ЦИФРОВЫЕ ТЕХНОЛОГИИ

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How to Research Institutions of the Technosocial Space? An Analysis of the Applicability of Three Meta-Institutional Concepts

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In the technosocial space, specific institution-related phenomena arise: technology is increasingly utilized in governance; technology enables new social models; in addition to humans, AI agents emerge as participants in collective action; and collective practices occur in various segments of technosocial spaces simultaneously. This phenomenon challenges the very basic understanding of the institution as a pure social construct that frame the behavior of humans in physical-social space. The rise of these institutional phenomena is accompanied by the emergence of new theoretical frameworks in research of institutions (e. g., algorithmic institutionalism, post-institutionalism, multi-agent systems institutionalism) that perceive technology as the first-order determinant of meso- and micro-institutions. This paper addresses the question: how to research institutions of the technosocial space? More concretely, what kind of meta-institutional concepts are the most appropriate for studying institutions of the technosocial space? To answer this question, a meta-institutional analysis that consisted of three phases was conducted. In the first phase, a novel model of institutional meta-ontology was created, which is built on the two pillars: 1) institutions are defined by composition, functions, actors, and space; 2) institutions can be both social and technological constructs. In the second phase, relying on the novel model of institutional meta-ontology, the three classes of meta-institutional concepts are generated: Social Institutions; Technology as Institution, and; Technosocial Institutions. In the third phase, the applicability analysis of three generated classes were performed. It is concluded that the theories that entail the meta-concept of what I call here Technosocial Institutions are the most suitable for studying institutions of the technosocial space.

Keywords: institutional theory, meta-institutional analyses, technosocial institutions, sociology of science and technology, sociology of humans and machines.

Introduction

Every institutional theory implies a certain ontological understanding of the institution. For example, Hodgson ontologically defines institution as "a system of established and prevalent social rules that structure social interactions" [*Hodgson,* 2006, p. 18]. Any ontological understanding of institutions implies a certain meta-ontological understanding of the institution. According to Van Inwagen [*Van Inwagen*, 1998], while ontology answers the question "What is there?", meta-ontology answers the question "What are we asking when we ask 'What is there?'?" Accordingly, in one interpretation Hodgson's definition of institution implies a meta-ontology according to which an institution is a *social construct* that, through *social mechanisms,* has functions to structure *the social interactions* of *humans* in *the physical-social space*.

However, within the technosocial space arise specific institution-related phenomena that challenge understanding of the institution as a pure social phenomenon: technology is increasingly utilized in governance; technology enables the operation of new (techno) social models; in addition to humans, AI agents emerge as participants in collective action; and collective practices occur in various types of technosocial spaces simultaneously.

The rise of these institutional phenomena is accompanied by the emergence of new frameworks in institutionalism such as algorithmic institutionalism [*Mendonca et al.*, 2023; *Almeida et al*. 2025], post-institutionalism [*Frolov,* 2019, 2024], multi-agent systems institutionalism [*Noriega, Sierra,* 2002; *Rubino et al.,* 2005; *Fornara,* 2008]. These new theoretical frameworks have a new comprehension of the institution that include technology as a core institutional component. perceiving it as a first-order determinant.

This paper presents the results of theoretical research that aimed to answer the question: What kind of institutional meta-concepts are most appropriate to be used in studying institutions of technosocial space? In other words, what is the applicability of the existing institutional theories for research of institutions of technosocial space considering their meta-institutional characteristics? It is assumed that only institutional theories that imply meta-institutional concepts that align with meta-institutional characteristics of institutions of technosocial space could be used in research. Primarily, I am referring to the institutional theories of meso and micro institutions. However, in many cases meso institutions of technosocial space have increased so much (billions of users) and became infrastructure of modernity [*Edwards,* 2003] that we can consider them more as macro than as meso institutions.

A meta-institutional analysis was conducted. The analyses consisted of three phases. In the first phase, a novel model of institutional meta-ontology was created according to 1) the institution is defined by its composition, functions, actors, and space; 2) institutions can be both a social and technological artifact. In the second phase, relying on the novel model of institutional meta-ontology, three classes of meta-institutions were generated from institutional literature: Social Institution; Technology as Institution; and Technosocial Institution. In the third phase, an analysis of the applicability of all three meta-institutional concepts was performed. This meta-institutional analysis is conducted for the first time (as far as I know) on a wide range of the institutional theories that exist in both, social sciences and computer sciences.

In addition to answering the main research question "how to research institutions of the technosocial space" this research contributes theoretical novelties. First, a novel model of meta-institutional ontology is proposed, Second, novel meta-institutional concepts are proposed (Social Institution, Technology as Institution, Technosocial Institution).

Recognition of the meta-ontological concept of institutions which institutional theories imply is important for the development of new institutional theories in general, and sociological institutional theories in particular. The introduced research also brings a new perspective of institutions and technology in sociology of science and technology. This paper points also to the need to recognize the specific epistemological frameworks of a new sociology, to which Tsvetkova [*Tsvetkova*, 2024] refers as sociology of humans and machines.

The paper consists of two parts. In the first part, the novel model of institutional meta-ontology is introduced. The second part describes the three generated classes of meta-institutions and their applicability in the research of institutions of the technosocial space.

A Novel Model of Institutional Meta-Ontology

In studies of meta-institutions it is assumed that any understanding of a particular institution implies a certain concept of a meta-institution. According to Lorini "the meta-institutional concepts are concepts that go beyond (Greek:meta) the institutions of which they are conditions of possibility" [*Lorini,* 2014, p. 127]. Existing meta-institutional concepts typically rely on meta-institutional models that refer to the (meta) abstraction of institutional function of some particular institution. Thus, Litvintsev and Litvintseva [*Litvintsev, Litvintseva*, 2023] perceive a *house* or *Lorini* [Lorini, 2014] a *game* and *victory* as a meta-institution.

The meta-institutional model proposed in this paper has two specific characteristics: first, the meta-institutional model refers to the abstraction of institutional concepts of a particular institutional theory rather than the abstraction of particular institutions, and second, it refers not only to the abstraction of the institutional function but also to the abstraction of the institutional composition, actors, and space.

More specifically, the proposed model of meta-institutional ontology is based on two principles:

First, institutions are phenomena that are characterized by the composition, functions, actors, and space. Institutional composition refers to the constitutional elements of institutions; functions relate to the reasons or purposes for which institutions exist and the approaches to their achievements; actors are the players of institutional roles; and space is the environment in which the institutions are situated.

Second, institutions can be both social and technological artifacts. Institution as a social artifact is "a causal construction" (involving social factors in causing or producing facts about the world) and "a constitutive construction" (social factors in constitution of the facts about the world) [*Kukla,* 2000; *Koiv,* 2019]. The institution as a technological artifact refers to an institution containing technological constituents. Technology is understood here in an instrumental and anthropological perspective according to which technology is "a means and a human activity" [*Heidegger*, 1953/1977, p. 5–6]. More specifically, technology is seen as an outcome-problem solving process that includes both material (equipment, tools, machines, codes, devices) and immaterial (procedures, models, skills) techniques.

In combination of these two principles a novel institutional meta-ontological model was created that distinguished classes of meta-institutions according to:

Composition

As a meta-ontological characteristic of institutions, composition refers to institutional constituents. With this ontological component, we want to distinguish the meta-institutional concepts that perceive institutions only as social artifacts made of social constituents (social rules, norms, patterns) from those that perceive institutions as technological artifacts made of technology (algorithms, code, machines) and those that perceive institutions as artifacts made of both, social and technological constituents.

Function

As a meta-ontological characteristic of an institution, institutional function refers to the purpose or goals of the institution, but also to the approaches or mechanisms that are used in the achievement of those purposes and goals. According to Schotter [*Schotter*, 1981], institutions can be classified in terms of the problems they solve and in terms of the kind of coordination mechanism they rely on. In this paper, the meta-institutional concepts are primarily differentiated according to the mechanisms that are used to accomplish institutional purposes or goals.

The logic of institutional determinism is a core of the institutional mechanism. It is the logic according to which institutions affect actors' behavior and how actors understand the rules. In general, rules can be defined as "prescribed guides for conduct or action" [*Merriam-Webster*, 2025]. However, different logics of institutional determinism imply different understandings of the rules. In this paper, I distinguish 1) social mechanisms based on the logic of institutional social determinism and rules that are acquired through socialization, learning, or imitation; 2) technological mechanisms that are based on the logic of institutional technological determinism and the rules that are embedded in technology; and 3) technosocial mechanisms that are based on the logic of institutional technosocial determinism, where rules are adopted through socialization and learning and are operationalized with the support of technology.

Actors

Actors are the performers of institutional social roles. In the institutional theories of social sciences there are individual and collective actors: humans appear as individual actors, and the human organizations and collectives (for example, communities or social movements) as collective actors. Recently, AI agents and human-AI agent hybrids have appeared as social actors. They have increasingly an ever more social intelligence and can act as actors whether in pure AI agent collectives or hybrid human — AI agent collectives [*Jennings,* 2014].

With the development of the institutional approach in MAS [*Noriega, Sierra*, 2002, *Rubino et al.,* 2006], AI agents (robots, unmanned vehicles, bots, avatars, etc.) emerge ever more as actors in institutional theory. Even though hon-human actors are recognized as social actors and agency or actants in social science [*Latour*, 2004], there are no institutional theories that considered them as institutional actors. In relation to the type of actors

to whom institutions are committed, I distinguish here between meta-institutional concepts that relate only to humans and those that relate to humans and AI agents as social actors.

Space

Institutional meta-concepts can be differentiated by their spatial characteristics. That is, the broader space in which the institution is situated, the narrow (internal) institutional space, and the characteristics of the relationship between the broader and narrow spaces. According to Stephenson et al., spaces are "built environments that emerge from organizational activities, objects, arrangements, and social practices" [*Stephenson et al*., 2020, p. 797]. The spatial characteristics of institutions predetermine its boundaries, the type of actors, and its institutional logic. With this ontological characteristic, we want to differentiate institutional concepts that have spatial characteristics of a physical-social space from those that have the spatial characteristics of the technosocial space.

Meta-Institutional Concepts

The Meta-Concept "Social Institution"

The meta-concept of Social Institutions is implied in most institutional theories of social sciences. This meta-ontological concept of institutions corresponds to the phenomenon of classical macro,meso and micro institutions such as family, school, organization, religion, money, parliament. They can be formal or informal.

Composition

In the institutional literature, the constituents of a theoretical model of Social Institutions are mentioned: rules, norms, patterns, mechanisms, procedures, beliefs, knowledge, expectations, etc. The rules as institutional constituents appear as "the rules of the game" [*Weber,* 2020; *North,* 1991], "the constitutive and regulative rules" [*Ludwig*, 2017], "rules-in-equilibrium" [*Guala*, 2016], and "systems of established and prevalent social rules" [*Hodgson*, 2006]. According to Tuamela [*Tuamela*, 2003], the norms that make up institutions are r-norms, which are based on rules, and s-norms, which are based on conventions. Parsons [*Parsons*, 1990] perceive institutions as "relatively stable and enduring patterns of behavior," while for Goodin [*Goodin*, 1996] institutions are "stable, recurring patterns of behaviour." Lewis [*Lewis*, 1969] holds that institutions are coordination and collaboration mechanisms. March and Olsen claim that institutions are "collections of standard operating procedures and structures" [*March, Olsen*, 1984, p. 738]. For Scott "institutions comprise regulative, normative, and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life" [*Scott,* 2001, p. 56].

All the mentioned constituents of Social Institutions are understood as social constructs or social codes, essentially different from technology. Even when it is recognized that technologies can significantly change institutional effects, the social and technological components are seen as separate. Technology is not viewed as an institutional component but as

an exogenous variable of the biophysical world, i. e. as an external factor of the secondary deterministic order [*Ostrom*, 2005]. This perspective can be accepted to describe the technologization (digitalization) of conventional Social Institutions. However, the deep integration of the social and technological mechanisms makes existing frameworks and methods for analyzing and designing institutions, which are based on the idea of institutions as pure social phenomena, very limited. Within the technosocial space, the specific institutional mechanisms, composed of the unified social and technological components, are used for structuring, regulating, and directing collective practices [*Lanzara,* 2009; *Dolata,* 2023; *Noriega, Sierra*, 2002; *Noriega et al.,* 2015; *Frolov,* 2019, 2024]. Technology becomes a constitutive element of the first order. Therefore, apart from conventional Social Institutions that could be partly technologized, we should consider the institutions that are composed of integrated social and technological constituents as a new phenomenon.

Function

In the theories of Social Institutions, there are various perspectives about the function of institutions. According to structural functionalists [*Durkheim,* 1893/1997; *Parsons,* 1990], institutions are recurrent and stable macro structures that have the function of maintaining solidarity and stability of the social order and enable society as a whole to perform. Rational choice theorists [*Knight, Sened*, 1996; *Calvert,* 1995] consider institutions as instruments that serve rational actors to maximize benefits for their preferences. Institutions help to bridge cognitive limitations, a lack of complete information, and difficulties in monitoring and enforcing agreements. Institutions also solve the problem of social dilemmas. According to rationalists, the institutions are solutions to problems that arise when people interact. Institutions are the product of the experience of collective and collaborative practices, equilibria that bring collective benefits and are transmitted as models.

Hybrid perspectives [*Weber,* 2020; *North,* 1991; *Williamson,* 1998; *Ostrom,* 2005; *Hindricks, Guala,* 2021] overbridge the agency — structure dilemma, considering that the institutional function is to support collective action and generate collective benefits, but also to keep society functional and stable through normative and value frameworks (which are situated in culture, law, religion, and collective practices). According to Ostrom [*Ostrom*, 2005, p. 3] "institutions are prescriptions that humans use to organize all forms of repetitive and structured interactions, including those within families, neighborhoods, markets, firms, sports leagues, churches, private associations, and governments, at all scales." Institutions have functions to enable and constrain social action. Hindricks and Guala claim that institutions have an etiological and teleological function: "...an etiological function explains the existence and persistence of an entity. In contrast, a teleological function concerns what it is good for, the purpose that it serves or its significance. Whereas the etiological function of an institution is to generate cooperative benefits, its teleological function is to secure some value" [*Hindricks*, *Guala*, 2021, p. 2035].

The theories of social institutions have in common that the function of the institution is achieved by social mechanisms. According to Hedstrom, social mechanisms are "a constellation of entities and activities that are linked to one another in such a way that they regularly bring about a particular type of outcome" [*Hedstrom*, 2005, p. 11]. Social mechanisms are formal and informal social arrangements which cause events with certain social outputs. Social mechanisms frame actors' behaviors by relying on rules, norms, procedures,

patterns, and associated sanctions and rewards. They are not based on technological means such as devices, installations, or algorithms. Social mechanisms are based on the logic of institutional social determinism. It relates to actors who adopt rules, norms, values (through socialization, training, insight, imitation) and who behave reflexively in accordance with institutional roles (self enforcement). Sanction and reward mechanisms are implemented by actors in institutions who are positioned in the role of monitoring and control (external enforcement).

When Ostrom considers the relationship between institution and technology, she considers technology as an external factor of secondary deterministic influence compared with institutions: "...rules define and constrain voting behavior inside a legislature more than attributes of the biophysical world. Voting can be accomplished by raising hands, by using paper ballots, by calling for the ayes and nays, by marching before an official counter, or by installing computer terminals for each legislator on which votes are registered. In regard to communication within a legislature, however, attributes of the biophysical world strongly affect the available options" [*Ostrom*, 2005, p. 23]. Institutions have deterministic primacy, and technology can only be aligned with them.

However, in the technosocial space, there are ever more institutional mechanisms thatrely on technology. Social and technological mechanisms jointly determine institutional functionality. Technology is increasingly becoming a factor of primary institutional deterministic influence, which not only improves the operational capabilities of institutions, but also become a core constituent of the institutional model and logic.

In my opinion, all components that contribute to the generation of institutional functionalities must be included in the analysis of institutional functionalities. The core architecture and operational capabilities of the institutions of the technosocial space cannot be seen if the technological constituents are not recognized. Moreover, the same types of institutions, with different technological characteristics will lead to different functional outputs, at least on an operational level. For example, the functions of digital money as a technological version of the conventional money institution or NFT as a new type of property institution, or NFT market as a new type of market institution cannot be analyzed, if the role of blockchain and internet technology is not included in the analysis.

Actors

The meta-concept of social institutions refers to humans and human organizations as the only actors whose social behavior could be framed by institutions. Theories of social institutions have emerged based on the nature of human sociality. They are specified and designed for human capabilities to perceive, communicate, accept, and adapt certain social behavior. They refer to responsibility and methods of sanctioning appropriate and understandable for humans. Social institutions support the logic of behavior and decision-making in accordance with the logic of appropriateness [*March, Olsen*, 2013] which refers to the type of individual decisions and behavior that follows from the rules of appropriate behavior for a given role or identity (which are institutionalized in social practices).

However, in the modern technosocial space, in addition to humans, AI agents and human-AI agent entities as intelligent social actors are appearing. AI agents have the increasing ability to recognize institutional frameworks and collective practices as well as the ability to act as a member of the collective. Social AI agents can take on different roles in collective

action and empower collective capabilities. Hybrid human — agent collectives are emerging [*Jennings*, 2014], and with them a new type of sociality, the so-called "artificial sociality" [*Malsch*, 2007; *Rezaev, Tregubova,* 2018].

Institutional theories based on the meta-concept of Social Institutions do not recognize AI agents and hybrid collectives as social actors, do not have the mechanisms to identify their social skills and social action, and do not have the ability to structure and regulate their behaviour. Their institutional social mechanisms are not designed for the governance of AI agents. To be clear, institutional theories that imply the meta-concept of Social Institutions can be used to analyze and explain the effects of institutions on the creators of AI agents and collectives. But, since they do not contain technological dimensions, social institution theories cannot be used to analyze institutions that directly structure and regulate the behavior of AI agents, or human-AI agent collectives.

In MAS theory, there are efforts to create AI agents that imitate people, and have the ability to recognize and behave in accordance with Social Institutions (value alignment, ethical machines, responsible agents, socio-cognitive technical systems). One can think according to this trend that Social Institutions can nevertheless frame the behaviour of AI agents. However, AI agents actually behave in accordance with their own technosocial institutional frameworks and mechanisms that recognize Social Institutions, but not in accordance with Social Institutions frameworks and mechanisms.

Space

In the institutional literature, the understanding of the spatial characteristics of Social Institutions is linked to two prevalent groups of theories of space: the Chicago and French school [*Wreight et al.*, 2022]. The Chicago school *[Park, Burgess*, 1969, p. 1921] argues that social space as well as its institutions originate from interactions in physical space, i. e. the physical place where social interactions take place. This space can be viewed as macro space (national or international order), meso-space (region, city, village) or micro-space (factory, office). The French school [*Bourdieu,* 1985; *Lefebvre,* 1974/1991] views the social space as a social structure. According to Bourdieu [*Bourdieu*, 1985] collective practices primarily take place in the social field, which represents the basic unit of social space. The social field could be an organization, professional association, class, etc. According to this interpretation, physical space is also a social construct that represents a reflection of the social structure. In other words, physical space is "a reified social space" [*Bourdieu*, 1997, p. 134]. Social interactions in space do not take place according to the logic of physical space, but according to the logic of social space.

Regardless of the differences in the understanding of social space, from a meta-ontological perspective, in my opinion both of these schools actually refer to the same physical-social space. The Chicago school perceives space as a physical space that has its own social structure, while the French school sees space as a social structure that finally frames a specific physical space. Therefore, in institutional theories, looking from a meta perspective the spatial characteristics of social institutions are linked to physical-social space.

The narrow institutional space of Social Institutions is the space in which interaction between humans or human organizations takes place, which is regulated by the framework of a particular institution. This space consists of territorial (building, city, nation) and social elements, structures, and boundaries.

Wreight et al. [*Wreight et al.*, 2022] have shown that in the institutional literature four perspectives of the relationship between Social Institutions and space appear: functional, situated, experiential, and mutually constituted. The relations between the wider and narrow institutional space are also explained in the theory of the institutional domain [*Abrutin*, 2016], according to which a narrow institutional space is a part of a broader space of institutional domain or sphere.

Due to their spatial characteristics, which are related to physical-social space, institutional theories with meta-concept Social Institutions cannot be used in the analysis of institutions of technosocial space. Given that the technosocial space is assemblages of social and technological artifacts, meta-concept Social Institutions do not recognize the technological dimension of the space. Technosocial space has its own elements, structures, logic, processes, discourses, semantics, and boundaries that differ from the physical-social space.

In addition, due to not recognizing agents as social actors, social institutions do not recognize the institutional space in which agents operate, both in interaction with people and in agent–agent interaction. The emergence of social AI agents and their collective actions expand the notion of the institutional and the generally social spaces. Broader technosocial spaces and narrower institutional spaces intertwine; however, the concept of Social Institutions cannot be used to explain this transition of social actions, as it does not recognize technology as a constitutive element of either the institution or the space.

The Meta-Concept "Technology as Institution"

The meta-institutional concept of Technology as Institution was generated from various theoretical perspectives that argue that certain technologies can be considered as institutions. I recognize here two approaches: Technology as Institution in itself, claiming that technology has embedded rules of usage that cannot be avoided [*Murphie, Potts,* 2003; *Lessig* 2000]; and technology used for social purposes that have the same functions as institutions — to structure, regulate, coordinate and order the behavior of actors [*Gillespie,* 2017; *Aneesh,* 2002; *Almeida et al.,* 2025; *Brooks,* 2013; *Lohr,* 2015].

Composition

In institutional theories that imply the meta-concept of Technology as Institution, an institution is composed of technology. Authors considered as institutions: ICT [*Avgerou,* 2002; *Orlikowski, Barley,* 2001], code [*Lessig,* 2000], algorithms [*Gillespie,* 2017; *Aneesh,* 2002, *Almeida et. al.*, 2025], big data and AI [*Brooks,* 2013, *Lohr,* 2015].

There are a few reasons why an institution cannot be reduced to technology and why institutional theories based on the meta-concept of Technology as Institution cannot be used in the research of institutions in the technosocial space.

First, authors who claim that the technological solution is an institution often reduce institutions to technological processes based on devices, machines, installations and ignore the social mechanisms that are embedded within technological solutions. We are not referring here to the influence of the environment (institutional, social, or cultural) that affects creation and functioning technology, but to the social solutions that are embedded within technology according to which technological processes are designed.

When technologists create technological solutions as institutions, they rely on existing social solutions or create a new one. When they create a new social solution, they are not only engaged in technology, but also in social engineering. However, the existing frameworks for creating technological solutions do not use the principles for creating a Social Institution, but for creating a technological solution. Despite the fact that technologists are discovering various social paradigms and trying to apply them, the creation of a Social Institution has its own specific logic which is mostly not considered. When an institution is not created according to the logic of developing social models, the technological biasing of institutions can occur.

Second, it ignores the fact that technologies are often coupled side-by-side with certain social mechanisms, forming a unified institutional mechanism.

Third, the concept of Technology as Institution is usually reduced to a solution that has a certain limited function (e. g. coordination or regulation). However, an institution is a much more complex phenomenon than one technological mechanism. An institution can be seen as a structured set of many mechanisms, while a technological solution that performs one function cannot be considered an institution.

Function

Institutional theories that imply meta-concept Technology as Institution, argue that institutional function is the result of technological operations.

Since the early industrial period, many classical authors such as Karl Marx, Frederik Taylor, and Torsten Veblen have recognized the role of technology in structuring human behavior. It was considered that despite the fact that technology is a value-neutral product of rationalization and innovation [*Murphie, Potts*, 2003]; it contains embedded rules and procedures that its users have to follow.

Over time, technology has been perceived not only as a structuring factor per se, but ever more as an instrumental governance mechanism. Mumford [*Mumford*, 1964] points out that technology determines the type of organizational order, whether democratic or authoritarian. Winner [*Winner*, 1980] notes that, apart from social institutions, the regulation of human behavior in large-scale sociotechnical systems is also influenced by technology. He views technology as an artifact (a system, device, or tool) and observes its influence within large-scale sociotechnical systems. According to Winner [*Winner*, 1980], technology can be instrumentalized and it can achieve a certain social effect. He addressed the necessity of building a theory of technology politics that will explain the structure-forming and regulating patterns of social order in various technological arrangements.

With the advancements of ICT, ideas about the use of digital technology in the governance of human behavior are flourishing. Lessig [*Lessig*, 2000] claims that in the age of cyberspace, "code is law". The regulator of human life in cyberspace is the code or software and hardware architecture: "...it determines how easy it is to protect privacy or how easy it is to censor speech. It determines whether access to information is general or zoned. It affects who sees what or what is monitored" [*Lessig*, 2000, p. 1]. According to Almeida et al. [*Almeida et al.*, 2025] algorithms are not just lines of code in the system, they are architectures that organize complex systems of interactions involving machines and humans. Almeida et al. [*Ibid.*] claim that algorithmic institutionalism uses the perspective of institutional theories to explain the functioning of these decision systems

and how they establish patterns and norms that affect human behavior and lead to deep changes in contemporary society. Similarly, authors of algocracy [*Gillespie*, 2017; *Aneesh*, 2002] claim that algorithms guide social action in precise ways and that their authority is increasingly embedded in technology itself, or more specifically, in the underlying code. Aneesh argues: "Under the algocratic mode of work governance, work is controlled not by telling the worker to perform a task, nor necessarily by punishing the worker for their failure, but by shaping an environment in which there are no alternatives to performing the work as prescribed" [*Aneesh,* 2002:8]. In these practices, computational calculations, automated recommendation or decision-making, and machine learning stand central. As Katzenbach and Ulbricht put it, "algorithmic governance is a form of social ordering that relies on coordination between actors [and] is based on rules, and incorporates particularly complex computer-based epistemic procedures" [*Katzenbach, Ulbricht*, 2019, p. 2]. Hence, whenever algorithmic systems intervene in social ordering, we can speak of "algorithmic governance" [*Gritsenko et al.*, 2022]. Hanisch et al. [*Hanisch et al.*, 2023] maintain that digital governance leverages algorithmic protocols to automate control, coordination, incentives, and trust.

The development of data infrastructure with the deployment of millions of devices and sensors, as well as advancements of relevant AI models caused a big data revolution and led to the idea of Dataism [*Brooks*, 2013]. The core of the idea of Dataism is the claim that systems that process big data provide the possibility of the cognitive and behavioral correction and guidance of humans, which leads to the need to theoretically, re-invent human anthropology [*Brooks,* 2013; *Lohr,* 2015; *Harari,* 2022]. The AI technology revolution follows the same track. Human-aware AI systems are capable of "modeling the mental states of humans in the loop, recognizing their desires and intentions, providing proactive support, exhibiting explicable behavior, giving cogent explanations on demand, and engendering trust" [*Kambhampati*, 2019, p. 1].

New technological disciplines are emerging that aim to create solutions for structuring and regulating human behavior relying on technology (e. g. Social Informatics, Cooperative AI, Multi-agent Systems). Lamb et al. describe social informatics as "an interdisciplinary study of the design, uses, and consequences of information technologies that takes into account their interaction with institutional and cultural contexts" [*Lamb et al.*, 2000, p. 1614]. It is claimed that "ICT are embedded in, help to shape, and are shaped by institutions" [*Kling et al.*, 2005, p. 29]. Recently Dafoe et al. [*Dafoe et al.*, 2020, 2021] built a conceptual framework of cooperative AI that combines strategic game models and AI technologies with the aim of improving social governance mechanisms.

All these authors have in common that Technology as Institution realizes its function according to the logic of technological institutional determinism. This refers to the coercion of behavior that results from the logic of technology usage. The logic of institutional technological determinism has its own understanding of rules. According to this logic, the rules are a technological setup where there is no possibility of avoiding them. The actor can only behave in the way that the technology allows. Institutional technological determinism differs from general technological determinism, which refers to the influence of technology not only on the behavior of individuals, but also on political, economic, cultural, and social systems.

Although technology can contribute to the improvement of existing and the creation of new institutional functions, there are a few difficulties with the claim that technology has institutional functions.

First, technology can contribute to institutional functionality, but institutional functionality cannot be reduced to technological functionality. Institutional functionality is the result of the influence of technological constituents, but also of social constituents embedded within technology that brings models of behaviour, expectations, norms, and values.

Second, institutional technological determinism cannot explain why humans choose certain technological solutions and agree to comply with them, while refusing to use others. The founders of social informatics [*Lamb et al.*, 2000; *Kling et al.,* 2005] were well aware that technology cannot be used to frame behavior if that technology does not function according to the logic of social institutions. If there is no social acceptance of technology (which must be aligned with the institutional order), no matter how functional technology is, it will not be accepted and used. The social acceptance of technology explains why many exceptional technological solutions were not used by the users.

Third, in most cases the function of Technology as Institution is reduced to a certain function, for example coordination or social cognitive assessment. However, these authors fall into functional reductionism when they reduce the institutional function to one or several functions generated by technologies.

Fourth, instead of instrumental and intrinsic functions, technology often generates imposed tacit, unintentional functions.

Actors

Among the authors whose institutional theories imply the meta-concept of Technology as Institution, there are views that see both humans and AI agents as actors.

For Mendonca et al. [*Mendonca et al.*, 2023], Almedia et al. [*Almedia et al.*, 2025], Lessig [*Lessig*, 2000] algorithms as institutions are used to govern human behavior. Mendonca et al. [*Mendonca et al.*, 2023] argue that algorithmic systems shape human behavior by assigning meanings, obligations, permissions, or resources to human action in opaque ways. Danaher [*Danaher*, 2016], Katzenbach and Ulbricht [*Katzenbach, Ulbricht*, 2019] argue that algorithms as institutions frame behaviour of both humans and AI agents. In their opinion, algorithmic governance has been used to describe a variety of sociotechnical practices aimed at assessing, directing, regulating, and managing the behavior of both human and non-human agents.

Space

In most cases the institutional meta-concept Technology as Institution, has spatial characteristics of technosocial space. For Batty and Barr [*Batty, Barr*, 1994] it is cyberspace or electronic space which is based on internet technologies. But more advanced theories [Mendonca et al., 2023; *Orlikowski, Barley,* 2001] considers the broader space — not only the one that is based on technologies, but also the social space that influences and frames institutional space. Thus, algorithmic institutionalism [*Mendonca et al.*, 2023; *Almeida et al.,* 2025] consider the institutional environment of algorithms as a broader space. Similarly, Sawyer and Jarrahi [*Sawyer, Jarrahi*, 2015] perceive that broader social space that affects Technology as Institution. They claim, referring to Orlikowski and Barley [*Orlikowski, Barley*, 2001], that “as an institution, ICT can be characterized as emergent, embedded, evolv-

ing, fragmented and connected to an ephemeral social presence that is shaped as much by other institutional and contextual forces as by technical and economic rationales" [*Sawyer, Jarrahi*, 2015, p. 14].

In the meta-concept Technology as Institution, narrow institutional space refers to the space that is framed and regulated by concrete technology. Since technology has a specific institutional function, for example to frame personal preferences, or to coordinate the behaviors of actors [*Mendonca et al.,* 2023], the narrow institutional space is reduced to the space framed by that specific technology.

The concept of Technology as Institution cannot be applied in the analysis of institutions of the technosocial space because their spatial concept does not correspond to the spatial characteristics of technosocial space institutions. Although the conceptualization of the broader space is well established, which is in accordance with research on the impact of social space on technologies [SCOT theory], the conceptualization of narrow space remains problematic, since the institutional space cannot be reduced to the action of a concrete, or a set, of technologies.

The Meta-Concept "Technosocial Institutions"

The metaconcept Technosocial Institutions is present in numerous institutional theories, particularly within institutional theories of multi-agent systems [MAS]. It is a meta-concept in institutional theories of electronic institutions [*Noriega, Sierra*, 2002, *Noriega, de Jonge*, 2016], artificial institutions [*Fornara et al.,* 2008], computational institutions [*Rubino et al.*, 2006], etc. Apart from MAS institutionalists, there are other authors whose theories could be related to the metaconcept of Technosocial Institutions. Some of them are focused on the study of institutional composition [*Dolata, Schrape*, 2016; *Dolata*, 2022; *Lanzara*, 2009; *Frolov*, 2019, 2024; *Agerfalk, Eriksson*, 2017], function [*Hindriks, Guala*, 2021; *Frolov*, 2019], actors [*Jennings et al.*, 2014], and space [*Castels*, 1999; *Dolata*, 2025; *Weyns*, 2006; *Ning et al.*, 2018; *Weinberger*, 2022].

The term "technosocial" is used in this research to refer to assemblages of technological and social components that are dedicated to governance. The term "sociotechnical" is not used since it is a broader term that refers to any "mutual constitution of people and technology" [*Sawyer, Jarrahi*, 2015] including mutual constitution in mines, factories, or electric grids.

The meta-concept "Technosocial Institutions" are characterized by the following: institutional composition is an arrangement of technological and social components; institutional function is the outcome of the joint influence of these technological and social components; humans and AI agents are actors of social roles; and institutional spatial characteristics are based on the concept of space that contains the technological and social components.

Composition

Numerous authors recognize the emergence of a specific class of institutions or institutional arrangements that contain social and technological constituents [*Lanzara* 2009; *Dolata, Schrape,* 2018, 2023; *Sierra, Noriega*, 2024; *Agerfalk, Eriksson*, 2017]. The creator

of the institutional assemblages theory, Lanzara [*Lanzara*, 2009, p. 4], claims that "...new digital institutions are emerging based on 'an assembled mix' of technical and institutional components that are in part an evolutionary outcome and in part a product of human intervention and design." Similarly, the post-institutionalist Frolov [*Frolov*, 2019], criticizing the neo-institutional approach to blockchain, argues that blockchains: "...have an organically hybrid character, combining elements of opposing institutional logics — normative and algorithmic law, Ricardian and smart contracts, private and public systems, uncontrollability and arbitration." In contrast to platform governance and organization, authors who view social order within platforms as a partial organization [*Ahrne, Brunsson*, 2011; *Ametowobla, Kirchner*, 2023], Dolata and Schrape [*Dolata, Schrape*, 2018, 2023] argue that social order within online platform spaces is generated by institutional arrangements of social and technical infrastructures. For Hindricks and Guala [*Hindricks, Guala*, 2021] certain institutions contain correlated devices or technologies that have the coordination role in establishing an equilibrium within institutions. Edwards [*Edwards*, 2003] perceives infrastructure as a socio-technical institution: "Infrastructures are not merely large systems, but sociotechnical institutions" [*Edwards, King*, 2021, p. 200]. According to the MAS scholars Sierra and Noriega [*Sierra, Noriega*, 2024, p. 29] "An electronic institution is a member of the class of socio-cognitive technical systems that are modellable with an electronic institution metamodel and implemented with an electronic institution platform."

Lamb, Sawyer, Kling [*Lamb et al.*, 2000, p. 1614] perceive social informatics as "an interdisciplinary study of the design, uses, and consequences of information technologies that takes into account their interaction with institutional and cultural contexts." ICTs are embedded in, help to shape, and are shaped by institutions [*Kling et al.,* 2005]. Technology, human action, and institutions are in a permanent evolutionary process of mutual constitution, and the main goal of information system designers is to maintain and optimize this process.

Referring to institutional composition as assemblages or arrangements of technological and social constituents equalizes the importance of both components, and the focus of the analysis is placed on the models of their assemblage. Consequently, the composition of institutions can be appropriately researched only if both components and their assemblages are included in the analysis.

Function

Institutional function in the metaconcept of Technosocial Institution is a result of the mutual influence of the social and technological constituents. Due to mutual influence, Technosocial Institutions achieve institutional functions that cannot be achieved by social constituents alone. Technology can efficiently establish equilibrium in social models, automate social processes, facilitate institutional roles, simulate collective behavior scenarios, ban offenders, facilitate social action, avoid social dilemmas, and improve the monitoring and correction of behavior, etc. According to Dalata and Schrape [*Dalata, Schrape*, 2016, 2018, 2023] arrangements of the social and technological infrastructures that constitute online platforms as social action space have a function to structure and regulate behaviour of platform users. In explaining their institutional theory, the Rules-in-Equilibrium Theory, Hindricks and Guala [*Hindricks, Guala*, 2021] refer to the role of the traffic lights as an example of the mutual functional influence of social and technological constituents of in-

stitutions. For them, traffic lights are correlation devices that maintain traffic equilibrium. They define correlation devices as "a mechanism indicating which action each player should select in a given coordination game" [*Hindricks, Guala*, 2021, p. 2030]. Traffic lights signal which actor in the traffic must stop, and which one must go. The MAS authors Noriega and De Jonge [*Noriega, De Jonge*, 2016, p. 47] referring to Simon's claim of institutional function, argue that electronic institutions serve the same coordination function that conventional institutions serve: "to act as an interface between the internal decision making of individuals and their (collective) goals" [*Simon*, 1996]. Rubino et al. [*Rubino et al.*, 2006] argue that the main institutional functions are: to manage the identity of the participants; to define and validate the requirements on participant capabilities; to establish some conventions for the interaction among agents; and to enforce the possible obligations.

Since the institutional theories that imply the concept of Technosocial institutions observe the institutional function as a result of the joint influence of social and technological constituents, they are the most suitable for the analysis of the functional institutions of the Technosocial space. However, in most cases, institutional theories that imply meta-concept of Technosocial Institutions refer only to the causal function (structuration, regulations, framing) of the institution that appears as a result of technosocial assemblages, but do not refer to the teleological function of institutions.

The concept of Technosocial institutions refers to the specific institutional logic by which the institutional function is realized, which combines the logic of social determinism and the logic of technological determinism. I call it the logic of institutional technosocial determinism. In my opinion, the logic of institutional technosocial determinism refers to the acceptance of coercive mechanisms of institutions by actors, who perceive them as expert systems and prescriptive guides in achieving certain individual, collective or social benefits. The post-institutionalist Frolov [*Frolov*, 2019] recognizes that blockchain as an institution is characterized by functional redundancy and the hybridity of institutional logics. Van Dijck [*Van Dijck*, 2009] refers to platform governance and talks about three mechanisms (which I interpret here rather as institutional logic) that they specify as a special type of governance: datafication, commodification, and selection.

Actors

Institutional theories that imply the meta-concept of Technosocial institutions consider humans and AI agents as social actors whose behaviour is institutionally structured, regulated, and framed. The institutional mechanisms of Technosocial Institutions that consist of social and technological components, can be combined in such a way that suits to the specificities of different types of intelligent agents. Technosocial Institutions have the capabilities to regulate any type of dual and multiple social interactions that appear between humans and AI agents in the age of artificial sociality. According to Rezaev, Tregubova [*Rezaev, Tregubova,* 2018] the term "artificial sociality" refers to three phenomena: the first is human-to-human interactions that are mediated by machines; the second is human-to-machine interactions; the third is machine-to-machine interaction.

Even though some authors [*Lanzara et. al.,* 2018, *Dolata, Schrape* 2022, *van Dijck et. al.*, 2018] do not refer to AI agents as actors of social action, it is clear that the institutional constitution of constituents perceived as techno-social assemblages allow AI agents to be included as actors. Frolov [*Frolov*, 2024] argues that to study institutional phenomena in

digital capitalism, it is necessary to apply the flat ontology approaches that recognize robots as institutional actors, such as those by Gilles Deleuze and Félix Guattari, Bruno Latour, Graham Harman, Manuel DeLanda, and Levi Bryant. Accordingly, he suggests the need to create new institutional approaches that would deal with robot rules. The most developed institutional theoretical frameworks that consider different types of intelligent actors are built in MAS institutionalism [*Rubino et. al.*, 2006, *Noriega,* 2024]. In the concept of "computational institutions" Rubino et al. use the word "computational" to refer to the fact that "the entities participating in the institution are not necessarily humans, but also computational virtual entities that operate in order to achieve the social shared goal(s)" [*Rubino et al.,* 2006:129]. They maintain that normative agents with specific institutional roles (legislative, judicial, executive) should be separated from non-normative agents. For Noriega the electronic institution plays the same role as conventional institutions, but "the not-so-subtle difference is that electronic institutions are meant to articulate interactions that may happen online and may involve humans as well as artificial entities" [*Noriega,* 2024, p. 4].

Those institutional conceptualizations that include humans and AI agents as actors can be used for the research and the development of the institutions of technosocial space. Recent advancements in human–AI agent assemblages [*Moran et. al.*, 2014], and emerging human–AI agent hybrids as a type of the social actors will challenge existing social agency theories.

Space

Technosocial Institutions are situated within the Technosocial space. This is the social space that is constructed of social and technological constituents, which can be reified in the physical environment, in the cyber environment, or in both simultaneously.

According to Dolata and Schrape [*Dolata, Schrape*, 2022], Dolata [*Dolata*, 2025], Lanzara [*Lanzara*, 2009], van Dijck [*van Dijck*, 2018], and Frolov [*Frolov*, 2019, 2024], a new class of institutions arises within cyber (online, internet, or virtual) space where the internal institutional space is an online platform space. This is a space where institutional arrangements of social and technological infrastructures constitute a playground for social interactions [*Dolata, Schrape*, 2023].

With the emergence of systems where social interactions occur within physical space and cyberspace simultaneously (for example smart cities, location based services), in literature new concepts of space such as general cyberspace, metaverse, pervasive space, and immersive space emerge. These concepts are that of extended cyberspace, which is reified in physical space and in virtual space. According to Ning et al. [*Ning et al.*, 2018] general cyberspace consists of cyberspace and cyber enabled space. Cyber enabled space is also called Cyber-physical-social-thinking space [*Xiong et al.*, 2023]. The metaverse also appears as a new extended variant of the concept of cyberspace, which Weinberger describes as follows "the metaverse is an interconnected web of ubiquitous virtual worlds partly overlapping with and enhancing the physical world. These virtual worlds enable users represented by avatars to connect and interact with each other, to experience and consume user-generated content in an immersive, scalable, synchronous, and persistent environment. An economic system provides incentives for contributing to the Metaverse" [*Weinberger, 2*022, p. 13]. The existing institutional concepts of cyberspace can be applied in the extended understanding of cyberspace.

MAS scholars have developed an abstract concept of the space that can be reified in both cyber and physical space. To describe the narrow space where agents operate, MAS authors build a concept of agents' environment. MAS institutions (electronic, digital, artificial) are situated within agents' environments. The agent environment is created by MAS engineers. According to Wayns et al. [*Wayns et al.*, 2006], within this environment different forms of structuring can be distinguished:

— Physical structure refers to the spatial structure, topology, and possibly distribution;
— Communication structure refers to the infrastructure for message transfer, infrastructure for stigmergy, or support for implicit communication;
— Social structure refers to the organizational structure of the environment in terms of roles, groups, societies etc.

This position is especially present among the authors of situated artificial institutions, who hold that an artificial institution is situated when "the whole regulation that is performed is based on the facts occurring in the environment where the agent acts" [*de Brito et. al.*, 2014]. Agent environments may have several roles, such as the inter-mediation between agents, the support for interaction, the embodiment of rules and constraints, etc. According to MAS authors [*Weyns et. al.*, 2006], the environment is the primary abstraction of the MAS system, and MAS engineering refers not only to the engineering of agents, but also to their environment. In MAS theories, the agent environment is understood as a narrow institutional space where a certain group of agents interact, framed by institutions which can be engineered.

Given that these theories perceive institutions as situated within space that consists of technological and social constituents, and are reified in physical and cyber **environments**, institutional theories which imply the meta-concept Technosocial Institution are the most applicable for researching spatial characteristics of the institutions of the Technosocial space.

Conclusion

The paper presents the results of theoretical research that answered the question: what kind of meta-institutional concepts are most appropriate for studying institutions of technosocial space? I assumed that only institutional theories whose metaconcepts refer to very basic characteristics of institutions of technosocial space could be used for their research. Relying on a novel meta-ontological model of institutions, three classes of meta-institutional concepts were generated from institutional literature. In the analyses of the applicability of the three metamodels it is argued that the institutional theories that imply metaconcept of Technosocial Institution are the best in research of institutions of technosocial space. The institutional theories that imply the meta-concept of Social Institutions perceive institutions as pure social phenomena. They suit research of conventional institutions (family, religion, organization), but they do not suit research of institutions of technosocial space. In addition, the institutional theories that imply the metaconcept of Technology as Institution cannot be used in the research of institutions of the technosocial space because they reduce institutions to technology while ignoring the social essence of the institutions. The institutional theories that imply the metaconcept of Technosocial Institutions such as theories of P. Noriega, N. Fornara, D. Frolov, U. Dolata and J.F. Schrape etc. are the most suitable for analyses and research of institutions of technosocial space. In their perception, institutions of technosocial space are: composed of equally social and technological constituents; their

function is the result of the mutual influence of social and technological constituents and their realization is based on the logic of institutional technosocial determinism; they frame the behaviour of humans and AI agents; and they are situated in a technosocial space that can be reified in both physical and cyber space, simultaneously. However, despite the fact that the mentioned institutional theories are usable, in the social sciences we need new, more advanced institutional theories that will be based on the meta-concept of Technosocial Institutions.

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Как исследовать институты техносоциального пространства? Анализ применимости трех метаинституциональных концепций

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В техносоциальном пространстве возникают специфические институциональные явления: технологии все чаще используются в управлении; технологии позволяют создавать новые социальные модели; помимо людей, в коллективных действиях появляются агенты искусственного интеллекта; и коллективные практики происходят одновременно в различных сегментах техносоциального пространства. Это явление бросает вызов самому базовому пониманию института как чисто социальной конструкции, определ-яющей поведение людей в физико-социальном пространстве. Возникновение этих институциональных явлений сопровождается появлением новых теоретических концепций в исследовании института (например, алгоритмический институционализм, пост-институционализм, институционализм многоагентных систем), которые рассматривают технологию как первостепенный фактор, определяющий мезо- и микроинституты. В статье рассматривается вопрос: как исследовать институты техносоциального пространства? Более конкретно, какие метаинституциональные концепции наиболее подходят для изучения институтов техносоциального пространства? Для ответа на этот вопрос был проведен метаинституциональный анализ, состоящий из трех этапов. На первом этапе была создана новая модель институциональной метаонтологии, основанная на двух столпах: 1) институты определяются составом, функциями, акторами и пространством; 2) институты могут быть как социальными, так и технологическими конструктами. На втором этапе, с опорой на новую модель институциональной метаонтологии, были сгенерированы три класса метаинституциональных концепций: социальные институты, технология как институт и техносоциальные институты. На третьем этапе был проведен анализ применимости трех сгенерированных классов. Сделан вывод, что теории, включающие метаконцепцию того, что в статье названо техносоциальными институциями, являются наиболее подходящими для изучения институтов техносоциального пространства.

Ключевые слова: институциональная теория, метаинституциональный анализ, техносоциальные институты, социология науки и технологии, социология человека и машин.