"Meet Me Halfway," Said the Robot to the Regulation

Linking Ex-Ante Technology Impact Assessments to Legislative Ex-Post Evaluations via Shared Data Repositories for Robot Governance

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Abstract. Current legislation may apply to new developments. Even so, these developments may raise new challenges that call into question the applicability of this legislation. This paper explains what happens at this moment for new robot technologies. We argue that there is no formal communication process between robot developers and regulators from which policies could learn. To bridge this gap, we propose a model that links technology impact assessments to legislative ex-post evaluations via shared data repositories.

Keywords: Iteration · Learning process · Robot technology · Governance · Robot impact assessment · Ex-post legislative evaluation · Shared data repository · Evidence-based policy

1 Introduction

New technologies represent the progress of science. They offer possibilities since then unimaginable, they solve problems in an innovative, better, and most of the times faster way. Technology represents hope and change; a change that may even disrupt the way we conceive reality. Sometimes they put in question and challenge existing norms, breathing into existence the need for legal change. However, while the pace of technology dramatically accelerates, legal responsiveness does not always follow as a consequent step [1].

Our legal system works in a *horror vacui* or, preferably, *horror lacunae* mode. We regulate everything since we are conceived, until we die – even after. We regulate legal entities and nature; we avoid the existence of legal lacunas. The regulation provides legal certainty: we know what boundaries have to be respected, and what are the consequences for violations. In light of new development, there might be already many

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laws that apply to a particular thing. Cloud robotics, for instance, is not regulated *per se*, but a mosaic of existing regulations that range from the Directive 2001/95/EC on general product safety and Directive 85/374/EEC on liability for defective products, to the Machinery Directive 2006/42/EC or including the General Data Protection Regulation 2016/679, may apply to it [2]. So it is normal that, before developing a new law, regulators make sure the legal system already responds to any associated issue.

Still, after a thorough legal assessment, regulators and scholars might find out that technological developments call into question the existing law. For instance, cloud robotics is a product with interconnected services, a hybrid product-service category that challenges the application of the current legal framework [2, 3]. It is in this moment when developers, or even regulators, might seek different responses with regards to arisen challenges of the technology.

This paper explains this process applied to robot technology. The reader might wonder why robot technology, if this may apply to any technology. And s/he might be right. This article primarily highlights the lack of a communication process between technology developers and regulators or policymakers. We focus our attention on robot technology because its disruptive nature challenges many areas of law, including taxation [4], the concept of *person* [5], and fundamental rights [6], but we acknowledge that other advancements might well be in a similar situation [7, 8].

Explained in length in [9], this short paper sets the scene with an example of an outdoor garbage service robot that did not find room in the road legislation in Sect. 2. We highlight the need for formalizing these communication processes between developers and regulators in Sect. 3. There is where we propose our iterative model for robot governance. The last section includes the conclusions and future work.

2 Robots and Regulation Meeting Halfway

Urban hygiene is not always an easy task. Waste removal vehicles may find difficult accessing narrow streets in old towns, architectural barriers may hinder waste disposal for the elderly, and other aspects like air quality might not be monitored. Aimed at solving these problems, the European Union (EU) funded the DustBot project in 2006.[1] The project included a door-to-door garbage collector robot named *DusCart*, and *DustClean*, a robot meant to brush and vacuum the streets, and equipped with sensors to monitor pollution levels (*see* Fig. 1).

The researchers reported positive results concerning the technology developed, the usability of the service provided and user acceptance [10]. Nonetheless, the researchers realized that safety standards and certifications were missing. While advances in private setting could fill that gap soon, they became aware of the fact that their robot did not fit any of the legal categories of "vehicle" recognized in public laws in any case [10].

Indeed, the robots were autonomous and, according to the Art. 8 of the 1968 Vienna Convention on Road Traffic, each moving vehicle including animals or atypical vehicles, need a driver. In light of allocation of responsibility uncertainties in case of

[1] Cfr.: http://dustbot.org/ last accessed November 9, 2018.

Fig. 1. DustCart from the DustBot project and its testing zone

damage, the researchers had to ask the municipality special permission to test the robots. The municipality of Peccioli allowed the testing site under certain conditions [11]. From the technical side, (1) the technology used was state-of-the-art; (2) ambient intelligence was used; (3) the researchers remotely supervised the operation of the robot. From the legal side, (1) three non-pedestrian-area streets and a square restricted the operation of the robot; (2) the testing site included a yellow-lane drawn in the street to indicate the robot path; (3) the robot was obliged to stop three times during its path to allow traffic decongestion; and (4) new ad hoc traffic signs were created and placed along the robot lane to inform citizens about the robot activities (for safety reasons but also for data protection, as external cameras were collecting the movement of the robot) (*see* Fig. 1).

This case illuminates various ideas: (a) the law is not always prepared to accommodate new technological developments, especially if these advance, as it is the case of robotics, exponentially; (b) a formal communication process between regulators and robot developers is currently lacking; (c) the regulator might be willing to meet the researchers halfway *pro innovatio*; and (d) the idea that the documentation of all this process could be collected in a data repository, and serve as evidence for future policies.

3 Iterative Regulatory Process for Robot Governance

Robot technology is one of the many technologies that challenge the regulatory framework in various ways, including ethics and security for responsible innovation [12], privacy [13] and the allocation of responsibility [14]. In light of all the issues this technology arises, part of the literature accentuates the need for an *issue manager*. Marchant and Wallach proposed the creation of "Governance Coordinating Committees (GCC)" for the governance of emerging technologies like AI [15]. The European Parliament proposed the creation European Agency for Robotics and Artificial

Intelligence early in 2017 [16], and Schatz has put forward the creation of an emerging technology policy lab within the general services administration of the U.S.A. in 2018.[2]

Our paper builds on and complements these initiatives. We aim at contributing to the discussion by proposing the modus operandi of those managers, a governance process that can serve as a backbone in coordinating and aligning robot and regulatory developers (*see* Fig. 2). This process is called *Iterative Learning Governance Process* (ILGP) and includes a Technology Impact Assessment (in this case a Robot Impact Assessment, ROBIA [17]), a Shared Data Repository (SDR), and a Regulatory Impact Assessment (*see* Annex 1).

A. Robot Impact Assessment

ILGP starts with an assessment of whether the new development or use of a robot is compliant with the current regulatory system or, on the contrary, some boundaries that limit the space of liberty of the creators [9]. Instead of developing one assessment for every impact a particular robot technology may pose, technology assessments (TA) focus on "forecast*ing*, at least on a probabilistic basis, the full spectrum of possible consequences of technological advance, leaving to the political process the actual choice among the alternative policies in the light of the best available knowledge of their likely consequences" [18].

Impact-based assessments only look at the impact about which they are concerned, for instance, privacy in the case of the Privacy Impact Assessment, or surveillance in the Surveillance Impact Assessment [19, 20]. Technology assessments, on the contrary, lie on the idea that technology can have several impacts, and they can inform policies from a bottom-up perspective in a wide variety of impacts. In our specific case, ROBIA explores what are the associated risks and impacts of robot technology [17].

B. Shared Data Repositories

From the available online information, it is not very clear whether the municipality of Peccioli formalized the process of how they granted permission to test the robots of the Dustbot project. In other words, if today someone wants to conduct such an experiment, then s/he is it might probably have to start the process from scratch. This includes an assessment of whether it is compliant with the law or not (ROBIA), and whether the law establishes any limitation.

It might be that 'a swallow does not make a summer,' and that the municipality did not want to spend resources on formalizing a process that is not recurrent. However, the number of projects including robot technology is augmenting, and legislation continues not being necessarily prepared to accommodate such new developments within their regulatory framework. By documenting and formalizing these processes, the regulatory framework could have grounded knowledge and understand what characteristics and what regulatory needs such robots have.

If ROBIA is considered an accountability tool - in this case to show that a robot is compliant with the regulatory framework - then we support the idea to use accountability tools (e.g., Privacy Impact Assessment) as data generators for policy purposes.

[2] Cfr.: https://www.congress.gov/115/bills/s3502/BILLS-115s3502is.pdf.

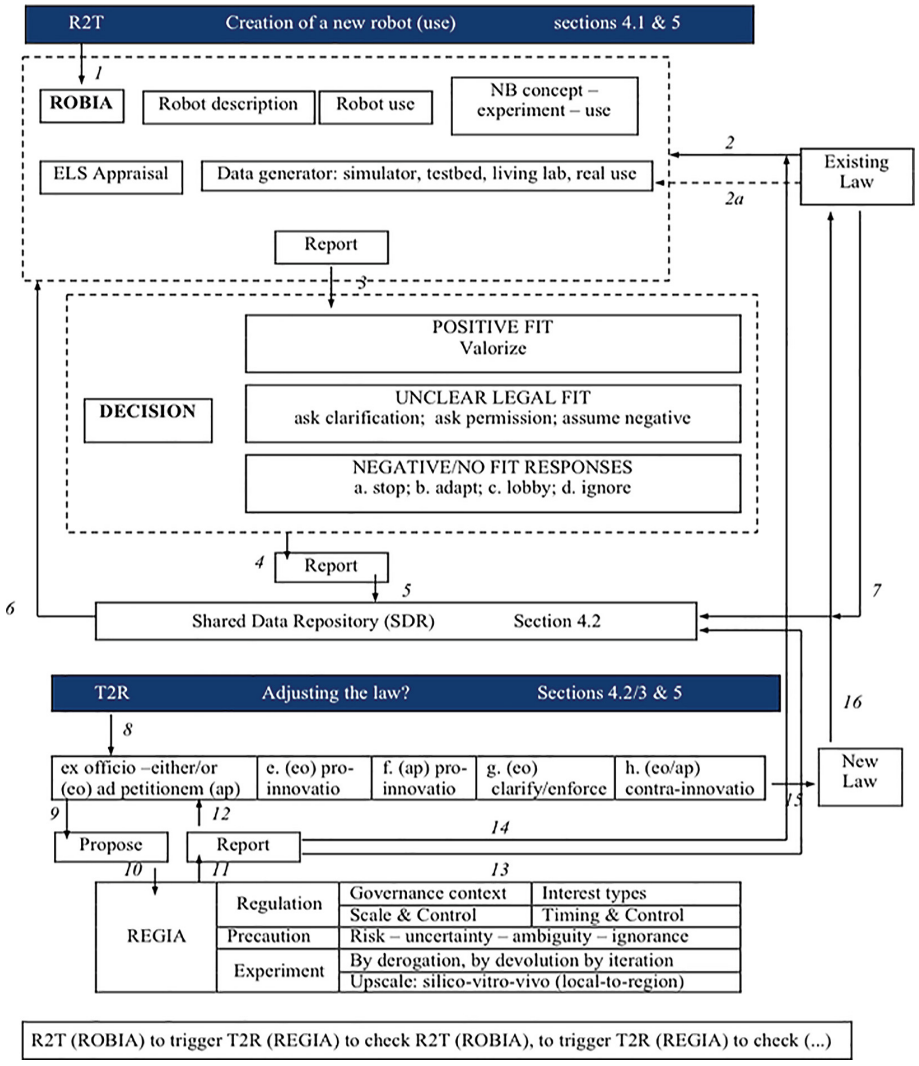

Fig. 2. Iterative Learning Governance Process (ILGP), extracted from [9]

If the legislator could create a Data Repository and collect all the knowledge from these technology assessments (associated risks, solutions for mitigating those risks), then the TA can *really* be "an iterative learning process."

These data repositories could take the form of a database and include ROBIAs, permission processes, and related robot legislation. The repository could also include the decisions of ethical committees, which nowadays represent an excellent source of information of the direction science is heading. Collecting such information could improve the transparency of the ethical committees' decision-making process, and contribute to the learning process of legislation, which could know the reasoning behind their go/no-go decision.

Compiling barriers, constraints, limitations, and frustrations of any development (e.g., lessons learned) would shed light on what needs more attention [21].

C. Regulatory Impact Assessment

Focusing on learning and evidence utilization, an ex-post legislative evaluation mechanism 'closes' the combined top-down/bottom-up model. In other words, over time, the regulator could take the information of the data repository, extract evidence and informed knowledge, and decide whether there is the need to take regulatory action or not.

The policymaker can choose different regulatory strategies, which is contingent upon many variables, including uncertainty, the nature of the interest or the context or scale of the development of use. If the regulator has decided to develop a new regulation, the regulatory may decide on regulatory experimentation first, choosing between derogation, devolution or iteration. The decisions could provide a common safe baseline to which all researchers, companies and technology developers within the ecosystem should adhere.

4 Conclusion

TAs have not been used a lot. Brooks argues "the outcome, whether negative or positive, tends to be more determined by political momentum and bureaucratic balance of power than by a rational process" [18]. However, TAs can generate much information relating to "what needs to be done" with technology development in legal terms.

Part of the literature supports the idea that the most constructive way is to tailor different forms of assessment to specific problems and situations. In the case of robots and AI, every robot is different regarding capabilities or embodiment, and it is likely to require different appraisals [22, 23].

ILGP is a back-step process that complements on-going proposals at the European and International level regarding the creation of an issue manager, and agency to assess robotic and AI technologies.

ILGP could orchestrate the production of evidence-based policies concerning robot technology via the implementation of ROBIA, the collection of the generated knowledge from different stakeholders in a data repository, and the subsequent integration into the policymaking process. By following this process, policymaking could learn from technology and foster more significant, meaningful and applicable policies.

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