

INSTRUCTIONS FOR THE COMPILATION OF THE TECHNICAL ANNEX

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Mandatory template to prepare the Technical Annex of your proposal!

When writing the Technical Annex **please closely follow** the instructions provided in the [COST Open Call – Proposers' Guidelines](#).

After **completing all the sections** of the Technical Annex, you must convert it to a single PDF document (maximum size 10MB) and upload it to the e-COST platform and submit it by the given deadline.

Please pay attention to the following eligibility criteria:

- 1) **Length limit of the Technical Annex (15 pages)**. This template **must not be modified in any way (both main headings and formatting)**. Please be aware that the COST standard font style is **Arial, size 10, line spacing 1**. This is important as it will be checked for eligibility related to the length limit.
- 2) **Anonymity**. A proposal **shall not contain direct or indirect** reference to proposers and/or institutions participating in the network of proposers.
- 3) **Respect of fundamental ethical principles**, as described in the [Rules and principles for COST Activities](#). The Main Proposer shall ensure that the ideas developed in the proposal are original and that all necessary authorisations from the intellectual property rights holders are granted to validly use photographs, slides, graphs, digital images, or any other material that you include in the Technical Annex.

Please closely follow the [COST Open Call – Proposers' Guidelines](#) for the comprehensive list of eligibility criteria.

TECHNICAL ANNEX

1. EXCELLENCE IN S&T AND NETWORKING

A. Main challenge

The widespread reliance on software and digital systems has prompted both local and international efforts to regulate its operation through legislation. Paradigmatic examples are European laws such as the General Data Protection Regulation (GDPR) or the AI Act, the UK Data Protection Act, the French Loi pour une République Numérique. Also, regulatory aspects of digital systems and software are present in different sectors such as e-finance, health systems, education, etc. A very cogent issue is the ethical imperative on AI, the human rights perspective, its ecological impact, its geo-political implications, etc.

In the following, we will refer to digital systems and software, as well as, hardware and physical devices as digital solutions.

Legal texts and regulations are technical and strive for being formal and precise, yet they can be subject to multiple interpretations as they are framed in natural language. For instance, this is the case with several regulations designed to prevent the manipulation of consumers of digital services: [1]

- the EU regulation 2022/2065 on a Single Market For Digital Services prescribes that “the maximum amount of the fine that may be imposed for the supply of incorrect, incomplete or misleading information, failure to reply or rectify incorrect, incomplete or misleading information and failure to submit to an inspection shall be 1% of the annual income or worldwide turnover of the provider of intermediary services or person concerned in the preceding financial year”;

- the GDPR forbids unfair data processing techniques;

- the AI Act forbids practices aimed to “the placing on the market, the putting into service or the use of an AI system that deploys subliminal techniques beyond a person’s consciousness or purposefully manipulative or deceptive techniques”.

Besides introducing coordination and interpretation in conjunction with other legislation (such as the competition law), this proliferation of regulations shows that there is an extremely high level of complexity in the precise legal boundaries of (properties and requirements of) digital systems [1]. Moreover, the form of these documents can be more descriptive/permissive (defining rights, statuses, or situations without imposing action) than prescriptive (defining duties, obligations and how to ensure them), also depending on their position in the hierarchy.

In contrast, digital solutions must be defined in formal languages in order to meet their requirements when used in the field. This fundamental mismatch hinders effective enforcement of legal aspects and can result in the misapplication of the law.

The aim of this Action is twofold in order to fill the significant gap that remains between legal frameworks and the digital solutions: on one hand to validate digital solutions against the legislation governing them and, on the other hand, to develop approaches to support legal processes through sound digital solutions.

A number of specific problems are being addressed by different communities:

P1. What are the models amenable to automation and suitable to support formal and precise human-based analysis

P2. How to extract algorithmic models for normative aspects of legal texts.

P3. How to determine inconsistencies and inadequacies in the models extracted.

P4. How to assess efficiency and efficacy of the verification methods use in terms of decidability, complexity, resource requirements, modularity

P5. How to determine if algorithmic solutions should be applied or not?

P6. How to establish the adequacy of state-of-the-art digital solutions for supporting the realisation of legal requirements?

Addressing these problems requires a coordinated effort. We need a community building initiative to create the critical mass to understand these problems both from the regulators and from the digital developers point-of-view. As observed in [2] “debating some issues intelligently required not just a knowledge of law or of technology, but of both. That is, some problems cannot be discussed purely on technical grounds or purely on legal grounds; the crux of the matter lies in the intersection.”

Despite the fact that Computer Science (CS) has important legal applications (and it is offered to students in some departments of humanities subjects as an optional module), it is far apart from Law or Socio-Political and Human Sciences. The construction of common grounds starts from the reconciliation of the different interpretations of seemingly similar concepts adopted in these disciplines. A paradigmatic example is the notion of ‘formality’ which in CS refers to mathematical and logical rigour amenable to the development of computational systems while in e.g., Law ‘formality’ may

primarily refer, especially when legal practitioners and academics use it in argumentation either of legal concepts constituting the structure of law or of authoritative sources [3]. Ultimately, our aim is to propose approaches and tools to make sure the adoption of digital solutions leads to practices following the laws regulating them.

B. Objectives

The Action aims to bridge the gap between digital solutions and the legal frameworks that govern them. To achieve this goals, we focus on two key intermediate components:

- Models that suitably represent regulations, such as logical rules in the case of laws, or workflows in the case of judicial and administrative procedures;
- Verification/Audit methods that ensure these formalised regulations are upheld by digital solutions, such as consistency checks or on-field monitoring.

Specifically, our scientific objectives are:

SO1. Extract prescriptive key elements from regulations. Laws for digital solutions comprise neustic components (i.e., dictative parts) that need to be told apart from phrastic ones (i.e., descriptive parts) and be turned into prescriptive requirements in order to give tangible mandatory obligations that can be automatically converted in checking tools. Like Taxation Law is algorithmic, and thus automatically calculatable, law in this domain should clearly identify what needs to be enforced. We aim to identify approaches to automatically tackle such mandatory obligations (cf. P1).

SO2. Support the analysis of descriptive regulations. As noted, not all legal requirements can be faithfully captured within digital solutions – many laws set out general principles or rights that usually can hardly be given a computational interpretation. We will define mechanisms (tools, procedures, best practices) to bridge this gap, enabling digital solution designers to work with legal experts and social scientists in assessing compliance with such principles. For example, while a law might broadly require “fairness” or “transparency” in an AI system, our Action will produce guidelines and adaptive software components that help auditors and domain experts judge whether those qualitative standards are met in practice. This interdisciplinary approach (cf. P1, P2) ensures that even high-level legal expectations can be monitored and verified in digital solutions with appropriate human judgement involved.

SO3. Realise law-compliant digital solutions. The introduction of legislation like the EU Data Act or GDPR imposes that new digital solutions guarantee their norms. Current practices to assess compliance include . However, these usually concern aspects of software that are weakly related with its behaviour, often falling short of guaranteeing that the code follows the law. This advocates either for - effective tools to build and automatically assess the compliance of digital solutions to such obligations (cf. P1 and P3), whenever these can be formalised; or - approaches based on, e.g., check-lists, experts’ analysis, users’ feedback, etc., when formalisation of some criteria is not possible/desirable (cf. P5 and P6).

SO4. Assessing how digital solutions respect regulations. It is commonplace for stakeholders to claim compliance with various sort of regulations without clear evidence. Existing tools are still experimental and there is no consensus on which elements and requirements need to be included. This calls for identifying and enhancing auditing processes, developing tools and (semi-)automatic techniques to assess such claims, to identify pitfalls, and to verify that legal requirements are respected. Moreover, interoperability issues of digital solutions have to be taken into account. Besides, this objective requires the development of common vocabularies (cf. P4).

The Action will create an inclusive network of European researchers and foster lasting collaboration beyond its lifetime that will shape future interdisciplinary research, promote excellence, and support Early Career Investigators and increase their visibility. This will be achieved pursuing the following organisational objectives:

OO1. Knowledge advancement. Build reference methods for the specification, analysis, and implementation of legal aspects of digital solutions as well as news about publications, and tools (such as guidelines, good practices, software tools, tutorials, illustrative use cases, etc.)

OO2. Community building. Bring together members of the different European communities working on legal aspects of digital solutions, specifically the communities around symbolic and data-driven AI, natural language processing, formal methods, law (including financial regulations and taxation), political sciences, and social sciences.

OO3. Training. Ease access to the topics of the Action in education and other areas of science, by organising training courses, summer schools, workshops, and publishing technical papers, position papers, and tutorials.

OO4. Networking. Foster interdisciplinary collaborations among participants of the Action through intensive use of Short Term Scientific Missions (STSM) and educational programs. Support young researchers in developing their research network for a fruitful career in an international environment.

OO5. Transfer knowledge. Create the opportunities to transfer expertise, scientific tools, and human resources across the different disciplines, between academia and industry, and between academia/industry and public administration.

OO6. Inclusiveness. Support young researchers, under-represented groups, and teams from regions with less capacity, allowing them to establish scientific collaborations with leading groups across Europe, participations to scientific events, involving them in the initiatives of the Action.

OO7. Communication and Dissemination. Foster the impact of the Action by disseminating its results to the scientific community and communicating it to other stakeholders in industry, certification bodies, European institutions, and the general public.

C. State-of-the-art

Nowaday, digital solutions are often ensembles of components, each developed for a specific purpose, and interacting with people or even the physical environment. This yields a high degree of complexity that sets digital solutions among the most elusive critical infrastructures of modern societies. In fact, guaranteeing the correctness of digital solutions is notoriously very challenging. In particular, legal and regulatory requirements add further challenges to this endeavour because, on the one hand, such requirements are described in technical jargon that developers can understand only with intense liaisons with domain experts and, on the other hand, the adoption of digital solutions is sometimes decided without properly pondering the feasibility or the impact on other technical and societal facets. The following quotes are representative of this state of affairs:

- “Today, all privacy regulations around the world are based on the 50-year-old paradigm of notice and consent. It no longer works. The systems we deal with—web pages with their multiple levels of advertising, the Internet of Things, and more—are too complex; consumers have no idea what sites they are contacting nor what their privacy policies are.” [5]

- “A legal rule may have multiple semantic annotations, where each annotation can represent a different legal interpretation.” [4]

D. Rationale for choosing networking to address the main challenge

The complexity of the problems discussed above is high due to two main factors: (i) the ample gap between CS and (ii) the fragmentation of regulatory and legal practices among different sectors and countries. This separation has a negative impact on the realisation of digital solutions that actually realise the intentions of regulators as well as the development of practices that do not effectively verify the adequacy of digital solutions. Besides the impact on economic costs, not tackling these problems can cause distortion in democratic processes, in the application of human rights, in correct relations between citizens and institutions.

A networked approach is essential to tackle the main challenge because of its interdisciplinary and pan-European nature. The gap between legal frameworks and digital solutions is too broad and complex for any single research group or field to handle. Only a concerted network can assemble the necessary critical mass of expertise –from legal theorists and CS communities and developers to sociologists and domain experts– to address all facets of the problem.

A COST Action is the ideal instrument: it enables collaboration across countries and disciplines, ensuring that solutions are not one-dimensional or siloed. By networking, we avoid duplicate efforts and instead coordinate research and create the opportunities to identify and study research themes that could have hardly been discovered by separated communities. For example, one working group can develop formal models of laws while another tests those models on real software systems, providing immediate feedback on the one hand while, on the other hand, spotting the limits of traditional techniques and practices that can be overcome only by developing new approaches.

The Action will facilitate this via frequent workshops, cross-disciplinary working groups, and Short-Term Scientific Missions (STSMs) that allow researchers to visit each other's institutions to transfer knowledge and tools. The Action will also develop a new generation of researchers with interdisciplinary skills through the planned training activities, the mentoring activities, and the schools. All these activities are crucial to build a community involving experts, NGOs, human rights activists, etc. that will systematically investigate the borders between regulatory frameworks and theoretical and applied CS.

These instruments will knit together a community that speaks a common language across law and tech. Furthermore, the challenges and their solutions have a strong European dimension. Regulations like the GDPR or AI Act must be implemented uniformly across Member States; sharing methods through a European network ensures that a tool or guideline developed in one country can benefit all. The network will include participants from across Europe (with particular encouragement to those from less research-intensive countries) to maximize diversity of perspectives and to build capacity where it's needed – reflecting COST's mission of spreading excellence.

E. Critical mass of the network

Text

2. IMPACT

A. Impact related to objectives

Text

B. Involvement of stakeholders

Text

C. Communication, dissemination and valorisation

Text

3. IMPLEMENTATION

A. Action Structure

The complexity of the problems discussed above is high due to two main factors: (i) the ample gap between CS and (ii) the fragmentation of regulatory and legal practices among different sectors and countries. This separation has a negative impact on the realisation of digital solutions that actually realise the intentions of regulators as well as the development of practices that do not effectively verify the adequacy of digital solutions. Besides the impact on economic costs, not tackling this problems can cause distortion in democratic processes, in the application of human rights, in correct relations between citizens and institutions.

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B. Work plan (tasks, activities and timeframe)

Text

C. Deliverables

Text

D. Gantt chart

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