GO TO SESSION 1 GO TO SESSION 2

Panel 75. Regulation, innovation and materiality in technological transition: a socio-technical comparative perspective

Convenors:
Alessandro Sciullo, Università di Torino
Claudio Marciano, Università degli Studi di Genova

Keywords: institutions, materiality, regulation, socio-technical system, technology

In the policy arena, the concept of transition is normatively adopted to refer to a prefigured trajectory of systems change based on the co-evolution of material and immaterial infrastructure. For example, energy transition is used to describe the gradual replacement of fossil sources with renewable sources, and the contemporary replacement of centralized governance models based on the monopolistic ownership of the grid towards a more horizontal and decentralized system. In this perspective, the concept of transition takes on a prescriptive meaning that homologates, or at least selects in terms of appropriateness, the expectations about the future held by various actors in a sort of coordinated vision of social change.

The socio-technical approach to transition cannot but be critical, aiming to "open the black box" of technological and scientific innovations by unveiling their political content. From a sociotechnical perspective, transition is understood as a field of struggle between divergent interests and visions of social change, where the emergence of competing technological solutions stems from the relational dynamic among actors in the system. The design, production and availability of the artifacts themselves is strongly intertwined with the role of non-technological and nonscientific factors, such as market regulation and public policies on research and development in industry, as well as to exogenous components such as climate change and geopolitical relations. The role of these factors clearly emerge when comparing transition processes occurring in socio-technical systems framed into wider social, cultural and institutional contexts at multiple scales: from the micro level of different territories characterized by situated socio-economic processes and networks of local actors baring their own cognitive frameworks, to the macro level of transition processes taking place in countries with partially or even completely different political, cultural and economic regimes.

On these premises, the goal of the session is to collect empirical studies and theoretical reflections on the role of regulation, i.e. institutional devices and socio-cultural frameworks that determine cognitive, normative and regulative rules in societal systems, in shaping the pathways and determine the results of technological innovations. The ambition of the sessions is to fill the gap between theoretical elaboration and empirical evidences in socio- technical system research, a "scandal" that Goldthorpe noted about sociological studies as a whole. The session welcomes contributions which covers one or more of the following topics from either a theoretical or empirical perspective:

- interplaying of material and institutional factors in shaping technological transition processes;
- pathways and results of technological transition processes occurring in different socioinstitutional settings;
- co-construction of technological and scientific knowledge: proposals and experiences;
- political and cultural embeddeness in technological innovation;
- the actors of technological innovation: network, power and resources.

11 JUNE 2025 14.30 - 16.30 SESSION 1

ID 713 - Falsehoods-as-facts and the role of regulation and governance in development of AI: lessons from professional services industry.

Wojtek Buczynski, University of Cambridge

Keywords: AI, innovation, regulation, laws, financial services, governance

AI is a winner-takes-all game. Regulation impedes innovation. AI will solve global warning. Generative AI will add X trillions of dollars to the global GDP. Etc., etc.

All of the above statements function in the public sphere – be it media, business or politics – as facts, repeatedly stated by subject matter experts. In fact; *none* of these statements is a fact – they are opinions, views or beliefs; but none of them is a scientifically verified fact . Repeated often enough, opinions begin to function as facts, misrepresenting personal and political convictions as expertise and / or science. Furthermore, when wielded by some of the world's wealthiest and most powerful AI entrepreneurs or heads of state they have the power to become self-fulfilling. Against this backdrop regulation, governance and ethical guidelines appear as the only feasible means of shaping the development of AI in ways that benefit the public, uphold and affirm fundamental rights, promote equality, serve sustainable development goals etc.

The additional – and sometimes discounted – factor to consider is that for most actors (other than AI companies themselves) AI is a means, not an end. The challenge is that unlike many other technological shifts – such as going carbon-neutral or migrating the IT infrastructure onto the cloud – there is no such thing as a clearly-defined end-goal for AI. This transition is anything but prefigured; AI is a perpetually moving target.

By building on our recent (Buczynski et al, 2022) and upcoming research (Buczynski et al, 2024) on laws and regulations I will present findings and reflections on what factors and actors shape and inform the adoption of AI in financial services and consulting industries, estimated to account for approx. 25% of the global economy.

Having personally worked in and researched both industries I had the unique opportunity to observe – in person or through industry interviews – the contrast in attitudes towards outcomes, impacts and accountability for AI between a highly-regulated industry (financial services) and an unregulated one (consulting). This contrast is also evident when analysing incentives and disincentives for implementing AI; the assumption of "first mover's advantage" does not hold universally in all industries.

While these entities represent primarily their shareholders' interests – which are not always aligned with the interests of the regulators, or even best interests of their clients – the interplay between the industry and the regulators is not always as adversarial as one could expect. By contrast, end-users and the impact of AI transition on their experience with these organisations sometimes seem like an afterthought, with a strong implicit assumption that all innovation is good innovation.

References:

Buczynski, W., Steffek, F., Cuzzolin, F., Jamnik, M., Sahakian, B., "Hard Law and Soft Law Regulations of Artificial Intelligence in Investment Management" (2022), Cambridge Yearbook of European Legal Studies, 24, 262-293, https://www.cambridge.org/core/journals/cambridge-yearbook-of-european-legal-studies/article/hard-law-and-soft-law-regulations-of-artificial-intelligence-in-investment-management/94A747407D4CA9226C6CCAE3E3E6616E#article, doi:10.1017/cel.2022.10.

Buczynski, W., Steffek, F., Cuzzolin, F., Jamnik, M., Sahakian, B., "Future themes in regulating artificial intelligence in investment management" (upcoming).

11 JUNE 2025 14.30 - 16.30 SESSION 1

ID 846 - How do political and private actors reconfigure the heat network system? Insights from the French urban projects on energy transition in urban environments.

Alena Coblence, Université Paris Nanterre
Hélène Nessi, Université Paris Nanterre

Keywords: sociotechnical systems, energy transition, urban planning, renewable heat production, heat networks

Heat networks (also known as district heating) are systems that distribute heat and sanitary hot water from a central source to consumers, via a network of underground pipes carrying hot water. Building on the concepts of system-builders and structural couplings, we investigate the systemic reconfiguration of the heat networks in France. Started in the early 2010s, the French government decided to intensify the renewable heat production in order to reach the national commitments to the EU in termes of renewable energy production and consumption for 2020. This decision to produce massively renewable heat forced heat network system related actors to reconfigure these networks via integration of renewable energy vectors, e.g. biomass, geothermal heat or fatal heat recuperation. While in 2010s the development of new heat network infrastructure is mostly limited to urban projects running for the label 'Eco quarters', nowadays, the coupling of heat networks with urban project planning is recognised as an optimal solution to integrate production and consumption of renewable energy in various urban projects. However, the latest objectives formulated by French government in 2020 in the National low-carbon strategy (SNBC) concerning the renewable energy production, indicate national preference to encourage production of renewable electricity rather than of renewable heat. For the construction sectors, this preference concretises with recent environmental regulation (RE2020) which impacts the decisional choices of actors related to urban planning.

By analysing the conception process of urban development projects in the interaction with conception and regulations impacting new projects of heat networks, we reveal the competition between sociotechnical systems of heat and electricity. We argue that the apparent national "technological" energy transition is a normative embodiment of political preferences. These purpose based political decisions are made to legitimate the political engagements, and are thus based on the feasibility criterion. We 1) show the structural couplings that allows for the heat network system reconfiguration, 2) uncover the powerplay and arguments of different actors in reconfiguration-contestation dynamics, and 3) shed some light on the impacts of the reconfiguration and new stabilisation of heat networks for local authorities and final users. Our results support the idea that continuity of the socio-technical system asks for constant mobilisation of resources by those that are advantaged by the present system. Second, the reconfiguration-contestation dynamics shows that while on the national scale the regulation is stabilising the position of heat networks, certain actors, such as developers, are keener to disrupt the reconfiguration process of heat networks by dismantling some established structural couplings with urban planning.

11 JUNE 2025 14.30 - 16.30 SESSION 1

ID 612 - The co-creation method in the deployment of new energy technologies

Agatino Nicita, Istituto di tecnologie avanzate per l'energia Nicola Giordano
Raffaele Albanese, Istituto di tecnologie avanzate per l'energia Nicola Giordano

Keywords: co-creation, new energy technologies, social acceptance, stakeholders involvment, energy transition

Climate change and its socio-environmental consequences imply the need to develop and make applicable sustainable but at the same time accessible technologies. This implies the ability to address diverse challenges, across disciplinary boundaries and great distances (both geographical and socio-cultural), through

collaboration between different actors with different backgrounds.

Academics and policy makers advocate the active involvement of potential stakeholders in their various roles as users, producers, consumers or owners in order to mitigate these challenges, especially the social ones. The literature and scientific debate on models and practices of citizen participation in energy-related decision-making processes is very broad, covering a wide range of approaches and different levels of analysis in terms of considering different aspects of participation and/or the population groups involved [1]. In the context of co-creation, stakeholders are engaged as empowered actors in the energy transition through co-designing policies and legislation, co-producing solutions and innovations, co-implementing projects and ultimately co-benefiting from the green transition process. The EU's new strategy to make clean energy a reality for all Europeans embodies this approach. In addition, this method could increase the social acceptance of new technologies [2], highlighting the central role of citizens and local communities in facilitating or hindering the development of new energy technologies.

In the Horizon Europe project "Hybrid services from advanced thermal energy storage systems (HYSTORE)", we adopt a co-creation methodology to involve people who interact with the demonstration sites where the pilot energy storage systems will be implemented. The project's inclusive nature is underscored by the involvement of individuals from diverse backgrounds, including technical and non-technical experts, as well as various roles such as decision makers, professionals, workers, residents, business people, representatives of social enterprises and cooperatives, and housing associations. Collectively, these stakeholders contribute to the process of defining the characteristics of the novel technology and identifying the potential motivations that could influence its acceptance and utilisation by the public.

In this contribution, the method and procedures employed in the co-creation activities for the development of a new technology will be presented. Furthermore, the salient aspects that have already come to light will be emphasised. Specifically, three of the scheduled meetings have already been conducted, revealing several challenges and barriers to the deployment of the new technologies, including high costs, the need to reduce size and dimensions, and the complexity and difficulty of utilisation.

References:

Ryszawska B., Rozwadowska M., Ulatowska R., Pierzchała M., Szymański P. (2021). The Power of Co-Creation in the Energy Transition – DART Model in Citizen Energy Communities Projects. Energies 14(17), 5266.

Wüstenhagen R., Wolsink M., Bürer M.J. (2007). Social acceptance of renewable energy innovation: An introduction to the concept. Energy Policy 35, 2683-2691

11 JUNE 2025 14.30 - 16.30 **SESSION 1**

ID 719 - When workers take over: can reappropriation be a new circular economy tenet?

Andrea Taffuri, Università di Torino

Luca Biserna, Università di Torino

Francesco Bartolomei, Università di Torino

Keywords: Circular Economy, Reappropriation, Workers buyout, socio-ecological transition, innovation

In the ecological transition agenda, the circular economy is often seen as a tool for enhancing sustainability and efficiency in production processes. However, in light of recurring economic issues such as employment crises, delocalization, deindustrialization, and the increasing financialization of production processes, it seems worth integrating the paradigm of circularity in a wider socio-ecological frame. The challenges mentioned above deeply impact job security, stability of incomes, life courses and social cohesion. In response, practices such as the reappropriation of factories by workers, as in the case of workers buyouts (WBOs) or factory recoveries, represent a strategic response to these critical social issues, while also showing the ability to integrate virtuous circular practices in the re-appropriated production system.

Reappropriation can be defined as a form of collective action that seeks to reclaim and restore key aspects

of a community's material and organizational (re)production processes through cooperative practices. In the industrial sector, reappropriation instances can be represented by the recovery of spaces, productive systems and decision-making processes by workers, which collectively determine how to manage the factory activities.

Through a comprehensive review of the literature and semi-structured interviews with two WBOs and one factory in the process of cooperative recovery, this article highlights successful examples of factory reappropriation in the Italian context and aims to deepen their understanding in terms of organizational transformation, socio-technical innovation and just transition potential. The concept of re-appropriation offers a sociological framework that can transform circularity from a mere technical concept confined to industrial processes into a tool for real socio-economic and ecological progress. This research aims to provide new opportunities to politicize the narrative of the circular economy, shedding light on how cooperative recovery, combining socio-economic sustainability and technical-ecological advancements within industrial processes, can represent a leverage point for ecological transition.

11 JUNE 2025 17.00 - 19.00 SESSION 2

ID 290 - Socio-Territorial Dynamics of Circular Transition in the Wood Sector: Insights from the MICS Project in Alta Irpinia Area

Ilaria Marotta, Università di Napoli Federico II
Fabio Corbisiero, Università di Napoli Federico II
Anna Maria Zaccaria, Università di Napoli, Federico II

Keywords: Socio-Territorial Dynamics, Technological Transitions, Wood Sector, Inner Areas

This study investigates the socio-territorial dynamics of technological transitions within the Italian wood sector, focusing on the Alta Irpinia area (Campania Region) through insights from the MICS – Made in Italy and Circular project (financed within the Next Generation Eu). MICS seeks to implement circular supply chains in small and medium-sised enterprises (SMEs) operating in resource-constrained settings.

The Alta Irpinia area, part of Italy's National Strategy for Inner Areas (SNAI), represents a compelling case study due to its reliance on artisanal practices and limited technological access. The alignment of material resources, institutional frameworks, and socio-cultural contexts is essential for fostering sustainable innovation.

Adopting a socio-technical perspective, we argue that technological change is not a linear diffusion process, but a complex interplay of social factors. Furthermore, while technological transitions are often portrayed as pre-determined pathways driven by advancements, such views overlook the power dynamics and negotiations among actors (Geels, 2011; De Haan & Haxeltine, 2018).

The socio-territorial approach then reveals how local communities, traditions, and institutions interact with macro-level technological trends, shaping territorial-specific outcomes (Pike et al., 2016). In the wood sector, this involves integrating traditional knowledge and practices into innovation systems.

Empirical findings from the MICS project highlight three key dynamics: territorial proximity and embeddedness foster collaboration and localised innovation networks, enabling SMEs to share knowledge and resources effectively (Boschma, 2005); institutional support, including collective goods, cooperative networks, and targeted policies, helps SMEs overcome technological adoption barriers and transition toward sustainability (Edquist, 2011); socio-cultural factors, such as values and norms tied to traditional craftsmanship, significantly shape the adoption of circular economy principles (Crescenzi et al., 2016).

In conclusion, this research contributes to socio-technical transition studies by demonstrating the value of a socio-territorial perspective in understanding and promoting technological – and sustainable - innovation, particularly in peripheral and rural areas. Tailored policies that bridge local needs and broader innovation ecosystems are critical for achieving sustainable transformations.

References:

Boschma, R. A. (2005). Proximity and innovation: a critical assessment. Regional studies, 39(1), 61-74.
Crescenzi, R., Rodríguez-Pose, A., & Storper, M. (2016). The territorial dynamics of innovation. Journal of Economic Geography, 16(3), 467-506.
De Haan, F., & Haxeltine, A. (2018). Power in sustainability transitions: Conceptualising and analysing the role of power in transformative change. Environmental Innovation and Societal Transitions, 26, 1-14.
Edquist, C. (2011). Towards a holistic systems of innovation approach. Triple Helix, 1(1), 1-19.
Geels, F. W. (2011). The multi-level perspective on sustainability transitions: A review. Environmental innovation and societal transitions, 1(1), 24-40.
Pike, A., Rodríguez-Pose, A., & Tomaney, J. (2016). Local and regional development. Routledge.

11 JUNE 2025 17.00 - 19.00 SESSION 2

ID 876 - Co-constructing “Public” Spaces: Technological Transitions, Regulation, and Digital Platforms in Rural Revitalization.

Giulia Montanaro, Politecnico di Torino

Keywords: Socio-technical dynamics, Rural development, WeChat, Construction Industry

This contribution examines the socio-technical dynamics of technological transitions within China’s rural revitalization programs, focusing on the Zhaoshan project as a case study. It explores how construction practices are shaped by the interaction between material innovations, institutional regulation, and local contingencies. The project illustrates the evolving socio-technical frameworks in rural areas, where public policy, local conditions, and economic reforms converge to influence architectural practices and material choices.

The Zhaoshan case highlights the emergence of new forms of public space, where physical spaces are both a product of public policies and the lived experiences of local communities. These spaces transcend traditional notions of public infrastructure and serve as hubs for cultural exchange, social engagement, and economic activity. They reflect a shift toward decentralised, participatory development, driven by local initiatives and governance models, where communities have greater agency in shaping their environment.

Technological transition, in this context, is understood as a socio-technical process where both material and immaterial infrastructures evolve together. In the construction industry, this shift is visible in the movement from traditional building methods to industrialised techniques. However, this transition is not solely technical – it also involves ideological changes, where both new technologies and existing practices are reinterpreted to fit the local context. The Zhaoshan project demonstrates how material choices and construction methods are influenced by broader socio-political factors, including the local community’s values and the regulatory frameworks in place.

A central aspect of this transition is the use of digital tools, particularly WeChat, which facilitates communication among the diverse stakeholders involved in the rural revitalization process. WeChat plays an essential role in coordinating between government bodies, local residents, architects, and other actors, enabling the flow of information and fostering real-time decision-making. Beyond its function as a communication tool, WeChat mediates the materiality of construction processes, influencing decisions about the reuse of materials and the adaptation of traditional techniques to modern standards. This digital platform not only supports the material aspects of construction but also contributes to the co-creation of knowledge and the shaping of socio-political identities, highlighting the intertwined nature of technology, regulation, and community participation.

The paper adopts a socio-technical perspective, aiming to “open the black box” of technological transitions by exploring how technological innovations are not driven solely by material advancements but are also deeply shaped by political, economic, and cultural factors. Using a Latourian framework, the study emphasizes the importance of understanding how human and non-human actors – such as materials, tools, and technologies – interact within a complex network of relationships. In Zhaoshan, for instance, materials are not simply evaluated for their physical properties but are imbued with symbolic meanings that reflect broader political goals and the socio-economic realities of rural revitalization.

In conclusion, this study underscores the critical role of both material innovation and institutional regulation in shaping technological transitions in rural revitalization projects. By examining the interactions between material practices, regulation, and digital platforms like WeChat, the paper contributes to a deeper understanding of how technology and society co-evolve in the context of rural development.

11 JUNE 2025 17.00 - 19.00 SESSION 2

ID 518 - The Values of Numbers - The Roots of European Proto-symbolic Algebra in Late-medieval Commercial Capitalism and Technological Transition

Raffaele Danna, European University Institute

Keywords: Indo-Arabic numerals, Co-evolution of scientific and socio-economic systems, Technological transitions, Knowledge co-construction

This paper investigates how Indo-Arabic numerals (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) shaped technological and cognitive transformations in medieval European commercial contexts, and gave a key contribution to the emergence of 'modern' symbolic algebra. Originating in ancient India, these numerals were adopted in the Arabic world before reaching Latin Europe in the late Middle Ages. However, their integration into European mathematics was far from obvious, and was intertwined with the socio-institutional frameworks and socio-technical transition of late medieval commercial capitalism.

By combining economic history, the social history of science, and a socio-technical systems approach, this study argues that the adoption of these numerals was enabled – and ultimately necessitated – by evolving economic practices during the so-called 'commercial revolution of the thirteenth century.' Through empirical investigation of Italian city-states, it reveals how material and institutional factors, such as monetary systems, units of measurement, and financial accounting practices, drove technological transitions that co-evolved with mathematical knowledge.

The analysis underscores how the development of European proto-symbolic algebra did not emerge in isolation as a purely intellectual endeavour. Instead, it was a co-constructed phenomenon embedded within and driven by situated economic processes and networks of actors engaged in trade and financial innovation.

The paper contributes to understanding the interplay of material and institutional factors in shaping technological transitions by illustrating how cognitive frameworks of arithmetic and algebra responded to and co-evolved with commercial practices and institutional frameworks. By tracing how regulatory and normative changes in late medieval Italian economies structured the adoption of the numerals, the study highlights the entanglement of material culture and institutional regulation in shaping technological transitions.

Ultimately, this research demonstrates that the origins of European proto-symbolic algebra were inseparable from its socio-institutional setting, offering a critical historical example of how socio-technical innovation emerges at the intersection of material infrastructure, regulatory frameworks, and cultural practices. This paper contributes to the panel by providing a critical historical perspective on technological transitions, offering insights into the co-construction of technological knowledge, scientific practices, and socio-institutional settings in the long run.

11 JUNE 2025 17.00 - 19.00 SESSION 2

ID 398 - From policy to practice: the digitalisation of social work in the implementation of the Italian minimum income scheme

Eleonora Costantini, Università di Modena and Reggio Emilia
Francesca Nannetti, Università di Modena and Reggio Emilia

Keywords: Welfare, Frozen digitalization, Social work, Policy implementation

The widespread adoption of digital technologies has been identified as a significant driver of organisational changes within working environments. The integration and extensive utilisation of advanced ICTs necessitates a focus on the dynamic interaction between individuals and technology in the organisational context, since this intricate system comprises a network of interdependent components embedded within organisations' daily practices.

The digital transition also impacted occupational settings involved in the delivery of social and personal services, with technological innovations playing a crucial role in this transformation. The introduction of digital tools for welfare management and the development of new digitally based intervention strategies have prompted a radical modification in the fundamental essence of social work. The nature of organisational action in the context of welfare policies is, at its core, relational. This inherent characteristic further complicates the relationship between digitalisation and social work, emphasising the necessity for a comprehensive examination of its implications within the specific context of professional practice, that involves individuals, digital artefacts, spatial and temporal dimensions that collectively define the social work's framework. Within such technologically dense work environments, activities are distributed and fragmented between human actors and technological artefacts, which not only support, but also enable, mediate and inform the performance of the activity itself.

The present study is one of the outcomes of a research project on the implementation of the Italian Minimum Income Scheme (Reddito di Cittadinanza), which represents an interesting case study due its strong reliance on a platform for measure management. Therefore, the aim of this research is to investigate one of the paradigmatic contexts in which socio-technological innovation induced by digitalisation has affected the processes of recalibration and transformation of social work. Interviews and Focus Groups were carried out with the entire multi-professional team employed in the provision of the measure in the municipality of Modena (4 interviews and 8 Focus Group for about 20 hours of recorded audio), therefore empowering the direct experience of those who actually and locally implement social policies. This study specifically examines the narrative and discursive dimensions through which the team refers to the digitalisation of a relational-intensive work. Discourse, given its central role in the construction of social processes, identities and structures, is itself a practice that is effective not only in representing reality, but also in acting and intervening on it.

By using tools from Corpus Linguistics and adopting a Corpus-Assisted Discourse Studies approach, both forms of appropriation and resistance to the digital transformation of welfare have been observed, mainly due to the challenge of enclosing the complex product of the relationship with the beneficiary - and with colleagues - within the new digital architectures' boundaries. Moreover, the lack of synchronisation, interoperability and shareability manifested by the digital infrastructure built for the implementation of this measure has created a kind of frozen digitalisation which has inevitably forced social workers to find new, unexpected ways of daily declining their work, especially through their creativity and discretion.