Legal dimension of responsible robotics

This report is based on Robotics4EU research, as well as second-hand data.

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Table of Abbreviations and Acronyms

Abbreviation	Abbreviation
AI	Artificial Intelligence
AIA	Artificial Intelligence Act
EC	European Commission
eIDAS	Regulation (EU) on electronic identification and trust services for electronic transactions in the internal market
EU	European Union
EU OSHA	European Agency for Safety and Health at Work
GDPR	General Data Protection Regulation
IEC	International Electrotechnical Commission
IP	Intellectual Property
ISO	International Standards Organisation
RAILS	Robotics & AI Law Society in Germany

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017283

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1. Introduction

This report provides an overview of the legal aspects a robotics industry should consider from a non-technological point of view. Our goal is to provide guidance on key considerations for robotics designers, manufacturers, integrators, and deployers, addressing the question of what factors should be considered to ensure the successful launch of a compliant AI-driven robot into the market.

The report aims to serve as a broad overview and general compilation of relevant regulations, resources and considerations for a robotics designer, developer or deployer to consider. The references provided aim to guide the reader in the right direction for further investigation related to the issue at hand.

The following document focuses on the main legal aspects related to liability and safety, including current discussions on that matter in policymaking and academia, IP protection and privacy. Further, the report outlines the main organisations and useful resources that help to dig deeper into the topic. Lastly, the gaps and challenges are discussed concerning the EU and national-level legal landscape and its development.

1.1. About Robotics4EU

The Robotics4EU (2021-2024) project aims to ensure a more widespread adoption of (AI-based) robots in healthcare, agri-food, inspection and maintenance of infrastructure, and agile production. This goal is reached through the implementation of the responsible robotics principles among the robotics community that results in societal acceptance of robotics solutions in all application areas.

Robotics4EU will create and empower the EU-wide responsible robotics community representing robotics innovators from companies and academia in the mentioned fields, but also citizens/users and policy/decision makers by raising awareness about non-technological aspects of robotics (ethics, legal, socioeconomic, data, privacy, gender), organising community building and co-creation events that bring together the robotics community and citizens, advocating for responsible robotics among all stakeholder groups, developing a responsible robotics maturity assessment model (a compass for responsible robots) and bringing the project results to relevant standardization bodies.

Robotics4EU implemented the following set of activities:

1. assessing the needs and developing a responsible robotics maturity assessment model that is a practical tool for the robotics developers and helps them to strategically plan and the uptake of the legal, societal and ethical aspects of robotics;
2. empowering the robotics community by organising capacity building events in healthcare, agri-food, agile production and infrastructure;
3. ensuring citizen acceptance of robotics (via citizen consultations) and assessing robotics ideas and applications provided by the industry with end-users (via online consultation and co-creation workshops);
4. reaching out to the policy makers by compiling a responsible robotics advocacy report, organising a high-level policy debate and transferring the results to the standardization bodies.[1]

1.2. Responsible Robotics

In the context of the Robotics4EU project, responsible robotics refers to robots that consider the values and expectations of the society that needs them. This concept plays an important role in Robotics4EU as safer, more considerate, durable, affordable, and practical robotics solutions – responsible robots – will be the central component in avoiding, limiting, and/or removing non-tech barriers that are currently in the way of the widespread adoption of robots.

The project employs various methods to promote responsible robotics in different fields of robotics, including but not limited to: citizen involvement in robotics development, policy recommendations & advocacy plans, and also the creation of a maturity assessment model named Responsible Robotics Compass (RoboCompass).

This tool, developed by Robotics4EU, will help to assess and determine the maturity of non-technological aspects of a robot in development, regardless of its area of application. It focuses on Legal, Data, Socioeconomic, Human experience, and Sustainability markers, considering how the technology is developed, which internal and external processes are in place, how it interacts with its user, and other relevant risks and risk mitigation measures.

It is a tool that helps companies to 1) identify their level of development along Legal, Data, Socioeconomic, Human experience, and Sustainability dimensions by assessing risks and mitigation steps, 2) receive recommendations and tools on how to improve, 3) track progress over time. This ensures trust and societal acceptance – all of which are expected to safely and widely adopt robots among their intended users.

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[1] Project information from CORDIS: https://cordis.europa.eu/project/id/101017283

In support of developing the maturity assessment tool in discussion – Robotics4EU executed a wide range of research and engagement activities (incl. stakeholder needs' analysis, interviews, surveys, co-creation workshops and policy workshops) to collect information on current issues as well as solutions regarding the socio-economic, ethical, data, privacy, and legal matters from policy makers and the robotics community (both the producers & consumers).

These insights are gathered into area-specific introductive reports such as the one at hand that present knowledge on the matter as of 2023, including trends and benefits within this area of robotics; describe the common non-technological challenges and barriers, including issues and worries related to socio-economics, ethics, privacy and legal matters; (3) and highlight relevant resources and initiatives currently available to the robotics community on the topic.

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2. Liability | Focus on Safety

AI-empowered robots are increasingly capable of making decisions autonomously. When their actions lead to harm, the question arises of how to ascribe liability - whether their human operators, designers, or the machines themselves should be held accountable. Also, is the accident the result of an error arising from the manufacturer of the robotics hardware, software, or artificial intelligence architecture? The liability questions are one of the most pressing in the robotics regulation.

The first step to approach this question is to focus on the safety standards that could prevent harm and ensure the robotics solutions' safe deployment. We provide an overview of the main horizontal regulation related to safety. Vertical regulation, focusing on the sector of application, will not be investigated here, as the application of robotics spans various sectors, from medicine to space. The summary of related horizontal safety standards and regulations is provided below:

International Standards (ISO)

The comprehensive list of safety and regulation requirements can be found under the ISO / TC 299, which has the goal of developing high-quality standards for the safety of industrial robots and service robots. The main standards are:

- ISO 13849-1:2023 Safety of machinery
- ISO 26262-1:2018 Road vehicles – Functional safety
- ISO 10218-1:2011 and ISO 10218-2:2011 Safety requirements for industrial robots
- ISO 13482:2014 Safety requirements for personal care robots
- ISO/TS 15066:2016 Safety requirements for collaborative industrial robot systems and the work environment

International Electrotechnical Commission (IEC)

The IEC publishes international standards for electrical and electronic products, including robots. These standards cover safety aspects related to electrical systems and can be crucial for ensuring robot safety. One of the main standards: IEC 61508-1:2010 - Functional safety of electrical/electronic/programmable electronic safety-related systems

EU level Directives / Regulation

The main regulation on Robotics in the EU is the Machinery Directive 2006/42/EC. This directive covers essential safety and health requirements, tackling:

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- Risk of loss of machine control;
- Risk of safety function failure;
- Reasonable foreseeable use[2].

Machinery Directive shall be interpreted only with the interplay of harmonised standards defining safe machinery design (EN ISO 12100:2010 Safety of machinery – General principles for design – Risk assessment and risk reduction). This standard specifies basic terminology, principles and a methodology for achieving safety in the design of machinery. It specifies principles of risk assessment and risk reduction to help designers in achieving this objective[3]. Following the standard, designers have to:

- Determine the limits of the machinery
- Identify the hazards
- Estimate the risk for each identified hazard
- Evaluate the risk and take decisions about the need for risk reduction
- Eliminate the hazard or reduce the risk associated with the hazard.

However, the new Machinery Regulation (Regulation (EU) 2023/1230) published on 29th June 2023 replaces the Directive and will enter into force in January 2027.

Beyond the Machinery Directive, other relevant EU directives include:

Directive 2014/53/EU of 16.04.2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment
Directive 2001/95/EC of 3.12. 2001 on general product safety
Product Liability Directive 85/577
Digital Content Directive 2019/770
Sale of Goods Directive 2019/771

The upcoming Artificial Intelligence Act holds significant importance for AI-powered robotics, as it establishes a comprehensive regulatory framework within the European Union. By defining rules and obligations for developing and deploying artificial intelligence, the Act aims to ensure ethical and responsible AI practices, including transparency, risk assessments, and the prohibition of specific AI systems like predictive policing. The regulatory clarity provided by the AI Act provides a structured approach that balances technological advancements with ethical considerations, contributing to the responsible and safe development of AI-powered robotics in the EU. After adoption by both Parliament and the Council, the AI Act will enter into force in 2026 (though some provisions apply).

The overview of the new regulation is covered in Section IV, "Upcoming regulation"

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[2] "I, Robot (AI-based robots under the AIA)" by Vera Lúcia Raposo, NOVA School of Law; NOVA University of Lisbon (Portugal). Presentation at Robotics4EU workshop "Regulating AI: The impact of the EU AI ACT on robotics for agile production"
[3] ISO 12100:2010

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National Regulation

Different countries have varying regulations governing the safety of robots, especially considering the application areas, such as healthcare, transportation, defence, etc. In addition, national product liability laws shall be followed and consulted, in connection to the industry-specific regulation and safety standards. For example, the robots in health care must comply with healthcare regulations.

Even though it covers the central part of the current regulation on robotics, safety is not a definite issue in the liability discussions. With AI-driven questions such as explainability and autonomous decision-making, the attribution of liability is a core issue. The following discussions are happening to solve the mentioned issue: (1) The introduction of a legal status of a robot and (2) Liability insurance schemes.

2.1. Defining the legal status of a robot

The question of liability for damage caused by robots has sparked considerable legal debate. In 2017, the European Parliament recommended exploring a specific legal status for robots, potentially categorizing the most advanced autonomous robots as "electronic persons" responsible for their actions[4]. However, this idea was met with mixed reactions, with some arguing that it could lead to inappropriate implications, such as either granting robots human rights or still requiring human representation.

While some experts propose a domain-specific technical-legal approach to determine the legal status of robots[5], others call for a broader discussion that redefines ontological and moral categories, considering the robot in moral terms, not as other person but a different kind of other, paving the way for the discussion on a new category of agent[6].

However, the debate on whether to attribute legal or moral subjectivity to machines is complex, it will most likely will resurface in the legal discussions and will have implications for the future landscape of robotics and AI.

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[4] European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics
[5] https://www.iris.sssup.it/retrieve/614bfd0e-c332-41bc-9dfd-636e77762 da2/Robot%20and%20AI%20as%20Legal%20Subjects.pdf
[6] Gunkel, D.J. The other question: can and should robots have rights?. Ethics Inf Technol 20, 87–99 (2018). https://doi.org/10.1007/s10676-017-9442-4

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2.2. Liability insurence schemes

The discussed Civil law liability recommendation proposes further development in defining obligatory insurance schemes, „which could be based on the obligation of the producer to take out insurance for the autonomous robots it produces"[7].

While there are no obligatory insurance schemes, private insurance companies are stepping in to propose insurance schemes for the robotics engineers or companies deploying robots and aiming to insure against third-party liability claims focused on injuries and property damage. The insurance services cover the risks arising from the robotics compliance specifics, alongside the General and Products Liability Insurance and providing risk management services.

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[7] European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics: https://www.europarl.europa.eu/doceo/document/TA-8-2017-0051_EN.html#title2

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3. IP Protection

AI-powered robots are increasingly capable of producing innovative problem-solving solutions, leading to intangible outputs that could potentially be classified as intellectual property (IP). This development raises questions regarding the boundaries of the existing IP framework. Should autonomously created art, processes, or other assets by robots be eligible for IP protection, and if so, what would be the appropriate method for conferring such protection? Additionally, the issue of IP ownership becomes a central concern. Should IP rights be ascribed to the human creator (e.g., the robot engineer), the robot's user, or even the robot itself?

The IP protection of the work generated by AI-powered robotics relates closely to the question of copyrights and patents in regard to AI-generated art or inventions.

Considering the current state of granting copyrights or patents to AI-generated art or inventions, the European Union (EU), for instance, does not permit AI entities to claim such rights. Instead, the eligibility of copyrights or patent granting is tied to the human creator behind the artwork or invention.

This ongoing discourse surrounding the rights associated with IP generated by AI systems (or, by extension, AI-powered robotics) brings us back to the fundamental question of the legal status of robots and the extent of their rights. A conversation if the AI-powered system can be listed as an inventor, and how the legal system can adequately safeguard the inventions of AI-powered robotics still necessitates further discussion and exploration. There are deliberations on the possibility of the owner/user of AI system being listed as an inventor[8]. However, currently there is no definitive resolution to this issue, and only a human inventor can be listed to acquire a patent.

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[8] https://www.epo.org/en/boards-of-appeal/decisions/j200008eu1

4. Privacy Regulation

The privacy, cyber security and data issues are well investigated in the AI scene, with the discussions and regulations on privacy protection, bias and fairness, and, accountability and explainability being discussed in the community. However, beyond the AI related issues that are also crucial in AI-driven robotics, the materiality of robotics brings additional challenges, such as: autonomous data gathering in private spaces, risk of surveillance, risk of data breaches and malicious attacks.

Alongside safety requirements, guiding the safe design, development and deployment of robotics, additional regulatory frameworks are functioning in the EU. As an overview of this regulatory framework, Robotics4EU have compiled a report on Privacy and Cyber Security that provides resources on the organisations, checklists, references and main legal documents that relate to the data and privacy. From the legal perspective, the main legal documents in the EU are:

- General Data Protection Regulation (GDPR): data privacy and protection law enacted in the European Union to safeguard individuals' personal data and regulate its processing by organisations.

- Cybersecurity Act: The Cybersecurity Act, adopted in 2019, aims to strengthen the EU's cybersecurity framework.

- eIDAS Regulation: eIDAS is a key enabler for secure cross-border transactions.

The report also covers societal acceptance and citizen expectations that go beyond regulatory compliance. Privacy and data security issues have been among the most important issues for citizens and have an impact on how they view robots and robotic technology in general:

"The most pressing issues relate to the misuse and vulnerability of data and worries about what kind of data as well as how much data the robots we might encounter in our daily lives collect and share."

To ensure the robot's compliance with privacy and cybersecurity regulatory framework and focus on a user-centric approach, it is essential to establish a robust approach to privacy and cybersecurity issues early in the robot's life-cycle. This proactive approach is crucial to prevent potential regulatory issues that may arise and to build trust with users, as addressing privacy concerns at the outset helps mitigate risks and ensures the responsible and secure integration of robotics technology into society, ensuring that the data collection, management and storage are in accordance with the citizen's expectations.

5. Upcoming Regulation

Machinery Regulation. Replacing Machinery Directive, the main goal of the regulation is to lay down **"health and safety requirements** for the design and construction of machinery, related products [...] ensuring a high level of protection of the health and safety of persons, in particular consumers and professional users."[9] The regulation provides direct application throughout the EU with no requirement for the transposition to national law. Key features of the Machinery regulation[10] are:

- Rules and procedures are applicable not only to newly manufactured machines but also to the machines that have undergone "substantial modifications";

- Regulation encompasses digital components, including software;

- Established third-party conformity assessment[11] of **software using machine learning approaches**:
  - If the software is a safety component for a robot
  - If the system with self-evolving behaviour ensures safety functions

- **Presumption of conformity** of products with harmonized standards (co-regulation approach: EU Regulation relying on the private standards)

Machinery regulation foresees two stages of product compliance:

- **2nd stage | Obligation to report malfunctions.**

- **1st stage | CE marking of conformity.** Before the product reaches the market, it will have to undergo a third-party conformity assessment.

Artificial Intelligence Act, AIA. On December 9, 2023, the European Commission, Council, and Parliament agreed on the AI Act, a significant legislation regulating artificial intelligence in the EU. The finalised text awaits formal adoption by both Parliament and the Council, followed by publication in the official journal to become binding. While most obligations will take effect within two years of adoption, the ban on prohibited AI systems, like predictive policing, becomes enforceable six months after passage. Additionally, provisions concerning General Purpose AI (GPAI) will be applicable after 12 months, with the entire AI Act expected to be fully enforceable in 2026.

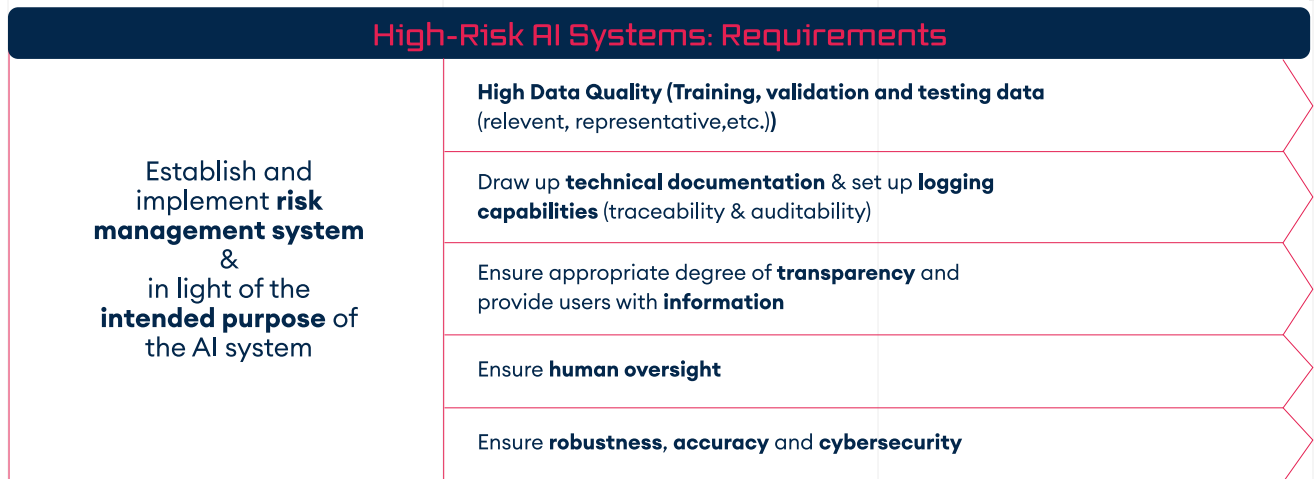[9] Machinery Regulation EUR-Lex - 32023R1230 - EN - EUR-Lex (europa.eu)

[10] "I, Robot (AI-based robots under the AIA)" by Vera Lúcia Raposo, NOVA School of Law; NOVA University of Lisbon (Portugal). Presentation at Robotics4EU workshop "Regulating AI: The impact of the EU AI ACT on robotics for agile production"

[11] Machinery Directive was based on the self-assessment

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The AIA is based on the risk-assessment model. The applicable legal framework is defined based on the category of risk:

- **Unacceptable risk AI:** banned

- **High-risk AI:** allowed under strict standards. Risk is defined as to the health, safety or fundamental rights of natural persons. AI-driver robots fall under this category.

- **Low-risk AI:** limited restrictions. Based on voluntary creation of codes of conduct and transparency obligations.

The AI Act (Annex II) defined the requirement for a third-party assessment. AI-driven robotics fall under the Annex II and are subject to High-Risk AI system requirements[12]:

High-Risk AI Systems: Requirements	
Establish and implement **risk management system** & in light of the **intended purpose** of the AI system	**High Data Quality (Training, validation and testing data** (relevent, representative,etc.)**)**
	Draw up **technical documentation** & set up **logging capabilities** (traceability & auditability)
	Ensure appropriate degree of **transparency** and provide users with **information**
	Ensure **human oversight**
	Ensure **robustness, accuracy** and **cybersecurity**

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[12] "I, Robot (AI-based robots under the AIA)" by Vera Lúcia Raposo, NOVA School of Law; NOVA University of Lisbon (Portugal). Presentation at Robotics4EU workshop "Regulating AI: The impact of the EU AI ACT on robotics for agile production"

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6. References to External Resources:

- **SIENNA project,** in the "Analysis of the legal and human rights requirements for AI and robotics in and outside the EU" provides a comprehensive list of legal issues on robotics and AI and lists the legislative texts and documents on the AI and Robotics by:

  > International Organisations (United Nations; World Trade Organization; Council of Europe);

  > European Union, on the level of Treaties/Charters, Regulations, Directives, Resolutions and Communications, as well as Proposals.

  Also, the project shared the recommendations on enhancement of the existing legal frameworks for genomics, human enhancement and AI and robotics.

- EU-funded **project COVR** published a paper "Validating Safety in Human–Robot Collaboration: Standards and New Perspectives", which discusses a cross-domain approach towards the definition of step-by-step validation procedures for collaborative robotic applications. Also, a toolkit for coboteers to determine how to test and validate safety for their collaborative robot application or component is available online.

Organizations:

- **European Agency for Safety and Health at Work (EU OSHA)**
  EU OSHA promotes safe and healthy working conditions by providing information, research, and guidance to employers, workers, and policymakers across Europe.

- **Robotics & AI Law Society (RAILS) in Germany**
  RAILS is working on a legal framework that facilitates technical developments, avoids discrimination, ensures equal treatment and transparency, protects fundamental democratic principles and ensures that all parties involved are adequately participating in the economic results of digitalization.

7. Gaps, Challenges and Citiziens' Concerns

Robotics4EU conducts comprehensive citizen, end-user and robotics community engagement activities. Citizen Consultations, conducted with 740 respondents, were designed to understand the attitudes and concerns of the general public towards the more prevalent adoption of robotics. Alongside citizen engagement, an integral part of the project is robotics community engagement activities, aimed at 1) discussing the importance of responsible robotics principles in design, development and deployment; 2) collecting the needs and issues in the industry that curb the advancement towards the adoption of responsible robotics. The following section will review both the citizen views that are related to the legal landscape and the industry's identified gaps and challenges.

7.1. Harmonisation of Regulation

In general, the existing EU legal framework is sufficient to cover the challenges posed by AI-driven robotics, tackling human rights, data protection, product liability and safety. The development of the regulation is on a solid track of a coherent strategy, which is based on the devotion to innovation support and competitiveness. However, the gaps in legislation on the EU / National level should be taken into account.
The Robotics4EU project conducted community analysis, which gathered responses from 1232 representatives (robotics community, policymakers, and other stakeholders). The analysis presents the most crucial legal issues identified by the respondents (see Figure 1).

Among the legal issues listed below, what do you think are the 4 most impactful?

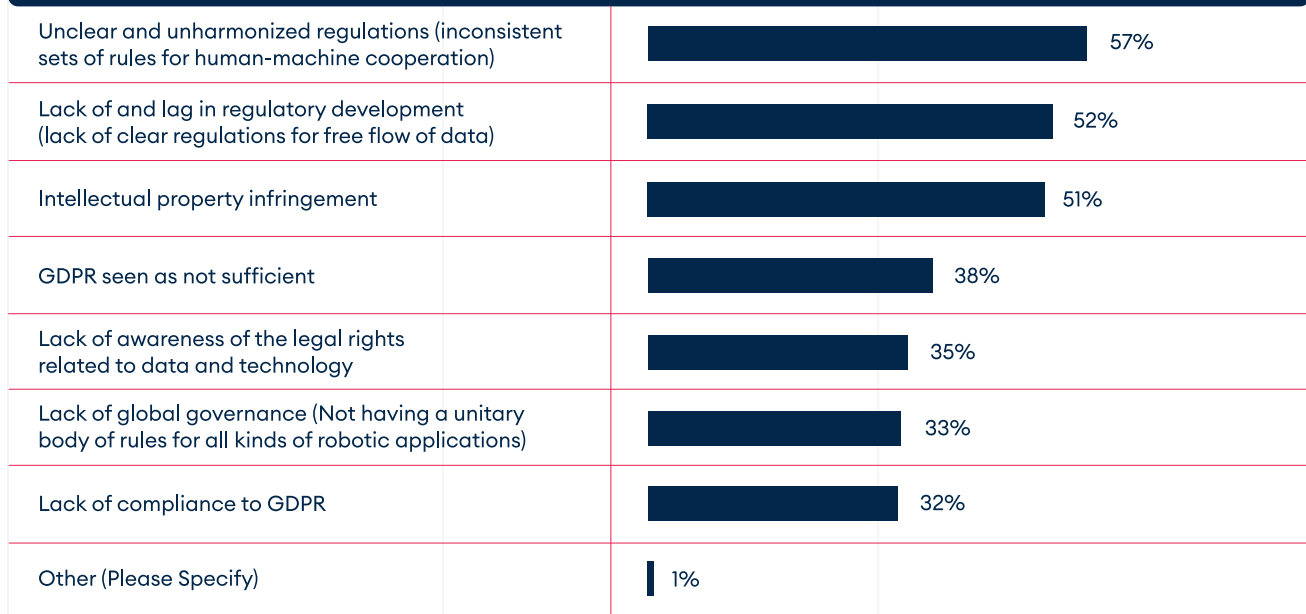| Issue	Percentage
Unclear and unharmonized regulations (inconsistent sets of rules for human-machine cooperation)	57%
Lack of and lag in regulatory development (lack of clear regulations for free flow of data)	52%
Intellectual property infringement	51%
GDPR seen as not sufficient	38%
Lack of awareness of the legal rights related to data and technology	35%
Lack of global governance (Not having a unitary body of rules for all kinds of robotic applications)	33%
Lack of compliance to GDPR	32%
Other (Please Specify)	1%

Figure 1. Legal issues identified by the Robotics4EU Needs Analysis

The most selected issue among legal issues was "Unclear and unharmonised regulations" (57% of respondents). The fragmentation in regulation arises in several dimensions. First, the fragmentation is due to the nature of robotics, an overarching term of very different application solutions with various risks and potential solutions[13]. The regulations for the different application fields of robotics might seem inconsistent and unclear, with some sectors advancing rapidly in the adoption of robotics and regulatory advancements (i.e., automotive sector) and some lagging with the regulatory advances due to the specifics and nuances of the sector (i.e., inspection and maintenance, healthcare).

As legal powers are first exercised by the EU Member states, the second dimension of fragmentation is due to the varying regulation landscapes in the EU Member States. The fragmentation in regulation curbs the realisation of a "single market" and calls for an overarching and harmonised approach across the European Union. The mentioned Sienna report calls for the establishment of common governance standards to address AI and robotics risks, related to ethical and human rights risks.[14]

[13] Konrad Siemaszko, Rowena Rodrigues, & Santa Slokenberga. (2020). SIENNA D5.6: Recommendations for the enhancement of the existing legal frameworks for genomics, human enhancement, and AI and robotics (V2.0). Zenodo. https://doi.org/10.5281/zenodo.4121082

[14] Rowena Rodrigues, Konrad Siemaszko, & Zuzanna Warso. (2019). SIENNA D4.2: Analysis of the legal and human rights requirements for AI and robotics in and outside the EU (V2.0). Zenodo. https://doi.org/10.5281/zenodo.4066812 p. 70

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7.2. Legal Frameworks for Testing

Through the robotics community engagements via online workshops and expert consultations, recurring issues, especially in the fields where robotics are deployed in the public spheres, the lack of regulatory framework for testing was emphasised. The gap was identified in regulation and safety standards being too restrictive in allowing robotic solutions testing in public spaces. The need for regulatory sandboxes to test robotics safely and effectively in the real-world environment was also emphasised by the Sienna report. [15]

7.3. General Awareness of the Legal Landscape

The mentioned Robotics4EU Needs Analysis[16] also questioned the respondents' awareness regarding regulations to assess the level of familiarity of the robotics community members with the current regulations. 37% of the respondents self-assessed themselves as being fully aware of applying regulations, 50% as being partially aware and 13% as not being aware of the regulations. As could be expected, the awareness percentages drop if the respondents who are not affiliated with robotics are considered: only 14% of them declare being fully aware of the applicable regulations. These results could be interpreted as a call for more education on the functioning of regulations and for a more transparent and accessible system.[17]

7.4. Citizens' Views on the Responsibility

One of the questions in the Citizen Consultations[18] activity inquired „Who should be responsible for ensuring that robots are socially and ethically acceptable?" (see Figure 2). Even though the question does not directly cover the liability issue, it paints a picture of the citizens' view on the responsibility of robotics' development in general. The most commonly chosen answer was "Actors responsible for developing the software and technology". The second most popular answer is "International institutions such as the EU". Important to note that the developers of the robot as a product are mentioned in the third place. The responses suggest that citizens anticipate robust self-regulation within the robotics field, both in research and industry, concerning adherence to social and ethical norms. Nevertheless, there is also an emphasis on the role of international institutions and national governments.

[15] Rowena Rodrigues, Konrad Siemaszko, & Zuzanna Warso. (2019). SIENNA D4.2: Analysis of the legal and human rights requirements for AI and robotics in and outside the EU (V2.0). Zenodo. https://doi.org/10.5281/zenodo.4066812 p. 73
[16] https://www.robotics4eu.eu/publications/deliverable-1-2-robotics-community-citizens-and-policy-makers-needs-analyses/
[17] Reference: citizen consultations
[18] Ibid

Who is Responsible?

When the citizens were asked about who should be responsible for robots being socially and ethically acceptable, they primarily point to the actors developing the technology - that is, the software and the technology that will be used in the robots.
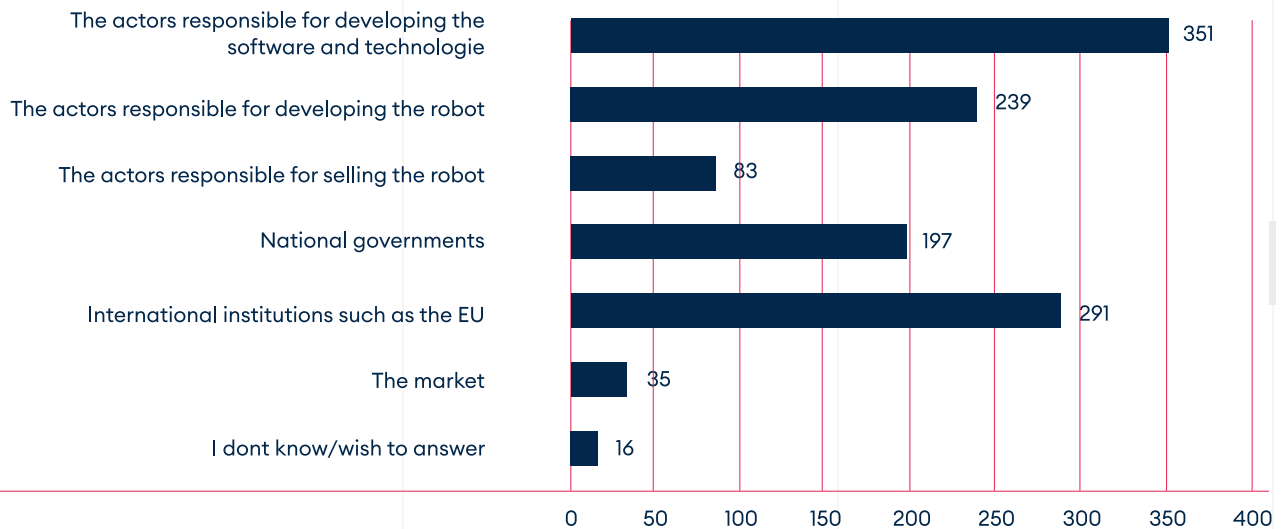

Figure 2. Who should be responsible for ensuring that robots are socially and ethically acceptable?

It's crucial to recognize that robotics's ethical and social acceptance cannot be solely attributed to legal frameworks, particularly hard law. Therefore, the commitment to upholding social and ethical norms should extend beyond mere compliance with legal requirements. For instance, the issue of liability isn't solely contingent on adhering to regulations; organisations engaged in robotics research, development, and deployment must establish internal protocols, rules, and environments that align with these ethical and social imperatives.

In essence, while legal frameworks play a significant role in regulating robotics, cultivating a culture that values ethical and social considerations within organisations is equally essential to ensure responsible and socially accepted robotics practices.

The rest of the Robotics4EU project activities and reports prepared in the topics discussed in the project can guide how to ensure that robotics designed, developed and deployed, from the beginning, aim to align with societal expectations and ethical norms.

8. Conclusions

The regulatory landscape of robotics is evolving to encompass the developments in the field and the integration of AI solutions into machinery. The main focus of the legislation revolves around safety and liability. The upcoming Machinery Regulation and Artificial Intelligence Act will define stricter rules on health safety and ensure fundamental human rights to natural persons. Striking a balance between fostering innovation and ensuring responsible use will be a crucial challenge in shaping the future of robotics regulation, with the potential to impact the sector's growth, competitiveness, and societal impact.

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