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Defining ‘robotics’ for legal responsibility: A conceptual framework

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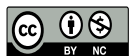
Abstract. Robotics offers significant potential, yet the absence of a universally accepted definition of the field and its components hinders the development of a clear conceptual model for legal liability. This study examines and analyzes the concepts, features, and key characteristics of “robotics” and “robot”, correlating them with the concept of “artificial intelligence”. It identifies problematic aspects of legal liability in the field of robotics to facilitate the development of a conceptual model of legal responsibility in this area. The research is based on the analysis of legal acts and scholarly literature. Methodology employed include system analysis, comparative legal analysis, formal legal analysis, and legal modeling, along with general scientific methods such as analysis, synthesis, induction, and deduction. The study compares various approaches to defining key concepts in robotics, particularly correlating “robot” and “artificial intelligence”. It highlights problematic aspects within the content of legal liability in robotics. The study argues that legal liability should differentiate between situations where harm is caused by an automated robot or robotic device and situations where harm occurs when a person collaborates with such a device. It concludes that legal responsibility in robotics should be differentiated based on the degree of autonomy (full or partial) and whether the robot performs the activity independently or in conjunction with a person. Given that artificial intelligence is currently created and managed by developers, it is essential to implement clear regulatory frameworks that define permissible and impermissible actions for developers and all stakeholders involved in the AI development process at every stage of its lifecycle.

Key words: robot, robotics, responsibility, artificial intelligence, autonomy, self-sufficiency, robotic device, machine learning, neural network

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Правовая характеристика робототехники в контексте юридической ответственности

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Аннотация. Робототехника имеет широкие перспективы применения, однако отсутствует единое понимание этой сферы и ее компонентов, что затрудняет разработку концептуальной модели юридической ответственности. Цель исследования – рассмотрение и анализ понятий, признаков и основных характеристик категорий «робототехника» и «робот». Для разрешения фундаментального вопроса юридической ответственности систем робототехники рассмотрены некоторые правовые проблемы данной сферы. Анализ научной литературы и нормативных актов являются основополагающими методами в данном труде. Применены методы системного анализа, сравнительно-правовой метод, формально-юридический метод, метод правового моделирования. Использованы общенаучные методы, включая анализ, синтез, индукцию и дедукцию. Проведено сопоставление различных подходов к определению ключевых понятий в сфере робототехники. В частности, проводится соотношение категорий «робот» и «искусственный интеллект». Выделяются проблемные аспекты в содержании юридической ответственности в сфере робототехники. В контексте юридической ответственности необходимо отдельно рассматривать ситуации, в которых вред причинен роботом и робототехническим устройством, действующим автономно, и ситуации, в которых человек осуществляет определенный вид деятельности совместно с автономным роботом или робототехническим устройством. Делается вывод о том, что юридическую ответственность в сфере робототехники следует дифференцировать в зависимости от степени автономности робота (полной или частичной) и в зависимости от осуществления роботом конкретного вида деятельности (совместно с человеком либо в его отсутствие). Однако на данном этапе развития технологий за искусственным интеллектом стоит определенный разработчик (или группа разработчиков). И прежде всего необходимо выработать четкие правила регулирования и закрепить допустимые и недопустимые действия разработчиков и всех субъектов, принимающих участие в создании конкретного механизма, на каждом из циклов «жизни» искусственного интеллекта.

Ключевые слова: робот, робототехника, ответственность, искусственный интеллект, автономность, самостоятельность, робототехническое устройство, машинное обучение, нейронная сеть (нейросеть)

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Introduction

Information technologies are now integral to almost all aspects of human activity. The need for clear legal regulation in robotics and artificial intelligence is increasingly recognized at the legislative level. Scholars worldwide are studying the issues of the legal personhood of AI and determining the liability in cases of harm involving robotics and AI (Girme, Bendale & Gharde, 2024:5207–5216). The terms “robotics” and “artificial intelligence” are frequently used together when discussing applications of information technologies (Kashkin, 2019:151–159).

The Russian Concept for the Development of Regulation of Relations in the Field of Artificial Intelligence and Robotics Technologies until 2024 (Order of the Government of the Russian Federation No. 2129-r dated August 19, 2020)¹, acknowledges the lack of a unified understanding of terms like “artificial intelligence,” “robot,” “smart robot,” and “robotics”. Interestingly, the document suggests that establishing unified terminology is unnecessary due to the rapid evolution of the field, arguing that rigid definitions could hinder effective regulation. Otherwise, regulation may fall behind the pace of a changing reality.

Despite the diverse applications of robotics and AI², questions persist regarding liability for harm to human health, life, or property. Addressing these legal issues requires clarifying the relevant categorical and conceptual framework. While research often focuses on AI, its characteristics, and legal regulation, robotics is often overlooked from a legal perspective. To develop a robust conceptual model of legal

¹ Government Order of the Russian Federation On the Approval of the Concept for the Development of Regulation of Relations in the Field of Artificial Intelligence and Robotics Technologies until 2024 No. 2129-r. dated August 19, 2020, Available at: https://www.consultant.ru/document/cons_doc_LAW_360681/ (accessed: 12.07.2024).

² Roadmap for the Development of the “End-to-End” Digital Technology “Robotics Components and Sensorics”. Available at: <https://digital.gov.ru/> (accessed: 17.07.2024).

liability in both AI and robotics, it is essential to analyze key categories, particularly the concept of robotics, its main features and characteristics, and its relationship to AI technologies.

The research methodology combines legal and general scientific approaches. Legal analysis is conducted through systemic, comparative and formal methods, as well as legal modeling. These are complemented by general scientific methods including analysis, synthesis, induction, and deduction. The study also incorporates a thorough analysis of relevant regulatory legal acts and scholarly literature on liability in robotics and artificial intelligence. A key component of the analysis is a comparison of differing definitions of core concepts in the field of robotics.

Navigating the regulatory landscape of robotics: Key categorical challenges

Russian Federation legislation does not define “robotics.” While the Concept for the Development of Regulation of Relations in the Field of Artificial Intelligence and Robotics Technologies for the Period up to 2024 mentions the term, it does not provide a detailed definition.

A definition of “robotics” and related concepts can be found in the Russian national standard GOST R 60.0.0.4 – 2023, “Robots and Robotic Devices³,” which aligns with the international standard ISO 8373:2021. According to this standard, robotics is the science and practice of designing, manufacturing, and applying robots. It is worth noting that the earlier standard (GOST R 60.0.0.4-2019) did not explicitly include robotic devices within the scope of “robotics.” This standard is an important reference for understanding the definition of “robotics” in the Russian context.

The GOST standard defines a *robot* as a programmable mechanism capable of performing tasks with a degree of autonomy. This implies that a robot can address assigned tasks based on its current state and external conditions without requiring constant human oversight. A robot’s primary function involves movement, object manipulation, or precise positioning, all under the control of a management system. Therefore, a robot’s actions are not fully independent or autonomous; they are governed by a specific mechanism or program. It is important to note that the applicability of these provisions to robots controlled by a self-learning neural networks requires further analysis.

According to the GOST standard, a robot is characterized by four key features:

1 Programmability: The ability to perform actions is determined by a program or code (created by humans or, increasingly, AI).

2 Executive Function: It serves to perform specific tasks.

3 Partial Autonomy: Full independence of action is not yet a feature of robots from a legislative perspective.

³ GOST R 60.0.0.4-2023/ISO 8373:2021. National Standard of the Russian Federation. Robots and Robotic Devices. Terms and Definitions (approved and enacted by Order of Rosstandart No. 255-st dated 20.04.2023). Available at: <https://files.stroyinf.ru/Data/800/80030.pdf> (accessed: 17.07.2024).

4 Purposeful Action: It is designed for movement, manipulation, or positioning to achieve specific goals.

Some researchers argue that the 2018 definition of a robot, which focuses on “movement,” “manipulation,” and “positioning” for task execution, is too narrow. They point out that a previous definition described a robot as “an executive mechanism ... possessing a certain degree of autonomy” (Begishev, 2021:57). The updated definition, however, broadens the category by including manipulation and positioning, potentially encompassing both mobile and static devices with robotic characteristics.

While the common perception of a robot is humanoid machine, the category includes diverse shapes and sizes. Examples of robot types include manipulators (movement function), mobile platforms (locomotion function), and wearable robots that augment human capabilities.

According to the GOST standard, it is crucial to differentiate between a *robot* and a *robotic device*. A robotic device is a mechanism based on robotic technologies but lacking all the properties of a complete robot. Examples include remotely controlled manipulators, tactile devices, working tools, or exoskeletons without actuators. The definition of a “robotic device” as simply lacking all features of a robot complicates its understanding. A robotic device can be understood as a mechanism that is part of a robot and is remotely controlled by a human. Therefore, “robotic device” and “robot” are related as part and whole.

Currently, numerous technical standards in the field of robotics apply to various types of robots and robotic devices.

Russia’s Roadmap for the development of the “end-to-end” digital technology “Robotics components and sensors”⁴, focuses on automated technical systems, sensor systems, and the interaction of technical systems with each other and with humans.

In foreign legislation, the regulation of artificial intelligence systems often takes precedence, with robotics sometimes not addressed separately. The primary legal category used is often simply “robot.” South Korea was an early leader in robotics legal regulation, having adopted the Act on the Promotion of Development and Dissemination of Intelligent Robots in 2008 [robopravo.ru] (Tikhomirov et al., 2018:8). A key element of such a robot is its ability to recognize its surrounding environment⁵.

The European Parliament Resolution of 20 October 2020⁶ defines robotics as technologies enabling automatically controlled, reprogrammable, multi-purpose

⁴ Roadmap for the development of the “end-to-end” digital technology “Robotics components and sensors.” Available: <https://digital.gov.ru/> (accessed: 15.07.2024).

⁵ Research Center for Robotics Regulation Issues. (2008). Act on the Promotion of Development and Dissemination of Intelligent Robots. Available: https://robopravo.ru/zakon_iuzhnoi_koriei_2008/ (accessed: 17.07.2024).

⁶ European Parliament Resolution of 20 October 2020 with recommendations to the Commission on a framework of ethical aspects of artificial intelligence, robotics and related technologies (2020/2012(INL)). Available: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020IP0275#ntr7-C_2021404EN.01006301-E0007 (accessed: 05.08.2024).

machines to perform actions in the physical world traditionally carried out by humans, potentially with the aid of AI or related technologies.

Australia's National Robotics Strategy⁷, adopted in May 2024, defines robots as machines with a degree of autonomy that can navigate their physical environment or manipulate objects. These robots possess sensitivity, mobility, energy, and autonomy.

Japan's Robot Strategy⁸ points out that the traditional definition of robots may be outdated due to advances in digitalization, cloud computing, network technologies, and artificial intelligence.

In China's 14th Five-Year Plan for the development of the robotics industry⁹, robots are referred to as the "crown jewel of the manufacturing industry." Their research, development, production, and application are viewed as key indicators of nation's scientific and technological innovation and advanced manufacturing capabilities.

Robots currently assist humans in hazardous or attention-intensive tasks, either independently or collaboratively. Robotics is a multidisciplinary field combining knowledge from various sciences. The primary categories in this field are "robot" and "robotic devices," which are correlated as a whole and its parts. The varying degrees of autonomy of these mechanisms influence the consequences of their actions.

For the purposes of legal responsibility, it is necessary to separately analyze situations where harm is caused by a robot or robotic device acting autonomously, versus situations where a human performs activities in collaboration with an autonomous robot or robotic device. These distinctions will be explored further.

Approaches to understanding the field of robotics in scientific literature

The ongoing lack of regulatory definitions for robotics and its key components has spurred scientific discussions on understanding and defining its categories. Some researchers define robotics as a branch of engineering and computer science (Gayatri & Nilima, 2024:223), while others view it as a scientific field focused on the design, production, and application of robots (Begishev, 2021:53–56). Establishing robotics as an independent field would require its own subject matter, legal regulation methods, and a comprehensive legal framework. However, currently, robotics is primarily governed by various standards, not only in Russia but also BRICS countries and globally. There are ongoing efforts to establish a unified categorical and conceptual framework across different countries.

⁷ National Robotics Strategy. Available: <https://www.industry.gov.au/publications/national-robotics-strategy> (accessed: 05.08.2024).

⁸ Japan's Robot Strategy. Available: https://www.kantei.go.jp/jp/singi/keizaisaisei/pdf/robot_honbun_150210EN.pdf (accessed: 15.07.2024).

⁹ 14th Five-Year Plan for the Development of the Robot Industry ("十四五"机器人产业规划) // Ministry of Industry and Information Technology (工业和信息化部). Available: https://wap.miit.gov.cn/zwgk/zcwj/wjfb/tz/art/2021/art_14c785d5a1124f75900363a0f45d9bbe.html (accessed: 05.08.2024).

Given that robotics encompasses a specific area of social relations centered on robots, it is important to analyze the characteristics that legal scholars attribute to robots.

The term “robot” is over a century old, with its first widespread use attributed to Karel Čapek’s 1920 play, *R.U.R.* However, the concept of robots as “artificial humans” dates back much further. Mechanisms with functionalities similar to modern robots existed even before our era, such as Philo of Byzantium’s statue capable of pouring wine¹⁰.

Among legal scholars, there is no universally accepted definition of “robot.” Some argue that a definitive technical definition is unlikely and instead propose focusing on legally significant characteristics (Bertolini, 2013:219). Some authors emphasize features like autonomy, software-based nature, practical functionality, and usefulness to humans (Baranov, 2018:42). However, the latter two features are considered contentious, as safety is a general requirement for all mechanisms, devices, goods, works, and services. Furthermore, the function of preventing robots from harming humans relies on their programmed code, which is inherently covered by the “specialized software” characteristic.

The key property differentiating a robot from software is its *cybernetic* nature (Begishev & Khasamova, 2022:27). The varying understandings of the term “robot” among scholars are partly due to differing cultural interpretations and attitudes toward humans and their interaction with the world. For example, German culture places humans at the center of the robot universe. Japanese robot culture emphasizes the unity of technological artifacts and humans. In Chinese, the concept of “robot” is expressed through words meaning “machine” and “human” (Lin, 2023).

The “sense-think-act” paradigm, prevalent in English-language literature, offers an interesting perspective applicable to both corporeal and incorporeal entities. This paradigm highlights: first, a sensor or input mechanism, which is necessary for stimulus and reaction; second, a control algorithm or system governing the reaction to the received data; and third, the ability to respond in a way that influences or becomes noticeable to the external world (Froomkin, 2016).

When considering robots and robotics in the context of legal liability, the focus should be on human interaction with new technologies and with others during the use of these technologies. The primary concern should be the social context in which robots may operate. While some argue that the meaning of “robot” may vary across contexts, and a single encompassing definition is necessary (Mamak, 2023:5), the category “robot” should be viewed as a collective concept, including robotic devices. This is similar to how “cybercrimes” encompasses all crimes committed using information technologies, despite their diversity.

¹⁰ Robotic history from ancient times to the present day. Habr. IT specialists community. Available at: <https://habr.com/ru/companies/inferit/articles/761622/> (accessed: 10.07.2024).

Furthermore, a robot can be of any shape and size, not necessarily resembling a human. As a programmable device, a robot possesses varying degrees of autonomy, and endowing it with artificial intelligence increases that autonomy.

Robotics and Artificial Intelligence

Artificial intelligence is considered the next stage in robotics development (Matveeva, 2022:228). Robots with AI, capable of autonomy, are classified as robots with AI systems (Rakhmatulina, Savina & Sviridova, 2019:210).

According to the National Strategy for the Development of Artificial Intelligence in the Russian Federation for the period up to 2030¹¹, artificial intelligence is a set of technological solutions that imitates human cognitive functions (including problem-solving without a predefined algorithm) and achieves results in specific tasks that are comparable to or exceed human intellectual activity.

Without delving into the complex topic of artificial intelligence, which requires separate study, it is important to note that, broadly speaking, artificial intelligence is software – a set of algorithms. A robot, on the other hand, is hardware – a device, or a “shell” that houses a specific program of actions. Essentially, a robot can be viewed as artificial intelligence with a physical body (Winfeld, 2012:8).

It is important to emphasize that artificial intelligence represents software capable of performing tasks that require cognitive abilities, such as image recognition, natural language processing, decision-making, and learning – extending beyond simple “movement” or “navigation” in space. Therefore, when discussing the “intellectual content” of a robot, we are primarily referring to algorithmized software, and only sometimes to true artificial intelligence.

Artificial intelligence and robotics are closely intertwined: they mutually benefit and contribute to each other’s development. AI technologies and algorithms expand the capabilities of robots, making them more intelligent, autonomous, and adaptable. Simultaneously, robots provide a physical platform for AI systems, enabling them to interact with the surrounding world (Oluwaseyi, 2024), through environmental processing, algorithms, and computer vision (Gobinath, et al., 2024:2).

As noted in the European Union Regulation on Artificial Intelligence, the ability to draw conclusions is the key characteristic of artificial intelligence¹².

Robotics, in contrast, focuses on creating physical devices capable of interacting with the environment, performing mechanical actions, moving, and manipulating objects. A robot may not possess advanced artificial intelligence and can be programmed to

¹¹ Decree of the President of the Russian Federation No. 490 dated October 10, 2019 On the Development of Artificial Intelligence in the Russian Federation. Collected Legislation of the Russian Federation. 2019, No. 41, Article 5700.

¹² Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act). EUR-Lex. Access to European Union Law. Available at: <https://eur-lex.europa.eu/eli/reg/2024/1689/oj> (accessed: 05.08.2024).

perform simple, repetitive tasks, such as assembling parts or moving objects along a predefined path. For instance, industrial robots are often programmed for specific tasks without intelligent behavior or learning capabilities, lacking the ability to make decisions based on data or adapt to changes.

AI technologies, such as virtual assistants, recommendation systems, and disease diagnosis software, exist solely in the digital realm without physical form. Their functionality does not rely on having a “physical body,” highlighting the distinction between artificial intelligence and robotics.

At the same time, the synergy between artificial intelligence and robotics enables the development of autonomous systems capable of independent operation in complex conditions. A robot’s autonomy is the characteristic that sets it apart from other machines. Machines fully controlled remotely by humans using telepresence technology, while visually similar to robots, are not considered robots in essence because they lack the ability to independently and autonomously respond to external stimuli and act accordingly (Froomkin, 2016:2).

In the context of legal responsibility, robots with artificial intelligence, capable of acting autonomously (either fully or partially) from human control, are of particular interest.

Legal Responsibility in the Field of Robotics

The issue of legal responsibility in robotics is a subject of ongoing debate. When considering the robot as the central category, various perspectives emerge regarding its legal status, which, in turn, impacts the identification of liability when a robot causes harm. Key approaches include viewing the robot as a thing, a slave, a source of increased danger, or equating it to animals or legal entities. Another concept considers the robot an “electronic person”, analogous to a legal entity (Klyuchko & Kluneyko, 2019:114-115). The first four approaches treat the robot as an object of law, while only the “electronic person” concept creates the fiction of the robot’s delictual capacity. However, like the liability of legal entities (e.g., in criminal law), holding an electronic person accountable remains problematic.

Furthermore, determining the legal capacity of any subject in civil legal relations requires addressing whether it possesses the will to perform legally significant actions (Mikhaleva & Shubina, 2019:30). Recognizing a robot as a subject of law makes sense if it allows for a more effective and balanced distribution of responsibility, and if the robot is capable of compensating for the harm it causes (Gadzhiev & Voynikanis, 2018:41). In other words, recognizing a robot’s ability to bear responsibility for “its actions” is tied to granting it corresponding rights and obligations.

While it is premature to speak of a robot’s complete autonomy, as its actions are ultimately controlled by humans (either remotely, from within the device (Vasiliev & Ibragimov, 2019:51), or through a pre-programmed mechanisms), technological progress is rapid. Under certain future conditions (global robotization, anthropomorphization and

intellectualization of robots, the emergence of software analogs of will, and technically insurmountable challenges of ethical programming) (Zhmurov, 2023:538), robot crime may become a real legal phenomenon. Therefore, a unified approach to legal responsibility in robotics, applicable in all situations, is needed.

Many researchers analyze responsibility in relation to artificial intelligence. The concept of “cyber-responsibility” for artificial intelligence and its units as legal objects is particularly interesting. This concept differs from traditional legal responsibility tied to specific range of legal subjects and is proposed to be formalized at the level of a federal constitutional law on artificial intelligence (Zyryanov, 2023). Currently, applying traditional legal responsibility models to AI systems is challenging. Considering the issues of responsibility in robotics addressed in this work, and the interconnectedness of robots and artificial intelligence, focusing on the responsibility of robots equipped with AI systems is reasonable.

Several approaches to liability of robots with artificial intelligence systems are analyzed in international academic literature, given their autonomy and independent decision-making capabilities (Girme, Bendale & Gharde, 2024:5214–5215).

- First, some propose the legal recognition of AI-equipped robots as legal persons, granting them delictual liability (Kurki, 2019:175–188).
- Second, the concept of strict liability is considered, where the owner, developer, or operator of the AI system is automatically responsible for any damage caused by the robot, regardless of intent (Wendehorst, 2020:150–180).
- Third, as an alternative, a negligence standard for AI-equipped robots is discussed, holding developers, owners, or operators liable if they fail to take reasonable precautions to prevent harm (Conklin, 2020).
- Fourth, some propose extending product liability laws to AI-equipped robots, treating them as products subject to defects or increased risks (Chandler, Behrendt & Bakier, 2023).
- Fifth, third parties (natural or legal persons) may be held liable if AI-equipped robots are under their control (Renieris et al., 2023).

Therefore, in the field of robotics, two main scenarios can be distinguished: harm caused by a *robotic device* and harm caused by a *robot*. In cases involving robotic devices, identifying the liable party and establishing accountability is relatively straightforward. As mentioned earlier, these devices do not possess all the characteristics of a robot and are always under human control. Depending on the specific circumstances, responsibility typically fall on: the developer of the algorithm or program, the operator performing technical maintenance, the user who violated operating rules and caused harm, or a third party, who unlawfully takes control of the device and causes harm.

When harm is caused by a *robot*, determining liability largely depends on the robot’s degree of autonomy and the independence of its “decision-making” in specific circumstances. Legal responsibility in robotics can be differentiated based on the robot’s autonomy (complete or partial) and the type of activity it performs (jointly with a human or independently).

Any violation of the law results from the actions of a subject capable of directing and controlling their will and behavior, reflecting on and being aware of their actions, and being able to take responsibility for the resulting negative consequences. At the current stage of technological development, even in robots equipped with artificial intelligence, it is crucial to remember that the system “learns” based on input data provided by its developer. Algorithms are written by humans. Even if the algorithm is generated by another program, the data’s origin is not independent. If the data is obtained from specific sources (according to its code), the artificial intelligence draws conclusions based on that data (e.g., using statistical data on individuals who commit crimes to identify unreliable for employment candidates). Therefore, the nature of society shapes the nature of artificial intelligence, and at this stage, humans bear responsibility for their deliberate actions.

Establishing clear rules for regulating and determining permissible and impermissible actions by developers and all entities involved in creating a specific mechanism is essential. A robot functionality, beyond advanced artificial intelligence, also depends on the proper operation of various sensors, scanners, and other components that allow it to assess its environment.

Conclusion

This study characterized robotics from a legal perspective, particularly concerning legal responsibility. Robotics is a rapidly evolving field encompassing the design, production, and application of robots and robotic devices across human activities. The lack of unified definitions and regulatory approaches in this area presents significant challenges for developing legal norms that can adequately address the issues arising from the integration of robotic systems and artificial intelligence.

The analysis highlighted the distinction between robots and artificial intelligence as crucial for creating a legal framework. Robotics involves both software (artificial intelligence) and hardware, necessitating specific legal regulation. The use of AI in robotic systems raises complex issues in determining liability when harm occurs, requiring a differentiated approach that considers the degree of autonomy and the nature of human-robot interaction.

The synergy of artificial intelligence and robotics enables the creation of autonomous systems capable of independent action in complex conditions. A robot’s autonomy is its defining characteristic. In terms of legal responsibility, AI-equipped robots acting partially or fully independently are of particular interest. However, at this stage of technological development, the “behavior” of AI remains governed by developers or users.

Legal responsibility in robotics can be differentiated based on the robot’s degree of autonomy and the type of activity it performs. Establishing clear regulatory guidelines and defining permissible actions for all parties involved in creating a specific mechanism throughout the AI’s “life cycle” is paramount. The study also examined international regulations in robotics and AI to identify trends and prospects for domestic legislation.

The research indicates that effective legal regulation requires clear definitions and classifications alongside flexible legal models that adapt to rapid technological advancements. This study did not cover all aspects of legal responsibility in robotics and artificial intelligence. Further independent research into private and public law regulatory mechanisms is promising, and will allow, with an understanding of the fundamental categories of this field, the formulation of a unified concept of legal responsibility in robotics.

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