"Trust in a Digital World": Creating the Responsible Supply Chain, Market Dynamics, and Trusted Infrastructures

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Abstract. This article investigates the sustainable evolution of a supply chain and makes the case for a Science and Technology Study-STS approach to analyze the institutional dynamics of markets. Thinking on the subject has its origins in a recent proposal for an EU directive on the extension of corporate sustainability due diligence (CSDD) in complex value chains and networks, developing from two exhibition projects curated by researcher-artists Kate Crawford and Vladan Joler: the Amazon Echo as a socio-technical system (an "Anatomy of an AI system") and a cartography of AI frontiers illustrating how power and technology have been intertwined since the 1500s ("Calculating Empires"). This work suggests that a "sustainable supply chain" can be considered as a "market infrastructure" that assembles technological artefacts with human actors, social practices, organizations and knowledge around an activity. Emphasizing the socio-material side in the process of market dynamics, a market infrastructure is "a materially heterogeneous arrangement that 'silently' supports and structures the consummation of market exchanges": (i) defined by forms of institutional work related to the introduction of "legal design" principles and practices ("using human-centred design in the legal domain"), (ii) supported by a "trust-based" institutional logic (and generated by the category of "responsible management"), (iii) and characterized by the contract as "a legal, economic, managerial and social artefact" (and grounded in the responsible use of digital technologies).

keywords: supply chain; contract-as-artefact; legal design; market dynamics; trust and digital technology; STS/ANT

Introduction and Theoretical Context

[1] «The *objects and structures* that surround us—from the walls of this gallery to the clothes on your back—are built on *networks of production* that span borders and millennia. To manufacture a single smartphone, miners extract ancient lithium in Bolivia, workers in China provide hundreds of hours of manual labor, and programmers around the world write rivers of code. Far from being isolated processes, these activities feed and complement each other, creating *a tangled web of people, materials, and data*. Taking inspiration from **Anatomy of an AI System**, a data visualization by Kate Crawford and Vladan Joler [2018], this installation explores what Crawford and Joler have described as the "*interlaced chains of resource extraction, human labor, and algorithmic processing*." The works on view use the tools of design to visualize and respond to cycles of production and the complex global networks they form» (https://www.moma.org/calendar/galleries/5472)

[2] «**Calculating Empires** charts the technological present by depicting how power and technology have been intertwined since 1500. It is a codex of *technology and power* that

shows how echoes of empires past resonate in today's technology companies. Kate Crawford and Vladan Joler visualize these major shifts in an intricate visual manifesto about *the way empires have used technology to centralize and consolidate their power*. The vast diagrammatic diptych draws audiences into a dark passage to study on one wall *the histories of communication and computation*, while the opposite wall addresses *systems of classification and control*. Read together, these maps illuminate *technical and social structures* that co-evolved over centuries. By seeing how past powers have calculated, we can begin to calculate the costs of contemporary empires. Calculating Empires thus gives audiences a detailed visual narrative about the *relationship between humans, ecologies, and technologies* […]» (https://ars.electronica.art/starts-prize/en/calculating-empires/)

How is it possible to "design" (conceptualise and create) a supply chain that credibly addresses the issue of sustainability of its processes? The reflection on this phenomenon starts from a specific episode: the recent approval of the proposed EU directive on the development of a 'Corporate Sustainability Due Diligence (CSDD) "into actual business practices in complex value chains and networks" (Saloranta, Hurmerinta-Haanpää 2022: 221; Salo-Lahti, Haapio 2024). Episodes [1] and [2] problematize (Alvesson, Sandberg 2011) the phenomenon. The large-scale cartography "Anatomy of an AI System" [1] is an installation that has become part of the permanent collection of the MOMA in New York, hosted in a specific section titled "Design makes global production networks visible". The map also constitutes the central element of the first of two sections of a further exhibition project, "Calculating the Empires: A Genealogy of Technology and Power, 1500-2025" [2], realised for the Osservatorio of the Fondazione Prada in Milan. In the first case, the artist-researchers propose a "spatial" analysis of the interaction with an Amazon's Echo device, in which «each small moment of convenience – be it answering a question, turning on a light, or playing and song – requires a vast planetary network, fuelled by the extraction of non-renewable materials, labour, and data». With the second project, the spatial dimension of the phenomenon is completed with the evolution "through time" (a sort of genealogy *à la* Foucault) of the relationship between "politics" and "technology", developed around two pairs of concepts: communication and classification; computation and control.

Combined, the two exhibition projects suggest a coherent research design. On the one hand, grounding the representation of a complex *supply chain* (that of AI) on the materiality of "an artefact/a device" (the Amazon's Echo) considered as a socio-technical system, constitutes an initial reference to the method of *Science and Technology Studies* (STS) (Bijker *et al*. 1987; Collins, Pinch 1993, 1998). Furthermore, both works converge in addressing the historical evolution of innovation processes – of a "sustainable supply chain" – by investigating the relationship between concepts (artefacts and materiality; classifications, standards and infrastructure) associated with specific STS research perspectives (*Actor-Network Theory*-ANT: Magaudda, Neresini 2020). This approach focuses on the permanence of (new) artefacts (not only technological) in the context of the social relations that produced them and within which the change and innovation (technical and social together) that they trigger is produced (Latour 1987, 2005).

In the CSDD directive proposal, "translating a public policy into practice" not only involves extending the scale of the phenomenon: from the current Corporate Social Responsibility (CSR) to an encompassing Environmental, Social and Governance (ESG) accountability. In what Michael Power labels "the audit society" (1997; 2021), an important level of analysis pays attention to how inextricable is "the connection between managerial techniques, control logics, and institutional, organizational and professional cultures" (Panozzo, in Power [2000]: viii). The combination of "material practices and symbolic constructions" (Friedland, Alford 1991) is particularly interesting when, in order to cope with the problems of increasing risk production, the erosion of social trust, and the recurrence of economic crises, economically advanced systems feed "the over-enthusiasm for controls". In terms of *accountability*, emphasis should be placed on the technical aspects of control in its links with the political and programmatic dimension (Power 1997): how procedures, tools, techniques and professional practices "materialize" and help "shape" the economic and social processes of which they are a part. Similarly, in *marketing management* terms (Ben Slimane *et al*. 2019; Chaney *et al*. 2019; Corciolani 2020), the institutional dynamics of markets (Giesler, Fischer 2017; Ben Slimane *et al.* 2019; Nøjgaard, Bajde 2020; Pedeliento *et al*. 2022) should pay attention to how a supply chain "assembles technological artefacts with human actors, social practices, organisations and knowledge around an activity" (Law 1986, 2009; Callon 1998; Latour 2005).

Table 1 (Appendix) summarises the theoretical context of this conceptualization: (i) the first column defines the main constructs derived from the perspective of organizational neo-institutionalism (institutional logics, institutional work, material & visual basis of institutions: DiMaggio, Powell 1991; Greenwood *et al*. 2006, 2017), (ii) declined for each row with respect to the emergence of "trust" as an institutional dimension (Möllering 2006, 2013) in a "digital context" (Lumineau *et al*. 2021, 2023), the centrality of the contract as an "artefact", and the practices of legal design as an interpretative context (Barton *et al*. 2019, 2021; Passera 2017; Hagar 2019a, 2019b); (iii) leading up to the emergence of the concept of infrastructure (Bowker, Star 1999; Star, Ruhleder 1996; Suchman 1987, 1997) and its declination into "market infrastructure" (Kjellberg *et al.* 2019).

Methods

Research Design. Gherardi (2012/2019) suggests some methodological premises to approach, in a practice-based perspective and through the logic of ANT (in a "sociology of translation": Law 1986), the analysis of the institutional dynamics of a supply chain considered as a market infrastructure. A "sustainable supply chain" can be interpreted as an expression of the technology of *accountability* (in an "audit society": Power 1997), i.e. the need to provide an account of reality and make it "accountable", legitimizing the one who reports as a "trustworthy subject". When the "translation" is complete, does the technology employed make a supply chain more "accountable" (as an "actor-network", i.e. as

the effect of the association of human and non-human materials in unstable alliances in search of stabilization, to the point of being perceived as a "trustworthy collective actor")? And how is the "supply chain" transformed in this collective process of "responsible management"? The interpretation of a "sustainable supply chain" as a set of situated and emergent practices (Carlile 2002, 2004; Nicolini 2012): (i) eliminates the artificial organizational boundaries of a phenomenon that is instead investigated as an "institutional learning" process in which "humran and non-human actors" take part, (ii) through a mechanism of "competent participation" in a social practice that produces and circulates "situated knowledge" (Suchman 1987, 1997; Carlile *et al*. 2012).

In this work, the success of artefacts concerns both accountability as a management tool and digital technologies applied to contracts, which in turn are considered as "artefacts", objects "designed and constructed" to mediate interaction between individuals and concepts (starting with the "category" of "responsible management"). Their success and the evolution of social change processes, depend on a possible configuration of networks of relationships that make possible the development and stabilization of innovation (both technological and social), the "translation" of a "responsible supply chain" into practice.

Interpretive Context. "Global value chains are complex in their infrastructure and legal structure" (Salorata, Hurmerinta-Haanpää 2022: 221): it seems reasonable to consider "contracts and contracting" as the fundamental basis of market exchanges, a research object from which to observe the process of change of a supply chain. Legal design (Haapio 2006; Hagan 2016, 2018, 2019; Corrales *et al*. 2019, 2021, 2022; Passera 2017; Rossi 2019) is a discipline that takes this peculiar perspective and in which the direction of convergence between digital technologies may be particularly evident (i.e., AI and blockchain): «recent innovations in contracting reflect collaborations by lawyers with non-legal professionals: […] information designers to pioneer legal *information design*, including stronger uses of visualization and simplification techniques, and with software engineers and other information technology specialists to develop examples of *legal automation* and *legal technology*, including coded prose and self-executing Smart Contracts» (Barton *et al*. 2019: 64). "The Legal Design Manifesto" places this discipline in a kind of international cultural movement, with a strong professional and academic connotation (legaldesignalliance.org).

Empirical Context

Within this interpretative framework, introducing the institutional dynamics of markets makes it possible to consider the evolution of a supply chain as an organisational field (Ziestma *et al*. 2017) "in its making", an institutional infrastructure (Hinings *et al*. 2017) in which processes of "alignment" or "stabilization" emerge as much as tendencies towards "contestation/resistance" or "fragmentation" of the field of forces (an 'action net' in ANT language) that contains and produces the reticular actor (the "actor-network") (Lawrence,

Suddaby 2006). The proposed EU directive (CSDD) is a first attempt ("*in the beginning there was the proposed directive*") to make the sustainability of a supply chain a "black box": (1) a taken-for-granted idea that takes on specific meanings in the course of a "translation process" in which, however, multiple "translators" ("*translating a policy*") are called upon to participate, going through the stages of "problematization", "interessement", "enrolment", "mobilisation" (Callon 1986; Latour 1987, 2005); (2) and involving in terms of 'heterogenous engineering' (Law 1986, 2009) the actors (human and non-human) as part of the processes of "materialisation into artefacts" leading to a more or less accepted interpretation of what constitutes an *accountability* system for "a sustainable supply chain" ("*the making of the sustainable supply chain*").

Findings: (Digital) Trust, Market Dynamics and Material Practices

Table 1 shows the main definitions of the concepts used and describes the connection between the components of the theoretical construction. The top right-hand box shows the result of the analysis. Emphasizing the socio-material side in the process of market dynamics, this work suggests that a "sustainable supply chain" can be considered as a "market infrastructure", "a materially heterogeneous arrangement that 'silently' supports and structures the consummation of market exchanges": (i) defined by forms of institutional work related to the introduction of "legal design" principles and practices ("using human-centred design in the legal domain"), (ii) supported by a "trust-based" institutional logic (and generated by the category of "responsible management"), (iii) and characterized by the contract as "a legal, economic, managerial and social artefact" (and grounded in the responsible use of digital technologies).

The analysis of institutional dynamics in marketing studies and research on consumption processes is based on the fundamental concepts of neo-institutionalist theories and on the more recent evolution of this perspective (Humphreys 2010a, 2010b; Scaraboto, Fischer 2013; Dolbec, Fischer 2015; Canniford, Bajde 2016). The proposed theoretical construction takes into account the "foundational pillars" that constitute the support of institutions, enabling them to "structure themselves" within an organizational field (Scott 2014): the regulatory pillar (definition of laws and regulations, both formal and informal); the normative pillar (norms, standards, shared values, common goals and appropriate behaviors to achieve them); and the cognitive pillar (symbolic systems, schemas and representations, shared practices). Furthermore, citing Scott (2014): «organizations require more than resources and technical information if they are to survive in their social environments. They also need social acceptability and credibility» (p. 71). In the end, social structures require "legitimacy" (Suchman 1995; Suddaby *et al*. 2017). This paper suggests that the credibility of a "sustainable supply chain" has to do with the legitimization of *accountability* ideas and objectives around the *category* of "responsible management", generating a "trust-based" *institutional logic*. The emergence of the "sustainable supply chain" is defined by forms of *institutional work* identified by

"legal design" practices around the contract as "a legal, economic, managerial and social artefact" (Corrales *et al*. 2019, 2021, 2021a, 2022; Passera 2017).

The concepts in the first column of table 1 are declined in the middle part of the table (second column): the institutional dimension of trust, the need to investigate it in terms of processes (Möllering 2013), as well as its evolution in a digital context (Lumineau *et al.* 2023). The notion of "category" (Durand, Paolella 2013; Durand, Thornton 2018) is linked to the concept of institutional logic (Thornton *et al*. 2012): the processes through which the former is formed seem to determine the generation of certain institutional logics (Durand, Thornton 2018). The mapping of the dimensions of the research field of "responsible management" (second row, third column: Laasch *et al.* 2020) reflects this dynamic. Finally, the central part of table 1 (part highlighted in grey) outlines the forms of *institutional work* related to "legal design" practices. Meyer *et al*. (2013, 2018) developed a framework that investigates "the impact of different semiotic modes across specific stages in the process of institutionalization": (A) institutional practices (initial placement; exposure; mobilization; typification; explanation; justification; taken-for-grantedness; translation) can be traced back to different phases of the institutionalization of "legal design"; (B) specific communicative features and (C) groups of "affordances of the visual mode (argue, specify, narrate, abstract) and the verbal mode (infiltrate, spatialize, captivate, materialize)", relevant in the institutionalization process, emerge from contract visualisation practices.

Discussion and Conclusions

Within the institutional dynamics of markets, the notion of *market infrastructure* (MI) emerges from the notion of infrastructure traceable to the STS tradition (table 1, third column: Star, Ruhleder 1996; Bowker, Star 1999; Bowker *et al.* 2019). The notion of MI has eight characteristic traits (Kjellberg *et al.* 2019): (1) relational; (2) modular; (3) interdependent; (4) actively maintained; (5) available for use; (6) emergent; (7) commercial; (8) political.

Concluding remarks. The theoretical and empirical implications concern two dimensions of analysis: (i) the role of materiality and visuality in marketing and consumer research; (ii) the introduction of the notion of MI in the evolving perspective on the institutional dynamics of markets. In the first case, "contracts-as-artefacts" are characterized (Meyer *et al.* 2013, 2018; Höllerer *et al*. 2019): (1) as "storage" of "sedimented social knowledge"; (2) as performative material objects; (3) as a form of "textual cooperation" in a narrative approach; (4) as "a form of communication"; (5) and as a specific form of "field notes" in a documenting approach. Finally, the notion of MI fuels three overlapping concerns that remain when considering the level of supply chain analysis in terms of institutional dynamics: (Nøjgaard, Bajde 2020; Pedeliento *et al*. 2023): (1) market ontology, (2) market ideas and (3) market agency.

References (primary and secondary resources) available upon request

Appendix

Table 1 - (Digital) Trust, Market System Dynamics and Market Infrastructures

Neo-Institutionalist concepts	*Trust and Legal Design as interpretive context*	*Supply chain and Market System Dynamics*
1. Institutional Logics: «the socially constructed, historically patterns of cultural symbols and material practices, assumptions, values, and beliefs by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their daily activities» (Thornton, Ocasio 1999: 804)	**"Institutions and Trust":** «(1) institutions are a basis for trust between actors, because they imply a high degree of taken-for-grantedness which enables shared expectations even between actors who have no mutual experience or history of interaction; (2) institutional-based trust between actors requires that the institutions […] are both a source and an object of trust; (3) the significance of (institutionally based) agency in the constitution of trust lies in the assumption that actors (re)produce collectively the institutional framework which then serves them as a source for trust (in other actors), but becomes an object of trust (in institutions), too» (Möllering : 2006, 373)	**A (digital) supply chain as a market infrastructure:** (i) defined by forms of institutional work related to the introduction of **"legal design" principles and practices**; (ii) supported by **a "trust-based"** institutional logic (and generated by the category of **"responsible management"**); (iii) and characterized by the **contract as "a legal, economic, managerial and social artifact"** (and grounded in the responsible use of **digital technologies**)
categories: «provides a cognitive infrastructure that enables evaluations of organizations and their products, drives expectations, and leads to material and symbolic exchanges. [They] are the symbolic and material attributes of products, firms, and industries that are both shared among actors and that distinguish these entities from others» (Durand, Thornton 2018: 636)	• **"Process view of trust"** (Möllering 2013): (1) continuing: how does trust change over time? (2) processing: how do trustors and trustees generate and 'process' information in order to produce outcome of trust? (3) learning: how does trust change as a result of learning? (4) becoming: how is trust involved in producing knowledge, social identities and relationships? (5) constituting: how is trust involved in the production of social structures?	**responsible management in a (digital) supply chain** (Laasch *et al.* 2020): **A. disciplinary domains:** (1) ethics; (2) responsibility; (3) sustainability; **B. spheres** (multi-level perspectives around the responsible manager): (1) job; (2) groups; (3) organizational; (4) occupational; (5) planetary/society **C. themes** ("managing responsibly"): (1) praxis, practices, process(es); (2) learning, change, innovation; (3) alternative management frameworks
2. Institutional Work: «purposive action of organizations and individuals aimed at creating, maintaining, and disrupting institutions» (Lawrence, Suddaby 2006: 215) **Legal Design** (Passera 2017; Haapio, Passera 2021): «is about **using human-centerd design in the legal domain**»: (i) graphic, visual, and communication design (ii) product and service development; (iii) and systems and organizational (re)design	**Trust in the 4th Industrial Revolution** (Lumineau et al. 2023: 23): (1) shift in the form of trust • trustors may lose some of their agency in making trust decisions • trust may follow different dynamics over time (2) shift in the modes of trust production • organizations' approaches for being perceived as trustworthy (and the competitive advantage associated with it) may change • organizations may face new challenges in managing trust decisions (3) shift in the targets of trust • actors may need to trust others that they have never met	**Infrastructure dimensions** (Star, Ruhleder 1996): embeddedness; transparency; reach or scope; learned as part of membership; links with conventions of practice; embodiment of standards; built on an installed base; becomes visible upon breakdown **"Thinking infrastructures" (valuing, tracing, governing):** «configure entities (through tracing, tagging); organize knowledge (through searching engines); sort things out (through rankings and ratings); govern markets (through calculative practices, including algorithms); and configure preferences (through valuations such as recommender systems). In short, thinking infrastructures fold into themselves an archaeology of concepts, tasks and processes that make thought and thinking possible […]: they configure the user, cognitively» (Bowker et al. 2019, 2).
Legal Design and institutionalization process: as forms of **institutional work** around che "contract as artefact"(A), considering specific **communicative features** (B) and identifying distinct **affordances of verbal and visual text** as semiotic modes (C) (Meyer et al. 2013, 2018)		
Ⓐ • **Forms of institutional works:** (1) initial placement; (2) exposure; — Stage 1 (3) appeal/mobilization; (4) typification; (5) explanation; — Stage 2 (6) justification; (7) taken-for-grantedness; — Stage 3 (8) diffusion/translation	Ⓑ • **Characteristics of the communicative situation:** (i) match between idea and existing meanings (ii) prominence of text producer (iii) clarity and predicability of outcome(s) (iv) anchoring in sensory perception (v) match between idea and shared understanding (vi) standing of text producer (vii) potential for contestation of idea (viii) match of vocabularies between contexts/audiences	**Market Infrastructure (MI)** (Kjellberg, Hagberg, Cochoy 2019): «as a materially heterogeneous arrangement that silently supports and structures the "consummation" of market exchanges». Characteristics of the MI: **(1) relational; (2) modular; (3) interdependent; (4) actively maintained; (5) available for use; (6) emergent; (7) commercial; (8) political**
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3. Material and Visual Basis of Institutions: «the material is the foundation for institutions and shapes key institutional processes such as how acts and actors are legitimized, how identity is evoked and invoked, which logics are stabilized and durable due to encoding into material form and how ideas are translated, theorized and transported across space and time» (Jones *et al.* 2017: 654)	**Verbal affordances:** (a) argue (b) specify (c) narrate (d) abstract **Visual affordances:** (a) infiltrate (b) spatialize (c) captivate (d) materialize **Contract as "a legal, economic, managerial and social artefact", grounded in the responsible use of digital technologies**	**The aims of contract visualization** (Barton et al. 2019): (i) supporting comprehension; (ii) improving perceptions and relationships among contractual parties; (iii) supporting cross-professional, inter- and infra-firm collaboration **Integrating design and technology (i.e., digital innovation) in the legal domain:** from "contracts as documents written by lawyers for lawyers" to "contracts as (user-friendly and smart) interfaces"