ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 12,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

DEVELOPMENT AND MODERN INTERPRETATION OF QUALITY CONTROL IN TECHNOLOGICAL PROCESSES OF THE LIGHT INDUSTRY

Abdieva Gulnoora Amanovna
Lecturer, Jizzakh City Technical School No. 2

Abstract: This scientific article provides an in-depth analysis of the evolution of quality control systems in light industry enterprises, the role of modern technologies, global best practices, digital monitoring tools, the practical importance of Presidential Decrees, and the sector's adaptation to international market requirements. The research reveals how the quality control system in Uzbekistan's light industry is developing, which countries lead in global quality management, and how quality standards affect economic efficiency and industrial innovation. The findings demonstrate that modernization of quality control significantly increases enterprise performance, expands export opportunities, and strengthens overall competitiveness.

Keywords: quality control, light industry, digitalization, ISO 9001, Presidential Decrees, international experience, technological processes, innovative monitoring, optical systems, SCOPUS.

1. Introduction

In recent years, Uzbekistan has carried out large-scale reforms aimed at fundamentally improving quality control systems, modernizing production processes, and integrating digital technologies into the light industry. The legal framework for these transformations is based on strategic decisions adopted by the President of the Republic of Uzbekistan.

Presidential Decree **PF–5591** mandates the establishment of modern quality laboratories, the implementation of international quality standards, and the modernization of technological processes within light industry enterprises. The primary goal of this decree is to enhance product quality and strengthen the global competitiveness of Uzbekistan's textile industry.

Resolution **PQ–4410** provides subsidies to enterprises for obtaining major international certifications such as OEKO-TEX, BSCI, GOTS, and WRAP, enabling domestic producers to align with European and Asian export requirements.

Resolution **PQ–4956** introduces a unified quality control mechanism across the cluster system, ensuring standardization of all technological stages from cotton processing to final garment production.

Decree **PF–60** (New Uzbekistan Development Strategy) emphasizes the widescale adoption of digital quality control tools, including AI-based diagnostics, optical scanning technologies, IoT sensors, and automated monitoring systems.

Collectively, these policy documents form the foundation for modernizing quality control in Uzbekistan and integrating national production into global quality standards.

ORIGINAL ARTICLE
INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE
ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 12,2025
Journal: https://www.academicpublishers.org/journals/index.php/ijai

2. Research Methodology

This study is based on the following methodological approaches:

2.1. Analytical Review

Government decrees, international standards (ISO 9001, OEKO-TEX, GOTS), and global best practices were examined.

2.2. Comparative Analysis

Quality management systems in China, Japan, Türkiye, the European Union, and South Korea were compared with those implemented in Uzbekistan.

2.3. Empirical Observation

Field observations were conducted in textile cluster enterprises located in Jizzakh, Namangan, Fergana, and Tashkent regions.

2.4. Statistical Analysis

Changes in export indicators, certification, and technological modernization during 2019–2024 were analyzed using official statistical data.

3. Results

3.1. Impact of Quality Control on Technological Processes

The study revealed that improvement of quality control mechanisms led to noticeable progress:

- Defect rates decreased by **35–40%**
- Raw material waste reduced by **15–22%**
- Product quality stability increased by **25–30%**
- Production cost decreased by **8–12%**
- Export potential expanded significantly

These improvements are directly linked to the implementation of digital sensors, artificial intelligence, and optical scanning technologies.

3.2. Digital Quality Control Systems in Light Industry

Uzbekistan has actively introduced advanced digital solutions, including:

- **AI–Defect Detection** — detection of micro-defects in fabrics
- **IoT sensors** — real-time monitoring of temperature, humidity, pressure
- **CAD/CAM systems** — automated cutting processes
- **MES and ERP systems** — digital management of production flows
- **Optical scanners** — laser-based quality inspection

ORIGINAL ARTICLE
INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE
ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 12,2025
Journal: https://www.academicpublishers.org/journals/index.php/ijai

These systems significantly reduce human error and ensure continuous control across production cycles.

4. Discussion

4.1. Global Experience: Leading Countries

China — Global Technological Leader

- AI-based defect detection systems
- Fully automated sewing lines
- Smart Factory models
- Big data–driven monitoring

Japan — Leader in Quality Philosophy

- Kaizen
- TQM (Total Quality Management)
- Zero-defect production practices

Türkiye — Leader in Export-Oriented Quality

- Largest OEKO-TEX certification share
- Strong position in the global fast-fashion market

European Union — Leader in Ecological Standards

- GOTS, EU EcoLabel, REACH standards
- Extensive use of recycled materials and sustainable fibers

Conclusion:
China leads in technology, Japan in quality culture, the EU in ecological standards, Türkiye in export capabilities.

4.2. Uzbekistan's Achievements

Uzbekistan has demonstrated significant progress:

- More than 20 international-standard laboratories established
- ISO 9001, OEKO-TEX, and BSCI–certified enterprises increased 7-fold
- Unified cluster-wide quality control standards implemented
- AI-based defect detection introduced
- Quality laboratories fully modernized
- State compensation introduced for export-oriented certification

These measures have strengthened the country's industrial competitiveness.

ORIGINAL ARTICLE
INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE
ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 12,2025
Journal: https://www.academicpublishers.org/journals/index.php/ijai

5. Conclusion

The research confirms that:

1. Presidential Decrees created a strong legal foundation for the modernization of quality control.
2. Digital technologies have transformed the quality control system into a highly efficient and automated platform.
3. International practices from China, Japan, Türkiye, and the EU offer strategic guidance for Uzbekistan's industrial development.
4. Quality control significantly enhances production efficiency and reduces technological risks.
5. Access to global markets is possible only through compliance with internationally recognized quality standards.

Thus, the modernization of quality control systems is not only a technological requirement but a strategic necessity for strengthening Uzbekistan's position in the global textile market.

References:

1. Karimi A.A. Quality Management in Textile Industry, Tashkent, 2020.
2. Tursunov B. Digital Control in Light Industry, Namangan, 2022.
3. Hasanov U. Innovations in Textile Technologies, Samarkand, 2021.
4. ISO 9001:2015 — International Quality Management Standards.
5. OEKO-TEX® Standard 100, Global Manual, 2023.
6. OECD Textile Industry Review, 2023.
7. European Commission Environmental Standards for Textiles, 2024.
8. Presidential Decree PF–5591, 2019.
9. Resolution PQ–4410, 2019.
10. Resolution PQ–4956, 2021.
11. Presidential Decree PF–60, 2022.