

Engineering Aspects of Innovation Management Systems

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Abstract—Innovation management systems enhance the quality and foster the continual improvement of industrial processes and products. Product innovations are often associated with inventions and breakthrough discoveries. When the output of innovation initiatives and actions results in a product that is significantly different from its competitors and adds value to interested parties, then usually engineers and inventors choose to protect their intellectual property by a patent or a utility model. This paper presents a methodology for applying the guidance, tools and methods for intellectual property management of ISO 56005 in industrial organizations in Bulgaria.

Keywords— innovation management systems, intellectual property, ISO 56001, ISO 56005.

I. INTRODUCTION

Innovation management deservedly attracts the attention of professionals and company owners around the world. Innovation is an original way to improve existing products, services, systems and networks, and adds value to a plethora of interested parties.

Traditionally, improvement was considered a domain reserved primarily for experts in the quality field. Probably every self-respecting quality manager would argue that the continuous improvement cycle, known as Deming's cycle or the PDCA (Plan-Do-Check-Act) cycle, in the ISO 9000 series of standards, is the foundation of most modern ISO-based management systems. And not surprisingly, this is a fact, as PDCA is the methodology for improvement in standards for quality management systems, environmental management systems (ISO 14000 series), occupational health and safety management systems (ISO 45000 series), artificial intelligence management systems (ISO/IEC 42000), etc.

All the core standards in the abovementioned series are based on the high-level structure known as Annex SL. As such, they all require that processes related to the improvement of the management system (MS) are in place. These requirements are specified in Clause 10 "Improvement" and its two sub-clauses:

- 10.1 "Continual improvement", and
- 10.2 "Nonconformity and corrective action".

What is typical for innovation management is that it thrives in volatile, uncertain, complex, and ambiguous (VUCA) environments. It recognizes and captures value from an opportunity, an idea, or a concept, where other types of MS predominantly perceive threats. This is in contrast with other standards for MS that rely mainly on establishing stable processes and aim for results that are relatively easy to forecast and control.

The purpose of this paper is to present a methodology for applying the guidance, tools and methods for intellectual property management of ISO 56005 in industrial organizations, with a specific focus on Bulgaria.

II. MATERIALS AND METHODS

The paper uses materials published by the International Organization for Standardization (ISO), the World Intellectual Property Organization (WIPO), the European Union Intellectual Property Office (EUIPO), the European Patent Office (EPO), and the Patent Office of the Republic of Bulgaria (BPO).

The methods applied in preparing this paper are: analysis of published standards with requirements and guidance, analysis of statistical data, critical review of intellectual property rights (more specifically patents and

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utility models), and comparison of trends on global, regional and national levels.

III. STANDARDS FOR INNOVATION MANAGEMENT

A. The ISO 56000 Series of Standards

The ISO 56000 series of standards came into focus when ISO 56002, with guidance for innovation MS, was first published in 2019 [1]. Since then, this series has grown significantly to include 11 standards. 3 additional standards for innovation management are under development as of 2026-04-26 [2].

The core standard in the ISO 56000 series – ISO 56001– was published as late as 2024 [3]. It follows the PDCA cycle and the high-level structure and clauses of Annex SL. This structure is expanded with elements that are specific to an innovation MS:

- Innovation intent (Clause 4.3.1);
- Innovation strategy (Clause 5.3);
- Innovation culture (Clause 5.4);
- Innovation portfolio (Clause 6.4);
- Organizational structures (6.5);
- Collaboration (Clause 6.6);
- Additional resources (Clause 7.1) that are key for innovation MS: time (7.1.3), finance (7.1.4), and intellectual property (7.1.7). The latter is discussed in more detail in the following sections of this paper;
- Innovation initiatives (Clause 8.2);
- Innovation processes (Clause 8.3).

ISO 56001 requires that the intellectual property (IP) management approach takes into consideration the following activities:

- Monitoring published IP rights (IPR);
- Analysing IPR to establish existing gaps to be exploited and/or to avoid potential IPR infringements;
- Identifying intellectual assets of the organization and/or its personnel that need to be protected by appropriate forms of IPR;
- Clarifying the ownership of IP;
- Maintaining an inventory, or an innovation portfolio, of innovation assets, IP and IPR;
- Periodically reviewing IPR (own IPR to establish whether it still maintains its value, and other organizations' IPR to decide whether it can obtain their IPR by purchasing, licensing, or creating partnerships).

ISO 56002 provides additional guidance for IP management in its Clause 7.8. A draft version of the upcoming second edition of this standard has been

developed and is being reviewed by the ISO Technical Committee ISO/TC 279 “Innovation Management” [4].

The guidance of this standard can help innovation managers by integrating some additional aspects of IP management into ISO 56001 MS requirements. These are:

- Justifying the need for creating, updating, and utilizing IP;
- Justifying the decision not to protect IP (associated costs, risks, confidentiality, etc.);
- Raising awareness and providing training related to IPR for all personnel to promote an environment that stimulates creativity and value creation;
- Ensuring or restricting access to IPR based on actual needs and potential impact;
- Monitoring IPR trends by country and type of innovation, as well as scanning for competitors (both in research and in industry).

IP and IPR are also discussed in other standards of the ISO 56000 series. The concrete examples are as follows:

- ISO 56003 clauses: 5 “Entering an innovation partnership”, 6.2 “Generating a long-list of potential partners”, 6.3 “Generating a short-list of potential partners”, 8 “Interactions between the partners”, and more specifically – 8.2 “Key factors of interaction”. In two of the Annexes to ISO 56003, there is also a mention of “Intellectual assets” (D.1.5) and IP (Annex E “Performance evaluation criteria” / E.1 “Monitoring, measurement, analysis, and evaluation”) [5];
- ISO/TR 56004 clauses: 8.3.2 “Data interpretation and gap identification”, 9.2.1 “Examples of the data analysis results organized by topic/theme”, 9.3 “Communication of the Innovation Management Assessment results” [6];
- ISO 56006 clauses: 4.2 “Strategic intelligence needs”, 4.5 “Expected strategic intelligence outcomes”, 4.6 “Strategic intelligence essentials”, 5.1 Operational planning and control”, 5.4.3 “Outcome of data gathering – Data and information (analysed data)”; 5.5.2 “Outcome of interpretation – Knowledge (interpreted information)” [7].
- ISO 56007 clauses: 5.4.2 “Culture, motivation and recognition”, 5.4.3 “Idea ownership and intellectual property (IP) management” [8];
- ISO 56009 clauses: 7.2.2 “Measurements for the preparation of the innovation initiative” and 7.2.4 “Measurements for developing the solution” [9], also invoking ISO 56008 [10];
- ISO/TS 56010 clause 4.8 “Distinguishing innovation from other related concepts” [11];

- ISO 56000 specifies the terms and definitions, as well as the innovation management principles. Clause 3.6 presents 13 “Terms related to intellectual property”. Furthermore, Annex A.3 “Definitions of intellectual property, bridging with the TRIPS/WIPO convention” clarifies IP and IPR as defined in the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) and the World Intellectual Property Organisation (WIPO) Convention [12].

Three additional standards are planned by ISO/TC 279 “Innovation management” to join the ISO 56000 series:

- ISO/DIS 56011 “Competency framework for innovation management — Guidance” [13];
- ISO/AWI 56012 “Innovation management — Innovation Ecosystem Management — Guidance” [14];
- ISO/AWI 56013 “Innovation management — Innovation Portfolio Management — Guidance” [15].

Another standard that is not officially part of the ISO 56000 series, but upon publication will provide competence requirements for auditing and certification of IM systems, is ISO/IEC CD TS 17021-16 [16].

B. Intellectual Property Management using ISO 56005

The standard ISO 56005 presents 8 principles that are the basis for IP management and are derived from the IM principles of ISO 56000 [17]. The content of this standard is structured in 6 clauses (1. Scope; 2. Normative references; 3. Terms and definitions; 4. IP management framework; 5. IP Strategy; 6. IP management in the innovation process) and 6 informative annexes with various IP tools and methods:

- Annex A “Tools and methods for invention record and disclosure”;
- Annex B “Tools and methods for IP generation, acquisition and maintenance”;
- Annex C “Tools and methods for IP search”;
- Annex D “Tools and methods for IPR evaluation”;
- Annex E “Tools and methods for IP risk management”;
- Annex F “Tools and methods for IP exploitation”.

The proposed methodology for IP management in the innovation process is based on Clause 6 of ISO 56005. Each process step is presented in the standard with the following elements: why, input, how, and output. All the steps of IM are linked to the PDCA cycle (see Fig. 1).

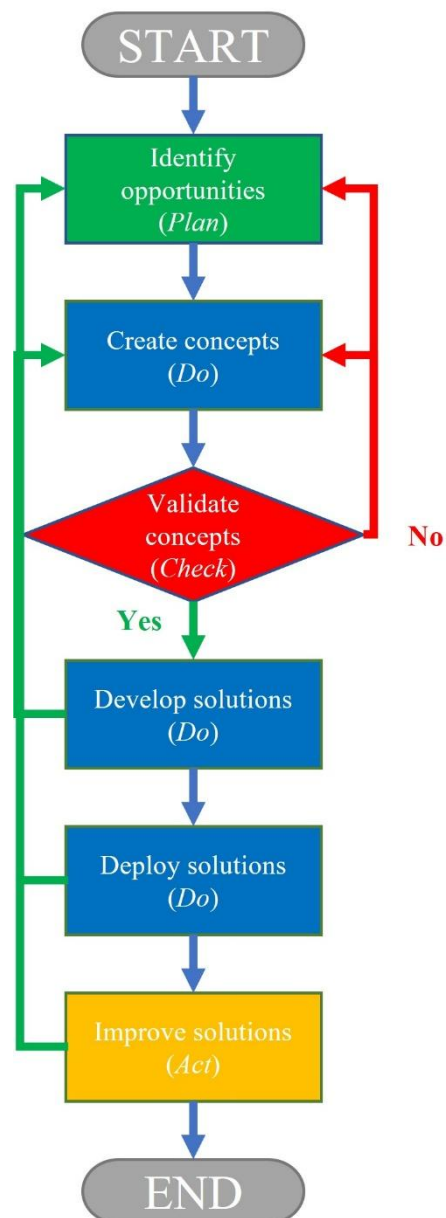


Fig. 1. IP management and the PDCA cycle.

The IP management process is iterative and non-linear. Only in some rare cases do innovations go “according to plan” from start to end. This is due to the high uncertainty and the many “unknowns” when developing a truly innovative solution.

At the “Plan” stage of the PDCA cycle, opportunities are identified. Initially, this can be done through IP landscaping and reviewing existing solutions that form the state-of-the-art in a specific industrial sector. Feedback collected throughout the entire IP management cycle can be used as input for the “Identify opportunities” step.

Several steps from ISO 56005 are considered as “Do” stages of the PDCA cycle:

- Creating concepts, which includes generating concepts based on the identified innovation opportunities and selecting concepts that possess the necessary potential to be converted into viable solutions;
- Developing solutions based on the opportunities, ideas and concepts, and executing the IP plan;
- Deploying and implementing solutions that have the highest perceived value for the interested parties. This would justify the protection and the commercialisation of IPR.

The “Check” stage of the PDCA cycle is represented by the step “validate concepts”. Validation is based on analysis of IP risks and opportunities, interaction with interested parties, IPR protection, tangible effects from technology transfer, etc.

The “Act” stage of the PDCA cycle is not officially mentioned in ISO 56005. It is proposed by the authors based on their experience that shows that to maintain the competitiveness of any industrial organization, any manager should continuously strive for improvement of the company’s offerings.

IV. INTELLECTUAL PROPERTY RIGHTS AND KEY ENGINEERING DOMAINS

A. Global Trends

The World Intellectual Property Organisation (WIPO) maintains data regarding patents and utility models, industrial designs, trademarks, and geographical indications. The IP data is presented with appropriate insights and analyses. The 18th edition of the Global Innovation Index (GII) was published in September 2025 [18]. Four out of the top 5 innovation clusters are based in Asia: Shenzhen–Hong Kong–Guangzhou (China), Tokyo–Yokohama (Japan), San Jose–San Francisco (USA), Beijing (China), and Seoul (South Korea). In the top 100 innovation clusters for 2025, China has 24, the USA – 22, Germany – 7, the United Kingdom and India – 4, and Japan, the Republic of Korea, and Canada – 3.

The stable growth in international patent filings is mainly due to China, which has 1795715 or 49,1 % of the 3725000 world patent applications. It is followed by the USA (501831), Japan (419132), the Republic of Korea (295722), and Germany (133485) [19].

China has a vast dominance in utility models with 3183030 applications out of nearly 3,3 million worldwide. It is followed by the Russian Federation (13594), Germany (6169), Indonesia (4842), and Thailand (4227).

The technology fields that prevail in the top 5 countries of origin for patent applications are: computer technology; digital communication; electrical machinery, apparatus, energy; measurement; medical technology; and transport. The technological sectors that show advances are supercomputing, electric vehicles and batteries, solar power, genomics, etc.

B. European Trends

Two organizations are key to understanding IP trends in Europe: the European Patent Office (EPO) and the European Union Intellectual Property Office (EUIPO).

The EPO maintains services that enable searching for patents in the European Patent Register by using the Espacenet search, as well as online filing of patent applications. The EPO also uses various channels to raise awareness about IP: the World IP Day (26 April), the European Inventor Award, the Young Inventors Prize, the “Talk innovation” podcast, etc.

201974 patent applications were filed in 2025 according to EPO data published as the EPO Technology Dashboard 2025 (formerly Patent Index) [20]. 47008 of these patent applications are filed from the USA, 24476 from Germany, 22031 from China, 21304 from Japan, and 14355 from the Republic of Korea. The top 10 is completed by France (10932), Switzerland (9914), the Netherlands (7006), the United Kingdom (5875), and Italy (4767). 67 % of the patent applications are filed by large enterprises, 26 % by SMEs and individual inventors, and 7 % by universities and public research organizations.

The technical fields with the highest number of EPO patent applications are: Computer technology, Digital communication, Electrical machinery, apparatus, energy, Medical technology, Transport, Measurement, Biotechnology, Pharmaceuticals, Other special machines, and Organic fine chemistry.

The EUIPO provides searches in their databases for trademarks (TMview), registered designs (DesignView), and geographical indications (GIview). Online application services are available for all these forms of IP. EUIPO also has a platform for dealing with the enforcement of IP rights (the IP Enforcement Portal, IPEP).

In January 2026, EPO and EUIPO jointly published “IP and innovation in European sectors” [21]. The study focuses on 361 IPR-intensive industries that apply various forms of IPR: patents, trademarks (TM), designs, copyright, geographical indications (GI), including protected designation of origin (PDO) and protected geographical indication (PGI), and plant variety rights (PVR). According to this study, “IPR-intensive industries generated 30.6% of all jobs in the EU during the 2021–2023 period” and “47.9% of total economic activity (GDP) in the EU, worth €7.7 trillion”.

C. Trends in Bulgaria

Bulgaria ranks 37th in the GI 2025 [18]. This is mainly due to strengths such as: “Industrial designs by origin/GDP”, “Creative goods and services”, “Knowledge and technology outputs”, “Venture capital investment/GDP”, “Domestic industry diversification”, ISO 9001 and ISO 14001 certification, etc.

The legal protection of industrial property in Bulgaria is overseen by the Patent Office of the Republic of Bulgaria (BPO). The Annual report for 2025 summarizes information regarding patents, utility models, industrial designs, trademarks, and geographical indications [22].

The patent applications for 2025 are 194 and show a growth of 4,3 % against the previous year. The 284 utility model applications have decreased by 15,7 % compared to 2024. The explanation provided in [22] about these figures is “the small number of programmes for improving the competitiveness of small- and medium-sized enterprises (SMEs) that state the registration of a utility model as a positive criterion”.

The technical domains for the patent applications in Bulgaria are: electrotechnics and electronics (41 %), manufacturing and construction (36 %), and chemistry and biotechnologies (23 %). The same technical domains have different shares in the applications for utility models filed in 2025: manufacturing and construction (44 %), electrotechnics and electronics (32 %), and chemistry and biotechnologies (24 %).

CONCLUSIONS

The paper has presented a comprehensive overview of the ISO 56000 series of standards for innovation management systems. The specific focus is on ISO 56005 and its guidance on tools and methods for intellectual property management.

The trends and dynamics of applications and registrations of patents and utility models are demonstrated by data from official sources and reputable organizations like the WIPO, EPO, EUIPO, and BPO.

The analyses in this paper can help innovation managers and inventors in their efforts to improve innovation management performance and create value from their intellectual property assets.

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