2. An ethical framework for maritime surveillance technology projects

Sari Sarlio-Siintola & Tuomas Tammilehto

Few aspects of life have escaped a vivid discussion of ethics. This is true in the field of security research and maritime surveillance too. For example, academics, researchers and practitioners, together and among themselves, have discussed in several forums various elements of ethics in maritime surveillance, notably when participating in European Commission-funded research projects. This thinking has materialised as numerous articles, reports and statements, obviously this paper and its earlier versions being ones too.

In the discourse, one key area of interest is the tension between privacy and security. Another impetus for ethical thinking is the need to develop solutions that do not pose a negative impact on human rights and civil liberties. A third is the implications of new surveillance technologies (Jeandesboz 2012). At the heart of all this is the fact that since EU law and various international conventions regarding, e.g., human rights, the rights of refugees, and SaR, all impose obligations on states to help and protect those in need (the duty of care). Thus, if and when new technologies increase the capability for situational awareness, this enhancement of capabilities will also lead to an increased responsibility to act. The same goes for other activities, such as crime: if and when crime occurs, authorities have the legal obligation to act.

The paper is organised in the following manner. In the next paragraph, followed by the short introduction above, we present our approach to ethics work; this covers both the actual research and development processes but also encompass the solution(s) to be created during those processes. Next, we present a methodology aiming to identify various ethical, legal and societal aspects of technology projects aiming to produce innovations for the market. Finally, in the last paragraph, we briefly discuss the operationalisation of the identified aspects, both as guidelines for technology and organisational arrangements but also as tangible ethical requirements.

ETHICAL DIMENSIONS OF TECHNOLOGY-BASED PROJECTS

RDI projects must consider a multitude of recommendations, guidance and requirements that derive from ethics, legislation and societal impact(s). Traditional research integrity must be followed naturally. Further, ensuring the comprehensive ethical and social sustainability of the solutions being developed is evermore essential. The reason for this is that, ultimately, only sufficient ethical sustainability ensures the social and political approval and market potential of any solution. Thus, all dimensions, i.e., research integrity, validation of the ethical features of the solution and the use of any versions of the developed solutions in real time settings, need to be addressed. This includes any test, pilot, trial or demonstration (see Figure 1).

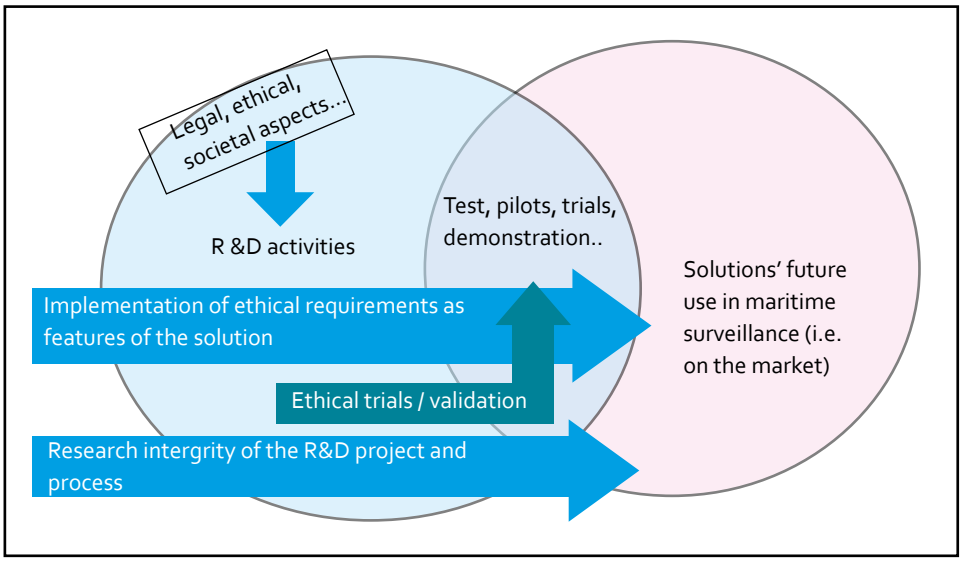

Figure 1. *Ethical Dimensions in Technology-Based Projects (Adopted from MARISA 2019)*

The current ethical guidelines of research and development focus heavily on traditional research integrity-related issues, followed by potential misuse and dual use (e.g., criminal or terroristic use). Regrettably, they do not fully cover all of what comes to ethical guidance or societal sustainability in the final product (the solution itself). This can hamper the development work, especially when building solutions requiring end-user information systems that process personal data. In these cases, the implications of data-protection-related requirements can look very different than in more traditional research and need to be addressed accordingly.

One critical point from the research integrity perspective is the rights of different end-users (and other natural persons) who participate in the project. In order to secure, for example, their right to privacy, specific emphasis must be put, e.g., on the collection of personal data or the dissemination of photos in which individuals could be identified. Further, the solution itself must comply with the many requirements set out in legislation, perhaps the most pivotal being the principles of Data Protection by Design and by Default. Thus, for example, privacy-enhancing technologies are not something auxiliary or supplemented; rather, the principles of data protection are deeply integrated into the architecture. Finally, data protection compliance cannot be neglected during the development phase, especially during any trials and/or pilots, since in this phase precisely, privacy and data protection features themselves are being validated too. Sometimes, one can

use fake or dummy data, but, often, meaningful piloting requires real data. Thus, data protection compliance is essential, regardless of whether data protection issues are a central focus or purpose of the project.

In the process of identifying the different ethical challenges and opportunities related to the solutions being created, a clear distinction should be made between: a) the layers of technology, b) user processes and c) business/governance models. This is highly important, since the implications of ethical, legal and societal requirements can be very different, depending on viewpoint. For example, requirements that can be implemented as technical features of the solution can be handled in the technical planning; implementation and validation again are analogous to end-user requirements. On the user-process level, the implementation of ethical requirements concern, for instance, user manuals or administrative arrangements, such as for the training of users. On the business/governance-models level, the relevant considerations could concern, for example, the division of responsibilities between different actors or various kinds of preparations. Further, feasibility considerations are recommended to be done before implementation of the solution in a specific environment.

A key aspect to consider, is the environment itself, with its feature in which the solution will be implemented: they might have implications for ethical requirements (on all levels). For example, both the MARISA and RANGER projects' solutions can be used stand-alone or as part of a larger architecture, e.g., Common Information Sharing Environment.

THE METHOD OF ETHICAL ANALYSIS

Many argue that ethics in security research must be seen as a way of putting critiques to work, not as a mere legitimising function of 'ethics approval' (see Leese, Lidén & Nikolova 2019). This argument was widely discussed both in Ethical, Legal and Social Aspects of Emerging Sciences and Responsible Research & Innovation (Zwart, Landeweerd & van Rooij 2014). The approach that we developed aims to provide a similar framework. The primary purpose is to maximise the benefits of the projects while preventing or minimising any ethical risks. The guiding principle of the work was to follow a so-called ethics-by-design principle (see Beard & Longstaff 2018).

During the projects (MARISA, RANGER and ANDROMEDA), we divided the analysis work into the following components:

1. a critical ethical analysis of the technology and its use in the relevant context (e.g., border control, customs, search and rescue, environment, and general law enforcement)
2. a legal framework for the project (including development, the solution itself, and its future use)
3. a *Social Impact Assessment* (SIA) and a *(Data Protection) and Privacy Impact Assessment* (PIA)

The results of the analysis were then condensed into a set of tangible ethical requirements for the projects. *A Code of Conduct* was also written; it contains the core ethical principles to be embedded in training material and business model documentation.

The analysis is largely a desktop study in which the content of various regulations, guidelines and policy papers are examined. Another pivotal element in ethics work is brainstorming. Usually, these sessions were held on particular topics, e.g., misuse or GDPR, but they also included general discussions on open topics. Further, ethics are discussed during the demonstration pilots, as many stakeholders are conveniently in attendance, thus providing the perfect opportunity for lively discussions. For example, the SIAs of each project

were conducted together with various stakeholders and experts in brainstorming sessions. The main results of these were related to risk management, since a large part of the SIA is to mitigate potential problems and promote positive impacts across the lifecycle of developments. As stated, the practice is participatory, and together with stakeholders it increases the understanding of change and the ways to respond constructively to such change (Esteves, Franks & Vanclay 2012).

Essential in the approach that we followed in the SIA is that various ethical issues (concerning both positive and negative societal impacts) were emphasised in the design phase of the innovation, i.e., the very early stages of the projects. Ethics are then not merely legal and moral constraints for innovation but active catalysts of innovation from which value can be derived. The PIA work in MARISA and RANGER was organised in collaboration with project partners, utilising a PIA tool provided by CNIL (Commission Nationale de l'Informatique et des Libertés). The same tool is to be used in the ongoing ANDROMEDA project.

The key ethical challenges identified in the projects are presented here below, in Table 1.

Table 1. *Examples of Ethical Challenges in the MARISA, RANGER and ANDROMEDA Projects*

CHALLENGES	LAYERS OF THE SOLUTION
Tensions between different rights and values, such as freedom and security, which are likely to become more pronounced as a result of new security technologies. Although the surveillance and other solutions per se do not violates anyone's rights, they do boost the discussion.	Business & governance models; User processes
Ethical and legal issues relating to privacy and data protection in both current and future configurations of MARISA, RANGER and ANDROMEDA, including both technical and organisational arrangements.	Business & governance models; User processes; Technology
RANGER's impact on wildlife and humans in the region where the radars are installed. Regardless of whether the risks are real or only feared, it is ethically and societally important to address the issue. The same goes with the installations of ANDROMEDA.	Business & governance models; Technology
Ethical and legal issues relating to Open Source Intelligent, big data and AI. These include the need for human agency and oversight; technical robustness; safety, privacy and data governance; transparency; diversity; non-discrimination and fairness (including awareness of and strategies to control subconscious biases); environmental and societal well-being; and accountability.	Business & governance models; User processes; Technology

Following the identification of various ethical aspects, the ethical, legal, and societal framework was built as a result of refining them into more detailed ethical requirements. These requirements were then clustered into three classes: 1) 'ethical awareness', 2) 'ethical analysis' and 3) '(any) activity'. At this stage, the requirements were specific and concrete enough to be associated with the relevant phase or layer of the project: pilots and trials, technology, user processes, business and governance model or generally on the solution. Finally, a specific *Code of Conduct* was formulated for each project, based on the results of the analyses. The code is designed for end-users, decision-makers and developers of the solution; the idea is that they shall be embedded both in training material and business model documentation.

THE RESULTS OF THE ANALYSIS AND THEIR IMPLMENTATION

Fundamental human rights, but also values and norms established in international and EU law, formed the value bases of the ethical requirements and the *Code of Conduct*. However, it must be added that the end-users and stakeholders raised many important ethical issues, especially on the use of technology. Their voices were particularly important when compiling the *Code of Conduct,* since it establishes the principles according to which development, deployment and use should be based on. Thus, the *Code of Conduct* covered the totality of ethical and societal considerations: the technology itself and how the technology will be used, as well as the whole business model as part of the European maritime surveillance ecosystem.

In Table 2, we list the main sections of the Code of Conducts.

Table 2. *Contents of the Code of Conducts in MARISA, RANGER and ANDROMEDA*

CODE OF CONDUCT (CHAPTER TITLES)	CONTENT
1 The Justification of the solution(s) is Based on Ethical Grounds	This is a starting point but also a justification for all: the project, the research and the end-results. If and when a project seeks to make a positive impact, it must be based on solid ethical grounds.
2 The Humanitarian Imperative and the Rights of the People at Sea	This is another key principle, more domain oriented that the first. It stresses the nature of the environment in which the solutions will operate.
3 Transparency, Liability and Human Decision Making	This is evermore important when AI is introduced to new applications.
4 Privacy and Data Protection	The importance of privacy has been heightened during past years and for a good reason. Many say that privacy will be the most valuable asset one can have.
5 Value for End-users Involvement	Another highly important aspect: because the projects are largely funded by European taxpayers, it is imperative that they create value too.
6 Moral Division of Labour in Maritime Surveillance and SaR	New solutions often change how we work and bear our responsibilities The duty of care can extend largely because of enhancements in surveillance technology, and this needs to be done ethically and sustainably.
7 Robustness, Accountability and Learning	These are essential for any solution and especially for solutions related to saving lives, e.g., in SaR missions.

Once defined, the ethical requirements must be considered in the technological development and organisational arrangements related to user process descriptions and training, as well as in governance and business modelling.

In Table 3 below are some ethical requirements of the MARISA project. In the leftmost column are the identified requirements. This is followed by the activity column, explaining what the action is about and where this requirement should be put into action. The work follows a need-requirements-action-feature continuum. For example, a need is first expressed, detailed and defined as an ethical requirement, and then the needed action is spelled out in necessary detail. Then, during the course of the research and development work, and especially during any trial, the fulfilment of the requirement could be verified and validated. Ultimately, this ensures the ethicality of the projects' outcomes.

Table 3. *Examples of MARISA's ethical requirements*

REQUIREMENT	AREA OF ACTIVITY / ESSENTIAL ACTIVITY
Recognise third countries in the sea as both end-users of MARISA and as partners in solving shared problems with the help of new technology.	The Advisory Board should include a representative from a third country. Address this in the workshops and the Advisory boards. (*Management*)
Provide transparency and proper functionalities to help estimate the quality, reliability and validity of various data to be used. Code this information for the end-user to help her in decision-making.	This requirement is translated into several requirements in the technical baseline. Specific KPIs have been defined to monitor the fulfilment of the functionalities during the validation. Rules can be configured by the users. (*Technology*)
Operational decisions shall never be made by a computer, not even the most efficient one: it must always be a human who makes the final decision. MARISA can only assist in operational decision-making, by providing information to the end-user/decision-makers. The end-users must be informed of liability issues in the training material.	The users will be always in the loop, and the toolkit will support decision-making and planning being the final decision lies on the end-users.This is explained clearly in the training and user manuals. *(Training*)
Organisational activities concerning data protection must be applied as part of the governance model for each new implementation of MARISA. Conducting a light PIA before the implementation is essential.	The final ethics deliverable D2.13 provides basic guidelines for the organisational activities. These are to be embedded in MARISA exploitation/ business modelling and in training material. (*Business Management/General Management*)

CONCLUSIONS

It should be evident that proper implementation of ethical requirements is essential for any project. In spite of this, ethical compliance has long been near synonymous with proper research ethics and other important dimensions granted a more or less anecdotal status. The problematic nature of such a narrow perspective is often particularly heightened in cases in which a project's subject matter falls under the topic of security. The MARISA, RANGER and ANDROMEDA projects are illustrative of this. When technological

advancements lead to an increased surveillance capacity (in this case of RANGER, in the form of novel over-the-horizon radars, or with ANDROMEDA and enhancements to command and control), so do the moral and legal duties to act against ill will and to help those in distress; with great power comes great responsibility. Furthermore, the technology can fundamentally change practice and customs: the moral division of labour can be altered, a change that calls for holistic ethical considerations.

To answer these challenges, together with addressing challenges of misuse and dual use, we have attempted to avoid a narrow perspective by developing a systematic framework for identifying ethical aspects. It exceeds the traditional science and research integrity perspective and offers a wider viewpoint. The goal is to help developers and practitioners of technological innovations turn these aspects into tangible sets of ethical requirements to be addressed during all phases of the project and on all layers of the solution being created.

Ethics are not about declaring principles. Rather, they are to be intertwined in every aspect of a project and beyond, from the proper development of products and services, to their use and all the way up to business and governance processes.

Finally, it must be stressed that the ethical work is never done. New ethical areas and issues arise continually, since everything cannot and will not be covered. As Søren Kierkegaard has so adequately put it, "One cannot seek for what he knows, and it seems equally impossible for him to seek for what he does not know. For what a man knows he cannot seek, since he knows it; and what he does not know he cannot seek, since he does not even know for what to seek." Therefore, it is impossible to be fully cognizant of all possible ethical issues and produce a complete framework, but we must try our best. The pursuit of such is indeed a requirement too.

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