the employee's conditions can be suggested.
43	Iswara et al. (2018)	The PDCA method	With the cart success to monitor if there are problems.
44	Hasnul et al. (2019)	Application PDCA	PDCA and cloud computing theory in the designing of the proposed system.
45	Kotvitska et al. (2019)	PDCA cycle	In general, the Ukrainian enterprises and pharmaceutical companies, in particular, are still causing significant methodological problems.

Table 2. Literature review journal of PDCA (continued)

No	Paper Identify	Research Object	Result
46	Andira & Haryanto (2019)	Research and Application of Industrial System	With the Os Ticket, it is hoped that it can help the helpdesk monitor problems.
47	Chen et al. (2020)	PDCA cycle	As a useful nursing management tool, the PDCA cycle standardizes by developing and applying effective nursing management approaches.
48	Sunadi et al. (2020)	The PDCA method	The study was implementing the SPC to analyze the data.
49	Khaerudin et al. (2020)	The PDCA method	With this analysis, it is desirable to determine how much this problem affects its operational activities.
50	Garza-reyes (2020)	Application PDCA	Providing further evidence of the application of lean methods and tools.

The features of the PDCA method. The method used is to review the 2010-2020 research papers that have consistently applied the PDCA cycle and have been published. Using the 2010-2020 research papers to know the PDCA method's development in recent years and the level of success after applying the PDCA methodology. The journals can be classified according to the agency focus of publication (Fig. 3), year of publication (Fig. 4), and country of publication (Fig. 5).

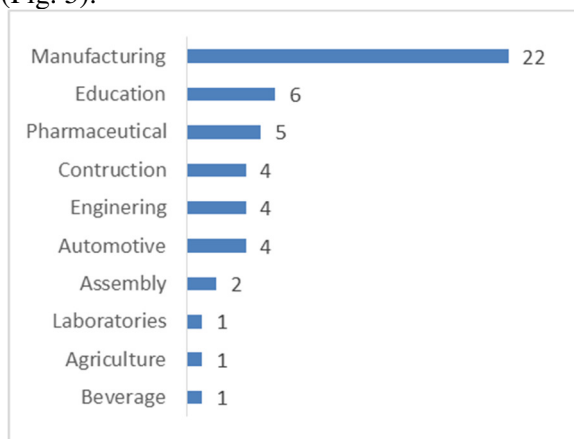


Fig. 3. Agency Focus

3.1. Relationship between PDCA and Industry 4.0

As shown, the method was strategically built over the PDCA structure due to the three motivations: (1) it is widely known in the market, generating greater receptivity among users; (2) it summarises the basic concepts of management, facilitating the understanding of the sequential logic of the method; and (3) it has a cyclical representation,

inducing the culture that the implementation of Industry 4.0 should occur progressively since, as observed by Schuh et al. A systemic and robust transition must be made gradually, respecting the organizational structure. (Fig. 6).

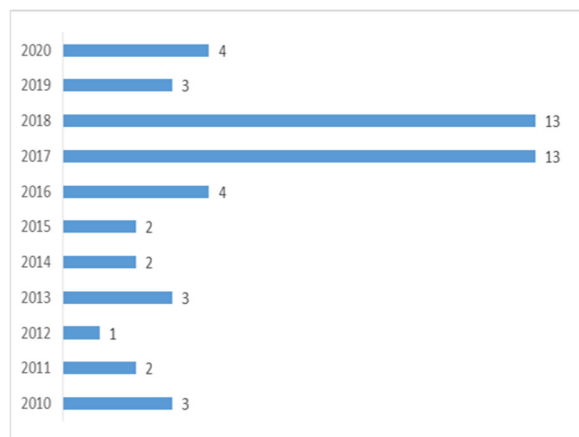


Fig. 4. Year of published

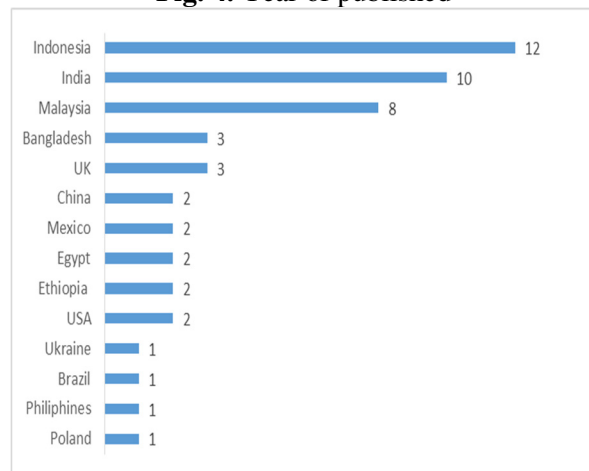


Fig. 5. Country of publication

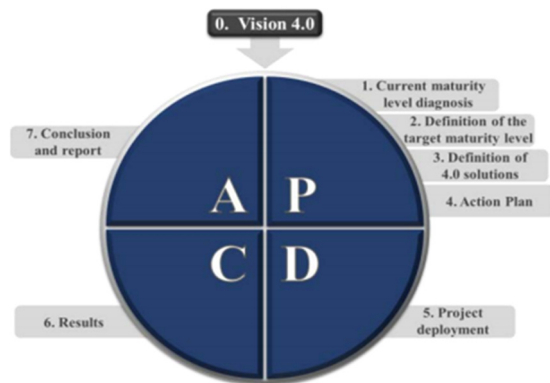


Fig. 6. The Framework the PDCA to Industry 4.0

4. CONCLUSION

The PDCA cycle (Deming's circle) is more than just a quality tool. The PDCA cycle is a fundamental concept of continuous-improvement processes embedded in the organization's culture. It is simple to understand and should be used by a large number of people in the company. The most important aspect of PDCA lies in the "act" stage after completing a project when the cycle starts again for further improvement. These findings provide useful information for practitioners seeking ways to improve their organizational performance by suggesting a starting point for deploying lean and/or quality improvement methods.

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