

THE PDCA CYCLE IN INNOVATION MANAGEMENT SYSTEMS BASED ON ISO 56001:2024

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Abstract

The Plan-Do-Check-Act (PDCA) cycle is a keystone feature of the structure of any ISO management system standard (MSS). The most popular MSS - ISO 9001:2015 with requirements for a quality management system focuses on the PDCA cycle in its section devoted to the process approach which is also one of the seven quality management principles.

In September 2024, ISO published the first edition of ISO 56001 - the standard with requirements for an innovation management system. The structure of ISO 56001 from Clause 6 to Clause 10 is aligned with the steps of the PDCA cycle at the system level. Surprisingly, Clauses 4 and 5 which contain requirements for the innovation management system and leadership are not explicitly mentioned.

The purpose of this paper is to present a method for analyzing and uncovering the steps of the PDCA cycle at the clause/process level, and further on – at the activity level. The work preceding the drafting of this paper involved an in-depth analysis of the core text of ISO 56001:2024 and using previous research on ISO 56002:2019 as a guide to determine the steps of the PDCA cycle. The results will facilitate managers in enhancing their integrated management systems with elements of innovation management.

Keywords: PDCA Cycle, Innovation Management Systems, ISO 56001, ISO 56002.

INTRODUCTION

The ISO 56000 series of standards were first introduced in 2019. Unlike other management system standards (MSS) where the requirements standard was the first one to be published and then was followed by supporting standards with guidance, ISO/TC 279 “Innovation management” chose to first publish the guidance innovation management standards, and only when sufficient practice in innovation MSS accumulated to issue the first edition of the standard with requirements for an innovation management system ISO 56001:2024 [1].

MSS such as ISO 9001:2015, ISO 14001, ISO 45001, specify in their introduction that the standard “is founded on the concept of Plan-Do-Check-Act (PDCA)”. For example, Fig. 2 of ISO 9001 for quality management systems (MS) “illustrates how Clauses 4 to 10 can be grouped in relation to the PDCA cycle” [2].

ISO 14001 for environmental MS goes on to explain that “The PDCA model provides an iterative process used by organizations to achieve continual improvement.” [3]. ISO 45001 for occupational health and safety MS also adds that the PDCA cycle “can be applied to a management system and to each of its individual elements” [4].

Similar to other these standards ISO 56001 is also based on the PDCA cycle. In a rather unexpected contrast, it omits Clauses 4 and 5 and only groups the following clauses “in relation to the PDCA cycle as follows: Plan (Clause 6), Do (Clauses 7 and 8), Check (Clause 9) and Act (Clause 10).” [1].

Considering that Clause 4 “Context of the organization” and Clause 5 “Leadership” and integral elements of the causes with requirements and form the complete network of processes in the systems approach to MS it can be said that

this problem can be solved by analogy with ISO 9001 and consequently align these two clauses with the Plan stage of the PDCA cycle. This is a reasonable solution if Fig. 1 in ISO 56002:2019 is used as a basis. Furthermore, ISO 56002 also states that the PDCA cycle “is informed and directed by the context of the organization (Clause 4) and its leadership (Clause 5)”, i.e. they serve as inputs for the remaining clauses from 6 to 10 [5].

If this explanation solves the problem of aligning the structure of MSS to the PDCA cycle at system level, there is still a lot to do to first uncover the steps of the PDCA cycle at clause/process level, and then – at operational/activity level.

The purpose of this paper is to apply a proven methodology for researching and applying the PDCA cycle to ISO 9001:2015 and adjust it to the specifics of the innovation MSS ISO 56001:2024.

EXPOSITION

The monograph “Research and Applications of the PDCA Cycle in Quality Management Systems” [6] presents in detail a methodology to uncover the steps of the PDCA cycle in the text of ISO 9001:2015. This methodology involves a careful semantic text analysis based on [7] that was used to align the verbs that denote requirements to the steps Plan (P), Do (D), Check (C), and Act (A).

The requirements in ISO MSS are specified after the word “shall”, and the word “consider” indicates reflecting upon possible actions before making a decision. A sample list of words or phrases in ISO 56001:2024 that hint the steps of the PDCA cycle is presented in Table 1 below.

Table 1. Verbs aligned to the PDCA cycle.

Step of the PDCA Cycle	Word or phrase
Plan (P)	determine, define, establish, specify
Do (D)	implement, perform, demonstrate, carry out
Check (C)	control, verify, validate, evaluate, audit, measure, monitor, review, determine if, determine whether
Act (A)	improve, enhance, update, retain

To provide value to readers who are versed in ISO MSS, the examples presented below focus on clauses that are additions and expansions to the High-level structure known as Annex SL [8].

Clause 7.1.7 Intellectual Property

This clause is part of 7.1 “Resources” and unique when compared to the same clause name and number in MSS such as ISO 9001, ISO 14001, ISO 45001, etc.

The analysis begins by location the word “shall” which signals one or more requirements. Next, a list of requirements is made by rephrasing the sentences into complete sentences starting with a verb. Then the PDCA type of each requirement is determined using the key words and phrases from Table 1. The result is presented in Table 2 below.

Table 2. The PDCA cycle and ISO 56001:2014 requirements, Clause 7.1.7.

ISO 56001:2024 Requirement	Step of the PDCA Cycle
To establish an approach for the management of intellectual property (IP) needed for the effective implementation of the innovation management system (IMS).	Plan (P)
To monitor disclosed IP that is relevant for the organization.	Check (C)
To analyse disclosed IP that is relevant for the organization to avoid potential infringements.	Do (D)
To identify intellectual assets to be protected.	Do (D)
To clarify ownership of IP.	Do (D)
To maintain an inventory of IP.	Act (A)
To review the inventory of IP periodically.	Check (C)

It must be noted that all of the requirements after the first row are listed after the verb “consider” which introduces the notion of type Plan (P) in their meaning.

Clause 1 “Scope” of ISO 56001:2024 points out that its requirements are generic, thus additional information is needed to complete the steps of the PDCA cycle. For a more comprehensive view on IP management one can explore further details in another specific standard on innovation management, i.e. ISO 56005:2020 [9]. Fig. 1 of this standard is especially useful for understanding the process flow and the PDCA cycle in IP management. Upon integrating the requirements of Clause 7.1.7

of [1] and the information from [9] the PDCA flowchart of IP management is created and the relevant input and output information is added for each step (see Fig. 1 below).

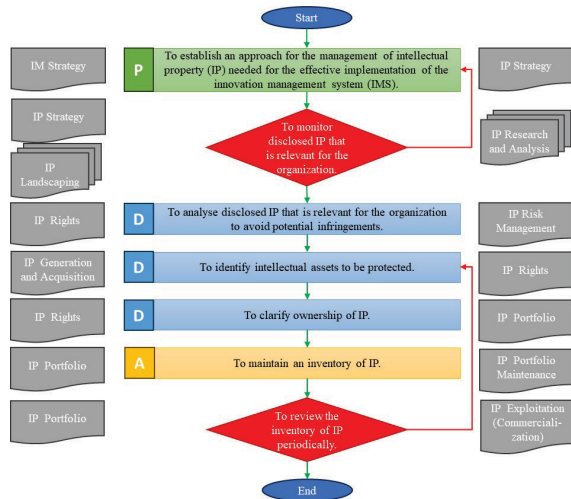


Fig. 1. IP management flowchart.

This flowchart can be further expanded and customized based on the specific internal and external context of the organization and its innovation maturity.

Clause 8.2 Innovation initiatives

This clause is also a key addition to the structure of Annex SL and is a specific feature of innovation MS.

According to the definition, given in ISO 56000:2020 the innovation initiative is a “set of coordinated activities aiming for innovation” [10]. The organization’s innovation activities can be summarized in an innovation portfolio (see Fig. 1 and Clause 6.4 of ISO 56001:2024). Due to the high uncertainty of innovation activities, not all of them result in actual innovations.

Clause 8.2 begins with the phrase “The organization shall manage each innovation initiative...” which clearly states that the PDCA process management cycle shall be put in place. The methodology used here is identical to the one applied in the analysis of Clause 7.1.7 and presented earlier in Table 2 and Fig. 1. The analysis of the requirements in Clause 8.2 is presented in

Table 3 in relation to the four types of steps in the PDCA cycle.

Table 3. The PDCA cycle and ISO 56001:2014 requirements, Clause 8.2.

ISO 56001:2024 Requirement	Step of the PDCA Cycle
To establish the scope, objectives and expected results of the innovation initiative.	Plan (P)
When appropriate, to review the scope, objectives and expected results of the innovation initiative.	Check (C)
To align the innovation initiative with the innovation strategy, objectives and portfolios.	Do (D)
To determine indicators for each innovation initiative.	Plan (P)
To determine how to apply indicators for evaluating the established criteria.	Plan (P)
To establish decision-making processes for each innovation initiative.	Plan (P)
To assign roles, responsibilities and authorities for each innovation initiative.	Plan (P)
To ensure the necessary (innovation) competences.	Plan (P)
To allocate the necessary resources and staffing levels.	Do (D)
To establish internal and external collaboration.	Plan (P)
To implement the appropriate innovation processes.	Do (D)
To solve issues related to intellectual property.	Do (D)
To consider legal, regulatory and other applicable requirements.	Plan (P)
To continuously capture knowledge gained, from both successes and failures.	Do (D)
To use knowledge gained, from both successes and failures.	Act (A)

As presented in Table 3 above, some of the ISO 56001:2024 requirements are not in the sequential order of the steps Plan-Do-Check-Act. Even though the type “Check” requirements may be practically before the Planning stage, after Planning and before Doing, after Doing and before Acting, and even after Acting, the basic order shall be maintained, i.e. to start with all requirements of type “Plan”, then to continue with type “Do”, and end with type “Act”. When there is more than one requirement of a certain type, e.g. several “Plan”-s, “Do”-s, “Check”-s or “Act”-s, then they must be put in a logical and chronological sequence.

For example, “To consider legal, regulatory and other applicable requirements.” should be moved at the very top and be placed prior to the requirement “To establish the scope, objectives and expected results of the innovation

initiative.”. This is done because the organization’s innovation initiatives must not violate any legal and regulatory requirements (see Fig. 2 below).

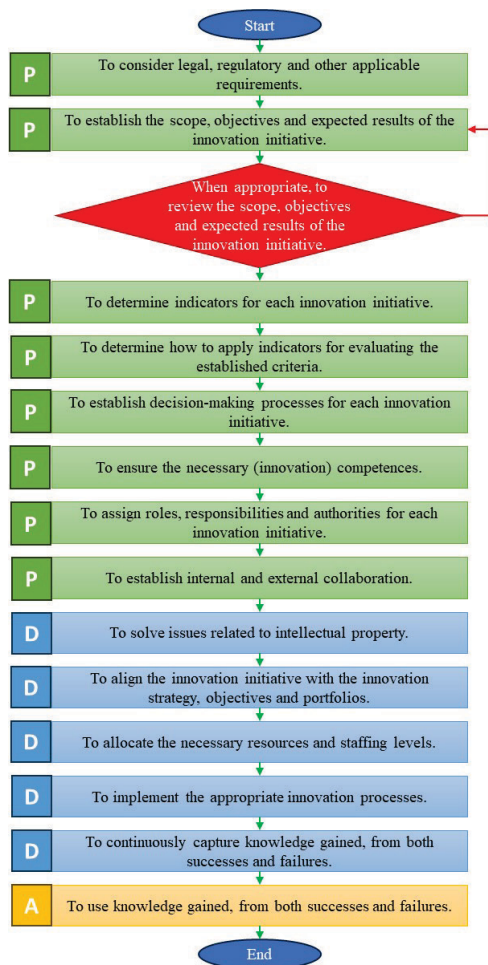


Fig. 2. Innovation initiatives flowchart.

Several supporting innovation management and other standards can help in getting the maximum of innovation initiatives:

- ISO 56003 for innovation collaboration with internal employees and external partners of the organization [11];
- ISO 56008 for measurements of innovation initiatives, processes and portfolios [12];
- ISO/AWI 56011 for the necessary competences of innovation managers [13], and
- ISO 16192 for lessons learned from successes and failures [14].

Any innovation initiative can be implemented by one or more innovation processes. They are the focus elements of Clause 8.3 of ISO 56001:2024. Fig. 3 presents the five generic innovation processes aligned to the PDCA cycle.

Clause 8.3 Innovation processes

Clause 8.3.1 presents the general requirements to establish (Plan), implement (Do) and maintain (Act) innovation processes. It also discusses the five generic innovation processes described in Clauses from 8.3.2 to 8.3.6.

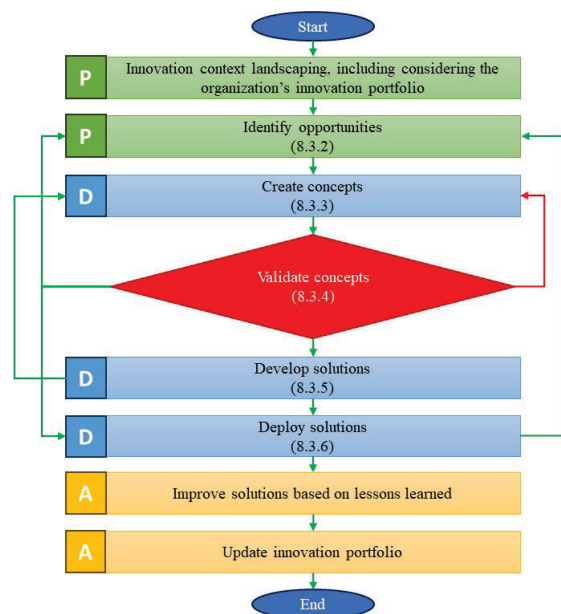


Fig. 3. Innovation processes flowchart.

Fig. 3 is enriched by adapting these innovation processes to a specific case. The additions are related to:

- Innovation landscaping prior to identifying opportunities. The potential opportunities can also be derived from scanning the existing innovation portfolio of the organization and critically analyzing emerging and state-of-the-art technologies and existing innovative solutions;
- Using lessons learned from successful innovation initiatives and processes, as well as avoiding the repetition of previous mistakes and failures;

- The experience gained with each attempted and achieved innovation is then used to update and enrich the innovation portfolio. At a later time, it can be used for value creation via technology transfer and branding.

The implementation of the elements of the innovation process in Clause 8.3 can be facilitated by using the guidance of ISO 56002 [5]. This approach has been used in the case study of inventing a harvester for rose petals [15]. This invention was protected by a Bulgarian patent 67311 B1 and a parallel utility model 3423 U1, both of which were presented and promoted in the Innovation Portfolio of the Centre for Technology and Intellectual Property of the University of Ruse “Angel Kanchev”.

The PDCA Cycle at the activity level

The innovation process step “Validate concepts” is used to demonstrate the alignment of innovation process activities to the PDCA cycle (see Fig. 4).

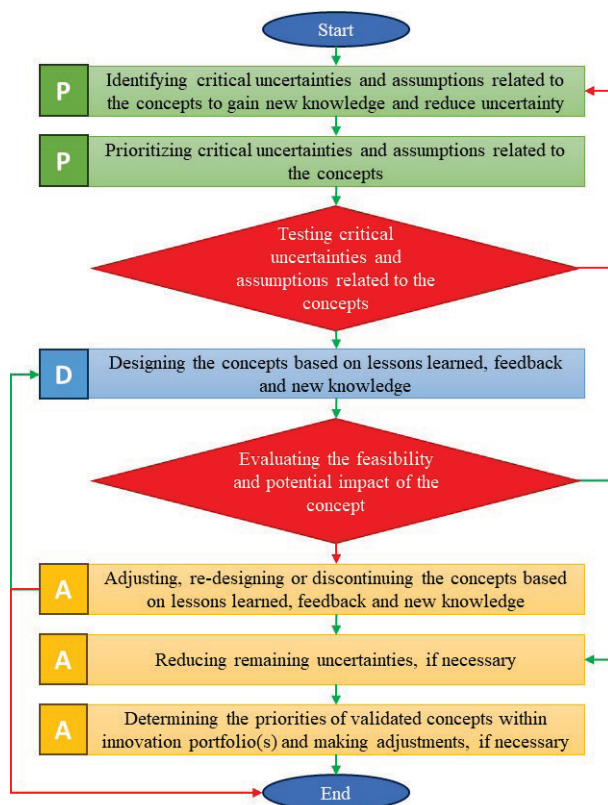


Fig. 4. Innovation activities flowchart.

Uncertainties are typical and inherent to innovations. In contrast with other MS based on ISO 9001, ISO 14001, ISO 45001, etc. where risks (the effect of uncertainty) are predominantly considered as negative, the ISO 56000 series of standards uses uncertainty as the environment in which innovations can be developed and thrive.

There is no guarantee that innovation initiatives, processes, and activities will achieve success. Nevertheless, the promising perspective of achieving a valued breakthrough innovation makes risk-taking a desired option. But this should be balanced by an informed analysis of critical uncertainties and assumptions, as well as their potential consequences and likelihood.

The designing of new concepts is less prone to failure when it is founded on the comprehensive merging of previous successful innovations, meaningful input from interested parties, collaborators and innovation partners, and consideration of emerging trends and technologies. An innovation does not necessarily have to always be a one-time great discovery like “Eureka!”. Instead, it will turn into an avalanche of innovations when a system approach is applied to the innovation processes and activities.

In the dynamic world we live in today we can only hope that our innovations will last a lifetime. But most probably we will have to adjust or even discontinue our concepts at a certain future moment. This is a natural course of events and it should not affect negatively our innovation appetite.

CONCLUSION

The PDCA cycle can rationalize and streamline the way we innovate. When this process management approach is applied systematically at the strategic, tactical and operational level, i.e. at innovation MS, process and activity level, it is a proven methodology that ensures higher innovation performance.

The requirements of ISO 56001:2024, alongside with the guidance of ISO 56002:2019, and other supporting

documents, tools and methods, pave the way to realizing value for the users and customers of innovation MS.

The opportunity to establish, implement, and certify an innovation MS based on ISO 56001 can become a competitive advantage that will improve the image of companies and research institutions.

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