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Modern Approaches To Identification And Classification Of Innovative Goods According To Commodity Nomenclature Of Foreign Economic Activity

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Abstract: This paper explores the scientific and practical aspects of identifying and classifying innovative products according to the CN FEA system. Rapid technological advancement, increasing prevalence of products with intellectual and multifunctional capabilities, and constantly evolving standardization rules pose new challenges for customs authorities. The study examines difficulties in identifying innovative goods, modern identification methods including expert and laboratory analysis, and the use of databases and AI-assisted classification tools. Special attention is given to Uzbekistan's current practices and recommendations for improvement. Implemented measures, such as specialized methodological manuals for modular electronic devices, advanced laboratory equipment, and automated risk assessment systems, have significantly enhanced the accuracy, reliability, and efficiency of innovative goods classification. The integration of these scientific and technological approaches demonstrates a model for improving customs operations in line with global standards.

Keywords: Innovative products, Identification, Customs classification, CN FEA, Harmonized System, Expert evaluation, Laboratory analysis, AI-based classification, Intellectual goods

Introduction

In the context of the global economy, innovative products are experiencing exponential growth and occupy a distinct position in international trade [1, 2]. These products, often equipped with intellectual functions, biotechnological materials, nanomaterials, smart devices, and IT platforms, are increasingly shaping trade structures. Accurate classification of such goods under the Commodity Nomenclature of Foreign Economic Activity (CN FEA) is critical for state economic security, customs duties assessment, and proper trade statistics [3, 4].

Innovative products are characterized by multifunctionality, rapid model updates, lack of standardized labels, and diverse naming conventions across markets. These features complicate the identification process for customs officials. Some products simultaneously correspond to multiple commodity positions or do not fully match existing Harmonized System (HS) codes, which creates practical difficulties in trade control.

The urgency of the study lies in the fact that the expansion of innovative goods necessitates new approaches in customs practice. The main objective of this research is to examine modern methods for identifying and classifying innovative products, analyze existing challenges, and propose scientifically grounded improvements for the customs system.

Methods

The methodological framework of this study integrates theoretical analysis, expert evaluation, laboratory testing, and digital technologies for classification [8, 9].

1. **Theoretical Analysis:**

Review of international standards, Harmonized System (HS) guidelines, and CN FEA classifications, as well as scientific literature on innovative products, intellectual devices, and multifunctional goods.

2. **Expert Assessment:**

Conducted by certified specialists in customs, electronics, biotechnology, and IT, expert evaluations analyzed product functionality, structural composition, and application scope [5, 6]. Factors considered include:

- Primary and auxiliary functions
- Internal circuitry and module composition
- Operational algorithms (software-hardware integration)
- Microcontroller and PCB role in functionality
- Accuracy of importer-submitted information

3. **Laboratory Analysis:**

Laboratory examinations determined physical, chemical, and electronic properties [7] of goods, including:

- Biotechnological and nanomaterial composition
- Sensor modules and microprocessors

- PCB layouts and cryptographic chips
- Functional testing for AI-based algorithms and signal transmission

4. **Digital and AI-Based Classification:**

Integration of international databases (WCO HS, EU TARIC, US CROSS, Japan Customs) and AI-assisted classification systems for automatic CN FEA code recommendation [1, 2]. Optical Character Recognition (OCR) and Natural Language Processing (NLP) tools analyzed multilingual technical documentation.

5. **Implementation of Automated Risk Assessment Systems:**

Real-time analysis of trade and logistics data allowed identification of high-risk goods and optimization of profiling procedures.

The combination of expert judgment, scientific testing, and AI-based analysis ensures a high degree of reliability, accuracy, and efficiency in identifying and classifying innovative products.

Results

The research revealed several key findings regarding the identification and classification of innovative products under the CN FEA system in Uzbekistan:

1. **Methodological Advances:**

The development of a specialized methodological manual for modular electronic devices significantly improved the accuracy and consistency of product identification. This manual provides step-by-step guidance on determining technical characteristics, operational principles, and functional capabilities, which standardizes expert evaluations.

2. **Laboratory and Technical Equipment Implementation:**

Introduction of high-precision measurement and analytical equipment enabled rapid and accurate assessment of physical, chemical, and functional parameters of innovative products. Automated testing reduced human error and increased reliability, contributing to evidence-based classification under CN FEA codes.

3. **Automated Risk Assessment Systems:**

Deployment of information systems for financial risk evaluation allowed real-time analysis of trade flows, logistics costs, and customs risk. These systems identified high-risk product categories, optimized profiling procedures, and reduced the likelihood of misclassification or illegal imports.

4. **Integration of AI-Based Classification:**

AI-driven platforms demonstrated the ability to analyze large datasets from technical passports and functional descriptions, accurately recommending CN FEA codes. Machine learning models outperformed manual classification in both speed and precision, particularly for multifunctional and rapidly evolving goods.

5. **Challenges Identified:**

- Lack of a national catalog of innovative products
- Insufficient local expertise in biotechnology and nanomaterials
- Limited access to international databases such as TARIC and CROSS
- Incomplete standardization of technical documentation

These results highlight the necessity of combining expert evaluation, laboratory testing, and digital technologies to achieve accurate identification and classification.

Discussion

The study underscores the complexity of classifying innovative products in customs practice due to their multifunctionality, rapid evolution, and non-standardized labeling. Unlike traditional goods, innovative products may simultaneously correspond to multiple CN FEA codes or defy conventional classification structures.

1. **Expert and Laboratory Approaches:**

Expert assessment remains indispensable for understanding product functionality and technical composition, while laboratory analysis provides objective, reproducible evidence. Together, they form a reliable foundation for accurate classification.

2. **Digital Transformation and AI Integration:**

The use of AI, machine learning, OCR, and NLP in customs classification significantly enhances operational efficiency. These tools enable automatic extraction and interpretation of technical data from diverse sources, reducing subjective errors and expediting the classification process.

3. **International Best Practices:**

Comparative analysis with the United States, European Union, and Japan demonstrates that integration of advanced laboratories, digital platforms, and legal databases enhances transparency, accuracy, and compliance. The WCO recommendations emphasize continuous HS updates, laboratory capacity expansion, and AI-assisted classification systems.

4. **Implementation Challenges in Uzbekistan:**

While recent reforms have strengthened expert services, laboratory infrastructure, and digital platforms, gaps remain in national product catalogs, AI classification tools, and access to international databases. Addressing these gaps is crucial for achieving alignment with global best practices.

5. **Policy and Practical Implications:**

Effective classification of innovative products supports accurate customs duties collection, enhances trade statistics, and mitigates financial risks. Moreover, it fosters technological competitiveness and compliance with international trade standards.

Conclusion

The study demonstrates that the identification and classification of innovative products under the CN FEA system present complex challenges due to their multifunctional nature, rapid technological evolution, and non-standardized documentation. Traditional classification methods, based solely on a single product function or material composition, are insufficient for contemporary innovative goods.

Key conclusions drawn from the research include:

1. **Necessity of Integrated Approaches:**

Accurate classification requires a combination of expert assessment, laboratory testing, and digital technologies. Expert evaluation remains essential for functional and structural understanding, while laboratory analysis provides objective, reproducible evidence for regulatory decisions.

2. **Role of Digital and AI-Based Tools:**

AI, machine learning, OCR, and NLP technologies significantly improve the speed, accuracy, and consistency of classification. Automated systems can process large datasets from technical documentation, compare multifunctional features with international examples, and recommend the most appropriate CN FEA codes.

3. **Alignment with International Practices:**

Comparative analysis with the United States, European Union, and Japan demonstrates that successful identification systems integrate advanced laboratories, digital databases, and legal frameworks, enhancing transparency and compliance with international standards.

4. **Current Status in Uzbekistan:**

Recent reforms, including digitalization, laboratory upgrades, and methodological manuals, have strengthened the identification and classification processes. However, challenges remain, such as the lack of a national innovative products catalog, limited AI tools, and restricted access to international classification databases.

5. **Impact on Trade and Policy:**

Effective classification supports accurate customs duties, trade statistics, risk management, and overall technological competitiveness. It also ensures compliance with international trade regulations, thereby facilitating Uzbekistan's participation in global markets [8, 10].

6. Recommendations

Based on the research findings, the following recommendations are proposed to enhance the identification and classification of innovative products under TIF TN:

1. **Establish a National Innovative Products Catalog:**

Develop a centralized electronic catalog containing detailed technical specifications, functional descriptions, and recommended CN FEA codes.

2. **Integrate AI-Based Classification Modules:**

Deploy machine learning models within the customs information system to automate the identification process, ensuring faster and more accurate classification.

3. **Enhance Access to International Databases:**

Ensure direct integration with international resources such as TARIC, CROSS, and HSDB to facilitate alignment with global best practices and maintain up-to-date classification standards.

4. **Train Specialized Technical Experts:**

Strengthen educational programs for engineers, laboratory technicians, and customs specialists focusing on biotechnology, nanomaterials, AI-enabled devices, and multifunctional products.

5. **Modernize Laboratory Infrastructure:**

Acquire advanced testing equipment and modernize existing laboratories to conduct high-precision physical, chemical, and electronic analyses of innovative products.

6. **Develop Updated Methodological Manuals:**

Provide step-by-step guidance for identification and classification, integrating new product categories, technological innovations, and multifunctional devices.

7. **Adopt Blockchain, IoT, and Digital Tagging:**

Implement QR codes, RFID chips, and blockchain-based product histories to ensure authenticity, traceability, and real-time monitoring of innovative goods.

8. **Continuous Monitoring and Updates:**

Maintain regular updates of AI models, international database connections, and methodological manuals to reflect ongoing technological advancements and emerging innovative products.

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