

# Importance of PDCA Cycle for SMEs

Dr. Abhijit Chakraborty  
Principal, Technique Polytechnic Institute,  
Dist-Hoogly, West Bengal, India

## Abstract

*The continuous improvement of any organisation is possible by following PDCA cycle. The SMEs are working but need a proper direction to enhance their efficiency and standards of product being produced by the SMEs. For the success of any organisation proper planning is very vital. Next, one has to do the plan i.e., to execute. After execution, it is to be checked and the gap found between the actual and implemented part is to be looked into and remedial measures are to be taken for the betterment of the SMEs.*

**Keywords:** *Quality, planning, analysis, plan, check*

## I. INTRODUCTION

Small manufacturing enterprises form an important part for the developing countries. It is a labour intensive industry. SMEs are facing tough competition due to globalisation and latest technologies being used by national and MNC companies. But they also are lagging in standards of product quality and performance.

SMEs have important place at all economies in the world, but especially to those in developing countries and, within that broad category, particularly in those economies with major employment and income distribution challenges. SMEs are considered as the engine of growth, essential to developing, competitive and efficient markets and reduction of poverty particularly in developing countries (Fan, 2003). Small and medium-sized enterprises are contributing to employment growth at a higher rate than larger firms. In the EU economy about 99.9% of the enterprises are SMEs of which 93 % are micro enterprises (European Commission, 2003). Micro companies are also a source of skilled workforce and have an important role in creating competitive industrial base (European Commission, 2003).

SMEs have specific characteristics that distinguish them from large corporations and that can of course change across different countries and cultures. According to literature, SMEs are generally independent, multitasking, and cash-limited based on personal relationships and informality, as well as actively managed by the owners, highly personalized, largely local in their area of operation and largely dependent on internal sources to finance growth

(Vyakarnam et al., 1997; Moore and Manring, 2009; Hudson-Smith and Smith, 2007; Ates et al., 2013).

The SMEs' problems can be addressed by the help of PDCA cycle. Deming in 1950s adopted PDCA. The Japanese eagerly embraced PDCA cycle and other quality concepts and to honour Deming for his contribution, they refer to the PDCA cycle as the Deming cycle.

In a central process, the actual results of an action are compared with a target or a set point. The difference between the two is then mentioned and corrective measures are adopted if the disparity becomes large. The repeated and continuous nature of continuous improvement follows this usual definition of control and is represented by the PDCA (Plan-Do-Check-Act) cycle (Basu, 2004).

The Plan Do Study Act (PDSA) cycle provides a "method for structuring iterative development of change, either as a standalone method or as part of wider Quality Improvement (QI) approaches, such as the Model for Improvement (MFI), Total Quality Management, Continuous QI, Lean, Six Sigma or 'Quality Improvement Collaboratives'" (Taylor et al., 2013).

In 1993 Edwards Deming modified the Shewhart cycle and called it the Shewhart Cycle for Learning and Improvement or in its more known format, the PDSA cycle (Moen and Norman, 2010). "Deming described it as a flow diagram for learning and improvement of a product or a process" (Moen and Norman, 2010). The PDSA cycle contained the following steps:

- i. Plan—Plan a change or test aimed at improvement.
- ii. Do—Carry out the change or test (preferably on a small scale).
- iii. Study—Examine the results. What did we learn? What went wrong?
- iv. Act—Adopt the change, abandon it or run through the cycle again.

The PDSA cycle is an accumulation of changes to the original Shewart cycle introduced in 1950 that contained the three steps Specification, Production, and Inspection (Moen and Norman, 2006). The cycle subsequently evolved into the Deming Wheel with the following steps (Moen and Norman, 2010):

- i. Design the product (with appropriate tests).
- ii. Make the product and test in the production line and in the laboratory.
- iii. Sell the product.
- iv. Test the product in service and through market research. Find out what users think about it and why non-users have not bought it.
- v. Re-design the product, in the light of consumer reactions to quality and price.

The Deming Wheel was reframed by the Japanese into the Plan Do Check Act (PDCA) cycle to include the following steps (Moen and Norman, 2010):

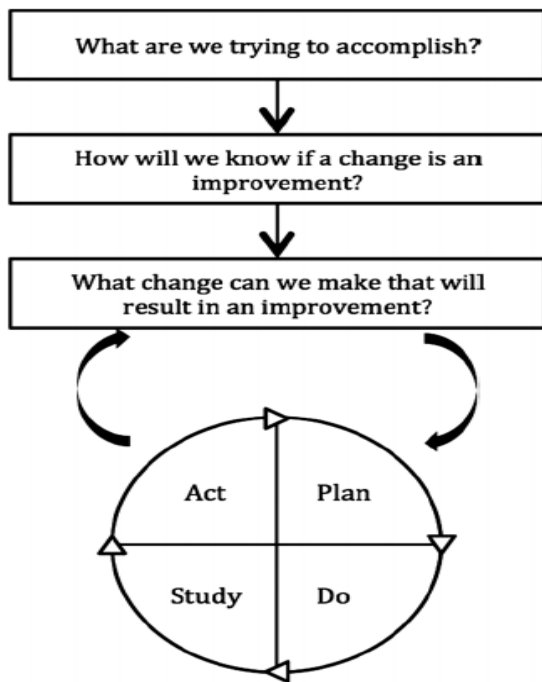


Figure 1: Model For Improvement, Source: Moen and Norman, 2010

Companies implementing Open Innovation will require cycles of continuous improvement to increase their Open Innovation capability, thereby also increasing their Open Innovation maturity (Enkel *et al.*, 2011).

PDCA is based on the “Shewhart cycle,” and was made popular by Dr. W. Edwards Deming, considered by many to be the father of modern quality control. During his lectures in Japan in the early 1950s, Deming noted that the Japanese participants shortened the cycle’s steps to the traditional plan, do, check and act. It is interesting to note that Deming preferred plan, do, study, act because the translation of “study” from Japanese to English has connotations closer to Shewhart’s intent than does “check.” This model has been around for 60 years and it is relevant in today’s

- i. Plan: Define a problem and hypothesis possible causes and solutions.
- ii. Do: Implement a solution.
- iii. Check: Evaluate the results.
- iv. Act: Return to the plan step if the results are unsatisfactory, or standardize the solution if the results are satisfactory.

Gerald Langley, Kevin Nolan and Thomas Nolan added three basic questions to supplement the PDCA cycle constituting the Model for Improvement. “This new approach provides a basic framework for developing, testing and implementing changes to the way things are done that will lead to improvement” (Moen and Norman, 2010).

world, providing a defined and well tested process to achieve lasting improvement to the problems and challenges which the industry is now facing.

Spending adequate time in each phase of the PDCA cycle is imperative for having a smooth and meaningful quality improvement process. The elements put forth here comprise a deliberate process based on the scientific method, and help ensure that improved efforts are conducted in a way that will maximize the degree of success achieved.

Before beginning the PDCA process, it is important to assemble the team that will participate and develop a communications plan about the effort.

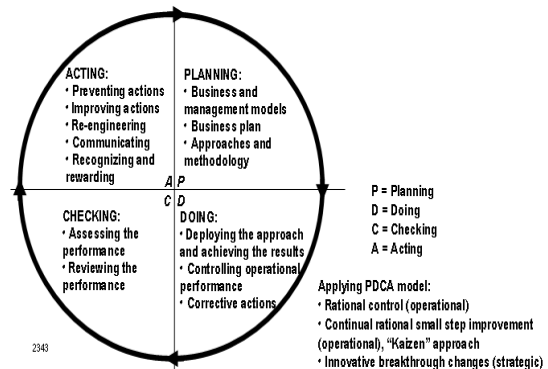


Fig. 2 PDCA cycle

## II. CASE STUDY

A Small automobile parts manufacturing company in West Bengal, India is producing considered in this context. Automobile parts supplier industry was chosen as a case study as it already has a formal requirement to define a continuous improvement method and to use it as a method to secure

continuous improvement for all processes at the company.

### III. METHODOLOGY

A research protocol including the main questions for the interviews was developed prior to conducting the research. Semi-structured interviews were performed in this case. The interviewing questions were answered by the professionals in design and engineering, project managers and quality assurance, and were directed at understanding the use of PDCA cycle. Since the company participating in this study is committed to PDCA cycle, the studies were concerned with implementation and performance and issues related to the use of this method. To allow deeper examination and ensure the reliability of the data from the interviews, the cases were analyzed more thoroughly through direct observations, informal conversations, attending persons at meetings and events, and review of archival sources.

### IV. ANALYSIS

The management of an organisation can in general be divided into a number of different levels. However, roughly there is a highest level being strategic management and a lowest level being operational management. Whereas strategic management comprises the long-term perspective with fundamental and directional strategic decisions, operational management addresses primarily the day-to-day implementation of strategic decisions usually within a one year horizon. A proper corporate strategy should couple / integrate both views and as well the different subunits of the organisation i.e., departments.

The results from the case study shows that the PDCA cycle is not always followed precisely according to the formally described quality assurance system in the company, which is the PDCA method. They have made their own in-house method which they emphasize is less time consuming and is satisfactory enough to achieve the desired improvements. This is the main reason why they do not use the PDCA method today. The companies have less experience with the PDCA method and have not given the PDCA method a real chance.

### V. APPROACH TOWARDS IMPLEMENTATION OF PDCA CONCEPT

The phases of the PDCA model below assume that just one underlying, or root cause will be addressed by testing just one intervention. When undertaking the PDCA process, the team may decide to address more than one root cause, and/or to test more than one intervention to address a root cause. In such instances, it will be important to measure the

effect of *each* intervention on the root cause it is intended to address.



Fig. 3

**Plan:** The purpose of this phase is to investigate the current situation, fully understand the nature of any problem to be solved, and to develop potential solutions to the problem that will be tested.

**1. Identify and prioritize quality improvement opportunities:** Usually a team will find that there are several problems, or quality improvement opportunities, that arise when programs or processes are investigated. A prioritization matrix may help in determining which one to select. Once the quality improvement opportunity has been decided, articulate a problem statement. Revisit and, as appropriate, revise the problem statement as one move through the planning process.

**2. Develop an AIM statement:** that answers the following questions:

- a. What one is seeking to accomplish?
- b. Who is the target audience?
- c. What is the specific, numeric measure(s) the company is seeking to achieve?
- d. The measurable improvement objective is a key component of the entire quality improvement process. It's critical to quantify the improvement you are seeking to achieve. Moreover, the entire aim statement also will need to be revisited and refined as you move through the planning phase.

**3. Describe the current process:** Surrounding the problem in order to understand the process and identify areas for improvements. Flow charts and value stream mapping are two examples of methods to accomplish this.

**4. Collect data on the current process:** Baseline data that describe the current state are critical to

further understanding the process and establishing a foundation for measuring improvements. A host of tools are available to collect and interpret data on the process, such as Pareto charts, histograms, run charts, scatter plots and control charts. The data collected must be aligned with the measures listed in the aim statement.

5. **Identify all possible causes** of the problem and determine the root cause. While numerous causes will emerge when examining the quality improvement opportunity, it is critical to delve in and carefully identify the underlying, or root cause of the problem, in order to ensure that an improvement or intervention with the greatest chance of success is selected. Brainstorming is a useful way to identify possible causes and a cause and effect/fishbone diagram and the 5 Whys are useful for determining the actual root cause.

6. **Identify potential improvements** to address the root cause, and agree on which one to test. Once the improvement has been determined, carefully consider any unintended consequences that may emerge as a result of the implementing improvement. This step provides an opportunity to alter the improvement and/or develop counter measures as needed to address any potential unintended consequences. Revisiting the aim statement and revising the measurable improvement objectives are important steps at this point.

7. **Develop an improvement theory.** An improvement theory is a statement that articulates the effect that you expect the improvement to have on the problem. Writing an improvement theory crystallizes what you expect to achieve as a result of your intervention, and documents the connection between the improvement you plan to test and the measurable improvement objective.

8. **Develop an action plan** indicating what needs to be done, who is responsible, and when it should be completed. The details of this plan should include all aspects of the method to test the improvements – what data will be collected, how frequently data are collected, who collects the data, how they are documented, the timeline, and how results will be analyzed.

**Do:** The purpose of this phase is to implement the action plan.

1. **Implement the improvement.**
2. **Collect and document the data.**
3. **Document problems, unexpected observations, lessons learned and knowledge gained.**

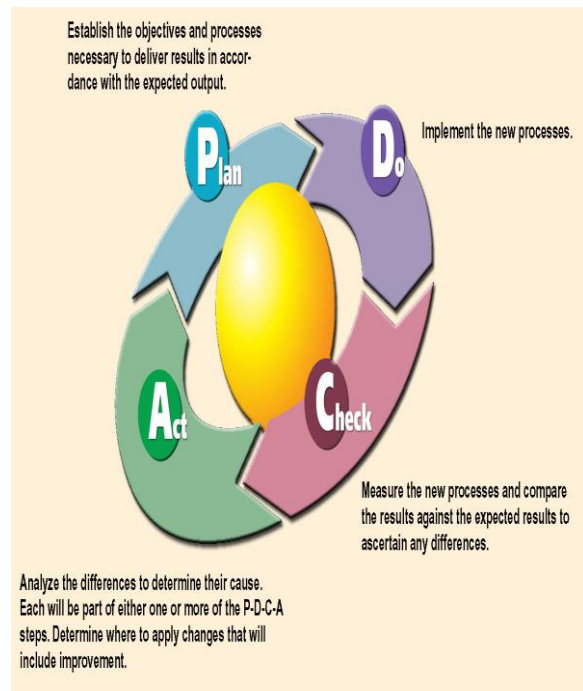


Fig. 4

**Check/Study:** This phase involves analyzing the effect of the intervention. Compare the new data to the baseline data to determine whether an improvement was achieved, and whether the measures in the aim statement were met. Pareto charts, histograms, run charts, scatter plots and control charts are all tools that can assist with this analysis.

1. Reflect on the analysis, and consider any additional information that emerged as well. Compare the results of your test against the measurable objective.
2. Document lessons learned, knowledge gained, and any surprising results that emerged.

**Act:** This phase marks the culmination of the planning, testing, and analysis regarding whether the desired improvement was achieved as articulated in the aim statement, and the purpose is to act upon what has been learned. Options include:

1. **Adopt:** Standardize the improvement if the measurable objective in the aim statement has been met. This involves establishing a mechanism for those performing the new process to measure and monitor benchmarks on a regular basis to ensure that improvements are maintained. Run charts or control charts are two examples of tools to monitor performance.
2. **Adapt:** The team may decide to repeat the test, gather different data, revise the intervention, or otherwise adjust the test methodology. This might

occur, for example, if sufficient data weren't gathered, circumstances have changed (e.g., staffing, resources, policy, environment, etc.), or if the test results fell somewhat short of the measurable improvement goal. In this case, adapt the action plan as needed and repeat the "Do" phase.

3. **Abandon:** If the changes made to the process did not result in an improvement, consider lessons learned from the initial test, and return to the "Plan" phase. At this point the team might revisit potential solutions that were not initially selected, or delve back into a root cause analysis to see if additional underlying causes can be uncovered, or even reconsider the aim statement to see if it's realistic. Whatever the starting point, the team will then need to engage in the Plan cycle to develop a new action plan, and move through the remaining phases.

PDCA offers a data-based framework based on the scientific method. This simple yet powerful format drives continuous and ongoing efforts to achieve measurable improvements in the efficiency, effectiveness, performance, accountability, outcomes, and other indicators of quality in services or processes which achieve equity and improve the small manufacturing enterprise.

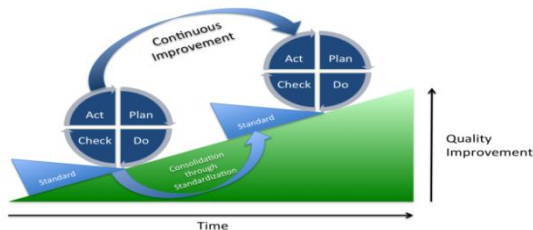


Fig. 5

## VI. CONCLUSION

The SME can develop to a large extent, if they are properly nurtured following effective and dynamic approach of PDCA cycle. Proper plan is to be made to improve operations by deterring what is going wrong and developing a potential approach. By using small group management techniques, to do the changes to solve problems on a small or experimental scale first. This will minimize the disruptions to routine work of the department.

Then critical success factors and key performance factors and key performance indicators are essential to be checked in the case of small scale changes for achieving the desired results. Continuously the key activities are to be checked to assess the quality in order to look into the probable problematic areas.

After that one has to act to implement the changes that have been made at the earlier stages. PDCA cycle can give its benefit to the SME only when all the departments across the hierarchy are

involved for the total development of the system. This will make the SMEs more competitive in present scenario of global market.

## REFERENCES

- [1] Ates, A., Garengo, P., Cocca, P., Bititci, U. (2013). The Development of SME Managerial Practice for Effective Performance Management. *Journal of Small Business and Enterprise Development*, 20(1), 28–54.
- [2] Enkel, E., Bell J. and Hogenkamp H., (2011), Open Innovation Maturity Framework. *International Journal of Innovation Management*, 15(6), 1161–1189.
- [3] European Commission. (2003). *The New SME Definition: User Guide and Model Declaration*. Official Journal of the European Union, 124, 36.
- [4] Fan, Q. (14-16 September 2003). Importance of SMEs and the Role of Public Support in Promoting SME Development. Creating a conducive Legal and Regulatory Framework for Small and Medium Enterprise Development in Russia," A Policy Dialogue Workshop, St Petersburg, Russia.
- [5] Hudson-Smith, M., & Smith D. (2007). Implementing Strategically Aligned Performance Measurement in Small Firms. *International Journal of Production Economics*, 106(2), 393-408. Moen, R., Norman C., (2006), Evolution of the PDSA cycle.
- [6] Moen, R., Norman C., (2010), Circling Back: Clearing Up the Myths About the Deming Cycle and Seeing How it Keeps Evolving. *Qual Progress*, 42, 23–8.
- [7] Moore, S.B., & Manring S.L. (2009). Strategy Development in Small and Medium Sized Enterprises for Sustainability and Increased Value Creation. *Journal of Cleaner Production*, 17, 276-282.
- [8] R. Basu, *Implementing Quality – A Practical Guide to Tools and Techniques*, Thomson Learning, London, 2004.
- [9] Taylor, M.J., McNicholas, C., Nicolay, C., *et al.* (2013), Systematic Review of the Application of the Plan–Do–Study–Act Method to Improve Quality in Healthcare. *BMJ Qual Saf* Published Online First: [11 September 2013] doi:10.1136/bmjqs-2013-001862.
- [10] Vyakarnam, S., Bailey, A., Myers, A., & Burnett D. (1997). Towards an Understanding of Ethical Behaviour in Small Firms. *Journal of Business Ethics*, 16(15), 1625-1636.