



Policymaking in the digital era: Exploring techno-legal assemblages and their impact on policy formulation

Antonio Cordella^a, Francesco Gualdi^{a,b,*}

^a Department of Management, The London School of Economics and Political Science, Houghton Street, WC2A 2AE London, United Kingdom

^b Department of International Business, Regent's University London, Inner Circle, NW1 4NS London, United Kingdom

ARTICLE INFO

Keywords:

Policymaking process

Formulation phase

Techno-legal assemblages

Technology in policymaking

ABSTRACT

This paper contributes to the literature by shedding light on the impact of digital technologies on the policy-making process. Specifically, it focuses on the formulation phase of policymaking, where policymakers discuss, draft, and approve formal legislation that directly or indirectly involves digital technologies. By drawing on the assemblage theory, the paper argues that the assemblages of existing technological and legal systems significantly influence the policymaking process during the formulation phase. Through a case study of the Italian reform of the Digital Administration Code (DAC), the paper offers a new framework that unpacks the various dimensions – organizational, normative, political, and technological – of the policy formulation phase impacted by techno-legal assemblages. This research provides valuable insights for policymakers tasked with discussing, drafting, and approving policies to digitize relevant public administration sectors.

1. Introduction

The formulation of contemporary policies is increasingly influenced by the dynamic interplay between pre-existing policy frameworks and the rapid evolution of digital technologies. In the digital era, policy formulation is not an isolated endeavor but rather a process deeply embedded in and reliant on established legal, regulatory, and technological systems (Borrás & Edler, 2020; Edmondson et al., 2019). These existing systems provide a foundation and a constraint, shaping how new policies are developed to address emerging challenges and opportunities. By examining how contemporary policymaking leverages and reshapes these systems, this paper sheds light on the complexities of formulating policies capable of being effective in a rapidly evolving digital landscape. To do so, the paper explores the impact of digital technologies on one specific phase of the policy cycle, the formulation phase.

The policy cycle framework (Howlett & Giest, 2012; Lasswell, 1971) provides a comprehensive lens to assess how digital technologies reshape the policymaking process. The framework has become a key tool in the field, enabling researchers to unpack the nuanced intersections of technology and policymaking (Janssen & Helbig, 2018; Valle-Cruz & Sandoval-Almazán, 2024).

Existing research has examined the broader influence of digital

technologies on the policy cycle (Craglia et al., 2020; Gilardi, 2022), as well as their impact on specific phases such as agenda-setting (Coelho, Cunha, & Pozzebon, 2022), implementation (Marchesani et al., 2023; Tangi et al., 2021), and evaluation (Sun & Medaglia, 2019). This body of work highlights how digital technologies transform practices, actions, and roles across the policymaking process. By leveraging the policy cycle framework, researchers have gained a granular understanding of how digital technologies enable more data-driven, participatory, and adaptive approaches to policymaking while also exposing vulnerabilities such as digital divides, algorithmic biases, and governance gaps (Koryzis et al., 2023; Schiff & Schiff, 2023; Valle-Cruz & Sandoval-Almazán, 2024).

Despite these contributions, two critical aspects of digital technologies' impact on the policy cycle remain underexplored, limiting our understanding of their transformative role. First, the prevailing linear conceptualization of technology's role in the policy cycle (Coelho, Cunha, & Pozzebon, 2022; Kolkman, 2020; Qiu et al., 2023) often overlooks the multidimensional impact of digital technologies and policymaking. Rather than shaping policymaking in a straightforward, sequential manner, digital technologies are deeply embedded within the broader context in which policymaking processes take place, shaping and reshaping them in complex and dynamic ways (Justesen & Plesner, 2024; Rip & Kemp, 1998). Second, the formulation phase - an essential

* Corresponding author.

E-mail addresses: a.cordella@lse.ac.uk (A. Cordella), gualdif@regents.ac.uk, f.gualdi@lse.ac.uk (F. Gualdi).

<https://doi.org/10.1016/j.giq.2025.102023>

Received 7 May 2024; Received in revised form 1 March 2025; Accepted 17 March 2025

Available online 27 March 2025

0740-624X/© 2025 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

stage where digital tools and data can shape policy design and stakeholder engagement - is often neglected in scholarly works (Ferreira et al., 2022; Höchtel et al., 2016). Digital technologies in the formulation phase have the potential to shape how policies are crafted, and stakeholders are engaged.

Technology and legal frameworks create boundaries and establish norms that subsequent policy formulation processes must navigate (Reidenberg, 1997). As digital technologies become increasingly embedded in legal frameworks (Hildebrandt, 2017), they interact with these pre-existing legal structures, often requiring negotiations with existing laws to accommodate new policies (Contini & Cordella, 2015). This interplay means that digital technologies do not simply impact policy formulation in isolation; they operate within, challenge, and sometimes transform the legacy of past policymaking embedded within legal structures.

Consequently, a deeper, more nuanced understanding is needed of how digital technologies not only influence the immediate policy decisions being made but also engage with the established legal frameworks that shape these decisions.

Accordingly, this paper aims to examine how policy formulation is shaped by the intricate intertwining between technological advancements and the legal frameworks that serve as the backdrop for policy formulation (Hildebrandt, 2018). To achieve this, we draw on assemblage theory (DeLanda, 2016; Deleuze & Guattari, 1983, 1988; Lanzara, 2009) and utilize the concept of techno-legal assemblages (Contini & Cordella, 2016) as an analytical framework. Hence, the paper addresses the following research question: How is policy formulation shaped by techno-legal assemblages?

To address this research question, we examine the case of the Italian reform of the *Codice dell'Amministrazione Digitale*, herein the Digital Administration Code (DAC). Initiated in 2016, this legislative effort aimed to establish a comprehensive legal framework to standardize the provision of digital services within the Italian Public Administration, enhancing interactions between government and citizens. However, during the DAC's formulation phase, significant conflicts emerged with the existing provisions of the *Processo Civile Telematico*, herein Civil Trial Online (CTO, also known as Trial on-Line), a well-established framework of legal norms and technological standards designed to digitalize Italy's Civil Justice system (Carnevali & Resca, 2014).

To analyze the impact of the CTO on the DAC's formulation, this paper adopts an explanatory case study approach, employing documentary analysis and interviews with high-level policymakers. This method allows us to thoroughly investigate how the techno-legal assemblage of the CTO shaped the DAC policy formulation.

Our findings contribute to the literature by presenting a comprehensive framework that unpacks the dimensions of policy formulation shaped by techno-legal assemblages. Specifically, we identify that techno-legal assemblages mold the organizational, technological, political, and normative dimensions of the policy formulation phase. This framework advances a more sophisticated understanding of the role technology plays in shaping the policymaking process, moving beyond simplistic, linear models to address the intricate interactions between legal and technological structures.

The proposed framework underscores the importance of formulating policies that align with the rapid pace of technological change and maintain coherence across regulatory and technological domains. Furthermore, the paper offers practical insights for policymakers to help them formulate policies that are both effective and resilient, better equipped to manage the complexities introduced by rapidly evolving digital technologies.

The paper proceeds as follows. Section two reviews key scholarly contributions on the relationship between technology and the policy cycle, with a specific focus on the policy formulation phase. Section three introduces the analytical framework of techno-legal assemblages and explains the operationalization of its core concepts. Section four outlines the research design, including methodological choices, case

study selection, data collection, and analysis approach. Section five illustrates the findings from the deductive and inductive analyses. Section six discusses the impacts of techno-legal assemblage on the policy formulation phase and proposes a theoretical framework for conceptualizing its different dimensions. Finally, section seven summarizes the paper's contribution to academic literature and implications for policymakers, acknowledges limitations, and suggests avenues for future research.

2. Related research: exploring the impact of digital technologies on the policy cycle and the overlooked policy formulation phase

In digital government research, the policy cycle framework is a principal tool for discussing the planning, design, and execution of policies enhanced by digital technologies (Gilardi, 2022; Janssen & Helbig, 2018; Simonofski et al., 2021; Valle-Cruz & Sandoval-Almazán, 2024). Stemming from the seminal work of Lasswell (1971), the policy cycle has proven to be valuable in breaking down the different stages of the policymaking process, which are: agenda setting, policy formulation and decision-making, policy implementation, and policy evaluation (Jann & Wegrich, 2017). Against this backdrop, limited attention has been devoted to assessing the impact of digital technologies on the policy formulation phase, despite reiterated calls for further scrutiny (Ferreira et al., 2022; Höchtel et al., 2016). In this section, first, we provide an account of related works discussing digital technologies against the whole policy cycle and the specific phases; second, we illustrate findings from prior literature focusing on the formulation phase, exposing relevant gaps that justify our research purpose.

2.1. Digital technologies transforming the policy cycle

Prior literature has emphasized the role of digital technologies in accelerating the entire policy cycle, allowing policymakers to deliver quicker evaluations and responses by leveraging digital technologies (Mureddu et al., 2020). The integration of continuous feedback mechanisms, powered by algorithms and simulations, has transformed the nature of policymaking from a traditionally linear sequence to a more dynamic and responsive process. This shift enables policymakers to make more agile decisions, effectively addressing complex and emergent issues (Valle-Cruz et al., 2020).

These digital-driven processes have also redefined the role of policymakers, expanding their functions and capabilities. With data-driven tools, policymakers can identify novel policy solutions that were previously inaccessible or undetectable without technological support (Janssen & Helbig, 2018). Hence, digital technologies have accelerated the policy cycle allowing policymakers to respond more effectively to increasingly complex challenges.

At a more granular level, digital technologies have redefined specific phases of the policy cycle. In agenda-setting, open data initiatives have empowered citizens to influence policy priorities (Qiu et al., 2023), enhancing the legitimacy of policymaking (Ingrams, 2023). During the policy implementation phase, digital technologies have been instrumental in enhancing public service delivery (Maciejewski, 2017; Tangi et al., 2021), with a remarkable example being the Internet of Things in smart city initiatives (Marchesani et al., 2023). However, scholars caution that existing technological architectures can sometimes restrict the range of available policy options (Cordella & Gualdi, 2019; Gualdi & Cordella, 2023). Digital technologies also transformed the policy evaluation phase, enabling a faster and more comprehensive assessment of public services and policies (Agostino & Arnaboldi, 2017; Sun & Medaglia, 2019). Continuous feedback loops integrate evaluation throughout the policy cycle, ensuring real-time adjustments and refining processes across each stage (Valle-Cruz et al., 2020).

These contributions underscore how digital technologies have become a central force in shaping a more adaptive, efficient, and inclusive policymaking process. However, while much of the literature

emphasizes the benefits of digitalization in enhancing policy development, another body of research examines its unintended negative consequences. For example, the widespread adoption of data analytics tools for policy design and implementation has placed an increasing burden on public sector and government agencies, many of which lack the necessary capabilities to manage the needed datasets. This gap has led to internal resistance and administrative bottlenecks, hindering effective policy execution (Giest, 2017). Moreover, efforts to improve services fruition through digital tools have often produced unforeseen outcomes, requiring policymakers to reassess and modify service delivery models. For instance, Wolf et al. (2024) illustrate this challenge with the example of a health app designed to enhance public health protection. Rather than using the app as intended, citizens repurposed it to complement other behaviors, complicating not only policy implementation but also necessitating further policy analysis and adjustments (Wolf et al., 2024).

2.2. Digital technologies and policy formulation

In contrast to the extensive study of the entire policy cycle or specific stages within it, the formulation phase remains largely underexplored, despite increasing calls from both the digital government community (Höchtl et al., 2016; Simonofski et al., 2021) and public policy scholars (Ferreira et al., 2022; Hansson-Forman et al., 2021). Scholars have expressed concern over the lack of academic focus on policy formulation, often described as “one of the most poorly understood of the policy process stages” (Ferreira et al., 2022, p. 173). The literature remains disproportionately focused on policy outcomes and implementation (Hansson-Forman et al., 2021). One of the reasons for this lack of attention is the inherent opacity of the formulation phase (Wu et al., 2017), which is often dominated by policymakers with “specialist knowledge, preferred access to decision-makers, or a paid position in a particular government agency or department” (Howlett & Giest, 2012, p. 19). Accessing the complex environment surrounding policy formulation is significantly more difficult and challenging than studying phases like agenda-setting or policy implementation, where public scrutiny and media coverage make information more accessible (Turnpenny et al., 2015).

In the domain of technology and policymaking, only a few notable studies discuss the impact of digital technologies on the formulation phase. Research has shed light on how Big Data Analytics provide policymakers with essential tools for evaluating policy options (Debnath et al., 2024; Fitsilis et al., 2022; Kolkman, 2020; Van der Steen, 2017) and for developing scenarios that minimize conflict among competing policy alternatives (Höchtl et al., 2016). Data-driven models also play a crucial role in enhancing policymakers’ understanding of public sentiment and expectations (Schintler & Kulkarni, 2014) allowing for a more contextually informed selection of policy instruments and increasing the robustness of available options.

Research has also explored how digital technologies have created new opportunities for citizen participation in the policy formulation phase. Studies highlight that this engagement can take a direct form, such as when governments use crowdsourcing platforms to solicit public input on specific policy options (Aitamurto, 2016; Coelho, Pozzebon, & Cunha, 2022). Alternatively, it can be indirect, as seen in the use of e-participation platforms and social media analytics to identify and cluster viable policy alternatives (Simonofski et al., 2021). Findings indicate that these mechanisms enhance inclusivity in policy formulation by integrating a broader range of perspectives.

However, while digitalization fosters public engagement, research also points to its role in the depoliticization of policymaking. Scholars have observed that as external stakeholders with technological expertise become crucial for managing and guiding policy choices, policy formulation increasingly takes on a technocratic character (Kunyenje & Chigona, 2022). This shift means that policymakers rely more heavily on data-driven, evidence-based assessments, reducing the influence of political considerations in decision-making (Valle-Cruz & Sandoval-

Almazán, 2024).

Table 1 below offers a systematization of the different contributions studying the impacts of digital technologies on the formulation phase of the policymaking process.

Findings from prior literature show that studies discussing digital technologies’ impact on the formulation phase tend to illustrate how specific digital technologies, such as AI or Big Data, produce linear effects within policy formulation. Existing studies explain how standalone technologies affect discrete tasks in the formulation phase: for example, machine learning enhances scenario modeling, and digital platforms facilitate public participation.

The impact of digital technologies on policy formulation is further discussed by analyzing how policy leadership is shaped not solely by policymakers but through a sociomaterial entanglement of experts, polls, statistics, technologies, and coalitions, revealing how material elements like public polls and standards interweave with social structures to drive policy formulation (Oborn et al., 2013). However, these studies often fail to address the complex, multidimensional interactions between digital technologies and the existing legislative frameworks that redefine the techno-legal foundations that constrain and enable new policy formulation (Reidenberg, 1997). This techno-legal landscape (Reidenberg, 1997) functions as a dual force, providing new opportunities for innovation while imposing regulatory boundaries that guide policy choices (Hildebrandt, 2017).

For instance, policy formulation processes involving law and technology have prompted debates about accountability and transparency, challenging traditional regulatory approaches, as seen in the Danish “digital-ready” legislation (Plesner & Justesen, 2022). Denmark’s “digital-ready” legislation initiative is aimed at ensuring that new laws and policies are formulated from the outset to be compatible with the existing techno-legal landscape. As Rip and Kemp (1998) pose, understanding these techno-legal landscapes is crucial for developing coherent policies that align technological capabilities with legal requirements and societal values.

Our research aims to contribute to the literature by exploring the intricate relationships that underpin policy formulation, highlighting how technologies that intertwine with existing laws, resulting in techno-legal assemblages, shape the policy formulation phase. Insights from prior studies suggest that addressing these techno-legal assemblages head-on can lead to more robust, responsive, and aligned policy frameworks that are better suited to the digital age (Contini & Lanzara, 2009). However, no clear indication of how these assemblages shape policy formulation is provided.

Accordingly, our research question is: How is policy formulation shaped by techno-legal assemblages?

Table 1
Categorization of the digital technologies’ impacts on policy formulation.

Impact of technology on the formulation phase	Description	Sources
Enhancement of the decision-making	Digital tools enable policymakers to increase awareness of the context and to better assess available options	Debnath et al. (2024), Fitsilis et al. (2022), Höchtl et al. (2016), Kolkman (2020), Schintler and Kulkarni (2014), Van der Steen (2017)
Facilitation of citizens’ contribution	Participation of the public in the formulation phase is encouraged through platforms and inputs that are better exploited	Aitamurto (2016), Coelho, Pozzebon, and Cunha (2022), Simonofski et al. (2021)
Depoliticization	Reliance on digital technologies increases the need for technocratic expertise and reduces the relevance of political factors	Kunyenje and Chigona (2022), Valle-Cruz and Sandoval-Almazán (2024)

To address this question, we examine the techno-legal assemblage concept, highlighting why it offers an effective analytical lens for understanding the role of digital technologies in shaping the policy formulation process (Reidenberg, 1997).

3. Analytical framework: techno-legal assemblages

To explore the complex interplay between technology and law in shaping policy formulation, this study employs the analytical framework proposed by techno-legal assemblages (Contini & Cordella, 2015, 2016). A techno-legal assemblage is defined as a “composite configuration” in which “the regulative properties of law and technology are intertwined” (Contini & Cordella, 2015, p. 128). In these assemblages, each component co-evolves with the other to shape policy processes, decisions, and outcomes (Contini & Cordella, 2016). This concept allows us to examine how digital technologies not only support but actively redefine the constraints and possibilities within the policy formulation phase.

The assemblage theory provides the foundation for this approach by emphasizing the dynamic interactions between different elements that together form a cohesive yet non-homogeneous system (DeLanda, 2016; Deleuze & Guattari, 1983, 1988). The concept of assemblage refers to a social whole that consists of distinct yet interconnected parts – a unity that does not unify but instead preserves the heterogeneity of its components (Deleuze & Guattari, 1983). Respecting the ontological status of assemblages, DeLanda’s (2016) late interpretation further refines this concept, describing assemblages as entities capable of “directly interact with one another” (DeLanda, 2016, p. 16). DeLanda’s work is particularly significant as it builds on Deleuze and Guattari’s original conceptualization while bridging it with the social and organizational research that highlights how assemblages influence the contexts in which they emerge (Ciborra, 2005; Lanzara, 2009). For this study, we adopt an understanding of assemblage theory that acknowledges Deleuze and Guattari’s foundational work while aligning more closely with its recent interpretations and applications. Expanding on this theoretical foundation, we introduce the concept of techno-legal assemblages (Contini & Cordella, 2016) as our analytical framework.

In techno-legal assemblages, digital technologies and law are not merely linked but deeply intertwined, forming interdependent relationships where changes in one element might affect others (Lanzara, 2009). This interconnectedness implies that any modifications within the assemblage during policy formulation can shape the entire system, reinforcing the idea that technological and legal components function as mutually constitutive forces within the policy landscape.

The notion of negotiation is central to this framework, highlighting how assemblages operate as arenas of constant interaction, where different logics converge to achieve functional coherence while maintaining autonomy. These negotiations reflect a balance of competing interests, values, and institutional constraints (Mohr & Contini, 2011). Interdependency within the assemblage further underscores the interconnected nature of its components, where institutional logics, technologies, and human actors mutually shape the functionality of the system (Lanzara, 2009). Relationships within the assemblage are dynamic and contingent, emerging from the interplay of humans and non-humans, which collectively define the system’s behavior (Fox & Alldred, 2022). Furthermore, assemblages evolve, adapting to external pressures, internal dynamics, and technological advancements. This evolution reflects phases of both stability and transformation, emphasizing the fluid and adaptive nature of institutional and technological structures (Lanzara, 2009).

Negotiation, interdependency, relationships, and evolution define how assemblages emerge, develop, and change over time (DeLanda, 2016).

Thus, assemblage theory helps to better understand the dimensions of policy formulation shaped by the interdependent relationships between digital technologies and law (Contini & Cordella, 2016; Fox & Alldred, 2022; Gualdi & Cordella, 2022).

By leveraging the analytical framework of techno-legal assemblages, this study examines the intricate dimensions of policy formulation shaped by the interplay of technology and law. Through the case of the DAC reform, the paper explores how these assemblages influence policymaking processes, highlighting the interdependencies, negotiations, and evolutionary dynamics at play. This approach provides valuable insights into the challenges and opportunities arising from the integration of technology and law, offering guidance for policymakers seeking to develop more adaptive and effective policy solutions in an increasingly complex socio-technical environment.

4. Research design

4.1. Research settings

To answer the research question, the explanatory case study approach has been chosen. This approach is ideally suited for addressing “how” research questions in scenarios where events occur independently of the researcher’s control (Baxter & Jack, 2012; Yin, 2018). This approach proves particularly adept at clarifying how techno-legal assemblages impact the distinct phenomenon of policy formulation.

The selected case study focuses on the Italian DAC reform, which is relevant to our research for three main reasons. First, its significance: the DAC reform represents a major national legislative initiative aimed at harmonizing all digital services within the public administration, making it a pivotal effort in Italy’s digital governance landscape. Second, the level of access: the researchers were granted privileged access to the highest-level policymakers directly involved in the policy formulation, allowing for an in-depth understanding of the formulation phase and the factors shaping it. Third, the DAC reform offers a unique setting for examining how an existing techno-legal assemblage (the CTO) shaped the formulation phase. The DAC reform not only encountered pre-existing technological standards but also interacted with a dense network of technological and legal entanglements that define the CTO (Carnevali & Resca, 2014) which had pervasive impacts on how the DAC policy formulation unfolded. This case study is grounded in robust empirical evidence, enabling the researchers to investigate the DAC policy formulation in its natural settings with a nuanced understanding of how techno-legal assemblages shape policymaking (Benbasat & Zmud, 1999).

4.2. Case study background

The purpose of the reform of the DAC was to provide a standardized blueprint for digital protocols across various public bureaucracies and to facilitate interactions between public administration, the commercial sector, and citizens. The DAC also specifies essential technological solutions necessary for the effective implementation of these protocols, which are periodically updated by the *Agenzia per l’Italia Digitale*, herein Agency for Digital Italy – AGID, under the Ministry of Public Administration (AGID, 2022).

To ensure the DAC’s seamless integration and enforcement, it was crucial to align it with the pre-existing technological and legal infrastructures across the diverse bureaucracies within the Italian public administration. This alignment was necessary to avoid potential legal and technological complications. Many public bureaucracies developed bespoke technological systems and legal frameworks designed to support specific functions, which risked becoming obsolete if not harmonized with the DAC’s regulatory framework (Consolandi, 2016).

A key challenge in applying the DAC was evident in its alignment with the CTO, which outlines both normative and technological standards for digitizing various procedural elements within civil justice, including online case file consultations, virtual interactions with judicial entities, and digital financial transactions (Carnevali, 2019). The CTO has been developed over more than fifteen years, requiring extensive resources allocated, refinement of legal and technological architecture,

and establishment of organizational standards across multiple layers of the Italian judiciary (Carnevali, 2019; Fabri, 2009).

The CTO's guidelines can be updated through ministerial decrees or bylaws from the Ministry of Justice (2011, 2014). Legally, the CTO is built on a complex array of legislative measures, integrating primary and secondary sources, including ministerial guidelines and established practices (Petrucchi, 2017). It is crucial to observe that, at the time of the DAC reform (2016), the CTO had already achieved considerable success in diffusing among the Italian judiciary, and expected results in terms of harmonization of civil justice were beginning to emerge (Carnevali, 2019).

In 2016, the Italian Parliament passed Bill 179/2016 to reform the DAC. This bill outlined both the legal framework and technological specifications necessary for the DAC implementation. The policy formulation involved significant contributions from senior civil servants, specialists, and consultants from various Ministries, particularly the Ministry of Justice, which provided critical insights during the bill's formulation.

The initial formulation of the DAC bill was presented by the government to Parliamentary Committees for detailed review. It included specific provisions, such as Articles 2.6 and 18.1, to govern the harmonization between the DAC and the CTO. These articles aimed to create safeguards for CTO procedures from the DAC's jurisdiction. For example, Article 2.6 stated that: "The provisions of this Code shall also apply to civil and criminal trials, insofar as they are compatible and unless otherwise provided by the provisions on civil trial online". The purpose of the government was to establish two distinct regulatory regimes: one governed by the CTO and another by the DAC. To ensure the preservation of the CTO architecture, Article 18.1 stated: "The provisions concerning the electronic filing of acts and documents in accordance with the legislation, including regulations, of Civil Trial Online shall remain in force".

During the formulation of the DAC bill, Parliament was tasked with providing an advisory opinion on the government's draft. This involved detailed discussions in multiple Parliamentary Committees. The most intense debates occurred in the Committee for Constitutional Affairs of the Chamber of Deputies (the Lower Chamber), which advocated for expanding the DAC's applicability to all judicial procedures, therefore including the CTO, contrasting with the government's draft that limited the DAC applicability to administrative and criminal proceedings. After several rounds of negotiations, the final version of the bill approved by Parliament maintained specialized provisions for the CTO while expanding the DAC's jurisdiction to additional procedures, reflecting a compromise between the government's objectives and Parliament's recommendations.

The conflict between the CTO's entrenched technical and legal architecture and the DAC reform's standardization objectives highlights the complexities faced during the formulation of the DAC. Understanding this conflict requires considering the CTO's lengthy development trajectory, which began producing promising outcomes after years of sustained effort (Carnevali & Resca, 2014). Policymakers working on the formulation of the DAC bill had to navigate challenging negotiations to balance the reform's standardization goals with the CTO's architecture.

4.3. Method

We adopted a qualitative research method to investigate the multifaceted ways the CTO techno-legal assemblage shaped the DAC policy formulation. This approach leverages the richness of qualitative data to generate novel insights into research subjects (Yin, 2018), offering a dynamic perspective on the evolving influences (Monteiro et al., 2022) of techno-legal assemblages on policy formulation.

The qualitative method enables to shed light on activities entrenched within specific public bodies, such as Parliament, Committees, and Ministries, allowing the researchers to account for the intricacies of

actions and interrelationships inherent within these organizations (Symon & Cassell, 2012). A specific focus on policymakers' maneuverings is quintessential to understanding the nuanced procedures of policy formulation and their subsequent transformation triggered by techno-legal assemblages.

4.4. Data collection

Our data collection consists of documentary sources and semi-structured interviews. The formulation phase of the DAC reform took place from June to August 2016. Accordingly, the documentary sources include all the legislative and administrative acts enabling the DAC until 2016: the original 2005 legislation and the 2010 and 2016 reforms; for the CTO, we examined all the primary (bills, acts) and secondary (administrative decrees) sources of law that were regulating the existing version of the CTO at the time of the DAC reform, spanning from 2010 to 2015. In total, we examined 33 documents for 840 pages. This comprehensive document analysis helped establish a baseline understanding of the legislative landscape (Tarrant & Hughes, 2019) surrounding the DAC reform. Table 2 provides an overview of the documentary analysis.

Concurrently, we conducted six detailed semi-structured interviews with key policymakers directly involved in the DAC formulation. The selection of the interviewees aimed to account for the three institutional actors involved in the policy formulation: the Parliamentary Committees, the Ministry of Public Administration, and the Ministry of Justice. Documents examined showed that the liveliest and richest debate took place in the Chamber of Deputies' Committee on Constitutional Affairs: hence, we approached the Committee's rapporteur (MP1) and the author of the alternative opinion recorded (MP2). The two MPs facilitated contact with a former Director General of the Ministry of Public Administration (DG) with whom they had interacted in the context of the DAC reform. For the Ministry of Justice, the authors identified the *Direzione Generale Servizi Informativi Automatizzati* (herein DGSIA, Directorate General for Automated Information Systems) as the key unit in charge of steering the CTO. We interviewed two Judges who led DGSIA at different times: one who managed the implementation of the CTO (Judge1), and the other one who was steering the DGSIA at the time of DAC reform (Judge2). Upon interviewing Judge1, he also suggested reaching out to a senior civil servant who was responsible for the technological architecture of the CTO (CivServ). The choice of interviewees, based on their pivotal roles within the policy formulation phase, provided profound insights, complementing each other and compensating for the possible query over the number of interviews (Buchanan et al., 2013). We privileged data quality over quantity (Hagen et al., 2019; McBride et al., 2019) building on the argument that "the level at which the researcher enters the organization is crucial" (Myers & Newman, 2007, p. 4). Table 3 details the roles and functions of the policymakers interviewed, along with additional data on the interview (code, data, duration).

In our research, we employed "triangulation of sources" (Patton, 2014, p. 556) by integrating document analysis with interviews to enhance our understanding of how policy formulation is shaped by techno-legal assemblages (Symon & Cassell, 2012). This approach enabled us to cross-verify and enrich the data collected through documents with first-hand accounts, ensuring a more robust comprehension of the case study, particularly relevant when "complex interventions" (Yin, 2018, p. 324) occur, such as the DAC formulation.

4.5. Data analysis

We approached the data analysis with two distinct purposes. First, we identified the characteristics of the CTO techno-legal assemblage, and second, we analyzed the different dimensions of the DAC policy formulation shaped by the CTO. We adopted a combination of deductive and inductive data analysis methods (Charmaz, 2014) mirroring similar

Table 2
List of documents consulted.

Subject	Name of document	Type of document	Date	Pages
DAC legislative process	Chamber of Deputies Committee on Constitutional Affairs minutes	Official transcript	23/06/2016	20
	Chamber of Deputies Committee on Constitutional Affairs minutes	Official transcript	02/08/2016	56
	Chamber of Deputies Committee on Constitutional Affairs minutes	Official transcript	03/08/2016	40
	Chamber of Deputies Committee on Budget minutes	Official transcript	21/07/2016	10
	Chamber of Deputies Committee on Budget minutes	Official transcript	26/07/2016	19
	Joint Committee on Simplification minutes	Official transcript	20/07/2016	7
	Joint Committee on Simplification minutes	Official transcript	27/07/2016	7
	Senate Committee on Constitutional Affairs minutes	Official transcript	29/06/2016	15
	Senate Committee on Constitutional Affairs minutes	Official transcript	12/07/2016	5
	Senate Committee on Constitutional Affairs minutes	Official transcript	27/07/2016	10
	Senate Committee on Budget minutes	Official transcript	01/08/2016	7
	Senate Committee on Budget minutes	Official transcript	02/08/2016	7
	Senate Committee on Budget minutes	Official transcript	03/08/2016	6
	Senate Committee on Treasury minutes	Official transcript	19/07/2016	4
	Senate Committee on Treasury minutes	Official transcript	27/07/2016	4
	<i>Consiglio di Stato</i> (Council of State) advisory opinion	Formal opinion	17/03/2016	26
	<i>Conferenza Stato-Regioni</i> (State-Regions collegial body) advisory opinion	Formal opinion	03/06/2016	2
	<i>Conferenza Regioni e Province</i> (Regions and Provinces collegial body) advisory opinion	Formal opinion	03/06/2016	13
	Union of the Provinces advisory opinion	Formal opinion	03/06/2016	3
	Data Privacy Authority advisory opinion	Formal opinion	09/06/2016	13
DAC Legislation	Chamber of Deputies Report attached to Government Act 307	Report	June 2016	48
	Legislative Decree 82/2005	Primary legislation	07/03/2005	129
	Legislative Decree 235/2010	Primary legislation	30/12/2010	45
	Legislative Decree 179/2016	Primary legislation	26/08/2016	54

Table 2 (continued)

Subject	Name of document	Type of document	Date	Pages
CTO Legislation	Legislative Decree 217/2017	Primary legislation	13/12/2017	49
	Law 24/2010	Primary legislation	22/02/2010	10
	Law 221/2012	Primary legislation	17/12/2012	77
	Law 114/2014	Primary legislation	11/08/2014	50
	Law 132/2015	Primary legislation	06/08/2015	25
	Ministry of Justice Decree 44/2011	Secondary legislation	21/02/2011	31
Other relevant	Ministry of Justice Act 16 April 2014	Technical norms	16/04/2014	24
	<i>Consiglio Superiore della Magistratura</i> (Superior Council of the Magistracy) resolution on the DAC	Formal Act	09/01/2019	21
	<i>Consiglio Nazionale Forense</i> (National Bar Association) opinion	Informal Opinion	30/01/2015	3

Table 3
List of policymakers interviewed.

Code	The position covered at the time of the DAC reform	Role in the DAC reform formulation	Interview date and duration
MP1	Member of Parliament and member of the Chamber of Deputies Committee on Constitutional Affairs	Rapporteur on the DAC reform within the Committee	20/06/22 – 30 min
Judge1	Judge, Former Director General of the DGSIA	Advisor for the Ministry of Justice	22/06/22 – 45 min
DG	Director General of the Ministry of Public Administration (PA)	Special Advisor to the Minister of PA	23/06/22 – 60 min
Judge2	Judge, Director General of the DGSIA	Advisor for the Ministry of Justice	27/06/22 – 45 min
CivServ	Senior civil servant in the Ministry of Justice	Advisor for the Ministry of Justice	28/06/22 – 45 min
MP2	Member of Parliament and member of the Chamber of Deputies Committee on Constitutional Affairs	Promoter of an alternative opinion on the DAC reform	28/06/22 – 45 min

choices in relevant digital government literature (Clarke, 2020; Mergel, 2019; Yuan & Gasco-Hernandez, 2021).

The first round of deductive coding aimed to ascertain and validate the specific characteristics of the CTO as a techno-legal assemblage by aligning empirical data with the key constructs of assemblage theory. The constructs identified – negotiation, interdependency, relationships, and evolution (Fox & Alldred, 2022; Lanzara, 2009) – provided a structured lens for analyzing the data and mapping the unique features of the CTO assemblage.

During the initial phase of the deductive analysis, interviews and documents were systematically coded to identify instances where the data aligned with these theoretical concepts. This coding was carried out by one researcher, who made an initial allocation of raw data to the key categories derived from assemblage theory. For example, negotiation-related data captured instances of compromise between stakeholders over technological and legal standards, while interdependency-related

data highlighted how the legal frameworks and technological systems mutually influenced each other.

To ensure the validity and reliability of the coding process, the entire research team reviewed the initial allocations, jointly revisiting the dataset in case of disagreements. This iterative process involved detailed discussions to clarify how individual pieces of data were understood within the context of the analytical framework. Through this collaborative approach, the team reached a consensus on the allocation and interpretation of the raw data, ensuring a shared understanding of how the concepts from assemblage theory were reflected in the empirical findings.

To assess how the CTO techno-legal assemblage shaped the DAC policy formulation, we conducted a second round of coding inspired by inductive principles (Charmaz, 2014). Open coding performed by one researcher enabled the team to dig into the data to identify and classify categories and themes. A thematic network was developed highlighting clear patterns and meanings within the data. Then, fundamental themes were integrated by the two authors into overarching organizational themes, thereby demarcating distinct analytical dimensions (Braun & Clarke, 2006). Fig. 1 illustrates the data analysis procedure.

5. Results

5.1. The CTO as a techno-legal assemblage

The first round of coding enabled us to systematically identify the defining characteristics of the CTO techno-legal assemblage. Table 4 offers a summary of the results of the deductive analysis.

The results illustrate the intricate and dynamic negotiations between the legal standards and the technologies governing civil justice

procedures in the CTO. The concept of negotiation has been used *verbatim* by Judge1 to describe the essence of the CTO: “The nature of the CTO, however, is grounded in a sort of negotiation involving different logics and actors within the process”. Other interviewed policymakers confirm this aspect, recurrently emphasizing the complexity of the negotiation of two distinct logics, the one of legal norms, and the one of technological standardization. As noted by CivServ, “The CTO is a complex infrastructure from a technological and legal point of view”. This negotiation reiterates over time as legal provisions accommodate technological standards, and technological standards execute legal provisions in the working context of Italian civil justice, triggering a deeper level of interdependency that defines the CTO’s *modus operandi*.

The interdependency between technological and legal logics underpinning the CTO restructured interactions within the judiciary. For instance, all the interviewees acknowledge the CTO’s integrated logic, emphasizing that to capture the CTO’s essence “technology alone is not enough” (MP2). This conclusion is backed by CiviServ who uses the expression “technical-legal rules” to describe the CTO architecture. According to another policymaker, the CTO would have never achieved and maintained “a very high, if not maximum, level of security” without simultaneously addressing “the applied technologies and the legal context” (Judge2). This intertwined relationship between law and technology underscores the techno-legal interdependencies of the CTO.

The technological and legal interdependency has changed the relationships between human and non-human actors in the civil justice context. The CTO has transformed how actors executed specific functions, such as issuing notifications, attaching materials in PDF format to certified emails, engaging via PEC (certified e-mail), and authenticating documents with digital signatures. Judge1 provides an example of the transformations engendered by the CTO: “In the CTO we had built a

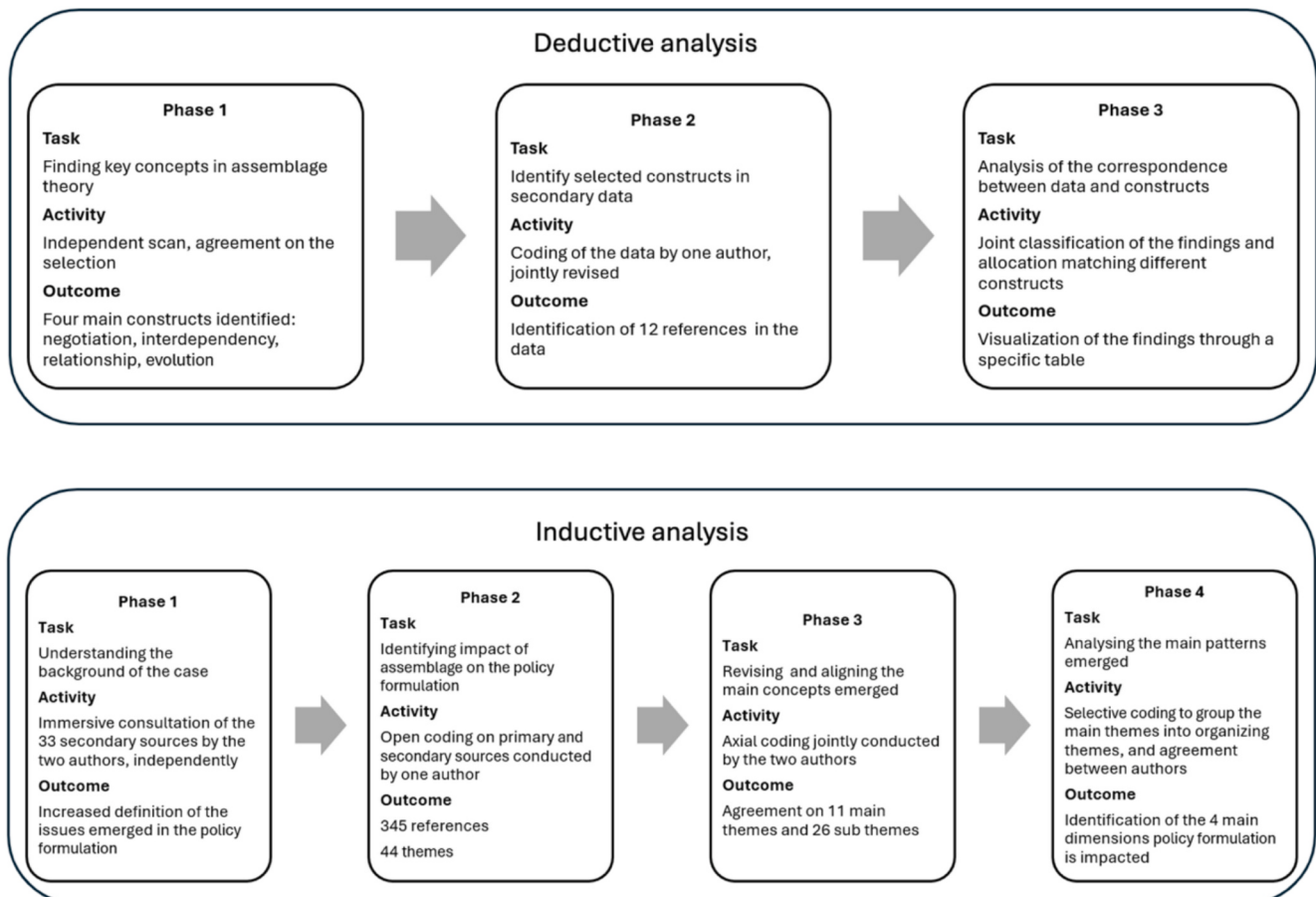


Fig. 1. Overview of the data analysis process.

Table 4
Overview of the findings of the deductive analysis.

Concept from assemblage theory	Description of the concept	Example of raw data
Negotiation	Different logics (legal, social, technological, institutional) combine to find an aligned configuration (Mohr & Contini, 2011)	“The CTO is a complex infrastructure from a technological and legal point of view” (CivServ) “The regulation establishing the technological-operational rules for the implementation of the CTO does not expressly establish the applicability to the CTO of the principles set forth by the DAC” (opinion of the <i>Consiglio di Stato</i> – Council of State)
Interdependency	Different logics deployed in the same context deeply integrate becoming interdependent (Lanzara, 2009)	“It is the combined use of technology and the processes it developed, that is, the organization of the CTO and the organizational shortcomings that push for it” (MP2) “There were no technological motivations per se, while there were operational motivations related to the technology in use” (MP2).
Relationships	Restructuration of human and non-human relations in existing environments (Fox & Alldred, 2022)	“The CTO changed the logic, shifting from authenticity and integrity of the document to authenticity and integrity of the procedural relationship that was to be carried out through the telematic process” (Judge1) “Implementing the DAC would have put at risk the technologically mediated practices already diffused in the CTO” (Judge2)
Evolution	Adaptation, dynamism, and search for equilibrium over time (Lanzara, 2009)	“The CTO consists of a huge castle of technical-legal rules applied and extremely stratified over time” (CivServ) “The CTO is a system that has held up in front of Constitutional Court: all its procedures, all its issues that are then stratified with even the most recent legislation” (Judge2)

technological integrator that allowed to receive electronically the documents made by the lawyer and to immediately register them on the court information systems”.

The strength of the CTO lies in how intertwined negotiations of law and technology evolved through iterative refinements spanning over fifteen years. This dynamic characteristic of the CTO is further evidenced by the temporal factor. On the one hand, norms and technologies had to mutually adapt to reflect their respective evolution: as one policymaker noted, the CTO’s achievements in 2016 were the culmination of a “path of accomplishment” initiated two decades before (Judge1). On the other hand, evolution allowed the layering of techno-legal provisions progressively embedding the techno-legal components into a cohesive techno-legal assemblage. As CivServ notes, the execution of

ordinary practices and tasks within the CTO has become increasingly accepted within the Italian judiciary: “Nobody questions anymore the validity of a digitally signed PDF sent to the judge, or the validity of a judge’s digitally signed ruling”.

Ultimately, the CTO exemplifies a techno-legal assemblage characterized by ongoing negotiation, interdependencies, relationships, and evolution, revealing how law and technology imbricate into homogenous and intertwined frameworks that structure the processes within Italian civil justice.

5.2. Impact of the CTO on the policy formulation process

The second round of coding adopted an inductive approach to evaluate how the CTO techno-legal assemblage shaped the policy formulation phase. The results from this inductive analysis reveal that the impact of the CTO assemblage on policy formulation manifests across four distinct dimensions: organizational, normative, political, and technological. Table 5 presents a thorough account of these main findings. In the following section, we will discuss each of these dimensions in detail.

5.2.1. Organizational dimension

The CTO’s creation intertwined technological architectures and judicial procedures into a techno-legal assemblage, profoundly reframing organizational practices of Civil Justice. The organizational practices reframed by the CTO techno-legal assemblage impacted the DAC policy formulation in three ways: formalizing practices and relationships that required specific safeguards; structuring organizational legacy that needed to be accounted for by the DAC policy formulation; and exposing challenges of aligning the CTO local practices against the purposes of nationwide administrative rationalization.

The CTO assemblage restructured the way civil justice functions, formalizing the management of key tasks, actors’ roles, and interactions into specific technological and organizational practices. One of the CTO designers acknowledges the transformational impact that the CTO generated on the judiciary organization: “The CTO initiated a transformation in the organizational framework, not only securing the authenticity and integrity of documents but also influencing the procedural relationships conducted through the CTO” (Judge1). Considering the scale of organizational transformations enabled by the CTO, policymakers expressed concern about altering these established organizational practices now designed into technological protocols by extending the DAC regulation to the CTO: “If the DAC were to dominate over the CTO, there would likely be an expansion in electronic documentation, presenting challenges, especially for clerks and judges. We hadn’t implemented the CTO rules to put the courts in difficulty” (DG). The CTO designers believed integrating the DAC technological standards into the CTO might profoundly modify civil justice operations: “An abrupt standardization of all components could have triggered significant management complications and substantial costs. It could have potentially stalled operations for an extended period, even though all stakeholders were familiar with the functionality of the CTO” (Judge2).

The complex interplay between organizational aspects and their technological enablers would require substantial efforts to align Civil Justice management with the DAC’s new directives, as an MP involved in the parliamentary discussions observed: “Integrating the DAC into the CTO, we would have drafted regulations and implemented technical measures which could impact upon the CTO. This necessitated a thorough re-evaluation of the CTO’s established technologically mediated workflows and practices” (MP1). With the CTO’s technologically mediated workflows and practices deeply embedded across civil justice, the Ministry of Justice was concerned that the DAC could disrupt daily operations within the Italian judiciary. Given the potential widespread impact of the DAC on technological standards and organizational processes, the Ministry of Justice’s primary objective was to mitigate the challenges to the CTO, particularly considering the investments made in

Table 5

Overview of organizing themes, codes, and examples of raw data from the inductive analysis.

Dimensions	Themes	Sub-themes	Raw data
Organizational	Reshaping organizational structures and relationships	Formalized relationship with Justice	“Clearly, using DAC as the key norm, and not the regulations of the CTO, the number of electronic documents and/or electronic signatures that could be used was wider than that regulated by the CTO. This would certainly have put the clerks in difficulty” (DG)
		Rigidity of organizational practices	“The issuance of the [DAC] Bill also impacts the regulations of the CTO by formalizing the production of electronic documents, electronic copies, and their certification of compliance, which do not align with the needs for simplicity, speed, and easy understanding that would be desirable within the CTO context” (opinion of the <i>Consiglio Nazionale Forense</i> – National Bar Association)
		Organizational elements legacy	“The reason for the derogation is this: it was still necessary to keep in place a system that had already achieved its standard, and therefore this small ‘hunting reserve’ was confirmed, which from my point of view is fine” (Judge2)
	Formalizing organizational structures and relationships	Organizational practices specificity	“The CTO even regulates the length of the annexes of a PEC, not what kind of Pec to use ... the length of the attachments!” (DG)
		Organizational specificity generating safeguards	“We shall consider the opportunity to suppress the following words ‘The provisions concerning the e-filing of acts and documents remain unchanged according to the regulatory provisions of the CTO’” (recommendation of the Chamber of Deputies’ Committee on Constitutional Affairs)
		Transforming practices of different PAs	“The CTO was designed as an internal monolith...” (Judge2)

Table 5 (continued)

Dimensions	Themes	Sub-themes	Raw data
Normative	Triggering normative conflicts with Parliamentary Committees	conflict among PAs	“On the one hand, we have a public administration that wants to regulate its action through a highly hierarchical digitization process. The CTO, on the other hand, is based on processual cooperation between the various social actors in the process” (Judge1)
		Self-regulating bureaucracies	“In that period 2015/2016, when we worked at DAC, we were concerned about intervening in areas that we considered conservative, including that of justice” (DG)
		Allowing the formulation of alternative opinions	“We were receptive to a whole series of improvements that came from the insiders and the experts” (MP1)
	Normative complexity	Enhancing the normative production with open innovation	“To specify, in Article 2 of the draft Bill, that it also refers to administrative, accounting, and tax processes, in order to provide greater consistency to the regulatory framework” (recommendation by the Parliamentary Joint Committee on Simplification)
		Emergence of actors facilitating the reform	“The government decided not to create frictions, and we did accordingly” (MP1)
		Emergence of actors opposing the reform	“I remember that there was some normative perplexity at the Ministry of Justice, or at least during the parliamentary process on the drafts that the government gave us” (Judge2)

(continued on next page)

Table 5 (continued)

Dimensions	Themes	Sub-themes	Raw data
Political	Emergence of normative conflicts	Misalignment between different legislation	“The presence of guidelines, and no longer of technical rules, vis-à-vis the fact that there were not yet these guidelines, could have become a problem for Justice. The same for the fact that the new DAC aimed to relax certain constraints for the PA” (CivServ)
		New legislation architecture	“On the policymaking, I believe that this difficulty in making sure that things are made that represent changes affected in the organization, in the processes, etc., is structural because it affects the lives of a number of people that typically the Minister does not want to get in the way” (MP2)
	Involving more actors in policymaking	Policymakers’ purposes and roles	“As a result, the legislative decree under examination aims to deeply modify and integrate the DAC and coordinate the provisions on the subject contained in other regulations, to ensure the punctual implementation and full effectiveness of the DAC” (Chamber of Deputies Committee on Constitutional Affairs opinion)
	Political negotiation	Political prudence generating safeguards	“Hence, there was a clear political choice: we wanted to reform DAC to make it as easy as possible to access these services. In this perspective, any friction with any other ministry was simply put aside” (MP1) “I remember it was a political decision of prudence to say, (...) it’s better to safeguard” (CivServ) “To fully implement the Bill [we recommend] to reintroduce the definition of electronic document, harmonizing it with the provisions adopted at the European level” (Chamber of Deputies Committee on Constitutional Affairs recommendation)

Table 5 (continued)

Dimensions	Themes	Sub-themes	Raw data
Technological	Political conflict among organizations	Institutions’ influence	“There was a power struggle across the ministries (...) Ministry of Justice did not want another Ministry to draft and implement technical regulations which could impact upon the CTO” (MP1) “That safeguard was due to the fact that if we also adopted the technical requirements required by the DAC, we [Justice] would have had to go back to where we were far ahead” (Judge1) “The same article [18] provides for the safeguarding of provisions concerning the e-filing of acts and documents of the CTO” (opinion of the <i>Consiglio di Stato</i> – Council of State).
	Technological specificity creates safeguards	Protection of technological standards	“[Senator name] points out that an excessively cautious approach in conferring probatory effectiveness to electronic signatures could hinder international trade” (Minutes of the discussion within the Senate Committee on Constitutional Affairs)
	Structuring practices according to technological characteristics	Neutrality of technology	“We built a telematic process, based on technical specifications that we had prepared when, for example, there was still no certified e-mail. We designed a certified e-mail specific to the CTO” (CivServ)
		Impact of technological tools and instruments	“The DAC does not impose any model. The DAC defines a series of technological ‘bricks’ and does not tell you how to mount the bricks. (...) On the contrary, the CTO was based on a regulation that was absolutely not neutral from a technological point of view” (DG)

its modernization. Policymakers aiming to reform the DAC voiced their frustrations with the technological and organizational constraints of the CTO that hindered their ability to rationalize the country’s digital policy: “Ideally, we would want all public administrations, including municipalities, health services, universities, and thus civil courts to operate

in a certain manner. Yet, realistically, altering court operations is not feasible" (DG).

5.2.2. Normative dimension

The CTO techno-legal assemblage has significantly influenced the normative framework during the formulation of the DAC bill. This impact manifests in three key dimensions: normative conflicts between the CTO and the DAC legislation, challenges that compelled Parliamentary Committees to refine and enhance policy formulation, and efforts to address or mitigate normative misalignments.

The normative influence of the CTO on the DAC policy formulation is deeply rooted in the enduring regulatory provisions embedded within the CTO's techno-legal assemblage. Over time, the foundational normative elements of the CTO have shown remarkable resilience against modification or dismantling. One interviewee highlighted: "The CTO, embedded in a complex and sometimes turbulent convergence of techno-legal directives, has demonstrated extraordinary tenacity. To preserve this techno-legal architecture, we preferred to say, 'Hold on, the new DAC is fine, but let's always put the clause that safeguards the CTO'" (CivServ). Consequently, policymakers within the Ministry of Justice expressed concerns about undermining the established CTO framework to integrate the new DAC mandates, which could introduce legal inconsistencies potentially requiring intervention by the Constitutional Court. On the normative misalignment between the DAC and the CTO, CivServ emphasizes that different sources of law could create a normative conflict: "The presence of [DAC] guidelines, and no longer of technical rules, could have become a problem for Ministry of Justice. The same [could be said] for the fact that the new DAC aimed to relax certain constraints".

In response to these challenges, the Ministry of Justice endeavored to maintain the structural integrity of the CTO within the legislative trajectory of the DAC. Parliamentary committees, recognizing the need for robust legislative support, consulted legal experts and stakeholders extensively. As the rapporteur of the Committee noted: "The inputs from the Constitutional Affairs Committee were enriched by a participatory process with the network of telematic jurists, bringing forth a wealth of suggestions and criticisms" (MP1). These consultations were reflected in amendments and strengthened the DAC's normative structure.

To navigate the normative conflicts between the CTO and the DAC, further negotiation rounds were essential. Proponents of the reform proposed a compromise to delay the enforcement of the DAC on the CTO, allowing the Ministry of Justice time to align the CTO's architecture with the new DAC regulations. However, a participant from the negotiation sessions revealed frustration with the lack of willingness to align normative frameworks by the Ministry of Justice: "We suggested a two-year hiatus for the DAC's applicability to the CTO, but the Ministry of Justice decisively rejected this, opting instead to enforce the DAC immediately under their specified legal safeguard" (DG). This decision underscored the complex interplay of techno-legal assemblages and the cautious approach taken by policymakers to navigate these waters.

5.2.3. Political dimension

The analysis of the data reveals that the CTO techno-legal assemblage has impacted the political dimension of the DAC policy formulation in three significant ways: it has exposed substantial political conflicts among various public organizations, it has increased the number and variety of policymakers involved and redefined their roles, and it has necessitated political consultations and discussions to address the divergences that have emerged.

The effort to exempt the CTO from the DAC application prompted the Ministry of Justice to strategically deploy its political and institutional influence. This was primarily due to the Ministry of Justice's resistance to the prospect of the CTO being subjected to regulatory oversight by a bill proposed by the Ministry of Public Administration and enforced by technical specifications from the AGID, a subordinate agency under the Ministry of Public Administration. An MP involved in the formulation

phase explains the challenge of standardizing norms that involve relevant institutions, "The Ministry of Justice is so influential that it resists regulation by external entities. If the Ministry of Justice wanted to deal with the issue, we could have found solutions to try to harmonize the CTO with the rest of the DAC legislation. The point is, they really did not want even to try. The true explanation is that the Ministry of Justice does not want to compromise with someone else" (MP1). This resistance shaped the entire policy formulation process, turning it into a "power game between Ministries" (MP1).

Parliamentary efforts to amend the bill to include the CTO triggered intense debates within the parliamentary committees. Committee members, typically tasked with offering formal, non-binding opinions, found their influence limited as the impact of the CTO diverged from their policy objectives. A senior MP remarked, "The political purpose of the DAC reform was to provide citizens a better life accessing the public administration easier. To achieve this goal, the government decided that any friction with any other ministry was simply to be put aside" (MP1). However, the political conflict hindered the political contributions MPs sought to make, with the Ministry of Justice prioritizing the protection of the CTO over the goal of a unified digital public administration. A policymaker from the Ministry of Public Administration recalled the difficulty of navigating the negotiation process: "The response [from the Ministry of Justice] was clear: 'Do not interfere in our sector because you do not understand it, and we are not open to changes'" (DG).

Political negotiation became crucial to resolving the applicability of the DAC to the CTO, introducing unexpected challenges, and altering the policy formulation's pace and sequence. One influential MP shared details of the complexity of negotiating to reach an acceptable compromise among policymakers: "I presented an alternative viewpoint with 35 conditions, prompting the Committee Chair to suspend the session and postpone it to the next day. We negotiated specific points at the Ministry of Public Administration, focusing mainly on an exemption for the Ministry of Justice. I distinctly remember being warned that implementing such legislation without providing the Ministry of Justice additional staff and IT resources could lead to a systemic deadlock" (MP2).

5.2.4. Technological dimension

The clash between the DAC's aim to establish common technological standards across all Italian public bureaucracies and the pre-existing standards of the CTO had two main impacts on the policy formulation phase.

Firstly, policymakers identified compatibility issues between the DAC legislation and the specific technological standards of the CTO. The Ministry of Justice highlighted the CTO's unique technological requirements concerning document formats, filing, transmission procedures, and communication tools among stakeholders, contrasting with the DAC's standards. One participant detailed this divergence, stating, "Since 1996, by 2016, we have seen a progression beginning with the digitization of clerks' office registers, advancing to paper-based documents, and culminating with the CTO. Such technological evolution was not mirrored in other public administrations. So, we have been experiencing continuous progress, way more than all the other branches of the public administration" (Judge1). The entrenched technological standards of the CTO were cited by the Ministry of Justice as a primary reason to justify safeguarding its systems, particularly under pressure from external stakeholders like the *Consiglio Nazionale Forense* (the National Bar Association) which argued that the DAC requirements, such as adding metadata or certifying document copies, would burden the parties involved in the CTO.

Secondly, this technological discrepancy created friction during the formulation phase of the DAC reform. Legislators in Parliamentary Committees challenged the protective clauses safeguarding the CTO's standards, arguing that the DAC was intended to provide flexible technological "building blocks" that could be adapted by any public administration. A senior public manager instrumental in drafting the

DAC explained, “The DAC proposes a suite of technological building blocks without prescribing their integration. The building blocks include various electronic document types, electronic signatures, their validity, transmission methods like ordinary or certified email, and digital identity verification tools such as ID documents or the Public Digital Identity System (SPID). The arrangement of these elements is left to the discretion of the implementers” (DG). While MPs recognized the need for the CTO to adapt and update its systems in line with the DAC, they argued that any technological realignment was feasible and not obstructed by technological barriers, but rather by operational challenges linked to the existing technology. A senior MP involved in the DAC formulation phase observed: “Technologically, there are no barriers to standardizing the rules. The necessary changes would have involved minor updates, there was not any lock-in on existing technologies that could have hindered the standardization effort. The issues were not technological but operational, related to the technology in use” (MP2). Despite these arguments, efforts by Parliamentary Committees to align the CTO with the DAC’s technological standards ultimately failed.

6. Discussion

The findings from this case study establish a foundation for understanding how techno-legal assemblages influence policy formulation. Having highlighted the characteristics of the CTO as a techno-legal assemblage, we can investigate its impact on the various dimensions of policy formulation as revealed by our thematic analysis.

6.1. Organizational dimension

Our findings illustrate the profound impact of the CTO’s techno-legal assemblage on organizational practices and processes, reshaping and constraining policy formulation in two notable ways. Initially, the complexity of the organizational practices, shaped in this assemblage, imposed boundaries that restricted the scope of adopting the DAC bill. Policymakers formulating the bill had to exclude certain domains, such as Civil Justice, from its application due to the unique organizational practices and configurations intrinsic to the CTO assemblage. This limitation on policy formulation imposed by the CTO techno-legal assemblage challenges prior literature that frames the impact of technology as a linear enhancement of the decision-making in the formulation phase (Fitsilis et al., 2022; Kolkman, 2020). Adopting a more nuanced conceptualization of technology – bundled in techno-legal assemblages – enables us to appreciate how technology restricts policy options (Gualdi & Cordella, 2023) instead of maximizing them (Janssen & Helbig, 2018).

Furthermore, the CTO’s assemblage led to heightened policy fragmentation by exempting its organizational structure from the DAC bill’s mandates, suggesting that a uniform policy may not suit the distinct frameworks of the CTO and the DAC. This fragmentation hindered efforts to unify the management of various public administrations under the DAC, thus undermining the objective of public administration management rationalization. This finding challenges prior research indicating technology’s capacity to streamline the policymaking process (Höchtel et al., 2016). Consequently, our findings illustrate that the interplay between technology and regulatory frameworks can introduce organizational complexities that obstruct the rationalization of policies such as the DAC.

6.2. Normative dimension

Our findings indicate that the normative structure, shaped by the CTO’s complex techno-legal assemblage, significantly influences the policy formulation phase. This complexity has led to increased fragmentation in policymaking, necessitating the use of various regulatory frameworks to satisfy the legal demands of both the CTO and the DAC. Consequently, policymakers have encountered normative conflicts

among legal sources, impeding the primary objective of policy standardization through the DAC reform. Prior literature has accounted for the efforts to design policy tools that could facilitate the standardization of legislation focusing on technology (Plesner & Justesen, 2022). Our findings shed new light on this aspect, highlighting that techno-legal assemblages shape policymaking hindering the necessary alignment of normative sources.

Moreover, the extensive reach of CTO regulations and norms embedded within the techno-legal assemblage added complexity to the entire policy formulation process of the DAC bill. Addressing these normative conflicts has required the involvement of diverse new actors, including legal experts, stakeholders, and jurisprudential authorities, who provide advice and clarify legal aspects of policy formulation. These findings enable us to discuss the expansion of the policy formulation phase in a completely different light. Prior literature has explained how technology facilitated citizens’ contribution to the formulation phase (Simonofski et al., 2021), encouraging public participation relevant to the definition of options and priorities (Coelho, Cunha, & Pozzebon, 2022). Against this backdrop, we argue that the policy formulation has indeed been expanded, with more actors involved and contributions required. However, the profound imbrication of technology and legal dimensions has necessitated additional legal expertise that could be provided only by selected stakeholders and not by the public. By extending this body of knowledge, we demonstrate that techno-legal assemblages in the policy formulation phase can trigger complex normative conflicts. Resolving these conflicts often demands additional efforts from policymakers, such as engaging in negotiations, making concessions, and involving various actors in hearings, consultancy, and advisory roles. These steps are crucial for effectively navigating the complex interplay between law and technology.

6.3. Political dimension

Our case study demonstrates how the CTO techno-legal assemblage acts as a catalyst for political confrontation among policymakers during the policy formulation stage. Findings show that the policy formulation has been deeply politicized: this was particularly evident when the decision to preserve the specificity of the CTO led to unexpected political tensions. Policymakers from the Ministry of Public Administration, who initially drafted the DAC bill, found themselves at odds with, and eventually overshadowed by, their counterparts from the Ministry of Justice, who were not originally expected to formally participate in the DAC’s policy formulation process. The frictions on the DAC reform were framed by many actors as a political confrontation among powerful institutions.

Furthermore, the redefinition of policymakers’ roles accelerated as high-level civil servants within the ministries directly engaged in negotiations with Members of Parliament (MPs). This interaction led to a symbolic shift in the center of negotiations from the expected (Parliamentary Committees, as prescribed by law) to the unexpected (Ministries and Government apparatuses) thereby recontextualizing the role of MPs under the influence of the techno-legal assemblage.

These findings explicitly challenge prior literature that has accounted for a depoliticization of the policy formulation phase due to the increasing reliance on technocratic expertise added by external stakeholders (Kunyenje & Chigona, 2022). To this end, the impact of the techno-legal assemblage was far from neutralizing political tensions: we provided evidence to argue that the politicization of the debate around the policy formulation increased, with institutions deploying their political power to direct the outcome of the process. These findings contradict prior research that showed how the adoption of technology in policy formulation decreased the relevance of political factors (Valle-Cruz & Sandoval-Almazán, 2024).

6.4. Technological dimension

Our analysis has elucidated how the CTO's techno-legal assemblage shapes technological decisions during policy formulation, particularly regarding the alignment between established technological standards and new solutions proposed in the legislation. The case involving the CTO and the DAC highlights that the techno-legal assemblage of the CTO has extended its regulatory influence into other areas of policy formulation.

Firstly, the CTO's techno-legal assemblage has added complexity to the policymaking process. The CTO's technological standards could not easily harmonize with the DAC's new provisions, creating significant challenges in aligning different technological systems under a uniform standard and exacerbating existing frictions.

Second, the CTO techno-legal assemblage has redefined the scope of the policy formulation phase. MPs recognized that they could not indiscriminately apply the DAC's provisions across various sectors without considering the specific techno-legal assemblages already in place. These insights challenge previous literature portraying technology as a tool that streamlines policymaking processes (Höchtel et al., 2016; Schintler & Kulkarni, 2014). Contrary to this perspective, and in line with more recent research (Gualdi & Cordella, 2023), our findings suggest that technology, when intertwined in a techno-legal assemblage, can complicate policy formulation and potentially divert it from its intended outcomes. This re-evaluation underscores the nuanced role of technology in shaping policy landscapes, calling for a deeper understanding of its integrative and disruptive capacities.

6.5. Techno-legal assemblage impact on policy formulation: a framework

Building on the findings of our research, we develop a theoretical framework that elucidates four key dimensions identified through the inductive thematic analysis. These dimensions illustrate how techno-legal assemblages impact the policy formulation phase. This framework views policy formulation as a complex negotiation process, deeply influenced by techno-legal assemblages. The discussions about integrating the DAC regulations with the CTO illustrate the critical role that the techno-legal assemblage, inherent to the CTO, plays in shaping the DAC policy formulation process. Specifically, the development of the DAC reform required adapting to the influences exerted by the CTO techno-legal assemblage, affecting the organizational, normative,

political, and technological dimensions. This approach helps to conceptualize policy formulation not just as a legislative activity but as a dynamic effort among multiple intersecting forces, (Fig. 2).

7. Conclusions

7.1. Contribution to literature

This paper makes three significant contributions to academic research on the impact of technology on the policymaking process.

First, it pays justice to the often-overlooked phase of policy formulation, underscoring its importance as the crucial stage where high-level policymakers draft, discuss, and design policies (Turnpenny et al., 2015). In doing so, the paper adds to the limited but valuable body of literature that has explored policy formulation (Kolkman, 2020; Kunyenje & Chigona, 2022; Valle-Cruz & Sandoval-Almazán, 2024), addressing calls to more deeply engage with this specific phase (Höchtel et al., 2016; Simonofski et al., 2021) to “bring it to the mainstream” of policymaking research (Ferreira et al., 2022, p. 182).

Second, this paper challenges the existing research stream that primarily emphasizes the linear impact of specific technologies on the policy formulation phase (Kolkman, 2020; Schintler & Kulkarni, 2014; Valle-Cruz & Sandoval-Almazán, 2024). The paper contends that understanding the multifaceted impact of technology on policymaking requires a broader perspective. By integrating the assemblage theory and leveraging the concept of techno-legal assemblages, this study demonstrates how the intertwining of technology with existing legal frameworks has significantly transformed policymaking activities during the formulation phase.

Third, the techno-legal assemblages analytical framework allowed us to further theorize the specific dimensions of policy formulation that are shaped by techno-legal assemblages. Drawing on empirical evidence from the Italian reform of the DAC and its interaction with the CTO, the paper illustrates how techno-legal assemblages substantially reshape the organizational, normative, political, and technological dimensions of policy formulation. The resulting framework offers a nuanced theorization of how policy formulation processes are constrained, supported, or transformed by these assemblages, contributing to a deeper understanding of these complex interactions in the existing literature.

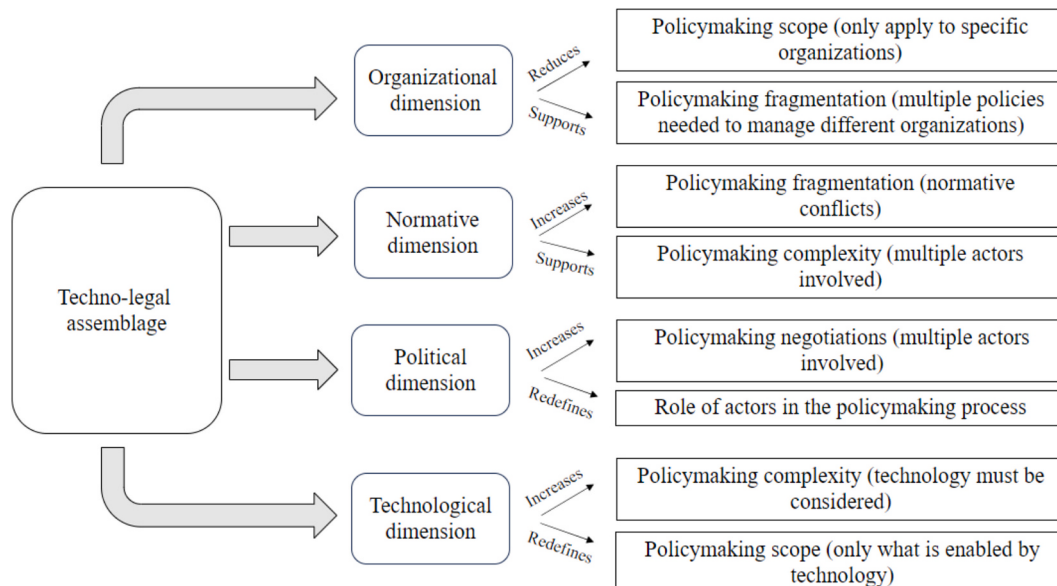


Fig. 2. Impact of techno-legal assemblage on the dimensions of the policy formulation phase.

7.2. Practical implications

The findings of this research are highly relevant to policymakers involved in policy formulation, as techno-legal assemblages increasingly act as a backdrop for policy formulation. Indeed, policymakers often find themselves unprepared and unaware of how the entanglement of technology and law shapes policymaking activity (Cordella & Gualdi, 2019). Building on our findings, we are in the position to offer two key recommendations.

First, we encourage policymakers, and specifically MPs who often have expertise in single domains, to increase their general awareness and understanding of how technology imbricates with existing legal structures in the contexts where it is adopted. We are not advocating for individual MPs' awareness and understanding but rather for collective awareness and understanding. Informal groups of MPs, or civil servants, can be formed to provide opportunities for sharing and exchanging informed views on the techno-legal influences shaping policy formulation. Examples include the Intergroup for Digital Innovation in the Italian Parliament, the Intergroup on AI in the European Parliament, and the Civil servants networks in the UK.

Second, policymakers should recognize that techno-legal assemblages carry legacy issues, making it challenging to reform policies that are built on techno-legal assemblages. Over time, this rigidity can contribute to the formation of policy silos, where different policy areas operate in isolation, limiting cross-organizational collaboration and coordination. To avoid fragmentation or policy failure, it is crucial to holistically assess the impact of techno-legal assemblages on the organizational, normative, political, and technological dimensions of the policy formulation phase. As highlighted in this paper, addressing these challenges is complex, but it is imperative for ensuring the constitutional and democratic integrity of political systems.

7.3. Limitations of the study and future research

We conclude this study by acknowledging three key limitations and proposing three related implications to guide future research.

Firstly, the geographical scope of our study is constrained. Aligning with existing research on technology and policymaking (Kunyenje & Chigona, 2022; Sun & Medaglia, 2019), we focused on one single country, being aware of its distinct practices, traditions, and boundaries. For example, the policy formulation in Italy is deeply influenced by the civil law tradition, resulting in a unique over-proliferation of normative acts. The intertwining of multiple overlapping legal sources with the technology can profoundly impact policy formulation. We encourage future research to compare our findings by studying the impact of technology on policy formulation in different contexts, such as common law countries, or by exploring differences and similarities between countries with comparable policymaking processes.

Secondly, our study unpacks the impact of techno-legal assemblages on four distinct dimensions of policy formulation. These dimensions – organizational, normative, political, and technological – emerge from the data analysis but can be influenced by researcher bias. It is indeed possible that techno-legal assemblages could impact policy formulation in ways that we have overlooked, potentially yielding different results. Acknowledging this limitation paves the way for further studies that could expand our framework, investigating how techno-legal assemblages impact other dimensions of policymaking that our study has not considered.

Thirdly, our data collection process has certain limitations. The relatively small sample size could affect representativeness. Furthermore, while we specifically focused on high-level policy formulation, this study risks “elite bias”, the tendency to interview only top-level officials within organizations (Myers & Newman, 2007, p. 5). Future research could explore the impact of techno-legal assemblages across different levels of policy formulation, such as local government and/or municipalities. Research could also investigate how the effects of these

assemblages vary in different phases of policymaking, such as in policy implementation, where street-level bureaucrats put policies formulated by high-level officials into action.

CRedit authorship contribution statement

Antonio Cordella: Writing – review & editing, Writing – original draft, Data curation, Conceptualization, Investigation, Methodology. **Francesco Gualdi:** Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization, Methodology. The two authors are listed in alphabetical order only and have contributed equally to the paper.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used Academic Assistant Pro to check for the correctness of the language. After using this system, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. This research received no grants or funds from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgements

The authors wish to thank the Senior Editor and the three anonymous reviewers for their critical guidance during the revision process. The authors received helpful feedback and comments from participants at the Hawaii International Conference on System Sciences 2022, where an early version of the project was presented.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.giq.2025.102023>.

References

- AGID. (2022). Piano Triennale per l'Informatica nella Pubblica Amministrazione. http://www.agid.gov.it/sites/default/files/repository_files/piano_triennale_per_linformatica_nella_pa_2022-2024.pdf.
- Agostino, D., & Arnaboldi, M. (2017). Social media data used in the measurement of public services effectiveness: Empirical evidence from twitter in higher education institutions. *Public Policy and Administration*, 32(4), 296–322. <https://doi.org/10.1177/0952076716682369>
- Aitamurto, T. (2016). Collective intelligence in law reforms: When the logic of the crowds and the logic of policymaking collide. In *Proceedings of the 49th Hawaii international conference on system sciences, Koloa, Hawaii*. <https://doi.org/10.1109/HICSS.2016.349>
- Baxter, P., & Jack, S. (2012). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, 13(4), 544–559. <http://www.nova.edu/ssss/QR/QR13-4/baxter.pdf>.
- Benbasat, I., & Zmud, R. W. (1999). Empirical research in information systems: The practice of relevance. *MIS Quarterly*, 23(1), 3–16. <https://doi.org/10.2307/249403>
- Borrás, S., & Edler, J. (2020). The roles of the state in the governance of socio-technical systems' transformation. *Research Policy*, 49(5), Article 103971. <https://doi.org/10.1016/j.respol.2020.103971>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Buchanan, D., Boddy, D., & McCalman, J. (2013). Getting in, getting on, getting out, and getting back. In A. Bryman (Ed.), *Doing research in organizations* (1st ed., pp. 53–67). Routledge. <https://doi.org/10.4324/9780203385449>
- Carnevali, D. (2019). Great success that was on the brink of failure: The case of a techno-legal assemblage in the “civil trial on-line” system in Italy. *European Quarterly of Political Attitudes and Mentalities*, 8(2), 21–35. <https://nbnresolving.org/urn:nbn:de:0168-ssor-62437-3>.

- Carnevali, D., & Resca, A. (2014). Pushing at the edge of maximum manageable complexity: The case of 'trial online' in Italy. In F. Contini, & G. F. Lanzara (Eds.), *The circulation of agency in E-justice: Interoperability and infrastructures for European transborder judicial proceedings* (pp. 161–183). Netherlands: Springer. https://doi.org/10.1007/978-94-007-7525-1_7.
- Charmaz, K. (2014). *Constructing grounded theory*. SAGE.
- Ciborra, C. (2005). Interpreting e-government and development. *Information Technology & People*, 18(3), 260–279. <https://doi.org/10.1108/09593840510615879>
- Clarke, A. (2020). Digital government units: What are they, and what do they mean for digital era public management renewal? *International Public Management Journal*, 23(3), 358–379. <https://doi.org/10.1080/10967494.2019.1686447>
- Coelho, T. R., Cunha, M. A., & Pozzebon, M. (2022). eParticipation practices and mechanisms of influence: An investigation of public policymaking. *Government Information Quarterly*, 39(2), Article 101667. <https://doi.org/10.1016/j.giq.2021.101667>
- Coelho, T. R., Pozzebon, M., & Cunha, M. A. (2022). Citizens influencing public policy-making: Resourcing as source of relational power in e-participation platforms. *Information Systems Journal*, 32(2), 344–376. <https://doi.org/10.1111/isj.12359>
- Consolandi, E. (2016). Tutti i problemi del nuovo Cad per la Giustizia digitale: la privacy vince sulla conoscenza. <https://www.forumpa.it/pa-digitale/tutti-i-problemi-del-nuovo-cad-per-la-giustizia-digitale-la-privacy-vince-sulla-conoscenza/>.
- Contini, F., & Cordella, A. (2015). Assembling law and technology in the public sector: The case of e-justice reforms. In *Proceedings of the 16th annual international conference on digital government research*, Phoenix, Arizona. <https://doi.org/10.1145/2757401.2757418>
- Contini, F., & Cordella, A. (2016). Law and technology in civil judicial procedures. In R. Brownsword, E. Scotford, & K. Yeung (Eds.), *The Oxford handbook of the law and regulation of technology*. Oxford University Press.
- Contini, F., & Lanzara, G. F. (Eds.). (2009). *ICT and innovation in the public sector: European studies in the making of E-government*. Palgrave Macmillan. <https://doi.org/10.1057/9780230227293>.
- Cordella, A., & Gualdi, F. (2019). Law, technology and policies: A complex negotiation to generate value. In *Proceedings of the 3rd international conference on E-commerce, E-business and E-government*, Lyon, France. <https://doi.org/10.1145/3340017.3340029>
- Craglia, M., Hradec, J., & Troussard, X. (2020). The big data and artificial intelligence: Opportunities and challenges to modernise the policy cycle. In V. Šucha, & M. Sienkiewicz (Eds.), *Science for policy handbook* (pp. 96–103). Elsevier. <https://doi.org/10.1016/B978-0-12-822596-7.00009-7>.
- Debnath, P., Karmakar, M., & Sumon, M. F. I. (2024). AI in public policy: Enhancing decision-making and policy formulation in the US government. *International Journal of Advanced Engineering Technologies and Innovations*, 2(1), 169–193. <https://ijaeti.com/index.php/Journal/article/view/707>.
- DeLanda, M. (2016). *Assemblage theory*. Edinburgh University Press.
- Deleuze, G., & Guattari, F. (1983). *Anti-Oedipus*. University of Minnesota Press.
- Deleuze, G., & Guattari, F. (1988). *A thousand plateaus: Capitalism and schizophrenia*. Bloomsbury Publishing.
- Edmondson, D. L., Kern, F., & Rogge, K. S. (2019). The co-evolution of policy mixes and socio-technical systems: Towards a conceptual framework of policy mix feedback in sustainability transitions. *Research Policy*, 48(10), Article 103555. <https://doi.org/10.1016/j.respol.2018.03.010>
- Fabri, M. (2009). The Italian style of e-justice in a comparative perspective. In A. Cerrillo i Martínez, & P. Fabra i Abat (Eds.), *E-justice: Using information communication technologies in the court system* (pp. 1–19). IGI Global. <https://doi.org/10.4018/978-1-59904-998-4.ch001>.
- Ferreira, E., Jordan, A., & Turnpenny, J. (2022). Policy formulation tools: New perspectives. In M. Howlett (Ed.), *The Routledge handbook of policy sciences* (1st ed., pp. 173–184). Routledge. <https://doi.org/10.4324/9781003163954>.
- Fitsilis, F., Koryzis, D., & Schefbeck, G. (2022). Legal informatics tools for evidence-based policy creation in parliaments. *International Journal of Parliamentary Studies*, 2(1), 5–29. <https://doi.org/10.1163/26668912-bja10031>
- Fox, N. J., & Alldred, P. (2022). Doing new materialist data analysis: A Spinozo-Deleuzian ethological toolkit. *International Journal of Social Research Methodology*, 25(5), 625–638. <https://doi.org/10.1080/13645579.2021.1933070>
- Giest, S. (2017). Big data for policymaking: Fad or fasttrack? *Policy Sciences*, 50(3), 367–382. <https://doi.org/10.1007/s11077-017-9293-1>
- Gilardi, F. (2022). *Digital technology, politics, and policy-making*. Cambridge University Press. <https://doi.org/10.1017/9781108887304>
- Gualdi, F., & Cordella, A. (2022). Techno-legal entanglements as new actors in the policy-making process. In *Proceedings of the 55th Hawaii international conference on system sciences*, Hawaii (online). <https://doi.org/10.24251/HICSS.2022.298>
- Gualdi, F., & Cordella, A. (2023). Policymaking in time of Covid-19: How the rise of techno-institutional inertia impacts the design and delivery of ICT-mediated policies. In *Proceedings of the 56th Hawaii international conference on system sciences*, Maui, Hawaii. <https://doi.org/10.24251/HICSS.2023.218>
- Hagen, L., Keller, T. E., Yerden, X., & Luna-Reyes, L. F. (2019). Open data visualizations and analytics as tools for policy-making. *Government Information Quarterly*, 36(4), Article 101387. <https://doi.org/10.1016/j.giq.2019.06.004>
- Hansson-Porman, K., Reimerson, E., Björstig, T., & Sandström, C. (2021). A view through the lens of policy formulation: The struggle to formulate Swedish moose policy. *Journal of Environmental Policy & Planning*, 23(4), 528–542. <https://doi.org/10.1080/1523908X.2021.1888700>
- Hildebrandt, M. (2017). The force of law and the force of technology. In M. R. McGuire, & T. Holt (Eds.), *The Routledge handbook of technology, crime and justice*. Routledge. <https://doi.org/10.4324/9781315743981>.
- Hildebrandt, M. (2018). Algorithmic regulation and the rule of law. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 376(2128), Article 20170355. <https://doi.org/10.1098/rsta.2017.0355>
- Höchtel, J., Parycek, P., & Schöllhammer, R. (2016). Big data in the policy cycle: Policy decision making in the digital era. *Journal of Organizational Computing and Electronic Commerce*, 26(1–2), 147–169. <https://doi.org/10.1080/10919392.2015.1125187>
- Howlett, M., & Giest, S. (2012). The policy-making process. In E. Aralar, S. Fritzen, M. Howlett, M. Ramesh, & X. Wu (Eds.), *Routledge handbook of public policy* (1st ed., pp. 17–28). Routledge. <https://doi.org/10.4324/9780203097571>.
- Ingrams, A. (2023). Do public comments make a difference in open rulemaking? Insights from information management using machine learning and QCA analysis. *Government Information Quarterly*, 40(1), Article 101778. <https://doi.org/10.1016/j.giq.2022.101778>
- Jann, W., & Wegrich, K. (2017). Theories of the policy cycle. In F. Fischer, & G. J. Miller (Eds.), *Handbook of public policy analysis* (pp. 69–88). Routledge. <https://doi.org/10.4324/9781315093192>.
- Janssen, M., & Helbig, N. (2018). Innovating and changing the policy-cycle: Policy-makers be prepared! *Government Information Quarterly*, 35(4), S99–S105. <https://doi.org/10.1016/j.giq.2015.11.009>
- Justesen, L., & Plesner, U. (2024). From sequence to simultaneity: Tonalities and organizational change in digitalized organizations. *Journal of Organizational Change Management*, 37(2), 408–422. <https://doi.org/10.1108/JOCM-01-2023-0022>
- Kolkman, D. (2020). The usefulness of algorithmic models in policy making. *Government Information Quarterly*, 37(3), Article 101488. <https://doi.org/10.1016/j.giq.2020.101488>
- Koryzis, D., Margaris, D., Vassilakis, C., Kotis, K., & Spiliopoulos, D. (2023). Disruptive technologies for parliaments: A literature review. *Future Internet*, 15(2). <https://doi.org/10.3390/fi15020066>
- Kunyenje, G., & Chigona, W. (2022). How influences of external actors affect information and communication technology policy formation in developing countries: Case of Malawi. *Journal of Information Technology & Politics*, 19(1), 34–49. <https://doi.org/10.1080/19331681.2021.1911907>
- Lanzara, G. F. (2009). Building digital institutions: ICT and the rise of assemblages in government. In F. Contini, & G. F. Lanzara (Eds.), *ICT and innovation in the public sector: European studies in the making of eGovernment* (pp. 9–48). Palgrave Macmillan. https://doi.org/10.1057/9780230227293_2.
- Lasswell, H. D. (1971). *A pre-view of policy sciences*. American Elsevier Publishing Company.
- Maciejewski, M. (2017). To do more, better, faster and more cheaply: Using big data in public administration. *International Review of Administrative Sciences*, 83(1), 120–135. <https://doi.org/10.1177/0020852316640058>
- Marchesani, F., Masciarelli, F., & Bikfalvi, A. (2023). Smart city as a hub for talent and innovative companies: Exploring the (dis) advantages of digital technology implementation in cities. *Technological Forecasting and Social Change*, 193, Article 122636. <https://doi.org/10.1016/j.techfore.2023.122636>
- McBride, K., Aavik, G., Toots, M., Kalvet, T., & Krimmer, R. (2019). How does open government data driven co-creation occur? Six factors and a 'perfect storm': insights from Chicago's food inspection forecasting model. *Government Information Quarterly*, 36(1), 88–97. <https://doi.org/10.1016/j.giq.2018.11.006>
- Mergel, I. (2019). Digital service teams in government. *Government Information Quarterly*, 36(4), Article 101389. <https://doi.org/10.1016/j.giq.2019.07.001>
- Ministry of Justice. (2011). Decree 2011/44 of the Ministry of Justice - Regolamento concernente le regole tecniche per l'adozione nel processo civile e nel processo penale, delle tecnologie dell'informazione e della comunicazione. <https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:decreto.ministeriale:2011-02-21;44;vig>.
- Ministry of Justice. (2014). Directive 16 April 2014 - Specifiche tecniche previste dall'art. 34, c1 del d.m. 21 febbraio 2011 n. 44, recante regolamento concernente le regole tecniche per l'adozione, nel processo civile e penale, delle tecnologie dell'informazione e della comunicazione. https://www.giustizia.it/giustizia/it/mg_1_8_1.wp?facetNode_1=0_21&facetNode_2=0_21_4&previousPage=mg_1_8&contentId=SDC1007352.
- Mohr, R., & Contini, F. (2011). Reassembling the legal: 'The wonders of modern science' in court-related proceedings. *Griffith Law Review*, 20(4), 994–1019. <https://doi.org/10.1080/10383441.2011.10854728>
- Monteiro, E., Constantinides, P., Scott, S. V., Shaikh, M., & Burton-Jones, A. (2022). Qualitative research methods in information systems: A call for phenomenon-focused problematization. *MIS Quarterly*, 46(4), iii–xix. <https://misq.umn.edu/misq/downloads/download/editorial/765/>.
- Mureddu, F., Schmeling, J., & Kanellou, E. (2020). Research challenges for the use of big data in policy-making. *Transforming Government: People, Process and Policy*, 14(4), 593–604. <https://doi.org/10.1108/TG-08-2019-0082>
- Myers, M. D., & Newman, M. (2007). The qualitative interview in IS research: Examining the craft. *Information and Organization*, 17(1), 2–26. <https://doi.org/10.1016/j.infoandorg.2006.11.001>
- Oborn, E., Barrett, M., & Dawson, S. (2013). Distributed leadership in policy formulation: A sociomaterial perspective. *Organization Studies*, 34(2), 253–276. <https://doi.org/10.1177/0170840612473552>
- Patton, M. Q. (2014). *Qualitative research & evaluation methods: Integrating theory and practice* (4th ed.). Sage.
- Petrucchi, L. (2017). *Il processo telematico e la lezione del Gattopardo*. Questione Giustizia. https://www.questionegiustizia.it/articolo/il-processo-telematico-e-la-lezione-del-gattopardo_23-10-2017.php.
- Plesner, U., & Justesen, L. (2022). The double darkness of digitalization: Shaping digital-ready legislation to reshape the conditions for public-sector digitalization. *Science, Technology, & Human Values*, 47(1), 146–173. <https://doi.org/10.1177/0162243921999715>

- Qiu, S., Gao, X., Yue, W., & Zhang, Q. (2023). Government-led and internet-empowered citizen participation in China's policymaking: A case study of the Shanghai 2035 master plan. *Government Information Quarterly*, 40(3), Article 101806. <https://doi.org/10.1016/j.giq.2023.101806>
- Reidenberg, J. R. (1997). Lex Informatica: The formulation of information policy rules through technology. *Texas Law Review*, 76(3), 553–594. <https://heinonline.org/HOL/P?h=hein.journals/tlr76&i=571>.
- Rip, A., & Kemp, R. (1998). Technological change. In S. Rayner, & E. L. Malone (Eds.), *Vol. II. Human choice and climate change* (pp. 327–399). Battelle Press.
- Schiff, D. S., & Schiff, K. J. (2023). Narratives and expert information in agenda-setting: Experimental evidence on state legislator engagement with artificial intelligence policy. *Policy Studies Journal*, 51(4), 817–842. <https://doi.org/10.1111/psj.12511>
- Schintler, L. A., & Kulkarni, R. (2014). Big data for policy analysis: The good, the bad, and the ugly. *Review of Policy Research*, 31(4), 343–348. <https://doi.org/10.1111/ropr.12079>
- Simonofski, A., Fink, J., & Burnay, C. (2021). Supporting policy-making with social media and e-participation platforms data: A policy analytics framework. *Government Information Quarterly*, 38(3), Article 101590. <https://doi.org/10.1016/j.giq.2021.101590>
- Sun, T. Q., & Medaglia, R. (2019). Mapping the challenges of artificial intelligence in the public sector: Evidence from public healthcare. *Government Information Quarterly*, 36(2), 368–383. <https://doi.org/10.1016/j.giq.2018.09.008>
- Symon, G., & Cassell, C. (Eds.). (2012). *Qualitative organizational research: Core methods and current challenges*. Sage.
- Tangi, L., Benedetti, M., Gastaldi, L., Noci, G., & Russo, C. (2021). Mandatory provisioning of digital public services as a feasible service delivery strategy: Evidence from Italian local governments. *Government Information Quarterly*, 38(1), Article 101543. <https://doi.org/10.1016/j.giq.2020.101543>
- Tarrant, A., & Hughes, K. (2019). Qualitative secondary analysis: Building longitudinal samples to understand men's generational identities in low income contexts. *Sociology*, 53(3), 538–553. <https://doi.org/10.1177/0038038518772743>
- Turnpenny, J., Jordan, A., Benson, D., & Rayner, T. (2015). The tools of policy formulation: An introduction. In A. Jordan, & J. Turnpenny (Eds.), *The tools of policy formulation: Actors, capacities, venues and effects* (pp. 3–30). Edward Elgar Publishing. <https://doi.org/10.4337/9781783477043.00011>.
- Valle-Cruz, D., Criado, J. I., Sandoval-Almazán, R., & Ruvalcaba-Gomez, E. A. (2020). Assessing the public policy-cycle framework in the age of artificial intelligence: From agenda-setting to policy evaluation. *Government Information Quarterly*, 37(4), Article 101509. <https://doi.org/10.1016/j.giq.2020.101509>
- Valle-Cruz, D., & Sandoval-Almazán, R. (2024). Role and governance of artificial intelligence in the public policy cycle. In J. B. Bullock, Y.-C. Chen, J. Himmelreich, V. M. Hudson, A. Korinek, M. M. Young, & B. Zhang (Eds.), *The Oxford handbook of AI governance* (pp. 534–550). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780197579329.013.25>.
- Van der Steen, M. (2017). Anticipation tools in policy formulation: Forecasting, foresight and implications for policy planning. In M. Howlett, & I. Mukherjee (Eds.), *Handbook of policy formulation* (pp. 182–197). Edward Elgar Publishing. <https://doi.org/10.4337/9781784719326.00018>.
- Wolf, T., Trang, S., Weiger, W. H., & Trenz, M. (2024). The technology-behavioral compensation effect: Unintended consequences of health technology adoption. *Journal of Information Technology*, 39(3), 521–546. <https://doi.org/10.1177/02683962231183979>
- Wu, X., Ramesh, M., Howlett, M., & Fritzen, S. (2017). *The public policy primer: Managing the policy process* (2nd ed.). Routledge. <https://doi.org/10.4324/9781315624754>
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage.
- Yuan, Q., & Gasco-Hernandez, M. (2021). Open innovation in the public sector: Creating public value through civic hackathons. *Public Management Review*, 23(4), 523–544. <https://doi.org/10.1080/14719037.2019.1695884>

Antonio Cordella is an Associate Professor in Management at the London School of Economics and Political Science (LSE), and a visiting professor at the Maastricht Graduate School of Governance, UNMERIT, the Netherlands. His research interests cover the areas of E-government, Economic Theories of Information Systems, and the Social Studies of Information Systems. His publications address problems related to the adoption of ICTs in the public sector and discuss the institutional and organizational implications of such adoptions. An Italian national, he holds a PhD in Information Systems from Gothenburg University, Sweden.

Francesco Gualdi is a Lecturer of International Business and Technology at Regent's University London. He is also affiliated to the Department of Management of the London School of Economics and Political Science (LSE), and he is a Research Fellow at the Center for Technology in Government (Albany, USA). He holds a PhD in Enterprise Engineering from Tor Vergata University in Rome. His main research interests cover the areas of AI adoption in public sector, digital government, impact of technology on policymaking activity. His research has been published in *Public Administration*, *Government Information Quarterly*, and *Information Policy*. Prior to the academic career, he served as strategic adviser to the Minister of European Affairs within the Italian Government (2014–2018).