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Harmonization of Robotics Legislation as a Factor in Technological Cooperation between BRICS Countries

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Abstract. The article examines the process of harmonizing legal norms in the field of robotics, which is a key factor in enhancing technological cooperation between BRICS countries. Through a comparative analysis of national legislations, significant differences in approaches to regulating robotic systems and artificial intelligence were identified. The study substantiates the necessity of establishing a unified methodological framework for the legal regulation of robotics within the BRICS format. Proposed institutional mechanisms for harmonization include the formation of model legislation, the creation of specialized coordinating bodies, and the introduction of universal technical standards. It is argued that convergence of legal systems in robotics contributes to creating a unified technological space, facilitating technology transfer, and enhancing the competitiveness of BRICS countries in the global market for innovative solutions.

Keywords: legal harmonization; BRICS; technological cooperation; artificial intelligence; robotics; model legislation; technical standards; intellectual property; digital sovereignty.

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Table of Contents

Introduction

1. Theoretical and Legal Foundations of Robotics Regulation

1.1. The Concept and Classification of Robotic Systems in the Legal Field

1.2. Conceptual Approaches to the Legal Status of Robots and Artificial Intelligence Systems

1.3. International Legal Standards and Ethical Principles in the Field of Robotics

2. Comparative Analysis of the Robotics Regulatory Framework of the BRICS Countries

2.1. Features of National Robotics Regulation Models

2.2. Problems of Legal Protection of Intellectual Property in the Field of Robotics

2.3. Safety and Responsibility in Robotics: National Approaches

2.4. Regulatory Sandboxes and Experimental Legal Regimes in Robotics

3. Problems and Barriers to Legal Harmonization in Robotics

3.1. Differences in National Legal Systems and Traditions

3.2. The Technological Gap between the BRICS Countries

4. Mechanisms for Harmonizing the Legal Regulation of Robotics in BRICS

4.1. Institutional Framework for Cooperation in Robotics Regulation

4.2. Formation of Joint Standards and Technical Regulations

4.3. Model Legislation as a Tool of Legal Harmonization

4.4. Creation of a Unified Information Space for Technology Transfer

4.5. Ethical Aspects of Robotics Regulation in the Context of BRICS Cultural Diversity

Conclusion

Introduction

In the context of the emergence of a new technological order, robotics has become one of the most significant areas of scientific and technological advancement, transforming economic, social, and political relations. According to Benchmark International,¹ the

¹ Benchmark International. (2024, May 9). *2024 Robotics Industry Report*. <https://www.benchmarkintl.com/insights/2024-robotics-industry-report/>

global robotics market is projected to reach 169.8 billion US dollars by 2032, growing at an average annual rate of 15.1%. Therefore, it is crucial to establish an effective system of legal regulation for this field that takes into account both individual states' national interests and the potential for international collaboration.

The BRICS group of countries (Brazil, Russia, India, China, South Africa, United Arab Emirates, Iran, Ethiopia, Egypt, and Indonesia) represents a developing integration alliance that includes a significant portion of the world's population and economic potential. According to the International Monetary Fund,² the combined GDP at purchasing power parity of these countries exceeds 65 trillion US dollars, accounting for approximately 40% of the global GDP at PPP. At the same time, these countries show significant interest in developing high-tech industries such as robotics, seeing them as drivers for economic growth and tools to ensure technological sovereignty.

However, differences in national legal systems, approaches to regulating innovative technologies, and strategies for technological development pose significant barriers to full-fledged cooperation between the BRICS countries in the field of robotics. The fragmentation of the legal landscape complicates technology transfer, the implementation of joint research projects, and the formation of a unified market for robotic products. Therefore, the issue of harmonizing legal norms in robotics to enhance technological cooperation becomes increasingly important.

The purpose of this research is to analyze the current approaches to the legal regulation of robotics in the BRICS countries and identify key issues in harmonizing legal norms. The authors aim to identify promising mechanisms for converging regulatory practices in order to enhance technological cooperation between these countries. To achieve this goal, methods of comparative legal analysis and a systematic approach are used, along with interdisciplinary research that combines legal, economic, and technical perspectives.

1. Theoretical and Legal Foundations of Robotics Regulation

1.1. The Concept and Classification of Robotic Systems in the Legal Field

The establishment of an efficient system for the legal regulation of robotics requires, first and foremost, a clear definition of the subject of regulation. A review of the laws of the BRICS countries reveals that there is no unified approach to defining the term "robotic system" or related concepts. Terminological ambiguity in this regard exists in most legal systems, which poses significant challenges for law enforcement and international coordination.

² International Monetary Fund. (2024, April). *World Economic Outlook: Steady but Slow—Resilience amid Divergence*. <https://www.imf.org/en/Publications/WEO/Issues/2024/04/16/world-economic-outlook-april-2024>

In Russian legislation, for instance, there is no legal definition of the term “robotic system” at the federal level. At the same time, some aspects of robotics are covered by legislation on artificial intelligence, such as the Decree of the President of the Russian Federation of October 10, 2019 No. 490 “On the Development of Artificial Intelligence in the Russian Federation.”³ This decree defines artificial intelligence as a set of technological solutions that simulate human cognitive functions, thereby creating a regulatory framework for intelligent robotic systems. However, this definition does not fully capture the unique characteristics of robotics, which involves physical interaction with the environment and constitute a distinct field of technology.

There is a more systematic approach to defining robotic systems in Chinese legislation.⁴ The 14th Five-Year Plan for the Development of the Robotics Industry,⁵ published in December 2021, categorizes robotic systems into industrial, service, and special types. These are defined as cyber-physical devices that can perceive their environment, make decisions, and perform actions without constant human intervention. This classification allows for differentiated legal regulation of different types of robotic systems based on their functional purposes and technological complexity.

Indian legislation, on the other hand, is characterized by a lack of clarity in the definition of robotic systems. The National Strategy for Artificial Intelligence (2018)⁶ views robotics primarily as a subfield of artificial intelligence, rather than as an independent entity deserving of specific legal regulation. This approach limits the potential for creating specialized legislation in the area and creates uncertainty in the legal framework for regulating robotic systems.

Brazilian law takes a more nuanced approach to defining robotic systems. According to the Brazilian Strategy for Artificial Intelligence (2021),⁷ robotics is recognized as an independent field of technology that intersects with AI but with its own unique characteristics. However, there is currently no unified classification system for robotics, making it challenging to develop a tailored regulatory framework.

³ Decree of the President of the Russian Federation of October 10, 2019 No. 490 “On the Development of Artificial Intelligence in the Russian Federation.” *Legislation Bulletin of the Russian Federation*, 2019, No. 41, Art. 5700. (In Russian)

⁴ Filipova, I. A. (2024). Legal regulation of artificial intelligence: Experience of China. *Journal of Digital Technologies and Law*, 2(1), 46–73.

⁵ Ministry of Industry and Information Technology of the People's Republic of China. (2021, December 28). *14th Five-Year Plan for the Development of the Robotics Industry*. <https://www.gov.cn/zhengce/zhengceku/2021-12/28/5664988/files/7cee5d915efa463ab9e7be82228759fb.pdf>

⁶ NITI Aayog. (2018, June). *National Strategy for Artificial Intelligence (#AIforAll)*. <https://www.niti.gov.in/sites/default/files/2019-01/NationalStrategy-for-AI-Discussion-Paper.pdf>

⁷ Ministry of Science, Technology and Innovation. (2021, July). *Brazilian Artificial Intelligence Strategy*. https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/transformacaodigital/arquivos/inteligenciaartificial/ebia-documento_referencia_4-979_2021.pdf. (In Portuguese).

The legislation of South Africa regarding robotics is in its early stages of development. The Digital Transformation Strategy for Africa (2020–2030),⁸ which reflects a regional approach, includes provisions for the development of robotics as a promising aspect of the fourth industrial revolution. However, it does not provide clear definitions or classifications for robotic systems.

Among the BRICS countries, the UAE demonstrates the most advanced approach to integrating artificial intelligence and related technologies. In 2021, the UAE published its National Strategy for Artificial Intelligence 2031,⁹ which focuses on creating an ecosystem for AI development, including its applications in robotics, healthcare, logistics, and other sectors. The document emphasizes the importance of establishing regulatory mechanisms to ensure ethical, safe, and transparent use of AI technologies. It also highlights key areas such as infrastructure development, personnel training, and international cooperation. These measures form the basis for a differentiated legal framework, although the strategy does not specifically mention the need for a separate classification of robotic systems.

To address these challenges, it would be beneficial to develop a unified glossary of terminology in the field of robotics at the BRICS level. Additionally, it is important to establish common approaches for classifying robotic systems while considering international standards and best regulatory practices.

1.2. Conceptual Approaches to the Legal Status of Robots and Artificial Intelligence Systems

Determining the legal status of robots and artificial intelligence systems is one of the most complex and contentious issues in modern legal theory and practice. The BRICS nations have different approaches to this issue, creating additional challenges for harmonizing legal regulations.

In Russian legal doctrine, an instrumental approach prevails, considering robots solely as objects of civil law¹⁰—high-tech devices owned by specific entities. This viewpoint is reflected in the Draft Concept for the Development of Regulation on Relations in the Field of AI and Robotics Technologies until 2024,¹¹ prepared by the Ministry of Economic Development. According to the document, legal personality

⁸ African Union. (2020, May 18). *The Digital Transformation Strategy for Africa (2020–2030)*. <https://au.int/en/documents/20200518/digital-transformation-strategy-africa-2020-2030>

⁹ UAE Government. (2021). *UAE National Strategy for Artificial Intelligence 2031*. <https://u.ae/en/about-the-uae/strategies-initiatives-and-awards/strategies-plans-and-visions/government-services-and-digital-transformation/uae-strategy-for-artificial-intelligence>

¹⁰ Civil Code of the Russian Federation (Part One) of November 30, 1994 No. 51-FZ. *Legislation Bulletin of the Russian Federation*, 1994, No. 32, Art. 3301. (In Russian).

¹¹ Order of the Government of the Russian Federation of 19 August 2020 No. 2129-r. *Legislation Bulletin of the Russian Federation*, 2020, No. 35, Art. 5593. (In Russian).

cannot be granted to a robot, even if it possesses artificial intelligence, thus ruling out the possibility of considering it an independent legal entity.

Chinese legal discourse, in contrast, adopts a more flexible approach when determining the legal status of robots. According to the 14th Five-Year Plan for the Development of the Robotics Industry, it is possible to create a special legal framework for highly autonomous robotic systems that combines elements of both object- and subject-oriented approaches. The concept of a “quasi-legal entity” is being actively discussed in academic literature,¹² suggesting that robots could be given limited legal rights in certain areas while maintaining their status as objects. This would allow for a more nuanced approach to the legal treatment of robots, taking into account their unique characteristics and potential risks.

Indian legal doctrine is characterized by a conservative approach to determining the legal status of robots. In the context of the National Strategy for Artificial Intelligence, robotic systems are considered as objects of law, tools of human activity that lack their own subjectivity. At the same time, it is acknowledged that it is necessary to develop specific mechanisms for regulating highly autonomous robotic systems, taking into account their technical characteristics.¹³

The Brazilian approach to defining the legal status of robots also exhibits a dualistic nature.¹⁴ On the one hand, civil law recognizes a robot as an object of property. On the other hand, discussions on digital law highlight the possibility of granting intelligent robotic systems a distinct legal status separate from that of traditional objects under civil law.

The approach of Saudi Arabia, a member of the BRICS, deserves attention. In 2017, the country granted citizenship to Sophia, a humanoid robot created by Hanson Robotics.¹⁵ This raises the question of how to define the legal status of AI. Although this decision is largely symbolic, it shows the potential for a major shift in traditional ideas about robot rights.

To address this issue, it is crucial to develop a framework of principles for regulating robotics at the BRICS level and establish joint research programs. These programs should aim to develop a common conceptual framework for addressing the issue of AI rights.

¹² Schmidt, K. (2016). Trust as a legislative challenge: Bipolar relation vs quasi-corporate status?—Basic trust models in legal practice, theory, and legislation. *European Review of Private Law*, 24(6), 961–980.

¹³ Shetty, D. K., et al. (2025). Analyzing AI regulation through literature and current trends. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(1), Article 100508.

¹⁴ Lantyer, V. H. (2023). Granting legal personality to artificial intelligences in Brazil's legal context: A possible solution to the copyright limbo. *University of Miami International and Comparative Law Review*, 31, 301–336.

¹⁵ Parviainen, J., & Coeckelbergh, M. (2021). The political choreography of the Sophia Robot: Beyond robot rights and citizenship to political performances for the social robotics market. *AI & Society*, 36(3), 715–724.

1.3. International Legal Standards and Ethical Principles in the Field of Robotics

A significant factor in the harmonization of legal regulation of robotics in BRICS countries is the development of international legal standards and ethical principles in this field. Analysis of international practice allows us to identify several key areas for the formation of such standards.

The work of the International Organization for Standardization (ISO) is of paramount importance, within which the Technical Committee ISO/TC 299 Robots and Robotic Devices operates.¹⁶ This committee develops standards for safety, performance, and terminology of robotic systems. Key international standards in this area include ISO 8373:2021 (Vocabulary),¹⁷ ISO 10218-1:2025 (Safety requirements for industrial robots)¹⁸ and ISO 10218-2:2025 (Safety requirements—industrial robot applications and robot cells),¹⁹ and ISO 13482:2014 (Safety requirements for personal care robots).²⁰

The BRICS countries exhibit varying degrees of integration of international standards into their national technical regulation systems. China and Russia possess the most developed standardization systems for robotics, actively participating in the work of ISO/TC 299 and implementing international standards. India, Brazil, and South Africa, by contrast, lag significantly behind in this area, creating technical barriers to the integration of their national markets for robotic products.

Ethical regulation of robotics has likewise become an increasingly important aspect of legal harmonization. In 2017, the European Parliament passed the Civil Law Rules on Robotics resolution,²¹ which includes recommendations for establishing ethical principles for the development and use of robotic systems.²² In 2019, the Organization for Economic Cooperation and Development (OECD) published the Recommendations on Artificial Intelligence,²³ outlining principles for the responsible management of artificial intelligence.

¹⁶ International Organization for Standardization (ISO). (2015). *Technical Committee 299: Robotics*. <https://www.iso.org/committee/5915511.html>

¹⁷ ISO. (2021). *ISO 8373:2021 Robotics—Vocabulary*. <https://www.iso.org/standard/75539.html>

¹⁸ ISO. (2025). *ISO 10218-1:2025 Robotics—Safety requirements—Part 1: Industrial robots*. <https://www.iso.org/standard/73933.html>

¹⁹ ISO. (2025). *ISO 10218-2:2025 Robotics—Safety requirements—Part 2: Industrial robot applications and robot cells*. <https://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/standard/07/39/73934.html?browse=tc>

²⁰ ISO. (2014). *ISO 13482:2014 Robotics and robotic devices—Safety requirements for personal care robots*. <https://www.iso.org/standard/53820.html#draft>

²¹ Nikolinakos, N. T. (2024). Major EU policy developments on liability for artificial intelligence, robotics, and emerging digital technologies: 2015 to 2018. In N. T. Nikolinakos, *Adapting the EU civil liability regime to the digital age: Artificial intelligence, robotics, and other emerging technologies* (pp. 21–75). Springer.

²² Nobile, C. G. (2023). Regulating smart robots and artificial intelligence in the European Union. *Journal of Digital Technologies and Law*, 1(1), 33–61.

²³ Yeung, K. (2020). Recommendation of the council on artificial intelligence (OECD). *International Legal Materials*, 59(1), 27–34.

An important international document is the Code of Ethics for Robotics Engineers, developed as part of the Engineering and Physical Sciences Research Council (EPSRC) project in Great Britain.²⁴ This code outlines five key principles: (a) robots should not be designed to destroy or harm humans; (b) robots are tools whose use must be respectful towards human rights; (c) robots must be designed with safety and security in mind; (d) the functioning of robots should be transparent; (e) legal responsibility for a robot's action should be clearly assigned to robots.

In the BRICS countries, the development of ethical principles for robotics is still in its early stages. In 2021, China introduced the Ethical Norms for the New Generation of Artificial Intelligence,²⁵ which outlines guidelines for the development and use of robotic systems. The AI Alliance Russia also released a draft of the AI Ethics Code in 2021.²⁶ However, ethical considerations in robotics have not yet been formally incorporated into regulatory frameworks in other BRICS nations.

The formation of common ethical principles for the development and use of robotic systems on the BRICS scale seems to be a promising area for legal harmonization. This would contribute not only to the advancement of technological cooperation but also to the promotion of shared values and approaches towards regulating new technologies on an international level. The BRICS Ethics Code for Robotics could serve as an important step in this direction. It could consolidate principles such as safety, transparency, non-discrimination, confidentiality, accountability, and social responsibility into the development and implementation of robotic systems.

2. Comparative Analysis of the Robotics Regulatory Framework of the BRICS Countries

2.1. Features of National Robotics Regulation Models

A comparative analysis of the robotics regulatory framework of the BRICS countries reveals several models that reflect the specific characteristics of their national legal systems and approaches to technological development.

The Russian model of robotics regulation combines state strategic planning with market mechanisms to develop the industry. A key document that defines the directions for robotics development is the Digital Economy of the Russian Federation National Program. Within this program, the Digital Technologies federal project has been implemented, which provides measures to support the growth of robotics and artificial intelligence. The legal basis for these efforts is the Decree of the President of

²⁴ Müller, V. C. (2017). Legal vs. ethical obligations—A comment on the EPSRC's principles for robotics. *Connection Science*, 29(2), 137–141.

²⁵ Ministry of Science & Technology. (2021, September 26). *Ethical Norms for the New Generation of Artificial Intelligence Released*. https://www.most.gov.cn/kjbgz/202109/t20210926_177063.html. (In Chinese).

²⁶ AI Alliance Russia. (n.d.). *AI Ethics Code*. <https://ethics.a-ai.ru/>. (In Russian).

the Russian Federation of October 10, 2019 No. 490 on the Development of Artificial Intelligence in the Russian Federation. This decree approved the National Strategy for the Development of Artificial Intelligence until 2030.

The Chinese model of robotics regulation is characterized by a high degree of centralization and integration into the overall strategy of the country's technological development. The key document for this model is the 14th Five-Year Plan for the Development of the Robotics Industry,²⁷ which was adopted during the implementation of the Made in China 2025 strategy. This plan provides comprehensive measures to support the development of the robotics industry in China. It includes the creation of special economic zones and tax incentives for manufacturers of robotic systems. Additionally, the plan aims to establish a national system of standards for robotics to ensure quality and safety.

The Indian model of robotics regulation is a combination of government strategic planning and industry self-regulation. This is exemplified by the National Strategy for Artificial Intelligence (2018),²⁸ which was developed by the National Institution for Transforming India (NITI Aayog) and defines robotics as a priority for the country's technological development. The strategy provides measures to create a supportive environment for the growth of robotics technology.

The Brazilian model of robotics regulation is based on a liberal approach that emphasizes the principle of technological neutrality. This approach is reflected in the Brazilian Strategy for Artificial Intelligence (2021),²⁹ which outlines the general direction for the development of advanced digital technologies, including robotics. The strategy aims to create regulatory sandboxes for testing innovative robotic solutions and establish ethical standards in robotics. It also focuses on developing human capital to ensure that people have the skills and knowledge needed to work with and manage robots.

The South African model for regulating robotics is still in its early stages of development. The key document that guides this process is the Digital Transformation Strategy for Africa (2020–2030),³⁰ which outlines the general direction of digital technology development in the region, including the use of robots. Within this strategy, there are plans to develop infrastructure to support the implementation of robotics solutions, establish a national standardization system for robotics, and invest in human capital training.

Of the BRICS countries, the United Arab Emirates stands out as an example of a proactive and integrated approach to robotics regulation. In 2021, the country adopted the

²⁷ Ministry of Industry and Information Technology of the People's Republic of China. (2021, December 28). *14th Five-Year Plan for the Development of the Robotics Industry*. <https://www.gov.cn/zhengce/zhengceku/2021-12/28/5664988/files/7cee5d915efa463ab9e7be82228759fb.pdf>. (In Chinese).

²⁸ NITI Aayog, 2018.

²⁹ Ministry of Science, Technology and Innovation, 2021.

³⁰ African Union, 2020.

UAE National Strategy for Artificial Intelligence 2031,³¹ which includes comprehensive measures to promote robotics as a critical area of technological advancement.

2.2. Problems of Legal Protection of Intellectual Property in the Field of Robotics

Ensuring effective legal protection for intellectual property in robotics is a crucial factor for enhancing technological cooperation between BRICS nations. A review of national laws in this domain reveals several areas that require harmonization to address challenges.

The first aspect relates to the patent protection of robotic solutions. In many BRICS countries, robotic systems are considered objects of patent law. However, the criteria for patentability and the patenting process vary significantly from country to country. In Russia, the patenting of robotic solutions takes place in accordance with general patent legislation, as outlined in Part Four of the Civil Code of the Russian Federation.³² While there are no specific norms that address the unique aspects of this technology, the process is still subject to the general rules and regulations. On the other hand, China has developed specific guidelines for the patenting of robotic inventions, issued by the State Intellectual Property Office.³³ These guidelines take into account the specific challenges and requirements of the industry. India, Brazil, and South Africa face the challenge of insufficient expertise among patent examiners in this field. This can make it difficult for innovative developers to obtain patent protection.

The second aspect relates to the protection of software used in robotic systems. In most BRICS countries, software is protected by copyright. However, there are challenges with the protection of artificial intelligence algorithms used in intelligent robots. In Russia, according to Part Four of the Civil Code of the Russian Federation, algorithms and mathematical methods are not eligible for patent protection. This creates risks for developers of intelligent robotic systems in Russia. Starting in 2020, China has allowed patenting certain types of AI algorithms, provided that they are technically implemented on a specific device.³⁴ India, Brazil, and South Africa continue to follow a traditional approach that excludes the possibility of patenting algorithms and mathematical methods.³⁵

³¹ UAE Government, 2021.

³² Civil Code of the Russian Federation (Part Four) of December 18, 2006 No. 230-FZ (as amended on July 22, 2024). *Legislation Bulletin of the Russian Federation*, 2006, No. 52 (Part 1), Art. 5496, Section VII, Chapter 72. (In Russian).

³³ National Intellectual Property Administration. (2024). *Notice on Soliciting Public Comments on the "Guidelines for Patent Applications Related to Artificial Intelligence (Draft for Comments)"*. https://www.cnipa.gov.cn/art/2024/12/6/art_75_196483.html. (In Chinese).

³⁴ Liu, Y., et al. (2024). Technology status tracing and trends in construction robotics: A patent analysis. *World Patent Information*, 76, Article 102259.

³⁵ Afanasiev, D. V. (2020). A fine line between patentable and non-patentable in the legislation of foreign countries and Russia: Discoveries, software, biotechnology, treatment methods and others. *Economy and Law*, 2(517), 73–96. (In Russian).

The third aspect relates to the protection of databases used for the training of intelligent robotic systems. In most BRICS countries, databases are protected by copyright or related rights. However, there are problems with defining a legal regime for synthetic data generated by robotic systems themselves.

To address these issues, it would be beneficial to develop harmonized approaches to intellectual property protection in robotics at the BRICS level. This could include the creation of agreed criteria for patentability of robotic inventions, development of specific mechanisms for protecting intellectual property created by and used by robotic systems, and measures to simplify registration and protection procedures for intellectual property rights related to robotics in the territories of BRICS countries.

2.3. Safety and Responsibility in Robotics: National Approaches

Ensuring the safety of robotic systems and determining liability for any harm caused by their operation are two of the most complex and important aspects of the legal regulation of robotics. A comparative analysis of the national approaches of BRICS countries to these issues has revealed significant differences that pose challenges to harmonization.

In Russia, legal regulation of robotic safety is mainly carried out within the framework of general laws on technical regulation and standardization. Federal Law of December 27, 2002 No. 184-FZ "On Technical Regulations"³⁶ provides for the development of technical regulations that set mandatory requirements for product safety, including robotic systems. However, there are currently no specific technical regulations for robotics, creating legal uncertainty in this area.

Issues of liability for damage caused by robotic systems in Russian law are addressed within the general framework of tort law. According to Article 1079 of the Civil Code of the Russian Federation, legal entities and individuals whose activities involve increased risk of harm to others must compensate for any damage caused by an activity that poses a heightened risk. This principle could potentially apply to highly autonomous robotic systems, although it does not specifically address the unique features of their operation and the potential for independent decision-making based on artificial intelligence.

China has developed a more advanced system of legal regulation for the safety of robotic systems. The Product Quality Law³⁷ and the Standardization Law³⁸ provide the

³⁶ Federal Law of December 27, 2002 No. 184-FZ "On Technical Regulations." *Legislation Bulletin of the Russian Federation*, 2002, No. 52 (Part I), Art. 5140. (In Russian).

³⁷ Product Quality Law of the People's Republic of China (Revised) (issued by the Standing Committee of the National People's Congress, Order No. 71 of the President of the People's Republic of China, February 22, 1993, effective September 1, 1993, revised by the Decision of the Standing Committee of the National People's Congress on Amending the Product Quality Law of the People's Republic of China, July 8, 2000, effective September 1, 2000). (In Chinese).

³⁸ Standardization Law of China (promulgated on November 4, 2017, effective on January 1, 2018). (In Chinese).

legal basis for the creation of mandatory national standards for the safety of robots. Based on these laws, a number of specific standards have been created, including GB/T 20867.1-2024, which sets safety requirements for industrial robots,³⁹ and GB/T 40013-2021, which establishes electrical safety requirements and testing methods for service robots.⁴⁰

Issues of liability for damage caused by robotic systems in China are regulated under general rules on tort law, taking into account the specific nature of high-tech products. The Civil Code of China, Book VII, "Liability for Torts"⁴¹ provides for the manufacturer's responsibility for damage caused by defective products, as well as the user's responsibility for improper use.⁴² In 2021, the National Committee for the Development of Artificial Intelligence released ethical norms for the new generation of artificial intelligence,⁴³ aimed at incorporating ethics and morals into the entire lifecycle of AI and providing guidance to those involved in AI activities.⁴⁴

In India, Brazil, and South Africa, the legal regulation of robotic safety and liability for harm caused by robots is carried out under general consumer protection and civil liability laws, without considering the specific features of robotics as a technological field.⁴⁵ This leads to legal uncertainty and risk for manufacturers and users of robotics.

A comparative analysis of national approaches to safety and responsibility regulations in robotics reveals several key differences that hinder harmonization:

1. Different methods of security control: from state-mandated inspections (China, Russia) to industry self-regulation (India, Brazil, and South Africa);
2. Different standardization systems: from mandatory national standards (China) to voluntary industry standards (India, Brazil, and South Africa);
3. Different approaches to determining responsibility for the actions of highly autonomous systems: from the responsibility of the owner/operator (Russia) to differentiated responsibilities for manufacturers and users (China);

³⁹ General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China. (2024). *GB/T 20867.1-2024 Safety requirements for robots—Application specification—Part 1: Industrial robots (Replaces GB/T 20867-2007)*. (In Chinese).

⁴⁰ General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China. (2021). *GB/T 40013-2021 Service robot—Electrical safety requirements and test methods*. (In Chinese).

⁴¹ Civil Code of China: Book VII Liability for Tort (2020) (May 28, 2020, effective January 1, 2021). (In Chinese).

⁴² Conk, G. W. (2020). *Translation: Tort liability—section 7—Civil Code of the People's Republic of China* (Fordham Law Legal Studies Research Paper No. 3624921).

⁴³ Ministry of Science and Technology of the People's Republic of China. (2021, September 26). *Ethical norms for the new generation of artificial intelligence released*. <http://www.most.gov.cn>. (In Chinese).

⁴⁴ Filipova, 2024.

⁴⁵ Cyman, D., Gromova E., & Juchnevicius, E. (2021). Regulation of artificial intelligence in BRICS and the European Union. *BRICS Law Journal*, 8(1), 86–115.

4. Different levels of legal precedent in cases related to robotics.

In order to bridge these gaps, it would be beneficial to establish common guidelines for ensuring the security of robotic systems and assigning liability for damage caused by their operations at the BRICS level. These guidelines could include:

1. An individualized approach to securing various types of robotics systems based on their level of risk;
2. Combination of preliminary safety checks and continuous monitoring of robotic system operations;
3. Allocation of responsibility among the manufacturer, operator, and user of a robotic system, contingent on the nature and cause of harm;
4. Mandatory liability insurance for damages caused by the operation of high-risk robotic systems.

2.4. Regulatory Sandboxes and Experimental Legal Regimes in Robotics

The innovative nature of robotics requires flexible approaches to its legal regulation. This allows for experimentation with new regulatory models while minimizing the risk of violating existing legal norms. Regulatory sandboxes⁴⁶ and experimental legal regimes⁴⁷ provide a controlled environment for testing innovative technologies and business models, which makes these innovative instruments particularly significant in this context.

In Russia, the legal framework for the establishment of regulatory sandboxes is established by Federal Law of July 31, 2020 No. 258-FZ "On Experimental Legal Regimes in the Field of Digital Innovation in the Russian Federation."⁴⁸ This law allows for the implementation of an experimental legal regime for digital innovation, which includes special regulations that differ from the general legal framework. Robotics and artificial intelligence are among the areas where experimental legal regimes may be implemented. In accordance with this legislation, several experimental legal regimes have been established, including testing unmanned vehicles on public roads and using medical robot assistants.⁴⁹

⁴⁶ Gromova, E. A., & Ferreira, D. B. (2023). Tools to stimulate blockchain: application of regulatory sandboxes, special economic zones, and public private partnerships. *International Journal of Law in Changing World*, 2(1), 17–36.

⁴⁷ Gromova, E. A., & Tjaša, I. (2020). Regulatory sandboxes (experimental legal regimes) for digital innovations in BRICS. *BRICS Law Journal*, 7(2), 10–36.

⁴⁸ Federal Law of July 31, 2020 No. 258-FZ "On Experimental Legal Regimes in the Field of Digital Innovations in the Russian Federation." *Legislation Bulletin of the Russian Federation*, 2020, No. 31 (Part I), Art. 5017. (In Russian).

⁴⁹ Decree of the Government of the Russian Federation of March 9, 2022 No. 309 "On Establishing an Experimental Legal Regime in the Field of Digital Innovations and Approving the Program of the Experimental Legal Regime in the Field of Digital Innovations for the Operation of Highly Automated Vehicles" (as amended on March 27, 2025 No. 373). Official Internet Portal of Legal Information. <http://pravo.gov.ru>. (In Russian).

In China, the creation of regulatory sandboxes for robotics has become a widespread practice.⁵⁰ As part of the 14th Five-Year Plan for the Development of the Robotics Industry, a number of specialized zones have been established to test innovative robotics solutions, including autonomous vehicles, industrial robots, and medical robots. Within these zones, special regulations have been implemented that provide for simplified certification processes, tax benefits, and special mechanisms for responsibility allocation. A unique aspect of the Chinese approach is its close integration of these regulatory sandboxes with industrial parks and technological clusters, creating a comprehensive ecosystem for robotics development.

In India, the development of regulatory sandboxes for robotics technology is in its early stages. The National Strategy for Artificial Intelligence calls for the establishment of innovation zones to test artificial intelligence and robotics.⁵¹ In 2020, the first such zone was established in Bangalore, focusing on autonomous vehicle testing.⁵² One unique aspect of the Indian approach is its emphasis on socially significant applications of robotics, such as healthcare, education, and agriculture.

In Brazil, the government has implemented a policy to promote innovation by creating regulatory sandboxes for robotics technologies. One such sandbox has been proposed, aimed at testing business activities using new digital technologies.⁵³ This sandbox provides a controlled environment for testing innovative technologies, including robotics, to ensure safe and effective implementation. Within this program, several pilot projects are underway in the fields of industrial robotics, autonomous vehicles, and agricultural robotics. These projects aim to demonstrate the potential of these technologies and pave the way for their wider adoption in Brazil.

In South Africa, the creation of regulatory sandboxes for robotics technology is limited to individual industry initiatives.⁵⁴ As part of the Digital Transformation Strategy for Africa, the launch of a digital experiment zone was announced to test innovative technologies, including robotics and artificial intelligence. However, practical implementation of this initiative has faced problems with insufficient funding and regulatory support.

A comparative analysis of regulatory sandbox practices and experimental legal regimes in BRICS countries reveals several key differences:

⁵⁰ Han, M., & Xu, D. (2022). The sandbox approach to fintech regulation: A case study of China. *Revista Chilena de Derecho*, 49(2), 193–232.

⁵¹ Abdulaziz, A. (2022). Special economic zones for the digital economy. *International Journal of Social Science & Interdisciplinary Research*, 11(07), 90–93.

⁵² Gopakumar, G. (2020). Regime of congestion: Technopolitics of mobility and inequality in Bengaluru, India. *Science as Culture*, 29(3), 345–364.

⁵³ Gromova & Tjaša, 2020.

⁵⁴ McCallum, W., & Aziakpono, M. J. (2023). Regulatory sandbox for fintech regulation: Do the conditions for effective adoption exist in South Africa? *Development Southern Africa*, 40(5), 1100–1116.

1. Regulatory support: from specific legislation (Russia) to *ad hoc* administrative decisions (South Africa);
2. Industry specialization: from diverse robotics technologies (China) to specialized areas (India, Brazil);
3. Financing mechanisms: public financing (China, Russia), public-private partnerships (India, Brazil);
4. Degree of integration with the innovation ecosystem: integrated approach (China), fragmented initiatives (South Africa).

To better harmonize all of the various approaches to creating regulatory sandboxes and experimental legal regimes for robotics at BRICS, it seems advisable to develop common principles, methodological recommendations, and mechanisms for sharing experience and best practices. Additionally, special attention should be given to cross-border testing of robotic technologies, requiring the creation of mechanisms for coordinating national regulatory sandboxes.

3. Problems and Barriers to Legal Harmonization in Robotics

3.1. Differences in National Legal Systems and Traditions

The harmonization of legal regulations for robotics in the BRICS countries faces a fundamental challenge due to differences in national legal systems and traditions. These countries represent different legal families: Russia is part of the continental (Romano-German) legal tradition, China combines elements of socialist and continental law, India and South Africa follow the Anglo-Saxon legal system, and Brazil, like Russia, follows the continental tradition. Additionally, countries with Islamic legal systems (UAE and Saudi Arabia) are also part of the BRICS partnership.

Differences in legal systems can be seen primarily in the methodological approaches to regulating new technological fields. In countries with a continental legal system, such as Russia and Brazil, a codified approach is dominant, aiming to create a comprehensive regulatory framework that covers all relevant aspects of the regulated relations. On the other hand, in countries with an Anglo-Saxon legal system, like India and South Africa, judicial precedent and the principle of legal pragmatism play a more significant role, allowing for the formation of case-by-case regulations in response to specific enforcement issues. The Chinese legal system combines elements of both approaches, with a high level of administrative discretion.

The second aspect of the differences relates to the role of the government in the legal regulation of new technology fields. In countries with strong state-centric traditions (like Russia and China), a proactive approach towards regulating new technologies is dominant, involving the creation of a regulatory framework in the early stages of technological development. On the other hand, in countries with a more liberal tradition (for e.g., India, South Africa, and, to some extent, Brazil), a more reactive approach based on the principle of technological neutrality and minimal government interference in technological development is more prevalent.

The third aspect of the differences between the two legal families is related to legal techniques and legal dogmas. In countries with a continental legal system, such as Russia and Brazil, an abstract approach to formulating legal norms is prevalent, as well as a desire to create a logically complete system of legal structures. Conversely, in countries with an Anglo-Saxon legal tradition, such as India and South Africa, a casuistic approach is more common, focusing on the resolution of specific cases without the need to develop a complete dogmatic system.

In order to overcome these differences and achieve harmonization in the legal regulation of robotics among BRICS countries, it would be advisable to adopt a hybrid approach that combines elements from both legal traditions. Some promising areas for harmonization include:

1. Development of model legislation on robotics that takes into account the specific needs and requirements of each BRICS country and allows for adaptation to their respective national legal systems;
2. Establishment of general principles for the regulation of robotics that are advisory in nature and do not require major changes to national legal systems;
3. Development of mechanisms for the mutual recognition of certifications of conformity and other regulatory permits in the field of robotics;
4. Creation of common approaches to ethical regulation of robotics, taking into account the cultural and legal diversity of the BRICS countries.

3.2. The Technological Gap between the BRICS Countries

The harmonization of legal regulations for robotics in BRICS countries faces a significant challenge due to the technological gap between member states. Uneven levels of technological development create an asymmetry in interests and approaches towards legal regulation in this area.

China, as a member of the BRICS, is widely recognized as a leader in robotics. According to data from the International Federation of Robotics, in 2023, China's robot density in industry reached 470 units per 10,000 employees, surpassing the global average of 162 units per 10,000.⁵⁵ The country also accounts for about one-third of global robot shipments, making it the largest market for industrial robots.⁵⁶ Chinese companies are actively developing their own robotic technologies, gradually reducing dependence on imports of high-tech components.

Russia demonstrates a medium level of robotics development among BRICS countries, although this indicator is increasing. In 2019, the International Federation of Robotics reported that the density of robots in Russian industry was 4 per 10,000

⁵⁵ International Federation of Robotics (IFR). (2024). *Global robot density in factories doubled in seven years: New World Robotics data revealed by the International Federation of Robotics*. <https://ifr.org/ifr-press-releases/news/global-robot-density-in-factories-doubled-in-seven-years>

⁵⁶ ABI Research. (2017, January 11). *Industrial robot revenue will nearly triple by 2025, fueled by Chinese demand*. <https://www.abiresearch.com/press/industrial-robot-revenue-will-nearly-triple-2025-f>

employees, rising to 11 per 10,000 by 2022, which is still below the global average.⁵⁷ Russian companies possess considerable expertise in specific areas of robotics such as military robotics and industrial automation systems. Nevertheless, the industry as a whole faces challenges due to its high dependence on imported technologies and components.

There has been a significant increase in the number of industrial robots in India in recent years. The density of robotics in Indian industry in 2021 was approximately 148 robots per 10,000 workers, which is comparable to the global average.⁵⁸ India has significant potential for robotics development due to its availability of skilled personnel in information technology and engineering fields. Indian companies are active participants in global robotics value chains, primarily in software development stages.

Meanwhile, Brazil and South Africa have a relatively low level of robotic development, but the industry in these countries is still growing. For example, in Brazil, only 1,858 robots were installed in 2022, however this still represents an increase of 4% compared to the previous year.⁵⁹

These differences in robotic development between BRICS countries create significant challenges for harmonizing legal regulations for robotics.

1. Asymmetry in interests in intellectual property protection: Technology exporting countries (such as China) are interested in strengthening patent protection, while importing countries (such as India, Brazil, and South Africa) want to soften the patent regime and facilitate access to technology;

2. Different approaches to technical regulation: Countries with a developed robotics industry (e.g., China and Russia) want strict technical standards to consolidate their technological advantage, while less developed countries prefer more flexible approaches;

3. Regulatory priorities: Countries with advanced robotics tend to focus on regulating advanced technologies like autonomous systems and collaborative robots, while countries with less developed industries primarily prioritize basic aspects like safety and certification.

To address these challenges, it would be beneficial to adopt a tailored approach to harmonizing legal regulations for robotics, considering the specific technological developments in different BRICS nations. This could involve implementing mecha-

⁵⁷ IFR. (2019, August 27). *Five trends in Russian robotics*. <https://ifr.org/post/five-trends-in-russian-robotics>; Klimovsky, A. (2025). *In less developed regions of the country, robotization is practically absent*. Regional Comments. <https://regcomment.ru/analytics/v-menee-razvityh-regionah-strany-robotizatsiya-prakticheski-otsutstvuet/>. (In Russian).

⁵⁸ IFR. (2023, May 3). *India's robot boom hits all-time high: India enters world's top ten in annual robot installations*. <https://ifr.org/ifr-press-releases/news/indias-robot-boom-hits-all-time-high>

⁵⁹ IFR. (2023, September 26). *World Robotics 2023 report: Asia ahead of Europe and the Americas*. <https://ifr.org/ifr-press-releases/news/world-robotics-2023-report-asia-ahead-of-europe-and-the-americas>

nisms for technology transfer, establishing technical assistance programs, and collaboratively funding research and development efforts in the field of robotics.

4. Mechanisms for Harmonizing the Legal Regulation of Robotics in BRICS

4.1. Institutional Framework for Cooperation in Robotics Regulation

The establishment of effective institutional frameworks for collaboration is a crucial prerequisite for the successful alignment of legal regulations on robotics in BRICS nations. An analysis of existing institutional structures within BRICS allows us to identify potential platforms for cooperation in this domain.

A first institutional mechanism could be the establishment of a specialized Working Group on Robotics and Artificial Intelligence within the BRICS Contact Group on Economic and Trade Issues. This group could be established based on a mandate approved at an annual BRICS summit, and it would include representatives from relevant ministries and agencies from participating countries. Its primary objectives could include:

1. Analysis of national legislation in the field of robotics and identification of key differences that hinder technological cooperation; development of recommendations for the harmonization of legal regulation of robotics among the BRICS countries;
2. Coordination of national robotics development programs and formation of joint initiatives; monitoring global trends in robotics regulation; and developing a coordinated position on international platforms for the BRICS countries.

A second institutional mechanism could be the establishment of an Expert Council on Robotics within the New Development Bank. The Council could include representatives from the scientific and business communities as well as civil society from various BRICS countries and perform the following functions:

1. Providing scientific and methodological support to the process of harmonizing legal regulation of robotics, including conducting research on legal, ethical, and social aspects of robotics development;
2. Reviewing draft regulatory legal acts in the field of robotics and developing recommendations for financing joint projects in this area.

A third institutional mechanism could be the establishment of a BRICS Competence Center for Robotics Regulation based at one of the leading universities in the BRICS countries. This center could perform the following functions:

1. Developing educational programs for the legal regulation of robotics, training, and the professional development of specialists in this field for government agencies in the BRICS countries;
2. Conducting comparative legal research on robotics and maintaining a formal database of regulatory acts and judicial practice on this topic.

The establishment of these institutional mechanisms would allow for the creation of a multi-tiered system of collaboration in the area of robotics governance, ensuring

efficient interaction between government entities, the scientific community, businesses, and civil society within the BRICS nations.

4.2. Formation of Joint Standards and Technical Regulations

The development of harmonized technical standards and regulations in the field of robotics is a key area of legal harmonization within BRICS. These technical standards play a crucial role in ensuring the safety, interoperability, and quality of robotic systems, laying the foundation for their free movement within the markets of BRICS nations.

An examination of existing approaches to robotics standardization within the BRICS countries reveals several areas that require attention during the harmonization process. These include:

1. Variations in technical regulation frameworks, ranging from centralized state systems of mandatory standards in China and Russia to decentralized systems of voluntary standards established by industry associations in India, South Africa, and Brazil;

2. The uneven level of implementation of international standards in national standardization systems and the insufficient representation of BRICS countries in international standardization organizations in the field of robotics;

3. The differences in approaches to assessing the compliance of robotic systems with technical requirements ranging from state certification in China and Russia to self-regulation and declaration of conformity in India, South Africa, and Brazil.

To address these challenges, it is advisable to implement a set of measures aimed at creating a harmonized system of technical standards and regulations for robotics in the BRICS countries. This could include the development of a concept for harmonizing technical standards, establishing a list of priority areas for standardization, creating model technical regulations, and establishing mechanisms for mutual recognition of conformity certificates.

4.3. Model Legislation as a Tool of Legal Harmonization

The development of model legislation in the field of robotics is an effective tool for legal harmonization. It allows taking into account the specific features of national legal systems while forming common approaches to regulation. Model legislation can be a “soft” harmonization instrument that does not require direct implementation in national legal systems but creates a common conceptual framework for convergence of legal approaches in BRICS.

Model legislation in robotics should include key components such as:

1. A conceptual framework defining the main categories and terms in robotics, such as the definition of robotic systems, autonomous robots, artificial intelligence, assistant robots, industrial robots, and other related concepts. Unification of terminology forms the basis for clear communication between participants in legal relationships and creates a unified conceptual basis for regulation;

2. Classification of robotic systems based on various criteria (such as degree of autonomy, functional purpose, scope of application, level of risk etc.), with differentiated approaches to the regulation of different categories of robots. This classification allows for avoiding excessive regulation of low-risk systems while ensuring appropriate control over high-risk systems;

3. General principles for the creation and use of robotic systems, including those of safety, transparency, responsibility, non-discrimination, and confidentiality, forming the basis for regulation and defining the general framework of national legislation;

4. Mechanisms for sharing responsibility for harm caused by robotic systems among different entities (for e.g., manufacturers, operators, users, owners), considering the specifics of autonomous systems and the multifactorial nature of harm;

5. Regulation of intellectual property in the field of robotics, including issues of patent protection for robotic solutions, the legal regime for software and databases used in robotic systems, and the legal status of intellectual property generated by robotic systems;

6. Security measures for robotic systems, such as certification, labeling, periodic monitoring, recall mechanisms, update mechanisms, and requirements for data storage and processing;

7. Ethical guidelines for the development and use of robotic systems that define value orientations for developers and users.

Development of model legislation for robotics at the BRICS level could be conducted in several stages:

1. Establishment of a working group to develop model legislation, comprising representatives from national legislative bodies, relevant ministries, academic institutions, and business;

2. Conducting a comparative legal analysis of existing national legislation in the field of robotics to identify key differences and common approaches;

3. Developing a concept for model legislation that defines its structure, key principles, and mechanisms;

4. Drafting a model legislation based on the specifics of the legal systems of the various BRICS countries;

5. Holding international expert consultations on the draft legislation with interested parties;

6. Adopting model legislation at the BRICS level and providing recommendations for its implementation in national legal systems;

7. Monitoring the implementation of the model legislation and updating it as technology and law enforcement practices evolve.

The experience of other integration organizations, such as the EU and the EAEU, shows that model legislation can be an effective tool for legal harmonization if it is adapted to national legal systems and takes into account differences in technological

development. In the context of the BRICS group of countries, model legislation in the field of robotics could provide for different levels of harmonization, from basic principles that are mandatory for all members to detailed rules that are more advisory in nature.

4.4. Creation of a Unified Information Space for Technology Transfer

The creation of a unified information platform for technology transfer in robotics is an essential component of harmonizing legal regulations and ensuring the practical implementation of cooperation mechanisms. Such a platform would create conditions for the efficient exchange of knowledge, technology, and best practices among the BRICS countries and contribute to reducing the technological gap and forming an integrated robotics ecosystem.

Key components of this unified information space could include:

1. The BRICS Digital Robotics Platform, which is designed to integrate the information resources of participating countries and provide access to scientific, technical, regulatory, legal, statistical, and educational information related to robotics. The platform would operate on a distributed architecture, with nodes located in each BRICS country, ensuring decentralized management and protecting the digital sovereignty of participants;

2. A unified registry of patents and other intellectual property in robotics aimed at ensuring transparency in the patent landscape and simplifying the process of technology licensing and transfer among the BRICS countries. Of particular importance would be the creation of mechanisms for simplifying the registration of patents developed in one BRICS country on the territory of another country in the association;

3. A comprehensive database of scientific research organizations, technology companies, and startups in robotics, offering an opportunity to find potential partners for joint projects and technology commercialization. This database could include information on competencies, technological capabilities, and available infrastructure for collaboration;

4. A system for monitoring and forecasting the development of robotics technologies, providing information support for decision-making in scientific and technical policies and regulations regarding robotics. This system could include mechanisms for foresight, technology scouting, and big data analysis to identify promising areas for technological development;

5. An educational platform that provides access to educational resources, professional development, and retraining programs for specialists in the field of robotics. Special attention should be paid to the development of competencies in the legal regulation of robotics, ethical aspects of using robotic systems, and security and data protection.

The creation of a unified information space requires addressing a number of legal and organizational issues, including:

1. Development of legal mechanisms for protecting intellectual property in the cross-border exchange of information on robotics;
2. Establishment of uniform standards for information security and the protection of data in cross-border interactions;
3. Determination of the legal status of information resources hosted on the BRICS digital robotics platform;
4. Development of mechanisms for financing and managing a unified information space based on the principle of equal participation by all BRICS countries;
5. Establishment of legal mechanisms to resolve disputes that may arise within the context of the unified information space.

The creation of a unified information environment can be achieved through a phased approach, starting with pilot projects in promising areas such as robotics (industrial, medical, and educational). As technology and participation expand, special attention should be given to ensuring the inclusion of all BRICS members, including countries with underdeveloped robotics industries. This requires the implementation of targeted technical assistance programs and educational initiatives.

4.5. Ethical Aspects of Robotics Regulation in the Context of BRICS Cultural Diversity

The formation of common ethical principles for the design and implementation of robotic systems is a challenging aspect of legal harmonization within the BRICS group, largely due to the diverse cultural, religious, and value systems of its member countries. At the same time, the ethical dimension of legal regulation in robotics is of particular significance in the development of highly autonomous systems⁶⁰ that are capable of making decisions affecting human welfare and safety.⁶¹

The BRICS countries have varied approaches to the ethical regulation of robotics, which reflect their national cultural and value systems. In China, for example, the ethical framework for robotics focuses on ensuring social harmony and promoting the collective well-being of society, which is expressed through prioritizing public interests above individual ones. In Russia, on the other hand, the emphasis is on maintaining human oversight over technological systems, and preventing critical decisions from being transferred to automated systems without human intervention. In India, ethical considerations in robotics are influenced by religious and philosophical principles, such as the concept of non-violence (*ahimsa*) and respect for all life forms. Meanwhile, Brazil and South Africa are shaping their ethical approaches to robotic regulation in the context of promoting social justice and inclusivity.

⁶⁰ Barfield, W. (2018). Liability for autonomous and artificially intelligent robots. *Paladyn, Journal of Behavioral Robotics*, 9(1), 193–203.

⁶¹ Kharitonova, Yu. S. (2023). Legal means of providing the principle of transparency of the artificial intelligence. *Journal of Digital Technologies and Law*, 1(2), 337–358.

The formation of common ethical principles for robotics in the BRICS countries requires a balance between respecting cultural diversity and the need to develop shared approaches to ethical dilemmas arising from creating and using robotic systems. The concept of overlapping consensus,⁶² proposed by philosopher John Rawls, can serve as a basis for this balance, suggesting the creation of shared principles that can be supported from different cultural and value perspectives, despite fundamental differences.

Within the BRICS context, the development of a Declaration of Ethical Principles for Robotics seems promising, establishing a set of fundamental principles that can be understood and applied within the various cultural and value frameworks of the member countries. Such principles could include:

1. The principle of human-centrism: robotic systems should be designed and implemented to improve human well-being and empower and protect human dignity;

2. The principle of safety: the design and implementation of robotic systems must take into account the physical and psychological safety of individuals and prevent potential harm;

3. The principle of transparency: the operations of robotic systems should be clear and understandable to users, including information about the system's principles, data used, and decision-making algorithms;

4. The principles of equity and nondiscrimination: robotic systems should be developed and applied in a way that promotes equality and non-discriminatory practices and avoids systematic discrimination against specific user groups;

5. The principle of accountability: specific actors (manufacturers, operators, and users) should be held responsible for the operation of robotic systems, supported by mechanisms for attributing responsibility for any harm caused;

6. The principle of sustainable development: The creation and implementation of robotic systems should take into account the principles of sustainability, including the minimization of environmental impact and the rational use of resources.

To establish common ethical principles, it is necessary to create special institutional mechanisms to facilitate dialogue between representatives from different cultural and value systems. The BRICS Robotics Ethics Forum could serve as such a platform, bringing together members of the scientific community, businesses, civil society, and religious organizations from BRICS countries to discuss ethical aspects of robotic development and establish common approaches to regulating it.

Another important aspect of the ethical regulation of robotics is the formation of mechanisms for the ethical review of projects implemented within the BRICS framework. These mechanisms should take into account the cultural diversity of the

⁶² Rawls, J. (1989). The domain of the political and overlapping consensus. *New York University Law Review*, 64, 233–255.

member countries and ensure the inclusion of representatives from different cultural and value systems when assessing the ethical implications of robotic solutions.

Conclusion

The conducted research leads to the conclusion that the harmonization of robotics legislation is a crucial factor in enhancing technological cooperation between the BRICS countries. Establishing a unified regulatory framework can contribute to the creation of the institutional conditions for the transfer of technology, the implementation of joint research projects, and a common market for robotic products. Such efforts will contribute to strengthening the technological independence of the member countries of the association.

A comparative analysis of national legislation on robotics has revealed significant differences in the approaches to defining robotic systems, their legal status, and intellectual property protection. These differences can be attributed to both objective factors, such as belonging to different legal systems and uneven technological development, and subjective circumstances, like differences in national strategies for technological development and a lack of coordination in regulatory policies.

The main challenges to harmonizing legal regulation of robotics within the BRICS group can be summarized as follows:

- differences in national legal systems and traditions;
- the technological gap between the countries in the BRICS group;
- lack of institutional mechanisms to coordinate regulatory policies;
- inconsistencies in approaches to intellectual property protection;
- variations in technical regulations.

To address these challenges, it is proposed to implement a range of measures to harmonize the legal framework for robotics, including:

- establishing an institutional framework for collaboration in robotics regulation;
- developing model legislation for robotics;
- formulating common approaches to protecting intellectual property in robotics solutions;
- creating a harmonized system of technical standards and regulations;
- establishing ethical principles for creating and using robotic systems;
- developing mechanisms for technology transfer to reduce the gap in technology between the various BRICS countries.

Of particular importance is the establishment of a multi-tiered institutional framework for collaboration in the field of robotics. This framework should comprise both intergovernmental bodies (such as the Working Group on Robotics and Artificial Intelligence) and expert platforms (such as the Expert Council, Competence Center, a Standardization Platform, and a Network of Robotics Centers).

The aim of such a framework is to ensure the active involvement of all BRICS nations, taking into account differences in their technological development levels and regulatory capacities.

In addition, a priority direction for harmonizing the legal regulation of robotics is the development of a model law that can be tailored to the specific needs of national legal systems. This model law should cover key areas of regulation for robotic systems, such as the definition of fundamental concepts, categorization of robotic systems, responsibility principles for autonomous systems, intellectual property protection mechanisms, safety standards, and ethical guidelines for the design and use of robots.

An important aspect of harmonization is the development of coordinated approaches to protecting intellectual property in the field of robotics. In today's digital economy, intellectual property has become a crucial asset that determines a country's competitiveness in the manufacturing of robotic systems. Harmonizing approaches to patenting robot inventions, safeguarding software and databases utilized in robotic systems, and establishing mechanisms for collectively managing intellectual property rights would reduce transaction costs for innovative businesses and promote technology transfer among BRICS nations.

The establishment of shared ethical principles for the development and use of robotic systems also plays a crucial role in legal harmonization. With the advancement of highly autonomous robots capable of making decisions based on AI algorithms, issues related to ethical regulation to ensure the safety, transparency, and fairness of these systems have become increasingly important. The development of a BRICS ethics code for robotics could be a significant step towards establishing a common foundation of values for technological cooperation among the member countries.

Therefore, the harmonization of legal regulations in robotics is a complex process that involves considering legal, technological, economic, and cultural aspects. Successful implementation of the proposed harmonization measures would create favorable conditions for the development of robotics in BRICS countries, encourage technological cooperation, and strengthen the alliance's position in global technological competition.

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