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Karin Väyrynen
University of Oulu, karin.vayrynen@oulu.fi

Sari Laari-Salmela
University of Oulu

Netta Iivari
University of Oulu

Arto Lanamäki
University of Oulu

Marianne Kinnula
University of Oulu

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Karin Väyrynen
Faculty of Information Technology and Electrical Engineering
INTERACT Research Unit
University of Oulu
karin.vayrynen@oulu.fi
000-0001-5216-3301

Sari Laari-Salmela
Department of Marketing, Management and International Business
University of Oulu Business School
0000-0002-6502-1684

Netta Iivari
Faculty of Information Technology and Electrical Engineering
INTERACT Research Unit
University of Oulu
0000-0002-7420-2890

Arto Lanamäki
Faculty of Information Technology and Electrical Engineering
INTERACT Research Unit
University of Oulu
0000-0003-3355-802X

Marianne Kinnula
Faculty of Information Technology and Electrical Engineering
INTERACT Research Unit
University of Oulu
0000-0002-1582-8869

Abstract:

Information technology (IT) related policymaking is an increasingly important topic in the Information Systems (IS) literature. Despite its significance, the challenges inherent in policymaking, stemming from the multifaceted nature of IT, remain poorly understood. This paper explores how an IT artefact evolves as a policy object throughout a 4.5-year public policy cycle centered on the Finnish Taximeter Law. We make two contributions. As a theoretical contribution, we provide a conceptual framework for understanding the IT artefact as a policy object. This framework identifies three forms of the artefact: a mental construct, a policy text, and a material IT artefact. Additionally, we propose a distinction between IT artefacts at the policy level and IT artefacts as real-world technologies. Second, we shed light on the challenges of translating multifaceted, real-world IT artefacts into abstract policy texts and subsequently reinterpreting these texts back into actionable, real-world technologies. Specifically, we enhance the understanding of the dynamics involved in public policymaking concerning IT artefacts. We reflect on the practical implications of our research by drawing on the case of "artificial intelligence as policy object" in the context of the European AI Act. Our findings thus hold implications for both IS researchers and policymakers.

Keywords: IT Artefact, IT Regulation, Law, Policy Object, Policy Cycle, Public Policymaking, European AI Act.

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1 Introduction

Public policymaking related to information technology (IT) has recently been identified as an important but still marginal information systems (IS) research area (King & Kraemer, 2019; Niederman et al., 2017). In contrast with policies of private organizations, public policies are produced by government officials and agencies (Anderson, 2013), and, as such, have coercive aspects that affect the development and implementation of IT (Bernardi et al., 2017; Klecun-Dabrowska & Cornford, 2000). One example of public policy statements, which are "formal expressions or articulations of public policy", are regulations (Anderson, 2013, p. 9). Such public policies are argued to affect the adoption and use of IT at the market level (Demlehner & Laumer, 2020; Tsatsou et al., 2010; Väyrynen & Lanamäki, 2020). They can both enable and constrain how digital transformation occurs (Hanelt et al., 2021; Vial, 2019).

However, there are several challenges regarding public policymaking in relation to IT. A major challenge relates to the capabilities of policymakers to understand in-depth the IT they seek to regulate (e.g., El-Moghazi et al., 2019). IT-related (public) policies contain textual representations of IT and may omit many significant aspects of IT, such as informational, social, or tangible aspects (Iivari, 2017; Lee et al., 2015; Orlikowski & Iacono, 2001). There is a stream of policy research in IS that discusses the complex, multifaceted process of policymaking in different IS contexts and the reciprocal relationship between (public) policies and practices as well as the emergence and influence of different stakeholder interests, needs, interpretations, framings, and power plays (Brown & Thompson, 2011; Eaton et al., 2018; Henriksen & Damsgaard, 2007; Karjalainen et al., 2019; Klecun-Dabrowska & Cornford, 2000; Klecun, 2016; E. Niemimaa & Niemimaa, 2017; M. Niemimaa et al., 2019). However, less attention has been paid to the IT artefact itself, and how it is intertwined with the process of policymaking.

A core motivation for this study arose from the public policy process initiated in 2015 concerning transport services in Finland. As a part of this process, a change to Article 25 of the Vehicle Law on the use of taximeters ("Taximeter Law" henceforth) was proposed in 2016. While under the earlier law, only a certified taximeter was an allowed IT artefact to determine the price of a taxi ride, the new law sought to allow also other kinds of IT artefacts to be used for that purpose. Due to a problematic formulation of the law text, an attempt to revise the already accepted but not yet effective new law was undertaken in 2018. This attempt failed, and the Taximeter Law that had been proposed in 2016 became effective in 2018. Throughout this regulative reform, difficulties involved in regulating IT artefacts became visible.

Against this practical research motivation, this study takes a step toward opening the black box of IT as a policy object. A policy object is the "object" that a policy seeks to regulate (e.g., artificial intelligence (AI) systems or taximeters); it is the "core dimensions or concepts" that a policy text proposes for that object (Sin, 2014). By positioning our study in the field of IS policy research (King & Kraemer, 2019), we draw insights from the policy cycle literature (Bridgman & Davis, 2003; Jann & Wegrich, 2007) and Sin's (2014) conceptualization of a "policy object". The concept of a policy object enables us to examine the way concrete information technologies on the market are being translated into, and processed as, policy objects. Moreover, it enables us to focus on those aspects that become 'lost in translation' and the effect they have on IT-related public policymaking. In addition to the concept of policy object, we utilize the definition of an IT artefact from Orlikowski and Iacono (2001, p. 121) as "bundles of material and cultural properties packed in some socially recognizable form such as hardware and/or software". The research question we address is:

RQ: How does an IT artefact evolve as a policy object during a public policy process?

We answer the research question through a longitudinal interpretive case study (Walsham, 1995) of a long-term, challenge-laden regulative reform unfolding in real time in a natural setting. We scrutinize the evolving nature of an IT artefact as a policy object in a public policy process, focusing on the regulative reform of the Taximeter Law. As a result, we illustrate how an IT artefact as a policy object takes different forms during the policy cycle, transcending between its representation as stakeholders' mental constructs, as a policy text, and as a real-world material entity (Sin, 2014). Our findings show how the IT artefact was defined in different versions of the Taximeter Law by drawing on certain functionalities of the artefact while omitting others, and how the policy object was interpreted by stakeholders.

Our findings contribute to the IS stream of literature on IT-related (public) policymaking in two ways. First, as a theoretical contribution, we provide a conceptual framework: a novel conceptualization of IT artefacts as policy objects which take three forms - as a mental construct, a policy text, and a material IT artefact -

and propose a distinction between IT artefacts on a policy level and IT artefacts as real-world technologies. Second, we increase the understanding of the dynamics of public policymaking related to IT artefacts and help to make sense of the challenges involved in the translation of multifaceted real-world IT artefacts into abstract policy texts and back into real-world IT artefacts. Our discussion of the practical implications, where we reflect on AI as a policy object in the context of the European AI Act, illustrates the applicability of our conceptualization also to other cases of IT regulation.

2 Theoretical Background

2.1 Related IS Research on Policy Concerns

There is an increasing interest in IS research on policies shaping and being shaped by information systems and the IS practice (King & Kraemer, 2019). Policies are intertwined with IS innovation, design, implementation, and use. IS researchers have studied policies in various contexts, scrutinizing policy formulation, policy implementation/enactment, and policies' impacts on organizations or society. We distinguish between two policy related IS research streams that significantly differ in what type of policy they are interested in. The first stream of research focuses on policies of private organizations, such as the large IS stream on information system security policies (Barlow et al., 2018; Feng et al., 2019; Karjalainen et al., 2019; Lowry et al., 2010; Moody et al., 2018; E. Niemimaa & Niemimaa, 2017; M. Niemimaa et al., 2019; Ormond et al., 2019), which differ from public policies that are produced by government officials and agencies (Anderson, 2013). The second stream focuses on public policymaking related issues, and our study belongs to this second stream. In the remainder of this paper, therefore, the term policy (making) refers to public policy (making).

Prior IS research on policies and policymaking presents interesting differences in terms of topics studied and approaches to policies and policymaking adopted; however, the extant studies have not scrutinized the role of IT artefacts as policy objects. So far, IS researchers have addressed various stages of the policy cycle and examined how policies are intermingled with and shape various kinds of information technologies and practices (Bernardi et al., 2017; Brown & Thompson, 2011; Coelho et al., 2022; Currie & Seddon, 2022; Henriksen & Damsgaard, 2007; Klecun-Dabrowska & Cornford, 2000; Klecun, 2016; Müller et al., 2022; Rhee et al., 2022; Stahl et al., 2012). Some studies have focused on the nuances of the policymaking process and discussed the reciprocal relationship between policies and practices, the emergence and influence of different stakeholder interests, needs, interpretations, and framings, and the use of rhetorical strategies to influence other stakeholders. This research stream underscores the political and power laden aspects of policymaking and how various kinds of discourses are involved in struggles around policymaking (Bernardi et al., 2017; Stahl et al., 2012).

Some of these studies address the relationship between policy and IT. Such research has demonstrated that IT may be strongly shaped by policymaking, which may be a highly complicated and contested process with a variety of actors involved, aiming at shaping or determining future IS innovations (Bernardi et al., 2017; Eaton et al., 2018). Negotiation, power struggles, and complex interplay between interests, values, frames, and resources may emerge along the way, influencing the resultant IS innovation (Bernardi et al., 2017). Some studies have also addressed policies with an IT artefact as a policy object; however, in these studies, the IT artefact is usually not the focus of the research. Instead, these studies focus on other policy-related aspects, such as on discourses or contests around the policy (e.g., Pouloudi et al., 2016), the role of interests, resources, and governance in the emergence of e-ID solutions (Eaton et al., 2018), an interpretation of how the role of health telematics has been described in policy documents (e.g., to serve aims of social cohesion and personal freedom) (Klecun-Dabrowska & Cornford, 2000), changes in the "tone" of policies relating to e-government adoption (Henriksen & Damsgaard, 2007), interaction of policy and practice in IT diffusion (Brown & Thompson, 2011), the role of rhetorical strategies on IS innovation in the context of health information systems (Bernardi et al., 2017), or the effect of ambiguous IT regulation on regulative legitimacy of technology (Väyrynen & Lanamäki, 2020).

Following the example of Bernardi et al. (2017), we focus in the current study on the relationship between an IT artefact and a public policy. However, our study differs from earlier studies by focusing on how an IT artefact as a policy object evolves during a public policy cycle. Most importantly, while earlier studies have shed light on the development and challenges of IS-related policies, the very core of what makes those policies relevant for our field has not been addressed: the way a concrete IT artefact is being translated into a policy object and the effect that inclusion and/or omission of different dimensions or characteristics of the concrete IT artefact has on a public policy. Even though some studies do take a broader and more

longitudinal view on the policy process (Henriksen & Damsgaard, 2007; Klecun-Dabrowska & Cornford, 2000), we are not aware of any IS studies that would systematically consider the whole policy process (i.e., the process from formulating to implementing regulations and laws).

2.2 Public Policymaking – The Policy Cycle

We utilize the multidisciplinary policy cycle literature (Bridgman & Davis, 2003; Jann & Wegrich, 2007) in our investigation of IT artefacts as policy objects in a public policy process. Public policy is popularly defined as "whatever governments choose to do or not to do" (Dye, 1976, p. 1). Public policy "has an authoritative, legally coercive quality that the policies of private organizations do not have" (Anderson, 2013, p. 9). Laws and regulations are typical outcomes of public policymaking[1].

The most conventional way of describing a policy process is as five stages of a policy cycle: agenda-setting, policy formulation, decision-making, implementation, and evaluation (Howlett & Giest, 2012). In this research, we adopt the policy cycle as our lens for data analysis (Figure 1). The **agenda-setting stage** encompasses the recognition of a problem and setting that problem on the agenda for public action. The **policy formulation stage** involves the definition of what should be achieved with the policy (i.e., the objectives), considering different alternative courses of action. In this stage, policymakers and other stakeholders usually negotiate in some form about the policy content and textual formulation of the policy. The **decision-making stage** is signified by a formal decision to implement the policy (i.e., adoption of the policy), or a decision not to adopt the policy. The **implementation stage** refers to executing and enforcing the adopted policy. Finally, the **evaluation stage** refers to the evaluation of the policy's effect in the light of the intended outcomes as well as unintended consequences. If problems are identified in this stage, a new policy cycle may start – the policy might be redesigned based on a modified problem-perception and setting of a (new) agenda.

We acknowledge that "no policy model can claim universal application since every policy process is grounded in particular governmental institutions" (Bridgman & Davis, 2003, p. 99). Reality is more complex than any model. That complexity is in fact the reason why the policy cycle has proven its success over time. Ever since the 1950s, policy analysts have understood that "a staged, sequential, and iterative process is a useful analytical and methodological device" (Howlett & Giest, 2012, p. 24).

2.3 An IT Artefact as a Policy Object

The complexity of viewing an IT artefact as a policy object is tied to its multifaceted and multidimensional nature as highlighted by the multiple definitions in IS literature. Benbasat and Zmud (2003), for example, emphasize the different layers of the IT artefact when defining it as "the application of IT to enable or support some tasks(s) embedded within a structure(s) that itself is embedded within a context(s)." (p. 186). Moreover, Lee et al. (2015), when conceptualizing the IS artefact, distinguish between its technology, social, and information aspects. While we here adopt Orlikowski and Iacono's (2001, p. 121) definition of IT artefacts as "bundles of material and cultural properties packed in some socially recognizable form such as hardware and/or software", we acknowledge the multifaceted nature of the IT artefact and the many ways in which IT artefacts can be conceptualized. We argue that whether and how different dimensions of the IT artefact are considered in IT-related policies will affect how the IT-related policies are formulated, understood, and implemented.

As IS research to date has not specifically focused on the IT artefact as a policy object, we turned to other disciplines for a conceptual lens. We draw on Sin's (2014) conceptualization of policy objects, which has been applied only in education research so far (Corrigan, 2015; Sweetman, 2019). According to Sin

[1] We acknowledge that there is some terminological confusion concerning (e.g., regulation, directive, and law). In the European Union, for example, A "regulation" is a binding legislative act. It must be applied in its entirety across the EU, whereas "a directive is a legislative act that sets out a goal that all EU countries must achieve. However, it is up to the individual countries to devise their own laws on how to reach these goals" (https://european-union.europa.eu/institutions-law-budget/law/types-legislation_en). In the USA, in contrast, "Regulations are rules made by executive departments and agencies and are arranged by subject in the Code of Federal Regulations" (https://www.senate.gov/reference/reference_index_subjects/Laws_and_Regulations_vrd.htm). A bill that is passed in identical form by both the Senate and the House and that is signed by the president of the USA becomes a law (also "Act of Congress") (https://www.senate.gov/pagelayout/legislative/one_item_and_teasers/Laws_and_Acts_page.htm). In the present paper, where the empirical case is in a European context, we will use the term "IT regulation" or "regulation of IT" when referring more generally to IT-related public policymaking with some coercive element (i.e., someone **must** abide by the regulation), and will use the term "law" in the context of our empirical case that was focused on the Finnish Taximeter Law. We see "laws" and "regulations" as binding legislative acts that are examples of public policymaking. Thus, for example, "law text" is a specific case of "policy text".

(2014), policy objects are the "core dimensions or concepts" that a policy text proposes. Sin (2014) argues that a policy object itself has no objective existence – it is what policy actors believe it is, which again is dependent on the context. Sin (2014) makes a distinction between (1) a policy object as an ontology: existing only as a mental construct in the minds of policy actors and (2) a policy object as an enacted ontology: "what the policy object becomes further to enactment under the influence of ontology" (p. 435). Here, we use these concepts in the context of IT-related policy. With ontology, we refer to the policy actors' mental construct of the IT artefact that is the object of an IT-related policy. This includes both the policy makers' (i.e., those who formulate the core dimensions or concepts of the policy object into the policy text) mental construct of the IT artefact, and the policy implementers' mental construct of the IT artefact. With enacted ontology, we refer to those real-world IT artefacts that policy actors perceive to match these core dimensions or concepts through which the policy object has been defined in the policy text. We refer to this enacted ontology as "the IT Artefact Policy Object as a material IT artefact". In addition to those artefacts, numerous other real-world IT artefacts (i.e., concrete technologies such as apps, platforms, devices, software, hardware, etc.) exist. However, only some of them match the dimensions or concepts through which the IT Artefact Policy Object is defined, and different actors may also have different views on which real-world artefacts represent the policy object in the first place.

Sin's (2014) conceptualization takes the policy text as something given (Sin, 2014, p. 437), as an anchor-point for the policy object conceptualization. This conceptualization is suitable for studying the policy implementation and evaluation stages in a policy cycle (so, stages that come *after* the policy text has been formulated and adopted). However, it is too limited for studying the whole policy cycle, because the whole policy cycle also includes the agenda-setting, policy formulation, and decision-making stages in which the core dimensions and concepts that the policy text proposes need to be formulated and adopted for the policy text to come into existence. Therefore, we adapt Sin's initial conceptualization for investigating how an IT Artefact Policy Object evolves during the *whole* policy cycle: we also conceptualize the policy text as an enacted ontology. We see the policy text as one important form that the policy object takes under the influence of the policy makers' mental construct of the IT artefact that is the object of the policy.

Examining the IT artefact as a policy object through this lens enables us to analyze the way different dimensions or concepts of an IT artefact are acknowledged in different stages of the policy cycle. By drawing on the definition of IT artefact by Orlikowski and Iacano (2001), and the definition of policy object by Sin (2014), we here ***define the IT Artefact Policy Object*** as "*a set of core dimensions and concepts through which an IT artefact is defined/described*".

To summarize, we conceptually distinguish three forms that the IT Artefact Policy Object takes: (1) as a policy text (an enacted ontology), (2) as a mental construct (an ontology), and (3) as a material IT artefact (an enacted ontology). Figure 1 summarizes our conceptual lens for studying how the IT artefact evolves as a policy object during a policy cycle.

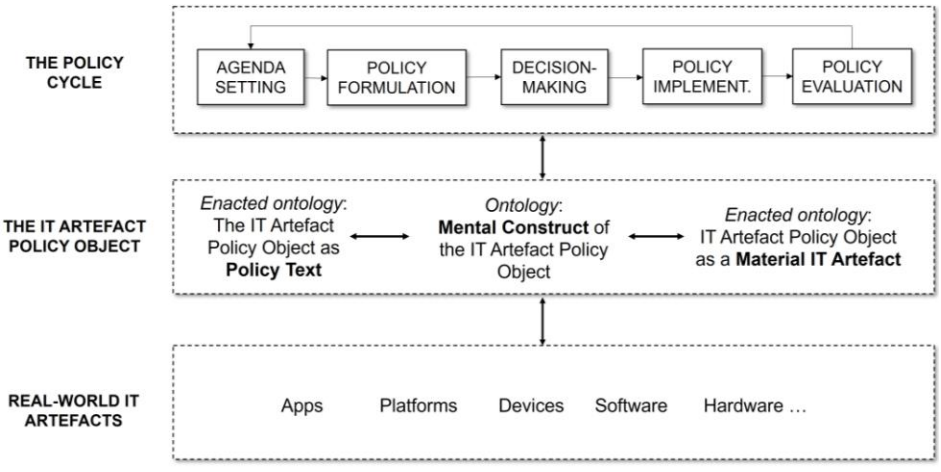

Figure 1. Proposed Conceptualization of An IT Artefact as a Policy Object in a Public Policy Cycle.

3 Research Methodology

This study represents an interpretive case study (Walsham, 1995) of the case of the Finnish Taximeter Law. "A case study examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities (people, groups, or organizations). The boundaries of the phenomenon are not clear at the outset of the research and no experimental control or manipulation is used" (Benbasat et al., 1987, p. 370). In interpretive case studies, the goal is to understand and make sense of the world, and theories act as sensitizing devices (Klein & Myers, 1999; Walsham, 1995). Single case studies enable focusing in-depth on the case in question, studying it holistically while lacking comparison with other cases that could provide supporting or contrasting evidence. For case studies, there are different strategies for case selection, such as going for a unique, critical, representative, revelatory, or longitudinal case (Yin, 2018). We did not specifically select this case as a representative one among several potential cases to study how IT artefacts evolve as policy objects. Instead, when we became aware in 2017 that the Finnish taxi industry will be de-regulated, including a change to the Taximeter Law in 2018, we decided to conduct a single case study on how the industry digitally transforms after the removal of the requirement to use an EU certified taximeter in all taxi cars. After several years of continuous data collection of this unique, longitudinal case, we realized the potential of this revelatory case for studying and conceptualizing how IT Artefact Policy Objects evolve during a public policy process. Our approach to analyzing the research data can best be described as a hermeneutic circle, which "refers to the dialectic between the understanding of a text as a whole and the interpretation of its parts, in which descriptions are guided by anticipated explanations" (Myers, 2019, p. 319). Understanding is built by moving back and forth between "the whole" and different parts. Hermeneutics is among the traditions underlying interpretive research, utilized already in IS research (see e.g., Iivari, 2018; Klein & Myers, 1999), and the hermeneutic circle has been proposed as a fundamental principle for interpretive research (Klein & Myers, 1999). The hermeneutic circle was deemed suitable for this case also because of the longitudinal nature of the case with a multitude of stakeholders involved and evolving researchers' understanding and because of the study's heavy focus on interpretation. The analysis of this study entails interpretations of interpretations: researchers' interpretations of texts (broadly speaking), including stakeholder interpretations and reinterpretations (see also Iivari, 2018). See Section 3.3 for more details.

3.1 The Case

This study is part of a longitudinal study (2017-2022) of the digital transformation of the Finnish taxi industry under a regulative reform of the laws – including changes to the Taximeter Law – that regulate the taxi industry. As part of a broader regulative reform of the transport services that was started in 2015, the regulator wanted to allow the use of other technologies (i.e., IT artefacts) than only the certified taximeter for the determination of the price of a taxi ride, such as platform-based ride-hailing, of which Uber is an example. A new Taximeter Law was proposed in 2016, introducing "other devices and systems" as IT artefacts that would be allowed to be used for price determination in taxi rides. Stakeholders, given the possibility to comment on the new law proposal, were drawing on different functionalities of certified taximeters and "other devices and systems". The new Taximeter Law was accepted by the Finnish Parliament in April 2017 and became legally binding on July 1st, 2018. However, between April 2017 and July 2018, a potential problem with the formulation of the new law was noticed: the new law was in contradiction with the European Union's Measurement Instruments Directive (EUMID) that regulates taximeters at the European Union (EU) level. Thus, in June 2018, a change was proposed to the already accepted, but not yet legally effective, new Taximeter Law, initiating a new policy cycle. In this new policy cycle, the term "technical interface" was introduced to be used instead of the term "other device or system" to describe IT artefacts that would be allowed to be used under the new Taximeter Law. This case offered us a possibility to study how three IT Artefact Policy Objects – which we refer to as the "Taximeter", the "Other Device/System", and the "Technical Interface" hereafter – evolved and took different forms during the public policy process.

3.2 Data Collection

For the present study, our ***primary data*** consists of 103 publicly available core documents produced by key stakeholders (regulator, parliament, and other policy actors) during the two overlapping policy cycles of the Taximeter Law (Table 1). In addition, we investigated and collected information on the technologies that were adopted and used by stakeholders after the new Taximeter Law became effective in July 2018.

As our ***secondary, supporting data***, we used 79 semi-structured interviews with a length of 10-218 min that we have conducted between 2018-2020 with the key stakeholders involved in and affected by the regulative reform of the taxi industry. We conducted 9 interviews with the regulator, 14 interviews with different government authorities, and 6 interviews with the Finnish Taxi Federation. In addition, we conducted interviews with stakeholders who implemented the Taximeter Law: 6 interviews with international ride-sharing organizations, 7 interviews with technology providers, 24 interviews with taxi dispatch organizations, and 8 interviews with taxi drivers. 5 interviews were conducted with other actors who possessed relevant insight into the case. We used the interviews for data triangulation and to support and confirm our interpretations of our primary research data, especially regarding the IT Artefact Policy Object as a mental construct of the policy actors.

Table 1. Summary of Primary Data for this Research

Document type	Items (pages)	Relevance for the policy cycle stage
Taximeter Law 1: Old Taximeter Law (SDK 1090/2002) (valid between 2002 – 30.6.2018)	1 (84)	Agenda setting (Taximeter Law 2)
Government Program (29.5.2015)	1 (74)	Agenda setting (Taximeter Law 2)
Taximeter Law 2: The Act of Transport Services (HE 161/2016) including the new Taximeter Law (became effective 1.7.2018)	1 (250)	Policy formulation (Taximeter Law 2)
Taximeter Law 3: Revised Taximeter Law Proposal (HE 86/2018) (rejected)	1 (77)	Policy formulation (Taximeter Law 3)
Stakeholder statements on HE 161/2016 (18.4.-3.6.2016)	63 (294)	Decision-making (Taximeter Law 2)
Stakeholder statements on HE 86/2018 (3.7.-3.12.2018)	25 (107)	Decision-making (Taximeter Law 3)
Meeting notes of Finnish Parliament and the Committee for Transport and Communication PTK 38/2017 pv EV 27/2017 vp – HE 161/2018 vp PTK 68/2018 vp LiVM 3/2017 vp – HE 161/2016 vp LiVM 37/2018 vp – HE 86/2018 vp	5 (199)	Decision-making (Taximeter Law 2 + 3)
Finnish Taxi Driver-Owners' Federation complaint to the Attorney General (17.5.2018) and Attorney General's response (11.9.2018)	2 (18)	Implementation, Evaluation (Taximeter Law 2)
Finnish Transport and Communication Agency Power Point presentations and leaflets (Aug 2017 – May 2018)	3 (43)	Implementation, Evaluation (Taximeter Law 2)
EU Measuring Instruments Directive 2014/32/EU	1 (133)	All stages of the policy cycle
WELMEC 12.1 Guidelines	1 (10)	Decision-making (Taximeter Law 2)
Total	104 (1289)	

3.3 Data Analysis and Conceptual Refinement

Our data analysis can be divided into two phases: 1) The initial phase where we identified the research problem for the current study based on the secondary data and later used the understanding gained from this phase for data triangulation; and 2) analysis of the primary data reported in the current study, including several cycles of conceptual refinement over three years. In line with guidelines on data analysis in interpretive studies (Myers, 2019; Klein & Myers, 1999; Walsham, 1995), this was a long-term iterative process that partly proceeded in a data driven manner yet was informed by particular theoretical sources acting as sensitizing devices. The process was ongoing for five years, which we have intensively collected data in the form of interviews with key stakeholders, different publicly available documents somehow related to the regulative reform process of the Taximeter Law, and other non-publicly available documents we received, for example, from case organizations.

3.3.1 Initial Phase of Data Analysis and Sense-Making about the Data

During the initial phase, the first and second authors, who collected all data for this research, held regular and numerous discussions over two years about the data while collecting the data and when writing other research papers about the data. Time and again the discussions evolved around the immense importance

of what the Taximeter Law text said *exactly*, how the technology that the law sought to regulate was described or defined in the law text, and how different stakeholders then interpreted this formulation of the law text regarding what technology would count as an Other Device/System. In this phase, the first author extracted in Nvivo all text passages in a sub-set of 50 most relevant interview transcripts to identify a set of themes (see Myers, 2019) regarding the taximeter and the taximeter laws. During this stage the interviews were coded from the perspective of several different themes. However,for the present paper, two high-level themes were the basis for further analysis: theme "Ride-hailing apps" and theme "Taximeter". Under the theme "Ride-hailing apps" we extracted all text passages that in some way referred to ride-hailing apps more generally, and additionally coded sections that referred to twelve specific ride-hailing apps. This resulted in 277 pages of text excerpts. Under the theme "Taximeter", we identified 14 sub-themes based on which we identified the research problem for the study at hand through numerous discussions amongst the whole author team.

In addition to the more general theme "Taximeter" (117 pages of data excerpts), the following of these initially identified sub-themes were especially significant for the identification of the research problem addressed in the study at hand: "Taximeter Law Proposal 2" and "Taximeter Law Proposal 3" (including different stakeholder's views and opinions about, for example, reasons for proposing the law, consequences if the law becomes adopted, interpretations of what the law text means, etc.), "Goals of the new policy/law", "Taximeter – corresponding device/system" (with sub-nodes regarding interpretations of what a device/system corresponding to the taximeter would be), sub-node "Price determined based on measurement of time and distance" (including different stakeholders' interpretations of what it means that the price is determined based on measurement of time and distance), and sub-node "Policy ambiguity and consequences". This NVivo analysis gave us grounds to study the policy objects in the second phase of data analysis (see Section 3.3.2). Even though the initial NVivo analysis is not used in the current study as such, it made it visible that stakeholders had very different interpretations of what kind of technologies the law defined, and that these different interpretations were made possible because of the way the law text was written. In addition, the different interpretations and viewpoints were also linked to different stakeholders' business models or more general interests, such as the producer of a certified taximeter drawing on an official guidance that stated that GPS is not reliable enough for measurement, trying to establish the view that Uber-type systems do not have a measurement accuracy corresponding to that of a certified taximeter and thus should not be allowed to be used. In contrast, Uber, but also the regulator in the context of Taximeter Law 2, was drawing on the feature of giving the customer price information before the ride, trying to establish that from a customer's perspective, the measurement accuracy is not important as the customer already knows the price up-front.

In this initial phase, we also identified a set of different technologies that were used instead of or in addition to taximeters after the new Taximeter Law became effective. We found during this stage that Taximeter Law 1, due to the way it was formulated, was ambiguous and opened possibilities for multiple possible interpretations of the law and interpretations of what solutions would be legal or illegal to be used after the regulative reform in 2018. In another study (manuscript under review), we analyze and report in more detail what the questions were that these interpretations revolved around in the context of Taximeter Law 1 as well as a new Pricing Law (such as, what does it mean that "pricing is based on measurement of time and distance"; are other technologies than a certified taximeter allowed; what does "corresponding level" mean; does information about the ride have to be given before starting the ride), on the reasons for why these different interpretations could arise in the first place, what these different possible interpretations entailed in more detail, and how the regulatory ambiguity affected digital transformation on an industry-level.

We also wrote a report in Finnish language to allow for an expert evaluation of our findings regarding different interpretations of the new Taximeter Law. The report was commented on by 18 persons from 13 different organizations, none of whom disagreed with our identification of ambiguities and technologies. During this initial phase of data analysis, the first two authors collected, discussed and analyzed the data for about two years continuously and intensively. The other authors joined the discussions around 1,5 years after data collection had started. It is important to note that during this very intensive engagement in data collection and continuous analysis, we gained an intimate understanding of this case of changing taximeter laws that allowed us to realize and formulate the research problem that the paper at hand addresses.

3.3.2 Analysis of the Data for the Present Paper

The analysis of the data for the current paper most strongly resembled a hermeneutic circle, where understanding constantly moves "from the whole to the part and back to the whole" (Myers, 2019, p. 213). In this phase, we went back and forth between the data and theoretical conceptualization. We dove deeper into the question of how an IT artefact evolves as a policy object during a policy cycle. We realized that the Taximeter Law 2, and Taximeter Law 3 proposals defined what kind of technology would be allowed to be used to determine the price of a taxi ride. This phase of the analysis was tightly linked with the understanding we received from the interviews with the regulator and other stakeholders and to our initial coding in NVivo: the ways the law was interpreted by different stakeholders had not quite been foreseen by the regulator, and the exact formulation of the law allowed for different interpretations of what kind of technology the law was actually referring to. This "leaning on our prior understanding of the case" is described as the concept of "prejudice", which is essential to hermeneutics (Myers, 2019, p. 233 f.). The first author took the lead role in analyzing the primary data for this paper. However, although we describe the process below in a rather linear form, we want to point out that data analysis also in this second phase was a 2-year-long iterative process with a lot of back- and forth, refining of concepts, and re-analysis when new ideas emerged among the authors. During this iterative process, for data triangulation, we also used 29 new interviews in addition to the 50 interviews analyzed in the initial phase of data analysis.

Organizing the data into themes: As a starting point for this second phase, the first author organized relevant and already during the NVivo analysis collected excerpts from the interviews, as well as excerpts from the primary data for this paper (see Table 1) in a Word document into three themes that the research team deemed key for the present paper: evidence of what was unclear in Taximeter Law 2 (i.e., ambiguities in the law), how and why Taximeter Law 2 was interpreted differently by different stakeholders, as well as what stakeholders said about Taximeter Law 3 proposal. The three high-level themes were "Ambiguity 1: when is a taximeter or other device needed", "Ambiguity 2: what is a device/system that is 'corresponding' to a certified taximeter regarding measurement accuracy and standard of data protection", and "Interpretations of Taximeter Law 3 proposal". This step resulted in 61 pages of data excerpts.

When analyzing the data further, the following concepts or lenses were driving our further analysis of the data that had been earlier coded into themes: (1) the different forms of the policy object (Sin, 2014) and (2) the five different stages of the policy cycle (Howlett & Giest, 2012). During a later stage in the data analysis process, we also adopted (3) the different dimensions or concepts through which the IT artefact was characterized. Next, we describe in more detail how we utilized these concepts in the data analysis.

Identifying the different forms of the policy object as a len: Leaning heavily on our vast understanding of the case overall, and on the data excerpts that had been organized into themes, we made a more systematic analysis of how the IT artefact evolved during the Finnish Taximeter Law policy cycle for the purpose of this study. What was especially intriguing was that two things happened at the same time: on the one hand, the regulator had defined in Taximeter Law 2 and then re-defined in Taximeter Law 3 proposal what other IT artefacts would be allowed for use to determine the price of a taxi ride. On the other hand, all kinds of new ride-hailing apps emerged on the taxi market once Taximeter Law 2 became effective and were "detached" from what happened on the policy-level. We started to search for previous research to find a conceptual tool to make visible and better understand what was happening in the 'translation process' during the public policy cycle: how technologies that the regulator had in mind translated to their definition in the new Taximeter Law text, how the law text was then interpreted by the stakeholders, and how this interpretation translated to technologies utilized under the new Taximeter Law. At the time, we only found Sin's (2014) conceptualization of the policy object that came at least close to explaining the phenomenon.

Identifying the "policy cycle" as an analytical lens: Already during the initial phase of data analysis, we understood that we collected data at different stages of "law-making" and "law implementation", and we also realized there was some interesting overlap in the Taximeter Law (proposals) ongoing. Our data collection had started half a year before Taximeter Law 2 became effective – at a time when it was clear that the Taximeter Law would change, and different stakeholders were trying to interpret what Taximeter Law 2 would mean for the technologies that would be allowed to be used once Taximeter Law 2 became effective. During our ongoing data collection, the way Taximeter Law 2 was being interpreted by different stakeholders was deemed problematic, because it allowed many different interpretations. Therefore, Taximeter Law 3 was proposed by the Ministry at a time before Taximeter Law 2 even had become effective, to correct the formulation of the Other Device/System. However, also the formulation of

Taximeter Law 3, which introduced the Technical Interface as an IT artefact, was deemed problematic and the proposal in the end rejected. We started to get acquainted with the literature on policymaking and found the five-stage policy cycle (Howlett & Giest, 2012) to be very well suited to "structure" our case. Sin's (2014) conceptualization of the policy object focused only on the implementation of the policy *after* the policy had already been formulated and written down, and thus did not cover the policy object *before* the policy had been written. We therefore adapted Sin's (2014) original conceptualization of the policy object as described in Section 2.3. The policy cycle (see Section 2.2) was well suited to describe the stages of the Finnish Taximeter Law process and allowed us to account that the formulation of the policy text needs to precede its implementation. We used the five different stages of the policy cycle to organize our primary data on a timeline according to the policy cycle stages for different policy cycles (see Figure 2 in the Findings, and Table 1), and used it as a lens when analyzing which different forms (Sin, 2014) the policy object took in different policy cycle stages. Based on this arrangement of the data, we identified the two overlapping policy cycles that are within the focus of this study (i.e., those of Taximeter Law 2 and Taximeter Law 3), as well as the final stages of the initial Taximeter Law. We then distinguished different stages in both policy cycles and noticed that the second policy cycle ended at the decision-making stage.

Identifying the policy objects: The stages of the policy cycle helped us to identify changes in the nature of the IT artefact as a policy object: when the IT Artefact Policy Object took the form of a mental construct vs. its enactment as law text and as real-life artefacts. We noticed that we looked at ***three taximeter-related IT artefacts as policy objects*** that had been created/included in the three Taximeter Laws. In the Findings section, we refer to the object of the Taximeter Law 1 as Taximeter; to the newly introduced object of Taximeter Law 2 as Other Device/System; and to the newly introduced object of Taximeter Law 3 as Technical Interface (see Table 2).

Analyzing IT artefact types and refinement of the IT Artefact Policy Object conceptualization: In the next stage, we identified text passages from the already earlier collected data excerpts of stakeholder interpretations of Taximeter, Other Device/System and a Technical Interface and excerpts that gave indications of what kind of IT artefact the regulator intended to be regulated and allowed to be used under Taximeter Laws 2 and 3. We also looked into additional interviews we had conducted after the initial data analysis phase as well as into the primary data for additional evidence that helped us with the analysis of the IT artefact types and policy object conceptualization. Moreover, we already identified in the initial data analysis phase different kinds of technologies that were used under Taximeter Law 2 and compared these technologies to how they did or did not match the definition of the three IT artefacts as policy objects. After several data analysis iterations, we realized that not all new IT artefacts utilized as "Other Devices/Systems" under Taximeter Law 2 represented any of the three policy objects. We therefore needed to conceptually distinguish the actual technologies developed and used by different stakeholders according to whether they correspond to a policy object. Based on that, we use the following **terminological distinction** in the remainder of the paper: "***real-world IT artefacts"*** are those concrete IT artefacts/technologies that are developed, adopted, and used by stakeholders. These real-world IT artefacts, in the context of IT policy, can conceptually be classified into two groups: "***An IT Artefact Policy Object as a material IT artefact***", which is an enacted ontology of the IT Artefact Policy Object and refers to those real-world IT artefacts/technologies that correspond to the IT Artefact Policy Object (e.g., those that match actors' mental construct of the IT Artefact Policy Object; those that match how the policy object is defined in the law text); and "***A real-world IT artefact not corresponding to the policy object***", which refers to those real-world IT artefacts that do not correspond to the IT Artefact Policy Object.

Analyzing the policy objects in different phases of policy cycle: In the next cycle of data analysis, we analyzed where/when in the policy cycle an IT Artefact Policy Object existed as 1) a textual description, and where as 2) a material IT artefact. The actual law documents contained the justifications for proposing a new law, allowing us a glimpse into the regulator's mental construct of the IT Artefact Policy Object as well as the wording of the law (i.e., the "IT Artefact Policy Object as law text"). To draw out the difference between the "IT Artefact Policy Object as a material IT artefact" and "a real-world IT artefact not corresponding to the policy object", we utilized the earlier collected information about the different technologies utilized as an Other Device/System. Stakeholders' statements on the law proposals, supported by interviews with the regulator and other stakeholders, also provided us with triangulation data for understanding the IT artefact as a mental construct.

Analyzing IT artefact core dimensions and concepts: Finally, we analyzed how the textual formulations of the different Taximeter Laws focused on different dimensions or concepts of the IT artefact. We found that IT artefacts were defined in Taximeter Laws 1-3 essentially through four

functionalities[2]: Different laws were drawing on different combinations of the functionality or defined a specific functionality in a slightly different level of accuracy. We compared how these four functionalities related to functionalities incorporated in real-world IT artefacts (e.g., taximeters, ride-hailing apps), and analyzed the relationship between the IT Artefact Policy Object and real-world IT artefacts. In addition, we re-analyzed the earlier extracted interview data excerpts from the perspective of the functionalities and found that different stakeholders were drawing on different functionalities of the IT artefact when making arguments or interpretations.

As for criteria for **evaluating interpretive research**, we refer to the seven principles identified by Klein and Myers (1999) – and summarized by Myers (2019, p. 48 f.) – that we argue picture quite strongly in our research. As seen in the discussion above, the principle of a hermeneutic circle (#1), describing how human understanding develops, is obvious in our research process: our understanding has been developing during a long time span and includes considering the parts and the whole in an iterative manner. For this to happen, our continuous discussions within the author team have also been essential. The principle of dialogical reasoning (#5) is also an integral part of the analysis process in several instances in which we have had to challenge and develop our existing notions and conceptualizations, as described above. Moreover, in line with this principle, we wish to underscore the influence of the researchers' background and experiences: researchers as analysts are heavily shaped by their background knowledge and assumptions — those guide what kind of interpretations emerge during data analysis (Myers, 2019; Klein & Myers, 1999; Walsham, 1995). The collaborative nature of our analysis has also enabled extensive negotiation and the resultant refinement of our understanding. The principle of contextualization (#2) also pictures strong in this study, as during these years our understanding of the context, i.e., of the digital transformation of the Finnish taxi industry, has developed in significant ways. We also describe to the readers the long-term trajectory of the reform of the Finnish Taximeter Law, discussing a multitude of factors leading to the current situation. This connects also with the principle of interaction between the researchers and participants (#3): we acknowledge the socially constructed nature of all our research data and interpretations. The principle of multiple interpretations (#6) refers to acknowledging and documenting multiple viewpoints that arise from the data and seek to understand what these arise from. Throughout the process of analyzing the data over several years, the author team intensively engaged in understanding and analyzing why certain stakeholders were drawing on, for example, certain functionalities or passages in the Taximeter Laws, and why they interpreted the Taximeter Laws in a certain way. Although we do not separately report on this in the Findings, this principle received significant attention during the initial phase of data analysis and sense-making about the data (see Section 3.3.1) and is also acknowledged in this study particularly through our collaborative analysis, through data and method triangulation, which enabled studying the perspectives of different stakeholders, and through member validation (Iivari, 2018) of our initial interpretations. We acknowledge that we could have in more detail inquired about the stakeholders' potentially divergent, conflicting, and opposing views as well as paid more attention to the bias and distortions in the narratives we collected (see Klein & Myers, 1999), but also believe that this represents a very different type of analysis and would result in a very different contribution from the one we seek to make with the present study. The principle of abstraction and generalization (#4) is visible in our linking instances of our empirical case to Sin's (2014) more abstract policy object conceptualization and then extending this conceptualization of the IT artefact to allow for its generalization during the policy cycle, as well as our general conceptualization of the evolution of the IT artefact during the policy cycle based on our empirical data. In the present study, we did not specifically follow the principle of suspicion (#7) which is about interpretation of meanings and is a critical approach to data analysis. As Klein and Myers (1999, p. 78) point out: "Since there is considerable disagreement among interpretive researchers concerning the extent to which social research can (or should be) critical (Deetz, 1996), we leave open the possibility that some interpretive researchers may choose not to follow this principle in their work".

4 Findings

Based on the categorization presented in the previous section, we present an analysis of the Taximeter Law policy cycles which defined three different IT Artefact Policy Objects (see Figure 2) during a period of 4.5 years. The goal in changing the law was to also allow the use of other IT artefacts than just the EU

[2] We acknowledge that some functionalities could be still split into smaller units of functionalities (e.g., measurement of time and measurement of distance separately). However, from the perspective of the definition of the three different IT Artefact Policy Objects (Taximeter, Other Device/System, Technical Interface), this grouping of functionalities was most meaningful.

certified taximeter for determining the price of a taxi ride. While the certified Taximeter was allowed to be used under all three laws, the other laws introduced first the Other Device/System, and then the Technical Interface to define other technologies allowed to be used in taxis. These laws were formulated in a technology-neutral way, specifying the Other Device/System and the Technical Interface through different functionalities instead of specifying which specific technology would be such an Other Device/System or a Technical Interface.

In the case of these Taximeter Laws, the IT Artefact Policy Objects were defined through different functionalities. The four functionalities of the IT artefact that formed the policy object in these cycles were:

Measuring: Measures time and distance with a certain level of measurement accuracy and standard of data protection (the level differed for different IT Artefact Policy Objects)

Pricing: Determines the price based on a measurement of time and distance and shows that price

Hailing: Allows for the hailing of a ride

Payment: Allows for the payment of the ride

Although real-world IT artefacts had also numerous other functionalities, our analysis focuses specifically on these four functionalities as they were the ones through which the IT Artefact Policy Objects were defined in the law text. Next, we describe the evolution of IT artefacts as policy objects and the associated translations as well as their implications for both policymaking and the development and use of technologies.

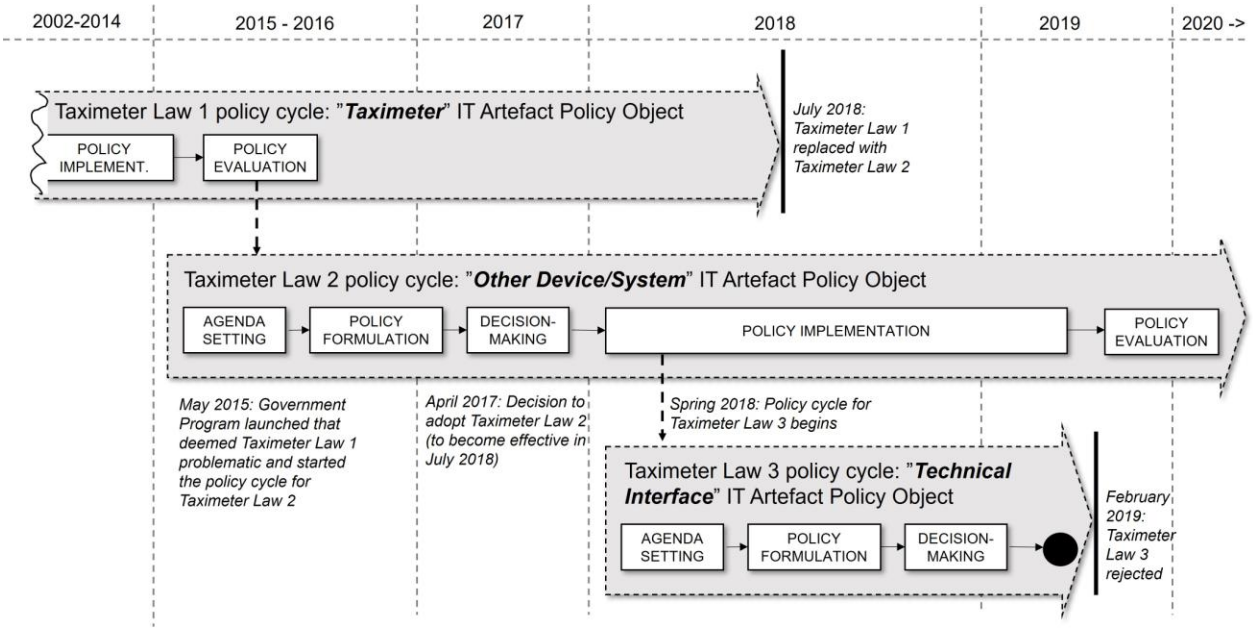

Figure 2. Illustration of the Policy Cycles and IT Artefact Policy Objects Introduced in these Cycles (Focus of the Empirical Analysis are the Taximeter Law 2 and Taximeter Law 3 Policy Cycles).

4.1 From Certified "Taximeter" in the Taximeter Law 1 to "Other Device/System" in Taximeter Law 2

A certified taximeter has been a mandatory equipment in taxis in Finland since 1962. The old Taximeter Law, effective from December 2002 to June 2018, stated that "*There must be a taximeter in M1-class vehicles that are used for licensed passenger transport. A taximeter cannot be in any other vehicle*." The term "taximeter" means a device that has been certified according to the EUMID, which regulates taximeter devices in detail. The EUMID gives clear requirements, for example, for the measurement accuracy (e.g., maximum permissible error for measuring the distance of ± 0,2 % and for the time elapsed of ± 0,1 %) and the standard of data protection (e.g., "*If disconnected from power, a taximeter shall allow the totalized values to be stored for one year for the purpose of reading out the values from the taximeter to another medium.*"). More generally, the EUMID defines the certified taximeter as follows: "*A device that*

works together with a signal generator to make a measuring instrument. This device measures duration, calculates distance on the basis of a signal delivered by the distance signal generator. Additionally, it calculates and displays the fare to be paid for a trip on the basis of the calculated distance and/or the measured duration of the trip." (EUMID, Annex IX)

Thus, the old Taximeter Law included the "Taximeter" IT Artefact Policy Object which was defined in more detail in the EUMID through the Measuring and Pricing functionalities.

4.1.1 Agenda Setting – Old Taximeter Law Deemed Problematic

In November 2014, platform-based ride-hailing providers Uber and Taxify entered the Finnish market. As in many other countries, there was a discussion about whether these providers are legal or illegal in Finland.[3] A Government Program launched in 2015 aimed to improve the possibility of developing digital services in the Transport Sector. The old Taximeter Law was deemed problematic because it prescribed the use of a specific type of technology – the certified taximeter – for price determination in taxi rides. "*This large investment of several thousand (euros) tied in the [certified] taximeter also prevents the development of all kinds of fixed-priced services*." (An excerpt from the Government Program).

4.1.2 Policy Formulation for Taximeter Law 2

The Ministry of Transport and Communication ("Ministry" henceforth) proposed a new Taximeter Law in April 2016 to allow the use of also other technology than a certified taximeter for price determination in taxis. This new Taximeter Law included the reasons and justifications for proposing a change to the old Taximeter Law, and the actual law formulation for the new Taximeter Law, which included the Other Device/System as a new IT Artefact Policy Object. During the policy formulation stage, the Other Device/System thus had to take form **as a mental construct in the regulator's minds** before the new law proposal could be formulated. No specific already existing IT artefact was mentioned as an example of the Other Device/System in the new Taximeter Law proposal. However, the proposal gave some indication that the regulator had in mind at least ride sharing services such as Uber and Taxify, who both already operated in the Finnish market at that time: "*The turnover of the Finnish taxi industry has remained the same even though some digital ride sharing services have operated in Finland already for some time and they are estimated to have tens of thousands of users. […] It is estimated that digital ride sharing services act as an alternative option to traditional street taxis […]*." (HE 161/2016) Several stakeholders also voiced this assumption in our interviews. A taxi dispatch organization said about the new Taximeter Law: "*[…] because for Uber this law has been made and all those other [ride sharing platforms]*", while a technology provider said: "*Here, [the regulator] has listened to Uber too much*".

At this stage, **the Other Device/System took also the form of a proposed law text**: "*If the fare of the journey is based on measuring the distance or time, a vehicle used for transport requiring a license shall have a [certified] taximeter, or some other device or system with which a corresponding level of measurement accuracy and standard of data protection can be achieved shall be used to determine the fare.*" Hence, the formulation of the Other Device/System focused on the Measuring and on the Pricing functionalities of the IT artefact – the Other Device/System measures the time and distance of the ride and calculates the price of the ride. This new Taximeter Law text also still defined the "Taximeter" IT Artefact Policy Object as being allowed to determine the ride price based on the measurement of time or distance.

4.1.3 Decision-Making for Taximeter Law 2

After the law was proposed, stakeholders could provide statements on the new Taximeter Law proposal. These statements served as input for the parliament for deciding whether to accept or reject the law proposal. The statements gave some indication of how the Other Device/System was interpreted by the stakeholders (i.e., the Other Device/System as a mental construct in these stakeholders' minds). We found that the law text formulation for the Other Device/System allowed stakeholders to draw on different functionalities of the IT artefact.

Uber, for example, emphasized the Pricing functionality of the Other Device/System when proposing to modify the law text so that an Other Device/System would have to provide a price-estimate: "*The*

[3] In September 2016, a Finnish court ruled that Uber operated illegally in Finland. In November 2017, after Taximeter Law 2 had been accepted, Uber exited the Finnish market to wait for the new law to become effective. Uber re-entered the Finnish market in July 2018, right after Taximeter Law 2 became effective.

legislation should also set rules for transparency of pricing and oblige to give a price-estimate." Uber argued for a law formulation that would ensure that the existing Uber system would be allowed to define the price: "*It is central that the new Act on Transport Services is sufficiently comprehensive and flexible, so that it enables determination of the price with the Uber app and other new types of tools and systems […].*" In addition, they argued that the use of, for example, GPS would decrease the time a taxi driver is without paying customers: "*Data gained from Norway shows that in Oslo taxis transport paying customers on average for 18 minutes of each hour. In fact, that time is even shorter, because also the travel to the customer is counted in these 18 minutes. In Norway, the taxi regulation resembles Finland's current regulation. In several market areas where ride-sharing services have been taken into use, the utilization rate of taxis can be significantly increased due to the use of navigation, GPS, and mobile technology*."

In contrast, a manufacturer of certified taximeters emphasized the Measuring functionality of the Other Device/System. They argued that the requirement of the Other Devices/Systems to have a *corresponding* level of measurement accuracy and standard of data protection essentially means that the Other Device/System should also have to undergo a similar certification process as a certified taximeter: "*When the requirements regarding measurement accuracy and protection standard are applied also to an "other device or system," it essentially will have to fulfill the requirements of the measurement directive.*" In addition to their initial statement on the law proposal, they pointed out that: "*WELMEC 12.1 mentions that GPS cannot be understood as a device that would fulfill the EUMID*."

The WELMEC 12.1 (2017) Guidelines stated "*The current state of the MID does not cover distance signal generators including those based on navigation satellites. Systems using this technology need to take into account that the distance signal is available continuously (e.g., navigation signals may be shielded by buildings or tunnels or be subject to manipulations) in relation to the maximum permissible error when installed*."

The certified taximeter manufacturer also expressed that they interpreted that the Other Device/System that the regulator had in mind when formulating the law was a mobile app.

The Finnish Parliament decided in April 2017 to adopt the new Taximeter Law in the form it had been proposed by the Ministry. The new law would become effective on July 1st, 2018.

4.1.4 Implementation of Taximeter Law 2

During the decision-making stage, the Other Device/System had still been a policy object that *might* at some time in the future become a material IT artefact. In the implementation stage, the **Other Device/System policy object first only existed as (1) in the form of the law text, and (2) as a mental construct** (between April 2017–- June 2018). The new Taximeter Law was not yet legally effective, and thus the certified taximeter was still the only real-world IT artefact allowed to determine the price of a taxi ride. However, it was certain that the Other Device/System *would* become enacted as a material IT artefact from July 2018 onwards. The Ministry's intention had been to give clearer specifications for those Other Devices/Systems after acceptance of the law. However, the newly accepted Taximeter Law 2 turned out to be in contradiction with the EUMID, which did not allow any country-specific specifications for devices that fulfill the same measurement purpose as certified taximeters. Thus, the regulator was unable to give these more detailed specifications. Depending on which functionalities of the Other Device/System in the law text one drew on, different interpretations of the law were thus possible. One of the interpretations was that only a certified taximeter can fulfill the requirement of "corresponding measurement accuracy" and thus qualify as a material IT artefact of the Other Device/System policy object.

Different interpretations of the Other Device/System voiced during the implementation stage were seen as problematic by the Ministry, especially the interpretation that only certified taximeters can represent the Other Device/System. This gave rise to a new policy cycle (see Section 4.2) in Spring 2018, before Taximeter Law 2 became effective.

On July 1st, 2018, the day the new Taximeter Law became legally binding, the **Other Device/System also gained existence as a material IT artefact**. While some already long-in-use real-world IT artefacts overnight "became" a material IT artefact of the Other Device/System policy object, such as Uber and Taxify ride-hailing platforms, other real-world IT artefacts were adopted in Finnish taxis for the first time. The Other Device/System was defined in the policy text as a device or system that measures time and distance (Measuring) and determines the price of a ride based on the measurement of time and distance (Pricing). Several technologies – in addition to the certified taximeter – provided this functionality: an

uncertified taximeter for which the official certification process was still ongoing (under the old Taximeter Law such a technology would not have been allowed to be used), *taximeter apps* that could be downloaded from the internet, *ride-hailing platforms* such as Uber, Taxify (later renamed to Bolt), and Yango, and *"taximeters"* that were bought on Ebay but were not fixed-installed in the car (in contrast, certified taximeters had to be fixed installed in the car). However, also **IT artefacts that corresponded neither to the Taximeter nor to the Other Device/System policy objects** continued to be used or were newly adopted by taxi drivers. They were, for example, ride-hailing apps giving a fixed price or price estimate before the ride (but not determining the price of the ride based on measurement of time and distance), and apps that allowed ride-hailing without calculating or giving any price information.

4.1.5 Evaluation of Taximeter Law 2

At the end of 2019, the Ministry initiated an evaluation of the effects of the regulative changes that concerned the taxi industry, including Taximeter Law 2. This evaluation led to yet another policy cycle of the Taximeter Law, where a new Taximeter Law was adopted and became effective in September 2021[4].

4.2 Technical Interface in a Proposed Revision (Taximeter Law 3)

4.2.1 Agenda Setting for Taximeter Law 3

A new Taximeter Law policy cycle was initiated in Spring 2018, during the implementation phase of Taximeter Law 2 and already before Taximeter Law 2 even became effective. The reason was the incompatibility of Taximeter Law 2 with the EUMID: "*The measurement directive does not seem to allow to permit optional technologies without a definition of the legal measurement task and a more accurate delimitation in the national legislation*." (HE 86/2018, p. 17) One interviewee speculated on the reason why a revision of the already accepted new Taximeter Law was proposed: "*Now they [the Ministry] have to correct [the law], because they wanted to legalize Uber so that Uber would not have to use a taximeter, but somehow the formulation of the law went a bit awry*". In this proposed revision, the Technical Interface policy object was introduced to replace the Other Device/System policy object.

4.2.2 Policy Formulation for Taximeter Law 3

In the policy formulation stage of the revision, the Technical Interface first existed as a **regulator's mental construct**. The Ministry attempted to differentiate between situations in which a certified taximeter would have to be used and situations in which some other technology would be allowed. They proposed that certified taximeters would have to be used when the taxi is hailed down on the street or ordered via phone, but not when the taxi is ordered via a mobile app (Hailing) that shows the price before the ride (Pricing) and allows payment of the ride (Payment): "*If there is a so-called private hire transportation, which practically is… Uber, for example, falls into this category. There it is not allowed to use a certified taximeter. So, we proposed a similar model also for Finland*." (Interview with a Ministry representative). The Ministry argued that nowadays, most consumers have different map apps on their phones that can provide information about a trip's distance or time, pointing out that the exact measurement of time and distance is not anymore as important as in earlier times. Therefore, the Ministry downplayed the role of the Measuring functionality, i.e., the exact measurement of time and distance. Instead, they emphasized the importance of the Pricing functionality: that consumers get some price information *before* starting the ride.

The **Technical Interface also took the form of a law text**, being proposed as: "*If the price of the journey is based on the measurement of distance or time, a taxi car has to use a taximeter when determining the price, unless the ride is ordered and paid with help of such a Technical Interface with which a sufficient measurement accuracy and standard of data protection are achieved.*" The proposed law formulation thus introduced the Technical Interface as an IT artefact that fulfills the same purpose as the Taximeter and the Other Device/System policy objects – it measures time and distance (Measuring) and calculates and gives information about the price (Pricing). However, the Technical Interface differed from the other policy objects in two functionalities: it would let customers pay for the ride (Payment) and it would allow ordering a ride (Hailing). In addition, the Technical Interface differed from the Other Device/System in that the

[4] The new law, which is currently effective in Finland, again requires the use of a certified taximeter in all rides where the price of the ride is determined based on measurement of time and distance. The use of another device or system, for which now clear specifications have been given concerning what type of data these have to collect, is allowed only in fixed-priced rides where the price of the ride has been determined already before the taxi ride starts.

measurement of time and distance had to be "*sufficient"* instead of having to be "*corresponding to that of a certified taximeter"*, thus weakening the requirements set for this functionality.

4.2.3 Decision-Making for Taximeter Law 3

In the decision-making phase, a small number of stakeholders were invited by the Ministry to make statements regarding the proposed revision of the Taximeter Law.

These statements gave some indication of **stakeholders' mental constructs** of the Technical Interface policy object compared to the Taximeter and the Other Device/System policy objects. These statements heavily drew on the Measuring and Pricing functionalities. Uber stated: "*The Uber app is not a taximeter". A taximeter is an independently functioning device that is physically connected to the vehicle, that calculates and shows the price of the trip to the passenger, all inside the vehicle. The mobile phone that a driver uses when utilizing the Uber app is none of the above; It does not calculate anything, it does not show any information to the passenger and is not an independently functioning device that would be connected to the vehicle."* Uber also described in detail how the Uber app ensures an exact correct measurement of time and distance (Measuring). The agency that has oversight over certified taximeters in Finland also drew on the Measuring functionality when pointing out that "*A Technical Interface is not a taximeter as defined in the EUMID. The measurement of the taxi trip's distance and duration in a Technical Interface is based, to our understanding, on digital applications that utilize satellite positioning. Satellite positioning, however, cannot with use of current technology be done uninterruptedly throughout the trip, for which reason the measurement of the trip distance is not as exact as with a [certified] taximeter, which measures the trip distance over the whole duration of the trip. For this reason, with a Technical Interface it is not possible to achieve the same measurement exactness as with a [certified] taximeter.*" A producer of a certified taximeter drew attention to the use of the term "sufficient" in connection to the measurement of time and distance and level of data protection (Measuring) and emphasized the importance of "data protection standard": "*Now the public discourse has been limited to that the use of a [certified] taximeter would be mandatory only if the price of the trip is based on time and distance, and that instead of the earlier equality requirement to the EUMID law would be removed and replaced with "sufficient" accuracy. […] Earlier presented justifications were based on the claim that map applications are even more accurate than a taximeter. However, the certification [of a certified taximeter] is not only related to the accuracy, but above all about the indestructability of data and memory*." Thus, they drew on one aspect of the Measuring functionality (i.e., data protection standard) that earlier had received less attention.

In a statement on the law proposal, another stakeholder pointed out questions related to what a Technical Interface means, as well as to what means and how to prove a "sufficient reliability" (Measuring): "*In the law proposal the term "Technical Interface" is being used. The term is neither defined in the Finnish legislation, nor in the current law proposal. […] The government also uses the term "sufficient" when talking about the reliability of measurement data and the level of data protection. A [certified] taximeter is required to have accuracy and reliability as defined in the EUMID, which the device producer must prove with help of a certificate issued by a notified body. For a Technical Interface it is sufficient when the producer/users find it to be "sufficiently" reliable, and proofing a potential insufficient reliability is left in the responsibility of the customer."* They also argued that the law proposal "*makes the law imprecise and open to interpretation [and] includes vague terminology that is unsuited for a law*."

The Ministry in the end recommended rejection of the proposed revision, and the **parliament rejected the proposed revision** in February 2019. This means that the policy cycle for Taximeter Law 3 and the Technical Interface policy object ended here. The proposed revision to the new Taximeter Law never entered the implementation stage of the policy cycle, and the Technical Interface never gained existence as a material IT artefact, because the law never became effective.

4.3 Real-World IT Artefacts vs. the IT Artefact Policy Object

To make visible the difference between the realm of real-world IT artefact development and use, and the realm of policymaking, we next illustrate with three examples how the definition of an IT Artefact Policy Object through different functionalities in the law text determined what real-world IT artefacts were being regulated through a law.

Example 1: Uber and Taxify apps, which were real-world IT artefacts, gave a price estimate before the ride and determined the final price of the ride based on the measurement of time and distance and

allowed ordering and paying for the ride. Thus, they had all those functionalities through which the Other Device/System and Technical Interface policy objects were defined. They had existed already when the old Taximeter Law was effective but did not represent an enactment of the Taximeter Policy Object and thus were not regulated through the Taximeter Law at the time. Under Taximeter Law 2, Uber and Taxify apps corresponded to the Other Device/System and thus represented an enactment of that policy object (i.e., material IT artefacts). Would Taximeter Law 3 have been adopted, Uber and Taxify would have corresponded also to the Technical Interface and would have represented an enactment of the Technical Interface policy object.

Example 2: Another real-world IT artefact was a ride-hailing app that gave a fixed price before the ride but did not allow payment of the ride via the app. Thus, it neither corresponded to the Other Device/System because it did not calculate the price based on measurement of time and distance, nor to the Technical Interface, because it did not allow payment of the ride. This real-world IT artefact thus was not (would not have been) regulated through any of the three Taximeter Laws and thus was neither a Taximeter, nor an Other Device/System, nor a Technical Interface material IT artefact.

Example 3: One class of real-world IT artefacts were taximeter apps, downloadable from some app stores, that calculated the price of a ride based on GPS-based measurement of time and distance. Those apps did not allow ride-hailing. Therefore, this type of app could be seen as an Other Device/System material IT artefact, but not as a Technical Interface material IT artefact.

We want to point out that an IT artefact policy object takes the form of a material IT artefact (which is the IT Artefact Policy Object as enacted ontology) only after the decision has been made that a policy – and in our empirical case more specifically a law – is being adopted and becomes effective. The Taximeter Law 2 and Taximeter Law 3 policy cycles thus differed significantly. Taximeter Law 2 was adopted, and the Other Device/System policy object took form as a material IT artefact. However, because Taximeter Law 3 was never adopted, the Technical Interface policy object never took form as a material IT artefact.

We also want to emphasize with these examples that although the realm of policymaking and the realm of real-world IT artefacts are interconnected, which is visible in how the Ministry tried to formulate the Other Device/System and the Technical Interface policy objects to “match” Uber and similar real-world IT artefacts, these two realms are nevertheless also separate. Uber and Taxify (i.e., real-world IT artefacts) have been operating since 2014 on the Finnish market, irrespective of the ongoing policy cycles for Taximeter Law 2 and Taximeter Law 3.

4.4 Summary of Findings

The aim of this study was to examine how an IT artefact as a policy object evolves during a public policy process to shed light on some of the challenges that the regulation of IT faces. Our empirical findings are summarized in Table 2. The table shows for each of the three IT Artefact Policy Objects through which law they were introduced, what technology the regulator had in mind when defining the policy object, through which functionalities the policy object was defined in the law, and examples of real-world IT artefacts that corresponded to the policy object and such that did not.

Table 2. Summary of the Three Identified IT Artefact Policy Objects

The IT Artefact Policy Object	"Taximeter"	"Other Device/System"	"Technical Interface"
Introduced/ Regulated through	Taximeter Law 1. Effective from 2002-June 2018; EUMID. Mandatory in all taxis in Finland until 06/2018, widely used also after that.	Taximeter Law 2. Proposed: spring 2016; Accepted: 04/2017; Effective: 07/2018	Taximeter Law 3. Proposed: 06/2018; Rejected: 02/2019
Real-world material artefact the regulator's mental construct was based on	An EU certified taximeter	Platform-based ride-hailing ("Uber")	Platform-based ride-hailing ("Uber")
Law text	EUMID: A device that measures the duration and calculates the distance of a trip (Measuring) and that displays the fare to be paid based on the calculated distance and/or the measured duration of the trip (Pricing).	A system or device for measuring time and distance with corresponding measurement accuracy and data protection standard as the Taximeter policy object (Measuring) and determining the price of the ride based on measurement of time or distance (Pricing)	A system or device allowed to determine the price of the ride based on the measurement of time or distance (Pricing), if the ride is ordered (Hailing) and paid (Payment) via a Technical Interface which has sufficient measurement accuracy and data protection standard (Measuring)
IT Artefact Policy Object as a material IT artefact	Taximeter that is certified to comply with the EUMID	e.g., technologies including "fake certified taximeters", platform-based ride-hailing, taximeter apps	None (because Taximeter Law 3 was not adopted and thus the Technical Interface policy object was never enacted as a material IT artefact)
Real-world IT artefact not corresponding to the policy object	e.g., platform-based ride-hailing, a ride-hailing app giving a price estimate (but price determination with a certified taximeter)	e.g., an app for ride-hailing only, a ride-hailing app giving a fixed price, a ride-hailing app giving a price estimate but not determining the final price	None (because Taximeter Law 3 was not adopted and thus the Technical Interface policy object was never enacted as a material IT artefact)

5 Discussion

Our empirical study on the Finnish Taximeter Law revealed the challenges that the multifaceted nature of an IT artefact poses for its creation as a policy object. Our study contributes to the IS research on public policymaking in two ways. As a theoretical contribution, we provide a novel conceptual framework of IT artefacts as policy objects with their different forms (i.e., as a mental construct, as a policy text, and as a material IT artefact) and propose a distinction between IT artefacts at the policy level vs. IT artefacts as real-world technologies. This conceptualization contributes towards understanding the iterative process of policymaking around the IT artefact and enables IS researchers to better understand IT-related public policymaking and regulation of IT artefacts as well as to scrutinize how IT artefacts are treated and evolve in the process. Second, our study helps to make sense of the challenges involved in the translation of multifaceted real-world IT artefacts into abstract policy texts and back into real-world IT artefacts. We propose that examining the public policy cycle through the lens of the IT Artefact Policy Object is a powerful way to grasp the complexities and dynamics involved in public policymaking related to IT artefacts. Our discussion on the practical implications, where we use the European AI Act as an example, demonstrates the applicability of our conceptual framework to other IT regulation contexts.

5.1 Evolution of the IT Artefact as a Policy Object – A Conceptual Framework

In this section, we first present our conceptual framework of the IT Artefact as a policy object, and how it evolves during a public policy cycle. Then, we discuss the case of the European AI Act that has been recently adopted in the EU to reflect on "AI policy objects" and potential impacts.

Drawing on a multidisciplinary literature base and the concepts of the policy cycle (Bridgman & Davis, 2003; Howard, 2005; Howlett & Giest, 2012; Jann & Wegrich, 2007) and policy object (Sin, 2014), we conceptualize the IT artefact as a policy object that evolves during a policy cycle and takes different forms. While Sin's conceptualization only focuses on the policy *implementation* stage of a policy cycle and takes the policy text as something given (Sin, 2014, p. 437), we show the dynamics underlying the evolution of the policy object during the whole policy cycle. Our findings show that the policy text, in fact, is not a given, but is a part of a complex cycle of interpretation and translation of an IT artefact in which the *realm of policymaking* and the *realm of real-world development and application of IT artefacts* are in interaction (see Figure 3).

To regulate the different forms that real-world IT artefacts may take, a representation of these real-world IT artefacts must be created in the form of an IT Artefact Policy Object. In this effort, the different dimensions (e.g., functionalities) are detached from the real-world artefact in the mind of the policymakers. Policymakers make their own interpretations of the way these dimensions need to be taken into consideration when formulating the policy, resulting in some mental construct of the IT Artefact Policy Object. The mental construct then needs to be translated into policy text, where these dimensions are combined in some (other) way to allow certain kinds of constellations. For example, Taximeter Law 2 as a specific kind of public policy was aimed at allowing both traditional taximeters and platform-based ride-hailing apps, which were defined through different functionalities. The policy text then is interpreted by the actors who need to abide by the policy. Again, the different dimensions through which the policy object is defined in the policy text are interpreted to form a mental construct of the IT Artefact Policy Object and then translated into the form of material IT artefacts, which yet again entail potentially different dimensions. In the case of IT-related law, which is one specific type of public policy, the way the IT artefact and its dimensions are defined in the text affects which real-world technologies will be in scope of the respective law, and which ones remain outside it. Depending on the formulation of the law that regulates IT, and once that law becomes legally binding, any real-world IT artefact would either match the policy object, i.e., represent an "IT Artefact Policy Object as a material IT artefact", or it will not[5] – and this may have far-reaching impacts.

Hence, based on our findings, we propose a framework in the form of a processual model (Figure 3) in which we distinguish three forms that an IT Artefact Policy Object takes during a policy cycle:

1. **The IT Artefact Policy Object as a mental construct**. This refers to the mental constructs of the IT Artefact Policy Object that the policymaker and those who must abide by the new policy hold. IT artefacts are of a multifaceted nature comprising many different dimensions and can be conceptualized in different ways. Different actors' mental constructs do not necessarily include all these dimensions and conceptualizations, but only a subset of these.
2. **The IT Artefact Policy Object in the policy text** (e.g., a law proposal or an effective public policy that specifies the IT artefact as a policy object). The IT artefact in the policy text can be defined through one or several of the IT artefact's core dimensions (e.g., functionalities)
3. **The IT Artefact Policy Object as a material IT artefact** (i.e., real-world technology that corresponds to the IT Artefact Policy Object as mental construct/policy text). When a policy becomes effective, the IT Artefact Policy Object gains existence among those (existing or emerging) real-world IT artefacts that correspond to the IT Artefact Policy Object (as mental construct/policy text).

The process illustrated in Figure 3 is an idealization that shows how the IT Artefact Policy Object takes different forms at different stages of a public policy cycle. As our case study showed, a public policy process may be terminated at some stage without going through all five stages. We want to emphasize that on the one hand, real-world IT artefacts and current IT Artefact Policy Objects as material IT artefacts can form the starting point for the identification of a need to change existing or create new public policy, thus affecting policy(making). On the other hand, it is also important to acknowledge that real-world IT artefacts may change in response to existing or proposed public policy.

Although our empirical case was focused on IT-related law as one kind of public policy, our conceptualization of how IT artefacts evolve as policy objects during a public policy process is equally

[5] We acknowledge that laws often are ambiguous or vague (e.g., Endicott, 1997; Lanamäki et al., 2025), which may result in a situation where it is not clear whether a specific real-world IT artefact represents an IT Artefact Policy Object. This, however, is out of the scope of the present paper.

applicable to other types of IT-related public policymaking. It is imperative to acknowledge the multifaceted nature and dimensions of IT artefacts. Moreover, understanding the process through which these dimensions become detached from the real-world artefacts and then recombined in new ways in policy texts and eventually in a new set of IT artefacts on the markets, helps identify those points in which something relevant might be 'lost in translation'.

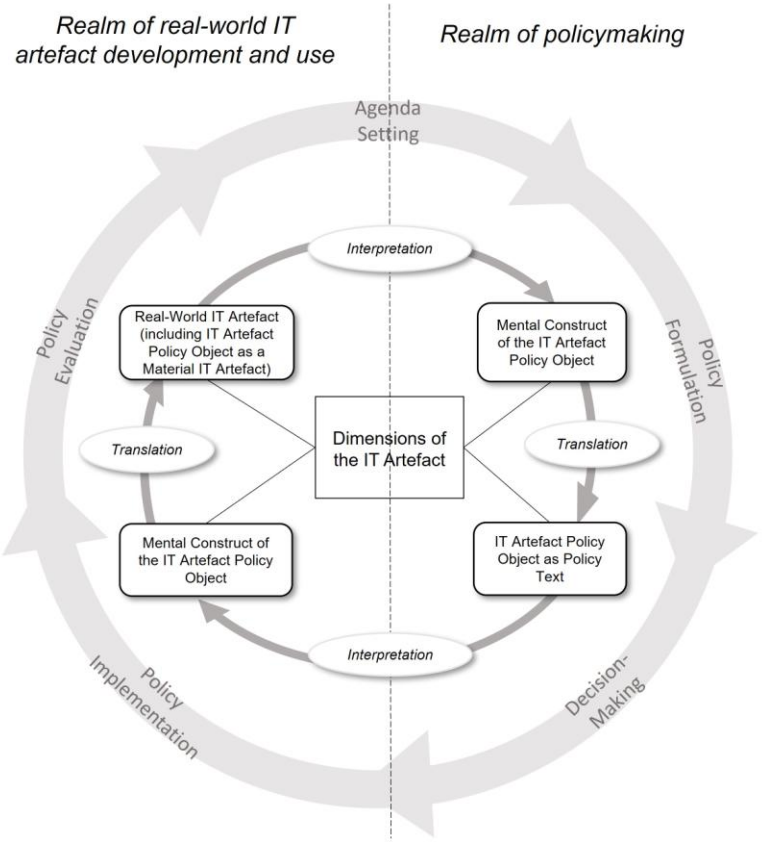

Figure 3. Conceptual Framework of the Dynamics of IT Policymaking: Evolution of the IT Artefact as a Policy Object.

5.2 Challenges Particular to the IT-Related Public Policymaking

Previous IS research has already characterized the complex, multifaceted process of policymaking (Bernardi et al., 2017; Karjalainen et al., 2019; Klecun-Dabrowska & Cornford, 2000; Klecun, 2016; E. Niemimaa & Niemimaa, 2017; M. Niemimaa et al., 2019; Stahl et al., 2012). Eaton et al. (2018) and Bernardi et al. (2017) have shown how policy and stakeholder (inter)actions, for example, in the form of frame contests, rhetorical strategies, or converging interests, affect IS innovation and development of IT. We corroborate these findings but also extend this by elaborating on three challenges involved in the case of IT-related policymaking.

First, a major challenge in IT-related policymaking is the translation from a mental construct of an IT Artefact Policy Object into formulated law text. IT regulations and laws define what technology (IT artefacts) is in the regulation's scope and, depending on what the regulation seeks to "regulate", may define, for example, what technology is legal or illegal to develop/use/bring to the market or what kind of requirements an organization needs to comply with. The creation of an IT Artefact Policy Object as a mental construct and in the policy text allows different technologies to appear and/or be used on the market, but can also render existing and future technologies illegal. Real-world IT artefacts can integrate and combine different dimensions of IT artefacts. In many cases, it is not meaningful or even possible to outline in the law text all these dimensions when formulating the IT Artefact Policy Object. Often, policymakers balance the need to allow the appearance of new IT artefacts while trying not to cause additional disruptions to the market. They may aim to allow or spur technological innovation and the emergence of new technologies through technology-neutral regulation (de Mello Santana, 2016;

Hildebrandt & Tielemans, 2013; Koops, 2006), or the "new IT artefact" might already be in use elsewhere, and this real-world artefact is then translated into a policy object for new legislation. One of the first questions to consider and decide when regulating IT and technology more generally is whether to regulate in a technology-neutral or technology specific way (Ohm, 2010). Technology-neutral regulation usually does not regulate the technology itself, but rather the effects of technology use. This often includes regulation of the functionalities of the technology, "since these functions generally define the uses to which the technology can be put and hence the effects that can be achieved" (Koops, 2006, p. 6). Taximeter Laws 2 and 3 were such regulations that regulated whether a technology is allowed to be used or not by referring to different functionalities of the technology, which our empirical case proved to be challenging. However, also in the case of technology specific regulation, the challenge of formulating the law exists, as Ohm (2010, p. 1700) pointed out: "once lawmakers decide to create a tech-specific rule, they must decide how specific to make the rule, requiring a difficult textual balancing act."

A second challenge relates to the interplay between innovation cycles and policymaking, taking place in the realm of real-world IT artefact development and use. Information technology development is fast and both affects and is being affected by policymaking (Hanelt et al., 2021). Consequently, policymaking faces the challenge of keeping up with the pace (Bennett Moses 2007, 2011; Koulu 2016) and maintaining a level playing field for both the existing technologies and the emerging solutions, as well as those that 'could be', but do not exist yet. The process of creating a mental construct and translating it into a policy object can therefore be seen as an effort to link policymaking with ongoing innovation. In addition to anticipation, regulators may have to react to the appearance of new technologies on the market by creating or adapting regulations.[6] Ride-sharing services such as Uber are known for "not waiting for the legitimacy that comes from changes in the law" (Witt et al., 2015, p. 3), entering markets and contexts in which they do not have existence as an IT Artefact Policy Object. More generally, the rise of ridesharing services has created a legal grey area (Crespo, 2016), requiring cities and countries to reconsider existing taxi market regulations (Cetin & Deakin, 2019). Our study demonstrated and theorized how such an existing real-world IT artefact can be translated to the policy level, but also how challenging this can be. Prior research has argued that policymakers often lack an in-depth understanding of the technology they seek to regulate (El-Moghazi et al., 2019). In our case, the policymaker did not lack an understanding of platform-based ride-hailing systems such as Uber, the use of which they sought to make legal through Taximeter Law 2 and Taximeter Law 3. However, the regulator nevertheless faced great difficulties in the creation of the corresponding IT Artefact Policy Object, as we will discuss next.

Third, we want to emphasize the challenge of having to balance and connect the two realms of "IT artefact as a mental construct" and "real-world IT artefacts", for example, by drawing on different dimensions of the IT artefact. The real-world IT artefact Uber represented an anchor point for both the Other Device/System and Technical Interface policy objects. However, the legalization of Uber could not be formulated in the law text just by bluntly stating that "Uber is legal". Instead, more general principles and requirements for "this type of technology" were required. The Other Device/System policy object was defined through one set of functionalities, and the Technical Interface policy object through another set of functionalities in the law text (proposal). Depending on the combination of functionalities, some real-world IT artefacts other than Uber represented one or both IT Artefact Policy Objects as material IT artefacts, while others represented neither (see Section 4.3). Thus, how exactly a real-world IT artefact is interpreted to form a mental construct and then translated into policy-text guides the development and application of different solutions on the market, where stakeholders translate the IT Artefact Policy Object as policy text back into real-world IT implementations and underlying technologies, for example during compliance efforts. Labadie and Legner (2023, p. 26), in the context of compliance with the European General Data Protection Regulation (GDPR), touch upon organizations' more general need to interpret compliance requirements and translate them "into what organizations should do (i.e., the capabilities)", which they see as a way to "create "common ground" between legal and IS perspectives and help to analyze compliance requirements in terms of changes to the existing routines and practices before a decision is made on concrete (technical) implementations". Our study provides additional evidence for the relevance of mental models that bridge the realms of policymaking and real-world development and use of IT and underlying technologies.

While the realm of policymaking and the realm of real-world IT artefact development and use are interconnected, they are at the same time also disconnected: Uber continued to exist as a real-world IT

[6] We want to emphasize that not all new technology requires new regulation. As a principle, regulation is usually not created for something that is not perceived as requiring regulation.

artefact, independent of the legal formulations accepted or proposed. Technology is being developed, adopted, and used even though it might not (yet) exist as a policy object in an IT regulation. In the case of IT-related laws and regulations, whether a real-world technology "matches" the policy object may determine whether that technology would be legal to be developed or used. Technology develops much faster than regulation, a phenomenon often referred to as the pacing problem (Marchant, 2011; Nordström, 2022). The characteristics of a real-world IT artefact can change while the IT Artefact Policy Object remains the same – similarly, the IT Artefact Policy Object may be changed, but that does not necessarily affect the real-world IT artefact. The different trajectories on which real-world IT artefacts and IT Artefact Policy Objects evolve, and how to match them, is one aspect making IT-related policymaking challenging.

5.3 Practical Implications: Reflections on Artificial Intelligence as a Policy Object in the Context of the European AI Act

Our study holds several practical implications. While these implications apply to different types of IT where IT artefacts are policy objects, we here use the case of the European AI Act to discuss these practical implications in more detail.

Currently, the EU is in the middle of a public policy process for the regulation of AI–the European AI Act[7]. Proposed by the European Commission in April 2021, it is the first broad legal framework that regulates AI systems. During the decision-making stage, the European Council presented its own proposal for the AI Act in December 2022, and the European Parliament presented its own proposal in June 2023. This was followed by six months of negotiations between the Council and Parliament (so-called Trilogue negotiations) about the content and most of the textual formulations in the AI Act, with an agreement being reached in December 2023. The policy process has passed the decision-making stage: All 27 EU member states voted for the AI Act to be adopted on February 2nd, 2024, the European Parliament voted for the adoption of the AI Act on March 13th, 2024, and after several months of finalizing the wording of the Act, it was published in the EU Official Journal on July 12th, 2024. The AI Act entered into force on August 1st, 2024. Thus, the AI Act policy process is currently in its implementation stage.

The AI Act sets requirements for the provision and deployment/use of AI systems, distinguishing four risk-categories of AI systems. The AI Act proposes to forbid certain types of AI systems (use), such as social scoring employed by governments. It sets only few requirements for the two lower-risk categories of AI systems (i.e., minimal-risk and low-risk) but sets high requirements for AI systems in the high-risk category. Organizations must be compliant within 9-36 months after the AI Act's adoption, depending on a specific AI system's risk category. Fulfilling these requirements for high-risk AI system development and use may cause an organization that develops/uses such systems (high) costs (Konttila & Väyrynen, 2022). A "forbidden AI system", a "high-risk AI system", a "low-risk AI system" and a "minimal-risk AI system" can be seen as four different IT Artefact Policy Objects that the AI Act seeks to regulate in different ways, setting different requirements for each of the objects. Here, one core dimension of an AI system is the potential risk that an AI system poses, for example, to someone's safety or fundamental rights. For an organization developing or using an AI system, it would have wide-reaching impacts whether this real-world AI system would correspond, for example, to a high-risk or to a low-risk AI system policy object, as it would directly impact what kind of requirements the organization would or would not have to fulfill.

As a first practical implication, we argue it is imperative for both policy makers and practitioners to acknowledge the dual nature of the IT artefact – as a policy object on one hand and as a real-world IT artefact on the other hand. This may enable policymakers to better understand the implications of the nature of the IT artefact for the policymaking process and its outcome. If the difference between the real-world IT artefact and the policy object that refers to it is not understood, the (re)definition of the policy object might result in a different kind of enactment than what was expected. We encourage policymakers to engage in a practical exchange with practitioners to minimize "harmful" gaps between the IT artefact as a policy object and real-world IT artefact that could lead to negative outcomes for individuals,

[7] The initial draft version of the AI Act, proposed on April 21st, 2021, can be found here: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52021PC0206
The full final draft, which has been leaked on 21.2.2024, can be found here: https://artificialintelligenceact.eu/wp-content/uploads/2024/01/AI-Act-FullText.pdf; The adopted version of the AI Act can be found here: https://eur-lex.europa.eu/eli/reg/2024/1689/oj
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organizations, or society at large. This is especially true for regulation of fast-developing technology such as AI.

As a second implication, policymakers are recommended to approach IT artefacts comprehensively from different dimensions and conceptualizations: to consider which of them, if not all, are relevant. This should be beneficial both from the viewpoint of their (evolving) mental constructs and the resultant law/policy texts. Regulators need to be careful when "designing" what real-world technology is in scope or out of scope of the regulation.

In the context of the AI Act, how "Artificial Intelligence System" as *the* IT Artefact Policy Object of the AI Act is defined – and which dimensions and conceptualizations are considered in its definition – affects whether a specific real-world AI system is in the scope of the AI Act or whether it remain outside. During the policy formulation and negotiation stages of the AI Act, the European Commission, Council and Parliament all presented different definitions of AI system, and the final definition that has been adopted still differs from the three definitions proposed earlier. For illustrative purposes, we take here the final definition of "AI system" as it is defined in the adopted AI Act as an example: "*An AI system is a machine-based system designed to* ***operate with varying levels of autonomy*** *and that* ***may exhibit adaptiveness after deployment*** *and that, for* ***explicit or implicit objectives****,* ***infers,*** *from the input it receives,* ***how to generate outputs*** *such as predictions, content, recommendations, or decisions that can influence physical or virtual environments.*" [8] (emphasis added) Thus, dimensions and characteristics such as the functionality of the system (e.g., infers how to generate outputs), that it generates some outputs, and that it operates with varying levels of autonomy have been proposed as the core dimensions and concepts that define an AI system – and distinguish it from systems that are not such AI (systems) that the regulator seeks to regulate.

Third, as a practical implication for the regulator, we point out that an IT artefact can act as a basis for a policy object, and especially in the context of fast-developing technology such as AI, regulators need to be prepared for a potential need to create new IT Artefact Policy Objects during the whole length of the policy cycle. In the context of the AI Act policy process, during the negotiation stage, a new real-world IT artefact that initially was not separately regulated in the AI Act was lifted to the policy-level: general-purpose AI. It received wide media attention at the end of 2022 due to the launch of ChatGPT, leading to heated debates during the Trilogue negotiation between Parliament and Council on whether to include general-purpose AI systems/models in the scope of the AI Act. The debate was about whether a separate IT Artefact Policy Object should be created in addition to the "AI system" policy object. After Trilogue negotiations nearly broke down over this struggle, an agreement was reached to include both *general-purpose AI systems* and *general-purpose AI models* as separate policy objects in the AI Act.

Fourth, for the developers and innovators of IT artefacts, it is also valuable to understand the dynamics underlying IT regulation: this study makes visible how the policy object is evolving within a policy cycle, or several of them. A particular real-world IT artefact can be an IT Artefact Policy Object as a material IT artefact at one point in time but remain outside a regulation's scope at another. Similarly, an existing IT artefact might become subject to new IT regulations, such as is the case with AI systems and general-purpose AI models under the AI Act. In the context of the AI Act, it can be expected that interpretations of what kind of AI systems are in or out of the regulation's scope will evolve over time, and the AI Act itself may also change over time to adapt to developments in AI.

For IS researchers and practitioners, it is recommended to offer help to the policymakers in their challenging task of regulating IT. IS research might provide suitable tools and theoretical lenses that might help conceptualize IT artefact dimensions that are relevant for IT artefact related policymaking, such as the resource-based view or regulatory compliance management. Labadie and Legner (2023, p. 26), utilized these lenses in the context of compliance with the European GDPR, where they (ibid.) touch upon organizations' more general need to interpret compliance requirements and translate them "into what organizations should do (i.e., the capabilities)", which they see as a way to "create "common ground" between legal and IS perspectives and help to analyze compliance requirements in terms of changes to the existing routines and practices before a decision is made on concrete (technical) implementations".

[8] The adopted version of the AI Act has been entered into the Official Journal of the EU on July 12th, 2024, and can be found here: https://eur-lex.europa.eu/eli/reg/2024/1689/oj. The definition of "AI system" can be found in Article 3.

5.4 Limitations and Directions for Future Research

Our study has limitations, but opens opportunities for future research, too. We did not have an opportunity to study in-depth the process the policymaker went through when formulating the IT Artefact Policy Object in the law text. While we complement publicly available information with interviews with the policymaker and other actors after the text had been formulated, future research could focus on the policy formulation stage. Such studies would benefit from our conceptualization of the IT artefact as a policy object. We also believe that there is a need for more IS research that focuses on public policymaking over the full length of the policy cycle instead of focusing only on a limited subset of stages. Here, we did not review existing conceptualizations of the IT artefact to extract different existing dimensions through which IT artefacts may be defined or characterized. This thus opens an interesting avenue for future research – a classification of existing conceptualizations of the "IT artefact" to arrive at a broader understanding of what all dimensions and concepts could or should be considered when formulating an IT artefact policy object. Here, we invite future IS research to provide more specific suggestions or understanding about the formulation of mental models that abstract away from underlying technologies and real-world IT. IS research could potentially make use of existing theoretical lenses such as the resource-based view, as has been done by Labadie and Legner (2023) in the context of compliance with the GDPR, to identify IT artefact dimensions suitable for regulatory compliance and policymaking processes. Another limitation of this study is that it focused on one specific policy cycle where we utilized the most common way of distinguishing five stages in the policy cycle. Application of other policy cycle models, such as the eight-stage model of the Australian Policy Cycle (Bridgman & Davis, 2003) may result in different findings. Bridgman and Davis (2003) pointed out that any policy model is linked to certain governmental institutions and therefore no policy model is universally applicable. While the policy cycle that we studied is not universally applicable, we believe our theorization of the different forms that the IT artefact as a policy object takes is applicable to other policy cycle examples.

Our empirical study focused on the case of a "law" as one specific example of public policymaking. Public policymaking, however, entails much more than the making of laws and regulations (Anderson, 2013). Future research may investigate whether additional important forms of the IT Artefact Policy Object can be identified for public policymaking contexts other than law-focused ones. The empirical case of our study focused on technology-neutral regulations, but as we pointed out, we believe that the challenge of creating an IT Artefact Policy Object as policy text is challenging also for technology-specific regulation. While we believe that our conceptualization of the IT Artefact Policy Object in a public policy cycle is suitable for technology-specific regulation as well, it is an avenue for future IS research to confirm this.

During our research process, we identified a potential new research avenue regarding vagueness as manifested in terms "corresponding" and "sufficient" in our analysis. The study of vagueness has some history already in law and policy literature (e.g., Endicott, 1997; Staton & Vanberg, 2008), and understanding vagueness is increasingly relevant for our IS field as well, for example in the current need for AI-based decision-making (Dobbe et al., 2021; Kerr & Scharp, 2022).

IS researchers are also invited to scrutinize the complex translations from mental constructs to policy text and real-world IT artefacts emerging in the policy process, acknowledging that these mental constructs are responding to the ongoing developments in technology taking place in society. We also wish to point out that hermeneutics could be utilized in a deeper sense than we did to make sense of these complex translations taking place. IS researchers are encouraged to examine the evolution of regulations within a whole policy cycle or even several of them, within which IT artefacts as policy objects are evolving, being constructed, interpreted, translated, and imagined in various ways. Currently, ongoing policy cycles in Europe and elsewhere offer a possibility to evaluate and test our conceptualization of the evolution of the IT artefact as a policy object. A concrete example would be the European AI Act in which numerous IT Artefact Policy Objects can be identified, as discussed above.

While we acknowledge that the evolution of IT artefacts as policy objects are affected by different interpretations and opposing views brought forward by different stakeholders, the focus of this study was on the evolution of the policy object and not on the interpretations of the stakeholders. We, therefore, do not report in detail on the opposing views that arose in the context of our empirical case study. Even though one of the principles of qualitative research presented by Klein and Meyers (1999) concerns the use of multiple interpretations when evaluating interpretative research, they nevertheless state that these principles do not form a mandatory checklist but rather represent sensitizing principles for researchers. A focus on opposing views would have resulted in a different focus and contribution from the one we sought to make with our paper. We therefore invite future IS research to engage with opposing views in the

context of public policymaking, as those play a role in many stages of the policy cycle and could make visible the role and impact of power struggles, hidden agendas, and existing and future business models that affect the formulation of the IT Artefact Policy Object, but also its interpretation.

Taking the example of the European AI Act and the public policy process related to it, the policy formulation stage offers an interesting context to study opposing views of different stakeholders who negotiate the AI Act (e.g., European Commission, Council, and Parliament) and how these opposing views picture in and affect the formulation of the AI Act. The case of negotiating the inclusion of general-purpose AI systems in the scope of the AI Act is an example par excellence, where Council and Parliament struggled and negotiated over months about whether and how to formulate the "General-purpose AI" policy object and what obligations to set for it in the AI Act. For example, the French-based general-purpose AI company Mistral had been lobbying for months to reduce heavily the AI Act's scope for foundation models, drawing on the importance of securing European-based foundation model companies' possibilities to catch up with, for example, US-based foundation model organizations. However, soon after the AI Act had been voted on February 2nd, 2024 and it became clear it will be adopted, Mistral AI announced on February 26th, 2024 that it would partner with Microsoft, hinting at a very different agenda that Mistal AI had in mind when presenting its views during the AI Act's Trilogue negotiations than the agenda it officially put forth. Similarly, now that the AI Act has been adopted, struggles over the interpretations of the AI Act, the definition of an "AI system", and other IT Artefact Policy Objects can be expected. This would thus provide an excellent ground for studying opposing views in the context of public policymaking.

6 Conclusion

Leaning on the case of the Finnish taximeter regulation's policy process over a 4.5-year period, we studied how an IT artefact evolves as a policy object during the different stages of a public policy cycle.

As a theoretical contribution, we introduce a novel conceptual framework for understanding IT artefacts as policy objects, highlighting their different forms: as a mental construct, as a policy text, and as a material IT artefact. Additionally, we propose a distinction between IT artefacts at the policy level and IT artefacts as real-world technologies. This conceptualization contributes towards understanding the iterative process of policymaking around the IT artefact and enables IS researchers to better understand IT-related public policymaking and regulation of IT artefacts as well as to scrutinize how IT artefacts are treated and evolve in the process. Understanding and being able to articulate the difference between real-world IT artefacts and IT Artefact Policy Objects is valuable for future IS researchers theorizing on IT regulation and policymaking.

Second, our study helps to make sense of the challenges involved in the translation of multifaceted real-world IT artefacts into abstract policy texts and back into real-world IT artefacts. The framework we present increases the understanding of the dynamics of an IT artefact as a policy object in a policy cycle. Such challenges are (1) the translation from a mental construct of an IT Artefact Policy Object into formulated law text, (2) the interplay between innovation cycles and policymaking which take place in the realm of real-world IT artefact development and use, and (3) the need to balance and connect the realms of "IT artefact as a mental construct" with "real-world IT artefacts" by, for example, drawing on different dimensions of the IT artefact. Such a better understanding of the dynamics of the IT artefact as a policy object is useful in the digital age, when public policies and regulation of IT, such as AI, are central concerns in society. IS researchers can use the conceptualization developed in this study to critically analyze different kinds of IT-related policies from the viewpoint of the policy objects involved: in the sense of mental constructs, law texts, and actual material entities, each engendering different dimensions, such as functionalities, to various extents and in various ways.

Our discussion of the practical implications of the framework in the context of the European AI Act illustrates the applicability of our conceptualization also to other cases of IT regulation. The case of the AI Act is a first indication of the benefits of the framework in understanding the iterative process of policymaking around an "AI policy object". Thus, we believe it to be beneficial for all IS researchers who are interested in approaching AI regulation from an "IT artefact policy object" perspective. Given that the efforts to regulate AI are ongoing worldwide (Roberts et al., 2024), the question of how AI will be defined as a policy object will be relevant in numerous geographic areas over the years to come.

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Declaration of AI

We used Microsoft Copilot to improve the readability of the Findings Section, and Microsoft Word's spell-checker to identify typos and grammatical errors.

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About the Authors

Karin Väyrynen is a Senior Research Fellow in Information Systems in the INTERACT research unit at the University of Oulu, Finland. She is the principal investigator of the Research Council of Finland funded AI-REG project (grant agreement #347221, 2022-2026) investigating the European Act on Artificial Intelligence. Her recent research focuses on studying the impact of public policy and laws on the development and use of technology, the role of regulatory ambiguity, industry-level digital transformation, and the reciprocal relationship between law and technological development. Her research has been published in journals such as the *Journal of Strategic Information Systems*, the *Journal of the Association for Information Systems*, the *Communications of the Association for Information Systems*, *Electronic Markets*, and *JMIR Medical Informatics*, as well as various information systems conferences.

Sari Laari-Salmela is an Associate Professor at the Department of Marketing, Management, and International Business at the University of Oulu Business School, Finland. Her research focuses on strategy and strategic organizing, combining organization-theoretical viewpoints with discussions in strategic management, information systems, public management, and organizational change, and applying practice theories and systems-theoretical perspectives. Her work has appeared in journals such as *Business Ethics Quarterly*, *Business & Society*, *Industrial Marketing Management*, *Journal of Business Ethics*, *Journal of Business Research*, and *Journal of Strategic Information Systems*.

Netta Iivari is a Professor in Information Systems and research unit leader of INTERACT research unit in University of Oulu. She has a background in Cultural Anthropology as well as in Information Systems (IS) and Human Computer Interaction (HCI). Her long-lasting research interest concerns understanding and strengthening people's participation in shaping and making their digital futures. Recently, she has addressed empowerment of children in and through computing and she has explored various forms of critical, participatory, empowering, and speculative design with children, having an interest in ethics, values and power-laden aspects. She has published in high quality IS and HCI journals such as in *European Journal of Information Systems*, *Information System Journal*, *Information & Organization*, *Information Technology & People*, *Interacting with Computers*, *International Journal of Human Computer Studies*, *Journal of Computer Supported Collaborative Work*, and *Behaviour & Information Technology*, and she has served as an editor in several IS journals.

Arto Lanamäki is a University Lecturer in Information Systems at the University of Oulu. He is currently part of the AI-REG project (2022-2026), focusing on the European Union's Act on Artificial Intelligence. His work has been featured in several conferences and journals, including the *Journal of Strategic Information Systems*, *Journal of the Association for Information Systems*, *Communications of the Association for Information Systems*, *Computer Supported Cooperative Work*, and the *Journal of the Association for Information Science and Technology*, among others.

Marianne Kinnula (marianne.kinnula@oulu.fi) is a Professor in human-centred design and digitalization at University of Oulu, with her research in the crossroads of Information Systems and Human-Computer Interaction fields. Her research focuses on user participation, inclusion, and empowerment in technology development. She would like to see a world with sustainable innovations: users able and willing to question technology use and technology solutionism and developers designing technology so that it brings value to all stakeholders. She holds an editorial position in International Journal of Child-Computer Interaction and has published actively in leading Human-Computer Interaction and Information Systems conferences and journals. Her professorship is part of the University of Oulu 'Generation Z and beyond' profiling theme that aims for co-evolution of human capabilities and intelligent technologies in the 21st century (https://www.oulu.fi/genz/).