Paradoxes of Rationalisation: Openness and Control in Critical Theory and Luhmann’s Systems Theory

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Abstract
For the Critical Theory tradition of the Frankfurt School, rationalisation is a central concept that refers to the socio-cultural closure of capitalist modernity due to the proliferation of technical, ‘instrumental’ rationality at the expense of some form of political reason. This picture of rationalisation, however, hinges on a separation of technology and politics that is both empirically and philosophically problematic. This article aims to re-conceptualise the rationalisation thesis through a survey of research from science and technology studies and the conceptual framework of Niklas Luhmann’s systems theory. It argues that rationalisation indeed exhibits a logic of closure, namely the ‘operational closure’ of sociotechnical systems of measurement, but that this closure in fact produces the historical logics of technical reason and, paradoxically, also generates spaces of critical-political openness. This opens up the theoretical and practical opportunity of connecting the politically just to the technically efficient.

Keywords
critical systems theory, critical theory, Luhmann, metrology, modernity, rationalisation, science and technology studies

Contemporary social theory predominantly theorises neoliberal capitalism in terms of what might be called social openness. It stresses its liquidity, creativity, flexibility, immateriality, reflexivity and the like. This emphasis leans on a broader narrative that signals a rupture in modernity, from ‘first’ to ‘second’ modernity, or from solid to liquid
(Bauman, 2000), reflective to reflexive (Beck, 1997), organised to disorganised (Lash and Urry, 1987), societies of discipline to societies of control (Deleuze, 1992), or from what might be called modernisation as increasing closure to modernisation as increasing openness. While I do not wish to deny the centrality and importance of social openness in our day and age, this stress has obscured the processes of closure that still inform society’s central institutions, like the bureaucratic petrification accompanying neoliberal market expansion, the financialisation of life (Cooper, 2008) and the development from digital networks to platforms (Lovink, 2016). It is in this context that I want to dust off a central concept from the Frankfurt School Critical Theory tradition and pose the question: what is rationalisation?

For the Critical Theory tradition, rationalisation signifies the sociocultural closure of capitalist modernity through processes like commodification, bureaucratic solidification and the development of positivist science. It denotes the proliferation of a technical, ‘instrumental’ reason – a calculus of optimal means – that increasingly tends to close in on itself at the expense of some form of political reason, or deliberation about ends. Critical Theory’s notion of rationalisation thus combines two important impulses, namely a logic of closure and a logic of instrumental reason. Research in science and technology studies (STS), however, has shown that this picture of rationalisation tends to hinge on a separation of technology and politics that is both empirically and philosophically untenable (Feenberg, 2010). As this separation renders technology an apolitical and ahistorical force, Critical Theory’s notion of rationalisation risks shielding technology from both social critique and political action. These are especially pressing risks in this moment of continuing neoliberal capitalist hegemony and environmental collapse, which demand the politicisation of myriad technologies – from the workings of algorithms to the measurement of Gross Domestic Product. What critical practices require is not a trade-off between politics and technology (like between wellbeing and welfare), but the theoretical and practical possibility of connecting the just to the efficient.

In order to accomplish this, this paper argues to separate the two logics of rationalisation identified by Critical Theory, namely the logic of closure and the logic of instrumental reason. It argues the thesis that the logic of closure is basic to rationalisation and that this closure in fact produces the concrete logics of instrumental reason and, paradoxically, also generates spaces of critical-political openness. It does so by interrogating this logic of closure through the conceptual apparatus of Niklas Luhmann’s social systems theory and empirical studies from STS. Rationalisation’s closure must be understood as what Luhmann calls ‘operational closure’, which refers to the ‘autopoietic’ or self-referential nature of systems: the system’s operations refer only to its own operations. Luhmann’s theory holds, paradoxically, that systems are open to
their environments because they are operationally closed. This will allow for an understanding of the paradoxical interplay of the technical and the political in the process of rationalisation while retaining Critical Theory’s core intuition of modernity’s closure for the theorisation of post-Fordist, neoliberal capitalism. I will argue this by, first, laying out the contours of the original rationalisation thesis and showing how STS research points us in the direction of Luhmann’s sociocybernetics to understand the systematicity of technology (Section I). Secondly, I will trace the historical development of systems of measurement – metrological systems – through an analysis of literature from STS and will attempt to make plausible that they embody a logic of self-production, self-performance and self-reinforcement (Section II). Thirdly and finally, I will draw out the paradoxes of openness and closure that animate these metrological systems and that shape the relations between technical calculation and political action and critique (Section III).

I Systematicity from Critical Theory to Niklas Luhmann

For the Critical Theory tradition from Max Horkheimer and Theodor Adorno to Herbert Marcuse and Jürgen Habermas, rationalisation forms a central animating principle of modern social life. Reading Max Weber through Georg Lukács, this tradition diagnoses capitalist modernity in terms of a corruption of reason: the universalisation of instrumental reason drives out the rationality that sustains autonomy and emancipation, like value (Weber), objective (Horkheimer) or communicative (Habermas) reason. This signifies the usurpation of political deliberation about ends by technical considerations about means. As Andrew Feenberg (2010: 129–30) puts it succinctly, then, rationalisation means ‘the generalization of technical rationality as a cultural form, specifically, the introduction of calculation and control into social processes with a consequent increase in efficiency’.

For Horkheimer and Adorno (2002 [1944]: 12, 39), this technical, ‘instrumental’ rationality (Zweckrationalität) exhibits a logic of identity, a ‘principle of equivalence’ which turns thought into tautology and smashes difference into similarity by way of domination and terror. Identity, in a word, requires force. It is a product of artifice, the result of the rational techniques that animate bureaucratic administration, positivist science and capitalist exchange alike. As rationalisation progresses, difference and value-reasoning are driven out to the point that identitarian instrumental reason arranges itself into a self-enclosed form, or a system. It is this driving out of difference that constitutes the closure of this system. For Horkheimer and Adorno, the system must be thought of as the totalising grid of Enlightenment thought, a logically structured pyramid of universals that force particulars into conformity – the Leibnizian dream of a mathesis universalis. Horkheimer and Adorno,
however, view this as the corruption of reason and the proliferation of unfreedom. Or as Martin Jay (1973: 41) notes: ‘At the very heart of Critical Theory was an aversion to closed philosophical systems’.

The rationalised system is the domain of what Habermas (1984: 171) calls ‘formal rationality’, a domain that comes into being at the point at which instrumental reason has become universalised and is turned upon itself. At this point, the ends of these systems of means are determined in terms of yet more means. Paradoxically, then, the means have become ends in themselves. This points to the main paradox of modernity that the Frankfurt School attempts to think through: the rationalisation of modernity is a violently irrational affair. Or as Marcuse (2007: xlv) puts it: ‘[Society’s] sweeping rationality, which propels efficiency and growth, is itself irrational’. The system under rationalisation drives out ends up to the point that it is no longer able to reasonably justify its own rationality, resulting in generalised heteronomy.

There are thus two central aspects to the logic of rationalisation in the formulations of the Frankfurt School. One the hand, a logic of a technical, instrumental rationality that deals with the calculation of efficient means; and, on the other hand, this rationality’s totalising motion, a logic of commensuration that thrusts its systemic closure. Rationalisation therefore denotes simultaneously a logic of efficiency and a logic of closure. This article argues that these logics should be separated in order to fully grasp the nature of rationalisation. Rationalisation, instead, consists in the process of closure of socio-technical systems that produces the logic of instrumentality as well as spaces of political openness. Failing to think through this point risks falling for an instrumentalist picture of technology that views technology as mere means that can be assigned various political ends from the outside, thus ending up with a social theory that thinks efficiency as a transhistorical, a-political social logic (Feenberg, 2010).

In order to argue this point, a study of the historical materialisation of technical rationality is required. This can be given focus by looking at the way in which this rationality is embodied in the distinctly technical form of communication that is measurement. The science of measurement is called ‘metrology’ and is concerned with the techniques, instruments and practices of measuring. This includes, among other things, determining how objects and processes are classified, what practices and methods are involved in measurement, how measurement instruments are selected and calibrated, and how heterogeneous objects are commensurated through common measures and standardisation (Cooper, 2015: 1787). This second-order study of the study of measurement in which I will be engaging here may be called metrology studies, a branch of science and technology studies (STS) that has been expanding since the concept of metrology gained a foothold in this field in the ’90s. Since then, a fairly rich literature has amassed on the role of the metrological
infrastructure in the history and present of science, economic markets and bureaucracies as well as the social and political struggles that animate their developments.

In the essay ‘Give Me a Laboratory and I Will Raise the World’, Bruno Latour (1983) first uses the term ‘metrology’ in the context of science and technology studies. Metrology, for Latour, is the name for the vast technoscientific infrastructure that allows for the circulation of scientific facts, like train tracks enable trains to move (Latour, 1987: 251). This metrological infrastructure, however, tends to disappear from sight as it locks firmly into place and allows for the smooth circulation of facts, like the light by which one sees: ‘People think that the universality of science is a given, because they forget to take into account the size of the “métrologie”’ (Latour, 1983: 167). The metrology creates identities between the elements that circulate along it; it commensurates difference by gathering heterogeneous units under a common metric. This process of commensuration must be seen, first and foremost, as a social technology (Porter, 1995): it allows scientists from the world over to communicate their results to one another, it enables buyers and sellers in markets to compare commodities and ensures that TV sets that are produced in California also work in New York (O’Connell, 1993). Metrological commensuration, in other words, transforms qualities into quantities, difference into similarity, heterogeneity into homogeneity and, as a result, produces comparability, calculability, communicability (Espeland and Stevens, 1998: 316). Horkheimer and Adorno’s ‘principle of equivalence’ is thus fundamentally a principle of communicability.

Commensuration has historically included the creation of what James Scott (1998: 80) calls ‘synoptic facts’, which result from a process of ‘simplification’ that ignores inessential differences and makes complex objects legible for bureaucratic agencies by assimilating them into a ‘total classificatory grid’. Creating such a grid or system is essentially a two-step process: creating mutually exclusive spaces of homogeneity and then ‘putting things in them’ on the basis of a classificatory principle (Bowker and Star, 2000). As both Bowker and Star and Scott note, such classificatory systems of equivalence exhibit an ethos of absorption and exhaustion. In addition, these processes of simplification are historically tied to the high modernist projects that grant administrative agencies control over their objects (Scott, 1998). One of the various ways of doing this is by turning qualities into quantities. Such quantities, countable quanta, are not just discovered but must be constructed and produced as part of this process of simplification. For instance, even an ostensibly straightforward task like counting people in a census, states quickly discovered, requires the construction of a people, including the institutionalisation of surnames to achieve unambiguous identification (Scott, 1998: 65). The countable does not pre-exist the technique of counting: its object must first be produced.
The practice of counting and quantification requires ‘technical instruments to “translate” phenomena into standardizable and measurable quanta’ (Power, 2004: 767–8). Because these quanta circulate in a homogeneous space governed by rigorous and standardised criteria, they allow for easy comparability, communicability and controllability. And crucially, they can be mathematically manipulated at a higher-order. Michael Power (2004: 771) dubs this ‘second-order measurement’, measurement which does not deal with the world directly, but with ‘further aggregation of numbers and the further creation, via statistical and mathematical operations, of ratios and indices’ (cf. on rankings and ratings: Esposito and Stark, 2019). In this measurement of measurement, the operations of the metrological system draw on previous operations rather than on first-order input: it signals the reflexivity that transforms the operations of metrological instruments into a metrological system. Power (2004: 772) further notes that these second-order measurements tend to become increasingly disconnected from the first-order measurement to which they refer, creating a kind of ‘hyper-reality of calculation’. Measurement systems thus become ever less concerned with directly representing their outsides and increasingly with connecting future measurements to their internal systemic metrological structures.

This first cursory glance at contemporary science and technology studies thus far vindicates a core intuition of Critical Theory. Similarity, it turns out, is indeed an institution (Douglas, 1986: 55). Technical rationality, moreover, at the least contains some force of commensuration, a tenor of expansionism and totalisation that cannot be separated from social power. Yet it also shows us the limits of Critical Theory’s understanding of instrumental rationalisation, since Michael Power’s remarks on quantification point to a radically different conception of systemativity or the system. Rather than a syllogistic pyramid, Power’s metrological system directs us to a second-order understanding of the system as we find it in the writings of the German sociologist Niklas Luhmann.

Luhmann’s systems theory is situated within the paradigm of second-order cybernetics, a transdisciplinary technoscientific paradigm developed in the 1970s that, like its first-order predecessor, regards natural, social, technical, biological phenomena as communication and control systems. Luhmann’s social theory transposes the theoretical framework of biologists Humberto Maturana and Francisco Varela to society. Where Maturana and Varela regard the cell as a cybernetic system with enzymes as its basic elements, Luhmann views society as a system that is made up instead of communications or distinctions. Specific to this second-wave cybernetics or second-order systems theory is the notion of autopoiesis, which refers to the self-production and self-reproduction of systems (Luhmann, 2012: 32). The enzymes of the cell, for instance, produce other enzymes as well as the membrane that forms the boundary of the system as a whole. For Luhmann, society, or the social
system, likewise produces itself as well as its own boundaries. It does so by drawing a distinction between system and environment, between inside and outside. Since this distinction between system and environment is drawn by the system itself, society is self-produced and irrevocably self-referential, even when it refers to its outside. Society is communication about communication.

In this sense, society is a second-order phenomenon: communications refer to other communications rather than to a first-order environment. The system is ‘operationally closed’, a notion synonymous with autopoiesis that signals the fact that the system’s operations only refer to other internal operations (Luhmann, 2009: 150). The system’s environment can never directly operate on the system, it can only ‘perturb’ the system as indistinct noise. The system first needs to reduce the complexity of the environment, that is, it has to ‘translate’ what it perceives as noise into distinct communications before it can process it as information. This necessity of complexity reduction means that the system is forced to select future operations in the face of a surplus of possibilities (Luhmann, 2012: 80). Due to its operational closure, it can only make this selection on the basis of former operations, which are fed back into the present in a recursive loop (Luhmann, 2012: 51). These guiding operations sediment into structures if they are repeated through time such that they generate relatively stable expectations for future operations (Luhmann, 2009: 145). They become ‘selection schemata’ for the connectivity (Anschlussfähigkeit) of present and future operations to past ones (Luhmann, 2012: 50). Michael Power’s second-order measurements, for instance, need to be connected up to existing measurements through structures such as methods, protocols and standardised instruments.

Using Luhmann’s systems theory to make sense of contemporary research into technical rationalisation is particularly interesting in light of Luhmann’s ambiguous relationship with Weberian social theory. There are obvious parallels between Weber’s conception of the rationalisation of modernity’s various ‘value spheres’ and Luhmann’s notion of the operational closure of ‘function systems’. In both cases, these specifically modern spheres or systems ‘differentiate out’ once they cease to refer to external or first-order criteria, such as morality or theology, and become self-contained or operationally closed (Luhmann, 1998, ch. 3; Weber, 1978 [1922]: e.g. 809–15). Equally, however, in his early career, Luhmann (1972; 1993: e.g. 191) set out to de-essentialise Weberian sociology of organisation, the means/ends schema of which Critical Theory accepts, by showing that purposive rationality is only one particular instance of a broader and differential process of systemic complexity reduction. Since his debate with Habermas, Luhmann is often regarded as an arch-enemy of Critical Theory, but in his early work Luhmann actually shares Habermas’s theoretical aim when he observes that his deflation of instrumental reason points to ‘an exit from the unsatisfactory
equation of instrumentality with rationality’ (Luhmann, 1993: 16; see also Habermas and Luhmann, 1971).  

In the rest of this article, I will follow the young Luhmann’s strategy of attempting to reveal instrumental reason as part of a broader process of complexity reduction, which in his mature work becomes the logic of operational closure. This operational closure denotes the historically and materially specific forms in which metrological systems in capitalist modernity exhibit autopoiesis. This autopoiesis develops through three forms of self-reference, namely self-production, self-performance and self-reinforcement.

II Spiralling into Control: Self-Amplifying Forces of Communicability

Horkheimer and Adorno’s ‘principle of equivalence’, which belongs to the core of metrology, is the guiding force in the creation of what Alain Desrosières (1998: 10) calls ‘spaces of equivalence’. These spaces should, in the first instance, be taken quite literally. They refer to the tabular grid forms that allowed for the easy comparability of numbers, and also to the creation of the territorial space of the state itself. In the unification of France, for instance, the abolition of the diversity of provinces and the creation of equally sized departments went hand-in-hand with the creation of cadastral maps and the establishment of a universal metric: the metre (Kula, 1986). Through this metrology, the territory was made ‘legible’ in Scott’s sense, that is, amenable to centralised control (Scott, 1998: 45). In addition to the territory, the French state also needed to measure and make legible its population by introducing a census at the beginning of the 19th century (Porter, 1986: 17). These population numbers allowed for new statistical operations which cut right through the old rank-based categories of French society and presupposed a certain equality among its objects: ‘It makes no sense to count people if their common personhood is not seen as somehow more significant than their differences’ (Porter, 1986: 24). In a word, then, through the metrological commensuration of its territory and population, the French state engaged in a project that was at once political and technical, a ‘politico-cognitive construction of a space of common measurement to the scale of the One and Indivisible Nation’, thereby constructing the attributes of the very nation it was measuring (Desrosières, 1998: 33).

This gives us a first clue toward the self-productive, autopoietic nature of bureaucratic rationalisation. In the case of France, this technopolitical project of creating spaces of equivalence was, rather than a case of technical reason driving out political deliberations, a tight tango between the implicit workings of the metrology and an explicit venture in modern statecraft. The explicit political aim of creating an equal citizenry, for instance, dovetailed with the implicit equalising effects of statistics (Scott,
There is a positive feedback loop here. The statistical and metrological creation of a citizenry of formal equals reinforced the applicability and accuracy of these very statistics, in turn cementing the notion of a modern citizenry. Thus, according to Theodore Porter (1995: 37), ‘the statistical enterprise was, to a degree, self-vindicating’. Further administrative vocabulary, moreover, now needed to be integrated in the existing metrology, and so needed to refer to previous structures and operations in order to operate effectively. This shows that this metrology exhibits the beginnings of operational closure, the recursive operation on the basis of its own operations. The creation of spaces of equivalence in both its literal and figurative senses thus already points to the autopoietic or self-productive nature of metrological systems.

‘Indeed,’ Theodore Porter (1995: 37) tells us, ‘the concept of society was itself in part a statistical construct.’ The regularities of crime and suicide that were unearthed in statistical research went above and beyond the individual, and so became attributed to an entity called ‘society’ (cf. Hacking, 1990: 131–2; Porter, 1986: 52). To early social scientists in the 19th century, however, it was not at all obvious that this newfound scientific object constituted an autonomous domain rather than an object of statecraft (Wagner, 2000). ‘Civil society’, Foucault (2008: 296) therefore argues, is ‘a concept of governmental technology’, indissolubly bound to biopower. A similar debate surrounded the social sphere of capitalist exchange and commerce, what Adam Smith called ‘commercial society’, or what we would call ‘the economy’ today.

In contrast to the metrological construction of ‘society’ as a whole, there is a growing literature on the emergence of ‘the economy’. Keith Tribe (2015) demonstrates that the production of ‘the economy’ as an object originates with the development of a metric for the national economy. He traces the idea of a ‘national dividend’, the annual flow of goods and services, from the writings of Marshall in 1890 to its elaboration in Pigou’s welfare economics in 1907 to its ultimate development into a national accounting framework in the 1941 Budget of Great Britain. Timothy Mitchell (2006: 1116) corroborates this account: ‘[t]he economy is a recent product of socio-technical practice, including the practice of academic economics’. He points to Keynes’s breakthrough in using the circulation of money as the basis for an aggregate ‘national income’ (Mitchell, 2005: 135). Notions like ‘national income’ and ‘national accounting’ gained momentum against a broader background of macroeconomic modelling pioneered by Dutch engineer-economist Jan Tinbergen (Van den Bogaard, 1999: 303). Thus, Mitchell (2006: 1119) concludes that ‘[m]etrologies create and stabilize objects; the economy is a very large instance of such an object, with rival attempts to define it and to design tools for its measurement and calculation’.

This suggests a complex and tight relation between the constitution of the economic system and the economic metrology. The metrology, as we
have seen, produces its own objects, which is to say its own elements, and is therefore fundamentally self-productive. The metrological system should thus be understood as an autopoietic subsystem of society, and could even be considered a function system that is geared toward measurement. This does require interpreting Luhmann’s thesis of functional differentiation in a more liberal and pragmatic fashion, which highlights the continuous co-evolution and transformation of social subsystems as opposed to the relatively stiff received list of existing function systems, like law, politics, science. In this case of ‘the economy’, the technical communications of the metrological system paradoxically refer to their outside other – namely the economy as the circulation of payments – by way of self-referential measurements. The economy, meanwhile, operates on these measurements as borrowed media or structural couplings (e.g. financial accreditation indexes structure what payments can be made). The metrological system and economic system thus symbiotically co-evolve in a generalised ‘relation of simultaneous enhancement’ (Drepper, 2005: 189), and the closure of the former enables the latter to develop into a rationalised system.

What is important for now is that the metrological system has self-productive qualities. Furthermore, to the extent that a metrological system succeeds in pressuring other systems in its environment to operate on its structures, it demonstrates performativity: their measurements increase their relevance and viability across society. Closely related to the system’s self-production, then, is its self-performance. The notion of performativity has received ample attention in the social sciences and the humanities since the ‘60s and ‘70s. In science and technology studies regarding the social sciences and economics, the notion has been elaborated by actor-network theorists such as Michel Callon and Donald MacKenzie. In addition, there has recently been growing attention for the performativity of economics and its metrology (e.g. Boldyrev and Svetlova, 2016; MacKenzie, et al., 2007; Muniesa, 2014) as well as in organisational and management theory (see Gond et al., 2016, for an overview).

For Callon (1998: 2), ‘performation’ means ‘that economics, in the broad sense of the term, performs, shapes and formats the economy, rather than observing how it functions’. The economy is not created or performed in a single, univocal stroke, but is the result of a political agonism between rival technoscientific statements, economic players and metrological infrastructures. The economy, then, is a metrological performance by the political ‘struggle between sociotechnical agencements’, pointing to both human and non-human actors in this struggle (Callon, 2007: 332). Callon highlights the fact that technological development is social and political through and through. Crucially, he adds to this that the criteria for success (or failure) are not simply given in the environment of the system. There are no transcendent criteria of
technical efficiency or instrumentality, a timeless calculus of optimal means that guides the development of capitalist modernity. Instead, Callon (2007: 332) points to the autopoietic qualities of a metrological system that sets up its own systemic structures and pressures the environment in which it thrives: ‘It is not the environment that decides and selects the statements that will survive; it is the statements that determine the environments required for their survival’ (Callon, 2007: 332). This relation to the environment is what I mean to capture with the notion of self-performance: the system’s capacity to force an adoption of ecological criteria that increase its chances of success.

How this works can be illustrated through a famous case study by Donald MacKenzie on the Black-Scholes-Morton model in option pricing. According to MacKenzie (2006: 17), this financial model exhibits what he calls ‘Barnesian’ performativity: it made the economic reality it purported to describe more true as a result of its description. The environment into which the Black-Scholes-Merton model was introduced in 1973 was not exactly like the smooth, abstract mathematical space of the model itself. The ‘open outcry exchange’ took place in a trading pit with ‘shouting, gesticulating, sweating, jostling bodies’ that was structured by spatial hierarchies and trading factions (MacKenzie, 2006: 177). Perhaps as a result, the correspondence between the model and the actual price patterns turned out to be fairly poor. Over time, this changed for the better as co-inventor Fischer Black started selling paper sheets to mediate between the mathematics of the model and the scrum of the trading pit. Traders could now fairly easily calculate whether prices were, according to the model, too low or too high, and place their bets accordingly. As a result, the market practitioners tended to ‘arbitrage away’ the discrepancies in the market prices that the model identified. The market thus tended toward correspondence with the model. As MacKenzie (2006: 166) concludes, with some minor qualifications: ‘The “practice” that the Black-Scholes-Merton model sustained helped to create a reality in which the model was indeed “substantially confirmed”.’

The metrology of the financial model had been exported into the trading pit and so had created an environment in which it could survive and in which its numbers could circulate. Anticipating the discussion in the next section, it is important to realise that this is not a matter of technology driving out politics, but of their peculiar intermeshing. For starters, there were multiple rival models that described the pricing of options. The Black-Scholes-Merton model won out largely because it was much easier to use in real time, not least due to Black’s selling of handy sheets. Having co-invented the model, Black had the legal-economic power to circulate the particular as the universal, the political power to sell his paper technology. This power, in turn, contributed to the very validity and applicability of his model: a self-performing process. Finally, financial models such as that of Black-Scholes-Merton legitimated the
previously illegal practice of derivatives trading, which showed it to be efficient pricing rather than gambling (MacKenzie, 2006: 158).

Michael Power (1997: 88) describes a similar performative process in *The Audit Society*, which details the bureaucratic process of ‘mak[ing] things auditable’ under New Public Management. Audit agencies must reduce the complexity of what they audit, for which they rely on sampling techniques as well as expert knowledge. Paradoxically, then, a self-referential auditing system always requires trust in an un-auditable environment: ‘checking itself requires trust’ (Power, 1997: 2). This is a result of the second-order nature of this metrological practice, since external auditing agencies do not audit organisations themselves, but rather their internal auditing system: ‘audit is control of control’ (Power, 1997: 82).

The external auditor, however, exports its metrology to its environment, namely the audited organisation. Making things auditable means creating a space of equivalence in which the elements of auditing can be communicated and circulated (Power, 1997: 94). As a result, the organisation’s internal performance goals are commensurated with the demands of the auditing process, forming a self-referential metrological system whose structures are shared across a multiplicity of organisations and function systems. This signals the self-performance of an autopoietic system that pressures the social systems in its environment to conform to its structures and so increases the currency and efficiency of its own operations.

The system demands communicability from its environment, a demand that Lyotard (1984: xxiv) calls ‘performativity’: ‘be operational (that is, commensurable) or disappear’. The extent to which metrological systems can put pressure on other social systems is not symmetrical, but is mediated by the wider ecosystem of systems in which there is ‘ecological dominance’: ‘the structural and/or strategic capacity of a given system in a self-organizing ecology of systems to imprint its developmental logic on other systems’ (Jessop, 2002: 25). This goes especially for those metrological systems that are tightly coupled to the ecologically dominant function system of the economy, like GDP, cost-benefit analysis and efficiency. As Critical Theory well saw, these particular metrologies tend to pervade social life. The recognition of this type of relief in power relations is important for a critical systems theory that wishes to steer clear of the risks of actor-network theory, in which (the evolution of) sociotechnical systems can turn out too flat, horizontal, devoid of power asymmetries (e.g. Star, 1990; Jasanoff and Kim, 2015: 16–17).

This point on the system’s demands of communicability takes us from the metrological system’s self-performance to its self-reinforcement: its measurements enhance its own validity by way of an initial process of positive feedback loops. One such powerful self-reinforcing loop is that which reinstates the past in the present and the future, the functioning principle of feedback technologies like focus groups, polling and questionnaires. Adorno criticised these positivist techniques for their
rationalising and ideological effects. It takes ‘the epiphenomenon – what
the world has made of us – for the object itself’ (Adorno, 1976). The
outcomes of these metrological techniques are thus not so much false as
they are partial and obscuring. They are ideological because they fail to
see their own role in the production of the measured, thus silently repro-
ducing the status quo in a process of social closure.

These metrological systems are caught in a positive feedback loop with
the environment in which they are situated: the system pressures or per-
turbs its environment into commensuration, thus strengthening its poten-
tial for further commensuration. This is not an idealist or social
constructionist picture, but one that stresses the material-technical
nature of metrological systems, both in their contemporary functioning
and in their historical role in the constitution of modern society. As
James Beniger (1986) shows, a self-amplifying loop between flows of
matter and energy on the one hand, and new communication technolo-
gies on the other, led to the ‘control revolution’ of rationalised modern-
ity. Metrological systems, moreover, are tightly coupled to physical
systems, as is evinced by metrological materials like standardised lab
mice and purified chemical reagents (Porter, 1995: 16). These material
parts of the metrology, in turn, are crucial building blocks in producing
further reliable technoscientific communicability.

In general terms, technoscientific measurement systems are, to an
extent, ‘self-vindicating’, meaning that their heterogeneous elements (the-
ories, apparatuses, objects, subjects) are mutually constitutive (Hacking,
1992). For example, as Porter (1995: 43–4) observes: ‘If psychological
tests predict school grades, this is in part because quite similar tests are
used in schools to evaluate students.’ Metrological systems co-evolve in
paradoxical and complex ways with their environments over time and
therefore amass stability and institutional inertia. For new metrological
structures to work, they need to be embedded in existing systems that
have themselves become immobile (Bowker and Star, 2000: 35–8). Yet
this new infrastructure’s reliance on it adds to this very immobility: if you
change one, you must also change the other.³ This is the basic logic that
leads to situations of technoscientific lock-in, of which the Qwerty-key-
board is the paradigmatic example (Perkins, 2003). The cross-commen-
suration, interconvertibility, interdependence or intercommunicability of
various metrological systems slowly evolves to form a complex and tex-
tured ecosystem that tends to become increasingly inert.

According to Bowker and Star (2000: 325), this metrological inertia
also entails its naturalisation and invisibilisation: ‘As classification sys-
tems get ever more deeply embedded into working infrastructures, they
risk getting black boxed and thence made both potent and invisible’
(Bowker and Star, 2000: 325). The metrology appears natural because
it is cornered in, interlocked into other structures that make it seem
unchangeable. Further metrological integration consequently appears
as the only rational, realistic or efficient option, granting it the sterilising logic of TINA or capitalist realism (Fisher, 2010). The self-reinforcing nature of the metrology can also reproduce and exacerbate existing racial inequalities (O’Neil, 2016). Metrological systems, in a word, tend to become ideological. Yet if STS shows one thing, it is that these technical interlockings are the result of social and political struggles and that they are permeated with political values that have sedimented from these struggles. What becomes clear at this point is that, contra the Frankfurt School, the depoliticisation of modern social organisation is not due to the fact that a nihilist instrumental reason has become the sole guiding value, but because the closure of metrological systems as such shapes and limits the political options deemed possible and instrumentally viable. I will draw out this insight further in the next section.

For now, I want to summarise by saying that the Frankfurt School’s core intuition that rationalisation exhibits a logic of closure and commensuration is generally corroborated by contemporary STS research. Metrological systems reduce the complexity of their environments by creating internal spaces of equivalence, at once drawing in all that is different from its environment into its logic of equivalence and driving out all the impurities that cannot be registered and connected up to its existing operations. This is the closure that Marcuse (2007: 14) is getting at when he writes that ‘one-dimensionality’ means that actions and ideas that do not fit the system ‘are either repelled or reduced to terms of this universe’. It testifies to the system’s operational closure, its becoming second-order: it becomes concerned with feedback connectivity to existing systemic constructions rather than with maintaining a one-to-one correspondence with its environment. It is precisely through this process of operational closure that the system can remain indifferent to certain irritations and parts of its environment, signalling the reduction of complexity or simplification involved in bureaucratic techniques of classification, standardisation and commensuration (Luhmann, 2012: 34). This metrological process of complexity reduction produces all the key features of an autopoietic system: the homogeneous elements that the system requires for its sustained reproduction (e.g. quanta and units), the programmed communication between these elements (e.g. methods of connectivity), and successful boundary maintenance (a difference between what is and what is not communicable in the system’s metrology).

Metrological systems not only produce their own internal operations and structures, but also put pressure on their environments to become commensurate with their structures, thus boosting their performance(s). In sum, then, the self-amplifying feedback loops through which metrological systems enact their ecological viability signals a motion from self-production via self-performance to self-reinforcement. In cybernetics, such self-amplifying, runaway loops are traditionally associated with radical change, revolution and rupture, whereas ‘negative’ feedback loops
are usually seen to produce order, homeostasis and regularity. The metrological systems that form the sociotechnical basis for complexity reduction characteristic of rationalising modernity, however, produce runaway loops in the direction of petrification, solidification and stabilisation. Like a reverse explosion, a chain reaction into singularity, these metrological systems cascade ever more firmly into place, forming ‘historically irreversible complexity’ (Luhmann, 1989: 41) that is then, finishing the dialectic, retained through negative feedback loops. The process of rationalisation first and foremost, then, denotes a historical situation in which social systems are spiralling into control.

III Paradoxes of Closure and Openness

Rationalisation as the self-amplifying process of ongoing operational closure of metrological systems may suggest – like the diagnosis of Critical Theory – a fatalist picture in which the political is driven out of these technical systems in a totalitarian fashion. It opens up the question of how social change, political contestation and critique are possible in this situation of increasing closure. Luhmann’s sociocybernetics, however, is not a theory of totalising systems, but one that emphasises irreducible contingency, difference and paradox. This differential and paradoxical nature of operationally closed systems follows from the basic premise of self-reference, which is paradigmatically expressed in the Liar’s Paradox: ‘This sentence is a lie’. The stakes of Luhmann’s systems theory are precisely to understand society by way of its founding paradox, namely what has been called the principle of ‘openness from closure’ (Wolfe, 2010: xxi). This refers to the proposition that the system is open to its environment precisely because it is operationally closed. For instance, the metrology’s operational closure reduces the complexity of the rest of society, yet, precisely as a result, opens up the possibility of measuring it and communicating about it.

The closure of the system also produces another kind of openness, namely an internal openness. The system’s paradoxical self-reference spawns a fundamental indeterminacy, complexity or contingency at its core: the system becomes open to the novelty, difference and vitality that many sociologists have come to associate with contemporary capitalist modernisation. This means, however, that there is no shift from ‘first’ to ‘second’ modernity as a de-differentiation from closed systems into a smooth open space, but a transformed paradoxical movement of systems through closure and openness. The system’s closure emerges from its fundamental openness, while this closure in turn generates both an internal openness and an openness to its environment. This allows us to theorise contemporary neoliberal capitalism, for instance, as at once a thickening of bureaucratic governance and financialised metrological
instruments and as an emergence of precarious entrepreneurialism and networked forms of creative labour.

This internal openness can also be considered the site of the political: the possibility that society could be otherwise. Two conclusions that can be drawn on the basis of the previous section testify to this. First of all, metrological closure is not an apolitical and value-free technical process, but at once technical and socio-political: and secondly, since metrics do not pre-exist metrological systems, socio-technical processes of metrological closure produce the thoroughly historical and immanent logics of instrumentality, like cost-benefit analysis, GDP calculus and, notably, efficiency (e.g. New Daggett, 2019). We should understand this politicisation and historicisation of metrological systems through the Luhmannian autopoietic paradoxes of closure and openness. If we do, we can conclude that Critical Theory’s core argument that rationalisation is a process of closure remains correct, but that this logic of closure is, firstly, analytically and empirically distinct from the logic of instrumental reason or efficiency and, secondly, thoroughly pervaded by socio-political openness.

Political reason and technical reason, then, do not inhabit two separate spheres of modern society, but are co-constitutive factors in the development of metrological systems. This can already be gleaned from a critical theoretic chiasmus on technocracy: is the technocrat a politician that actually deals in technicalities, or is he a technician that actually engages in politics? Choosing either side of this chiasmus will make you look like a witty social critic, but the problem is that you will want to have both. The account of rationalisation that I am proposing here does not attempt, as Timothy Morton (2016: 57) puts it, to ‘flatten out the inherent twist in a chiasmus, to make the twist into a pure circle’. Instead, it attempts to fully think through the paradoxical entwinement of politics and technology, to get into focus the point at which the latter veers back into the former and vice versa (cf. Thygesen, 2012). This motif that stresses such inversions, reversions, perversions, and ultimately, subversions, rather than a simplistic figure of totalitarianism, is in fact already present in the basic Weberian paradox of rationalisation: when rationalisation becomes total, its instrumentality veers back into politics and the ‘means become ends in themselves’.

Contra Habermas, then, a purely technical reason cannot colonise a deliberative, political process as if the latter were, even if only analytically, opposed to it (Porter, 1995: 89–90). As Callon (1998: 38) writes: ‘it is not values which serve as a bastion to the infinite extension of calculation’. And vice versa, it is impossible to bypass free discourse and mutual understanding by pointing to instrumental calculations in a space of ‘norm-free reality’ (Habermas, 1987: e.g. 327). Instead, Luhmann’s paradoxes make intelligible that the closure of metrological systems opens up a techno-political space which precisely enables agents to contest and
negotiate different political options. These negotiations, in turn, determine the shape and content of the metrological media that structure future politics (see Rose, 1991). In this sense, the bare contingency of ‘the political’ is brought to life through its paradoxical loopings with metrological ‘politics’. Metrological technologies, then, are not just a neutral instrument wielded by dominant social powers, but are imbued with power relations at every level. And _contra_ Horkheimer and Adorno, these technologies are not simply an expression of domination, a generalised will to power, for appeals to ‘objective’ metrology are as often a way to limit rather than to expand power (Espeland and Stevens, 1998: 316).

The reconnection of the political and the technical enables us to get a textured and complex view of the way in which power and politics pervade and structure metrological systems, both in terms of how metrological politics takes shape and the ways in which specific metrological systems have become ‘ecologically dominant’. In addition, this reconnection opens up a new field of critique. Since instrumental reason, the logic of efficient means, is no longer placed in a trade-off situation with political and critical reason, the critical systems theory proposed here can still explain the socio-cultural closure Critical Theory wanted to make sense of, while also appealing to the virtues of efficiency and instrumentality to overcome such closure.

This is the political option – a _politics of efficiency_ – opened up by the severance of efficiency and closure. Such a politics can be split up into two interdependent parts. Firstly, a systemic metrological politics that engages in a struggle over methods, practices and metrics of measurement, like the critique of GDP by post-growth economics or the construction of alternative financial accreditation indexes in ‘investee politics’ (Feher, 2018); and secondly, an _ecological pragmatism_ or politics of self-performance that aims at changing the environment in which these metrics are situated and that shapes their efficiency or inefficiency. An example of the latter is the political struggle for electric cars that focuses not so much on the efficiency of their engines but on setting up a cultural, political, juridical and technical infrastructure that determines _what it means_ for an engine to be efficient at all (Kirsch, 2000). This critical systems theoretic account can, then, both explain the depoliticisation of fossil fuel vehicles due to metrological rationalisation as well as provide a critical vista that in principle allows us to connect the just to the efficient.

**Conclusion**

Rationalisation must be understood as the operational closure of socio-technical metrological systems, which is thrust forward by initial positive feedback loops imbued with the autopoietic logics of self-production, self-performance and self-reinforcement. This picture of rationalisation
respects Critical Theory’s core proposition that rationalisation is a process of sociocultural closure, while rejecting its thesis that rationalisation can be identified with instrumental reason as such. Rationalisation’s logic of closure, rather, is analytically and empirically separate from its logic of efficiency. The former in fact produces the latter.

As a result of this reconceptualisation, this picture also breaks with Critical Theory’s inclination to identify technical reason with a transhistorical instrumentalism that is devoid of politics, values and ends. It recognises, instead, that the production of efficiency, instrumentality or any other metric is always at once technical and socio-political. Luhmann’s stress on the differential, paradoxical and contingent nature of systems allows us to bring out this duality and to appreciate the complex nature of the political in rationalised and rationalising modernity. The contingency that is the result of the self-referentiality of metrological systems, for instance, functions as a political warrant that these systems might always be different. The paradoxical nature of the system, meanwhile, highlights the fact that precisely the rationalisation, or the closure, of metrological systems produces an open political space of contestation. It is thinking through this paradoxical nature of rationalising metrological systems that puts us in a position to fully understand the interrelated phenomena of closure and the phenomena of openness that characterise contemporary capitalist modernity.

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Notes
1. The original German reads: ‘So könnte es vielleicht einen Ausweg aus der unbefriedigenden Gleichsetzung von Instrumentalität und Rationalität weisen...’. This translation is my own. For more recent developments on the topic of ‘critical systems theory’, see Amstutz and Fischer-Lescano (2013) and Möller and Siri (2016).
2. The same paradox is highlighted in the title of Theodore Porter’s Trust in Numbers. Porter’s thesis is that statistics and numbers are a form of social technology, not a transhistorical logic that allows us to bypass the social. Numbers simply postpone the question of trust a step further, or they shape it in a particular way, but they do not eliminate it. Ultimately, the system of numbers itself cannot be justified in terms of numbers, but only in terms of an environmental criterion that is precisely alien to numbers: trust.
3. As Luhmann (2013: 4) notes: ‘Every change to a subsystem is also a change to the environment of other subsystems’.

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