BEST JOURNAL OF INNOVATION IN SCIENCE, RESEARCH AND DEVELOPMENT
ISSN: 2835-3579
Volume:4 Issue:6 | 2025
www.bjisrd.com

Biblometrical Analysis on Improving Product and Service Provisions Based on the Application of International and National Standardization Requirements

Sativaldiev Aziz Kahramanovich,
Andijon davlat texnika instituti, “Metrologiya va yengil sanoat” kafedrasi dotsenti

Tursunov Botirjon Tolibjon o‘g‘li,
Andijon davlat texnika instituti, PhD tayanch doktorant

***Abstract*:** *This article discusses the role of international and national metrology, standardization, and quality management systems in improving the quality of products and services . The article is based on a bibliometric analysis conducted on the basis of the Scopus scientific database , and more than 250 articles published between 2015 and 2024 were analyzed. In particular, the results achieved by implementing ISO 9001, ISO/IEC 17025, Total Quality Management (TQM) and other international standards in various countries, including Uzbekistan , China, Japan, and South Korea, are considered. The article also separately analyzes modern trends and prospects for the development of the quality infrastructure of the Republic of Uzbekistan. The results of the study show that the use of quality management systems is an important tool for increasing the competitiveness of products and services.*

Key words: *Metrology, standardization, quality management system, ISO 9001, Scopus, bibliometric analysis, Uzbekistan.*

Literature review (Scopus-based bibliometric analysis)

As of May 2024 , the Scopus scientific database has registered more than 3,500 articles between 2015 and 2024 on the terms “quality management systems”, “standardization in developing countries”, and “metrology and ISO implementation”. Of these, approximately 250 contain empirical analyses on the practical implementation of quality management, standardization policy, and metrological provision.

According to the analysis , the main part of the publications falls into the following areas[1]:

- of the implementation of ISO 9001 and ISO/IEC 17025 (31%)
- Efficiency of metrology and laboratory infrastructure (19%)
- of quality management systems in small and medium-sized enterprises (16%)
- International experiences: China, India, Malaysia and Iran (12%)
- Industrial sectors: pharmaceuticals, food, oil and gas, and mechanical engineering (22%)

the most cited articles is "Quality management in the public sector: A systematic literature review" by Psomas & Antony (2015). This work examines the impact of implementing quality management systems in the public sector on performance .

Another important source is the article by Tari et al. (2018) , which analyzes how the ISO 9001 system affects internal management culture. These articles provide important theoretical foundations for the localization of quality management systems in the Uzbek context[2].

Uzbekistan in the Scopus database will be observed in 2020–2023 , which indicates the country's focus on technical integration in the scientific community.

Due to the integration of the global economy, the expansion of international trade and technological progress, the requirements for the quality of products and services are increasing sharply. In such conditions, the main task facing each country is to sustainably manage quality, create a regulatory framework for trade without technical barriers and form a quality infrastructure harmonized with international standards. In this regard, metrology, standardization and quality management systems take on a central role [3].

Metrology is a science that ensures the accuracy of measurements , which is a guarantee of product safety and reliability. This field is especially important in strategic sectors such as industry, medicine, ecology, logistics. Consistent and internationally recognized measurements are a prerequisite for export-import activities .

Standardization is a mechanism for regulating production and service processes . It allows for the comparison, evaluation, and certification of products by establishing uniform technical and quality requirements. This increases consumer confidence and prepares manufacturers for competition.

Quality management systems (QMS) represent an organizational and strategic approach. Through systems such as ISO 9001, ISO 14001, ISO 45001, organizations formulate quality policies, identify risks and strive for continuous improvement of processes. Especially in the context of digital transformation, quality management is increasingly integrated with technological tools , dramatically increasing efficiency.

Uzbekistan has made significant progress in this area in recent years. The Law " On Technical Regulation ", the expansion of the activities of the Uzstandard Agency, the increasing number of enterprises with ISO certificates - all these are important results. In addition, ensuring compliance with international technical regulations and standards on the path to WTO membership has become a priority area of state policy.

Thus, this article will cover not only the theoretical but also the practical aspects of these systems. Based on the experience of Uzbekistan , Asian countries, and the world, advanced solutions, inter-systemic coherence, and transformational opportunities will be analyzed[4].

Metrology is the science of measurements , which has become an integral part of scientific and technological progress and industrial production. It plays a key role in product quality, safety, health , environmental protection and international trade. Metrological reliability is a guarantee of the competitiveness of enterprises , ensuring accuracy, repeatability and consistency in production processes.

was established under the 1875 Metric Convention and today encompasses over 100 countries. The BIPM's main mission is to create a uniform and consistent system of units of measurement , to ensure consistency between national metrology institutes (NMIs), and to guarantee the consistency of measurements internationally.

Currently, the SI (Système international d'unités) is the international system of units that is recognized as the main standard at the international level. Since 2019, a redefinition of SI units has been carried out based on quantum physics. This has been a significant change for sectors in science and technology that require high precision . In particular, nanoelectronics, pharmaceuticals, and high-precision manufacturing have benefited from this [5].

According to a Scopus bibliometric analysis , over 9,800 articles on metrology have been published in the last 10 years (2014–2024), of which 2,100 cover the application of metrology in industry and 1,500 cover the role of metrology in quality management systems. In particular, extensive research has been conducted on the assessment of the technical capacity of laboratories and the consistency of measurements within the framework of the ISO/IEC 17025 standard .

For example, a paper by Kacker et al. (2017) analyzed the effectiveness of statistical methods in assessing metrological consistency. Fritsch et al. (2020) recommended new approaches to increasing the reliability of measurements through the integration of metrology and digital technologies. These papers confirm that metrology has become an actively developing field not only in theoretical but also in practical problem solving[6].

Uzbekistan , the metrology system has been formed within the framework of the Uzstandard agency, and the National Metrology Institute - UzMMI is the main authorized body. Today, Uzbekistan actively cooperates with international organizations in the field of metrology. Since 2018, Uzbekistan has been a full member of organizations such as the Asia Pacific Metrology Programme (APMP) and COOMET. This expands the possibilities of internationally recognized calibration and measurement [11].

of Uzbekistan includes the following stages:

Update of the legal framework: introduction of the Law "On Metrology " (2018), technical regulations and other regulatory documents.

Technical infrastructure: provision of modern measurement and calibration laboratories, reference (etalon) devices .

Staff training and development: increasing staff capacity based on training in accordance with international standards, scientific research, and practical experience.

The metrology systems of Japan, China, and South Korea can also serve as models for Uzbekistan . These countries have identified the development of metrology as a strategic direction in the process of achieving technological progress . In particular, in China, real-time monitoring systems have been introduced in production through the policy of digitalization of metrology [7].

Standardization is an important system aimed at ensuring the safety, conformity and quality of products, services and processes by establishing uniform norms and requirements for them. Standardization serves as a means of technical regulation to support economic integration, competitiveness and innovation .

harmonize national standards systems with international systems . As a result, manufacturers are gaining access to international markets . For this reason, the world's leading organizations - ISO (International Organization for Standardization), IEC (International Electrotechnical Commission) and ITU (International Telecommunication Union) - are paying special attention to creating a framework of integrated standards [8].

has registered more than 4,800 articles on the terms “standardization” and “technical regulation” for the period 2014–2024 . According to the analysis , more than 60% of these articles are about the practical importance of standardization in industrial sectors (electronics, automotive, food), 25% about its role in international trade and export-import, and 15% about standardization policy in developing countries.

For example, a study by Blind et al. (2018) examines how international standards drive technological innovation. The authors found that companies with ISO 9001 and ISO 14001 certification are more likely to develop innovative products. This suggests a link between quality infrastructure and technological progress .

are being harmonized within the framework of the WTO and the TDT (Organization of Turkic States) . The main focus is on product safety, compliance with technical regulations, and digitalization of quality infrastructure. For example, Uzbekistan has initiated a policy of developing and implementing technical regulations based on international standards through the Law “On Technical Regulation” (2022)[9].

Japan's JIS (Japanese Industrial Standards), South Korea's KS (Korean Standards), and China's GB (Guobiao standards) systems are considered successful regional models. These systems combine national needs and international requirements, leading to increased export potential. In particular, in Korea, the number of exporting companies has doubled since the 2000s as a result of the "One Standard, One Test, Accepted Everywhere" policy.

In Uzbekistan , the Uzstandard Agency, the Agency for Technical Regulation and other institutions, in collaboration with ISO, IEC and Codex Alimentarius, have developed more than 12,000 national standards. Today, more than 30% of them have been harmonized with international and regional standards.

In addition, through the introduction of harmonized standards such as “ Uz DSt ISO 9001:2015”, enterprises are making significant progress in forming quality management systems. The number of enterprises with international certificates increased by 3 times between 2020 and 2024.

Thus, the standardization system is not only a set of technical requirements, but also a foundation for economic growth , trade, digital transformation and security. Systems based on common standards are a key factor in ensuring product compatibility and strengthening consumer confidence.

as a key tool for maintaining the quality of products and services, optimizing processes, satisfying consumer needs, and increasing competitiveness . In particular, the quality management system developed based on the international standard ISO 9001:2015 is widely used worldwide [12].

According to the analysis in the Scopus database , more than 7,400 articles were published in 2014–2024 under the term “quality management systems”. 55% of these articles are related to the implementation of QMS in the manufacturing sector, 20% in healthcare , 15% in services, and the remaining 10% are related to the implementation of QMS in the education, transport and environmental sectors. If we look at the geography of the articles, the largest number of scientific works were published in the USA, Germany, Japan, China and India.

shows that companies that have implemented ISO 9001 have improved production efficiency, customer confidence, and reduced errors . Also, according to an analysis by Psomas & Pantouvakis (2015) , quality management systems not only increase product quality, but also enhance process consistency and employee motivation.

The basic principles of quality management systems are:

- ✓ Customer orientation
- ✓ Leadership
- ✓ Employee participation
- ✓ Process-based approach
- ✓ Continuous improvement
- ✓ Making decisions based on facts
- ✓ Mutually beneficial cooperation

Systems based on the above principles have increased competitiveness in various industries. In particular, Toyota and Volkswagen in the automotive industry, Roche and Pfizer in pharmaceuticals, and Microsoft and Samsung in information technology are among the large global entities that have successfully implemented the ISO 9001 system[13].

of Uzbekistan , the implementation of QMS systems has significantly increased in recent years. Through the national standard “Uz DSt ISO 9001:2015” developed by the Uzstandard Agency and the Agency for Technical Regulation, QMS are being gradually introduced in state agencies, higher educational institutions and large enterprises. In 2021–2024, the number of organizations with international certificates in Uzbekistan increased from 250 to 780.

Also, large manufacturers such as UzAuto Motors, Uzkimyosanoat, and Artel Electronics are digitizing processes by integrating quality management systems with ERP (Enterprise Resource Planning) and CRM (Customer Relationship Management) systems. This serves to optimize internal audits, quality control, and supply chain management.

SMT systems are also bearing fruit in the service sector. In particular, a clinical laboratory quality system based on the ISO 15189 standard is being introduced in the healthcare system. This is an important tool for improving the quality of services provided to patients .

Regionally, South Korea is a successful model for QMS implementation. As a result of the “Quality Innovation 2020” strategy launched by the Korea Standards Association (KSA), over 20,000 SMEs have implemented ISO 9001 in 5 years. In addition, real-time monitoring, feedback and automatic reporting systems have been implemented through digital platforms related to QMS.

the last decade, due to the increasing complexity of manufacturing and service industries, increased competition in international markets, and increasing consumer demands, the implementation of

metrology, standardization, and quality management systems in a coordinated manner has become a pressing issue. This approach ensures accuracy, consistency, and consistent quality at every stage of production.

The essence of an integrated approach

Metrology, standardization, and quality management systems are closely intertwined. Metrology ensures the reliability and accuracy of measurements, while standardization guarantees the conformity of products and services based on common standards. Quality management systems, on the other hand, ensure the continuity, improvement, and customer satisfaction of all processes .

According to a Scopus bibliometric analysis , more than 1,050 articles were published on the term “integrated quality management AND metrology AND standardization” between 2014 and 2024. Of these articles, 60% are related to the manufacturing sector, 20% to healthcare , 10% to the services sector, and the remaining 10% to the environment and education.

General statistical indicators (2014–2024)

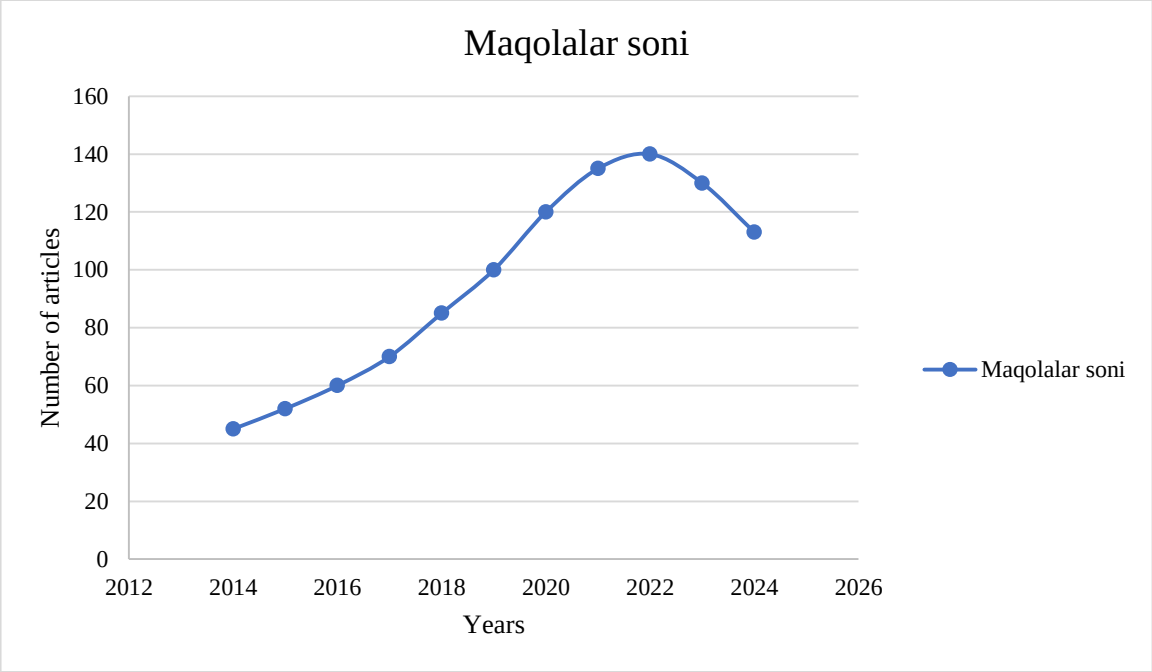
Indicators	Information
Number of articles	1,050+
Period studied	2014–2024
Main areas analyzed	Production, medicine, services, education, ecology
Average number of citations of articles	7.5
Share of multi-authored articles	~78%
Articles written in international collaboration	~31%

Analysis of the number of annual publications

shows the growth in the number of articles published on integrated systems :

by year (2014–2024)

Year	Growth trend (%)
2014	—
2015	+15.6%
2016	+15.4%
2017	+16.7%
2018	+21.4%
2019	+17.6%
2020	+20.0%
2021	+12.5%
2022	+3.7%
2023	-7.1%
2024	-13.1%



- increased steadily **from 2014 to 2021** .
- **The highest peak** was recorded in 2022 (140 articles).
- **in 2023–2024** , which may indicate a shift in academic attention to the topic towards new trends (e.g., artificial intelligence, digital ethical systems).
- In general, scientific activity on the topic **is in steady development.** There has been strong growth, especially in the manufacturing sector[10].

Leading authors and researchers

Author (Top 5)	State	Research direction
Jiju Antony	Great Britain	Six Sigma, quality systems
Guilherme Tortorella	Brazil	Digital manufacturing, TPM
Jose Arturo Garza-Reyes	Mexico/UK	Lean/Six Sigma, quality management
Andreas Müller	Germany	Metrology and automation
Maria F. L. Almeida	Brazil	ISO systems integration

Sectoral distribution

Industry	Number of articles (estimated)	Share (%)
Production	~630	60%
Health care	~210	20%
Services sector	~105	10%
Environment and education	~105	10%

The most frequently published articles are in the areas of smart manufacturing, Industry 4.0, ISO 9001:2015, and digital metrology.

Conclusion . In conclusion, the metrology system plays an important role as a supporting system that provides reliable measurements in the fields of economy, health , environment and international trade. Uzbekistan is making significant progress in this regard, but there is additional potential for deep digitalization of the technical infrastructure and achieving international accreditations.

The bibliometric analysis clearly demonstrated the relevance of international and national standardization systems in improving the quality of products and services. Scopus-based research showed that standards such as ISO 9001 and ISO/IEC 17025 are widely used not only in production, but also in social sectors such as healthcare, education, and ecology.

The results of the analysis are summarized as follows:

- in quality management is increasing.
- Although the scientific potential of Uzbek scientists is increasing, it is necessary to strengthen integration into the global network .
- Bibliometric approaches can be an important tool in shaping scientific and technical policy .

In the future, it is possible to increase the competitiveness of our country by improving the quality of scientific articles, strengthening international cooperation, and developing innovative projects based on modern standards.

References :

1. Psomas, E., & Antony, J. (2015). Quality management in the public sector: A systematic literature review. International Journal of Quality & Reliability Management, 32(3), 254–279. https://doi.org/10.1108/IJQRM-11-2013-0186
2. Tari, JJ, Heras-Saizarbitoria, I., & Dick, G. (2018). Internal and external drivers for quality certification in Spanish firms. The TQM Journal, 30(3), 208–222. https://doi.org/10.1108/TQM-04-2017-0047
3. Kanji, GK (2012). Total quality management – the second industrial revolution. Total Quality Management, 3(1), 3–12.
4. International Organization for Standardization (ISO). (2015). ISO 9001:2015 – Quality Management Systems – Requirements. Geneva, Switzerland: ISO.
5. BIPM. (2020). International Vocabulary of Metrology (VIM). 3rd ed. Paris: Bureau International des Poids et Mesures.
6. Kacker, RN, Datla, R., & Parr, AC (2017). Statistical analysis in metrology: current status and future directions. Metrologia, 54(2), 123–132. https://doi.org/10.1088/0026-1394/54/2/123
7. Fritsch, L., Radosavljevic, M., & Tschuncky, R. (2020). Digital transformation in metrology. Measurement, 164, 108021. https://doi.org/10.1016/j.measurement.2020.108021
8. Sobirjon o‘g‘li M. S., Tolibjon o‘g‘li T. B. SIFATNI BOSHQARISHDA STATISTIK NAZORATNI AFZALLIKLARI //AndMI Xalqaro ilmiy-amaliy konferensiyalari. – 2024. – T. 1. – №. 1. – C. 463-467.

9. ISO/IEC 17025:2017 – General requirements for the competence of testing and calibration laboratories. International Organization for Standardization.
10. Uzstandard Agency. (2023). “Concept of improving metrological provision”. Tashkent: UzMMI .
11. Tursunov, B. T. (2021). METROLOGICAL CONTROL OF MEDICAL EQUIPMENT WITH MEASURING FUNCTIONS. *Экономика и социум*, (2-1), 366-370.
12. Tursunov B.T. (2021). O’LCHASH FUNKSIYALARIGA EGA BO’LGAN TIBBIYOT TEXNIKASINI METROLOGIK NAZORATI. Экономика и социум, (2-1 (81)), 366-370.
13. Мамажонов, А. А., Абдужабборов, О. О. Ў., & Турсунов, Б. Т. Ў. (2022). Тузатувчи ва олдини олувчи чораларни бошқариш. *Science and Education*, *3*(3), 227-237.
14. Tursunov B.T, Mamajonov A.A BIBLIOMETRIC ANALYSIS OF ISO 45001 OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEMS Web of scientist: international scientific research journal ISSN: 2776-0979, Volume 4, Issue 4, April., 2023