

Measurement as a Medium for Communication and Social Action II: The Promise and Power of Being Amodern

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A Challenge for the Social Sciences

As was elaborated in Part I, understanding the implications of an unmodern (Dewey 2012) or amodern (Latour 1999) philosophy for measurement, communication, and coordination begins from the way the use and development of language is not controlled or determined via a process of deliberate design. Hayek's (1948, p. 54) sense of this "central question of all social sciences" points toward the fundamentally symbolic nature of social reality, in Ricoeur's terms (1981, p. 219), and the active role of things themselves in conceptual formations not determined by any one thinker or actor (Gadamer 1989, p. 463). The technical media of language and communication, from phonemes to books to digital fonts to wifi to voltmeters, enable fragments of knowledge possessed by different people to spontaneously coordinate and self-organize in ways that may appear to have been centrally directed. But no individuals, organizations or governments have the depth or breadth of reach necessary for controlling the emergence or production of even phenomena as relatively simple as new slang terms, much less for the technical standards embodied in complex electronics or machines.

What are the conditions in which the spontaneous actions of individuals bring about distributions of resources that look as though they were made according to a single plan? Hayek's perspective on this problem of the social mind foregrounds a process of spontaneous coordinations (Birner and van Zijp 1994). How do those coordinations come about? We have a clue in Ricoeur's (1981, p. 193) observation that the reader's world horizon and opportunities for new directions and choices are

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expanded by new modes of being or forms of life received from a text. We all experience this appropriation of meaning and the projection of new world horizons from texts thousands of times a day. Reading a clock might tell me that I need to leave now to be at a meeting on time. Reading *Huckleberry Finn* might make aware of more opportunities for different moral choices in my life. Opening a window in response to a request for some fresh air might make work in a stuffy room more pleasant.

But past these mundane examples, we can see the general power of standards, for example, in the way that calibrating all clocks to the same measure of time simplifies the printing of train and plane schedules and the organization of meetings for people not in continuous contact. The efficiency of these coordinations is made possible by shared linguistic and technical standards embedded in thousands of word/concept/thing and instrument/theory/data assemblages. When we consider the combined effects of various standardized communications media, from pronunciation to grammar to vocabulary to symbols to technical specifications, we start to see how individuals' existential horizons come to be fused in a shared social world. In this regard, recent reconsiderations of operationalist and pragmatist philosophical perspectives in the context of psychological measurement offer productive directions for further inquiry (Maul et al. 2016).

Our immediate problem of interest is one of understanding how to coordinate local behaviors and decisions over a variety of different kinds of decisions across wider swaths of society in an uncoerced way that respects individual rights and liberties. Elaborating on the positive consequences of spontaneously self-organized effects, Hayek (1945, p. 88) quotes Whitehead's (1911, p. 61) observation that "Civilization advances by extending the number of important operations which we can perform without thinking about them." Indeed, everyday tools like telephones, computers, and automobiles are so complex that individual engineering experts do not have the range of knowledge needed to master all of the component parts in a single device. Most people have little more than the most elementary grasp of how their homes, furniture, clothing, or food are produced, and have even less of an inkling when it comes to their medications or their electronic communications, computing, and entertainment systems. Rudimentary levels of technical understanding do not, however, prevent the widespread use and enjoyment of an incredible range of appliances, tools, concepts and grammatical constructions, none of which could be created and deployed by any individual.

This phenomenon extends into science, where theoretical, experimental, and instrumental communities provide each other with ideas, results, and tools in uneven and disjointed fashion (Galison 1997, 1999). Instead of a positivist prioritization of observation, or the anti-positivist prioritization of theory, as the unifying focus of science, Galison offers a post-positivist intercalation of observation, theory, and instruments in an open-ended model that allows each area partial autonomy in effecting local coordinations of belief and action. The disunity of science in practice requires translations of ideas across these communities, none of which possesses all of the knowledge needed to produce useful results. The coordinations and

translations essential to alliances across areas of expertise counter-intuitively result in a stronger science than would be otherwise possible.

To take a simple example, Whitehead (1911, p. 62) reflects on the importance of a technology so seemingly unremarkable as Arabic numerals. The advantages of this symbol system relative to the Roman system are striking. When the Arabic numerals were complemented later by the introduction of symbols for arithmetic operations, the equals sign, and algebraic variables, a new kind of efficiency in the representation of relationships was secured. As Whitehead notes,

Symbolization of the associative law ($x+y=y+x$), for instance, simplifies the representation of the idea that 'If a second number be added to any given number the result is the same as if the first given number had been added to the second number'. This example shows that, by the aid of symbolism, we can make transitions in reasoning almost mechanically by the eye, which otherwise would call into play the higher faculties of the brain. (p. 61)

This simple example of symbolic representations employed by billions of people daily illustrates the extent of everyone's dependency on networks of social conventions. No single individuals ever possess or create for themselves all, or even very much, of the information, knowledge, understanding, methods, or technology needed to achieve significant success in any area of life. Everyone is born and enculturated into a preexisting social world that provides a wealth of linguistic and technological tools essential to achievements of any kind. If every new person had to invent their own concepts, alphabets, phonemes, and grammar, and had to train others in their use, communication alone would be so time consuming that little else could be accomplished. Taking advantage of prior generations' products, from roads to institutions to familial norms, is our common human inheritance (Hyde 2010). Creative advancement takes place in dialogue with tradition, and often in opposition to it, but never in absence from it.

Mach (1919, p. 481) grasped that "Language, the instrument of this [scientific] communication, is itself an economical contrivance." That is, the economy of thought accomplished in symbolization is analogous to the economy of labor accomplished via machinery (Banks 2004). This economy is what Gadamer (1989, pp. 105, 428–430) refers to in terms of the way language prethinks the world for us, and so playfully lifts the burden of initiation by facilitating community. Hayek constructively identifies the spontaneous coordinations enacting the economy of thought as the central problem of all social sciences, and approvingly cites (Hayek 1948, p. 88) Whitehead's (1911) sense of advancing civilization by increasing the number of operations that can be performed without thinking about them. Hayek does not, however, follow through the implications of the insight to a full articulation of the role of technology (including texts, alphabets, and phonemes, in addition to tools and readable instruments) in an amodern account. Amodern perspectives on the coordination of word/concept/thing and instrument/theory/data assemblages across the various domains of experience have, however, become of intense interest in the philosophy, history, and social studies of the natural sciences, as much as in the social sciences and psychology (Ackermann 1985; Bud and Cozzens 1992; Dear 2012; Golinski 2012; Hutchins 1995, 2010, 2012, 2014;

Ihde 1991, 2012; Latour 1987, 2005, 2010, 2013). Indeed, despite having raised the question central to formulating an alternative amodern focus on the propagation of inscriptions across media, Hayek instead locates knowledge in the mind and ignores the common embodiment of knowledge in technology across fields.

Tarde (1902, 1903), in contrast, developed an entire economic psychology from the spontaneous coordinations of transactions at the individual level. Without espousing a superficial imitation of the natural sciences, Tarde held that success in quantifying individual variation in terms of relative importance, and not just in terms of what can easily be counted (Barry and Thrift 2007, p. 516; Tarde 1903, p. 107), would be an intellectual achievement of a new order surpassing the accomplishments of the natural sciences (Latour 2010). Ironically, quite in tune with Tarde's emphasis on the laws of social imitation, Hayek (1988, p. 21) held that "mind is not a guide but a product of cultural evolution, and is based more on imitation than on insight or reason."

But the central problem in tracing individuals' imitative patterns, for Tarde, is the lack of available instrumentation of this kind feeding the economic discipline and spreading out from the metrological chains (Latour 2010, p. 149; Latour and Lépinay 2010, p. 77). Where Hayek does not follow through on his insights and intuitions concerning the fundamental importance of technical embodiments of knowledge shared via social affiliations, Tarde, Latour, and the field of science and technology studies set the stage for the articulation of a full-fledged amodern paradigm of research and practice. Significant potential resides here for deepening and expanding the insights of Kahneman (2003) and others (Taleb 2012) concerning bounded rationality, the need to temper the overconfidence attending fast, intuitive, and emotional everyday reasoning, and the ways in which individuals' and groups' partial knowledge combine in a kind of stochastic resonance (Fisher and Wilson 2015, pp. 69–71). Extension of this paradigm into psychology and methods of the social sciences is made possible by probabilistic measurement models and methods capable of contextualizing individual variation via metrological traceability.

Rasch models, especially in the construct mapping context (Stone et al. 1999; Wilson 2005, 2013) provide a means of achieving this kind of methodological authenticity because of the way they balance consideration of each facet of the theory/data/instrument assemblage (Fisher and Stenner 2011). As such, methods based in these models posit ideal uniformities, check observations against expectations, and focus attention on individual expressions of the learning progression, developmental sequence, or theoretical construct measured. The vast majority of Rasch model applications, however, remain caught up in data analysis, largely ignoring theory development and instrument calibration standards. Current practice explores the wide varieties of ways things come into presence, never arriving at or even pointing toward the possibility of systematic representations framing and exhibiting individual variations in a shared frame of reference. A new social conception of measurement theory and practice focuses on sorting out where and when it is possible for variations in the concrete ways individuals live out general forms of life to be meaningfully and usefully represented in common languages. A new metrology of psychometric, sociometric, and econometric unit standards could be

created by equating all instruments measuring the same thing, developing predictive theories capable of explaining causal relations (Stenner et al. 2013), and setting up traceability systems (Fisher 2009a, b; Fisher and Wilson 2015). Far from projecting unrealistic or inhumanly oppressive scientific ideals, this proposal seeks only to extend everyday model-based reasoning processes (Nersessian 1996, 2002, 2006, 2008, 2012, 2015) in new directions. We will now take up consideration of some practical consequences of this extension.

The Press of Externalities

Latour (1991, pp. 9–10) dismisses two facile clichés of hermeneutics often used to justify an ontological divide (as in Bryman 2007; Martin and Sugarman 2001) between the social and natural sciences. The first is that social scientists talk to people who talk back, while natural scientists talk to nature, which does not talk back. The second cliché is about the difference between the science of text interpretation and the inductive and deductive modes of reasoning applied to objects “out there” in the world. In dismissing the first cliché, Latour (1991) observes that natural scientists are as social as social scientists are in their interactions with each other, their publishers, their administrators, their funders, and their publics. As to the second, Latour (1991) says,

walk to a laboratory, open a journal, talk with scientists, look at them: they are surrounded by hundreds of textual documents of various origins, of traces of different instruments, of faint parchments from decaying fossils, of subtle clues from more or less reliable polls; they are assembling them, reshuffling them, discounting some, stressing others.... Look at the exegetic work necessary to associate in a fine web iridium levels at the Cretaceous boundary, the dinosaurs’ demise, the probability of meteorite impact, and nuclear winter.... No historian could be more astute in digging out an indefinite number of subtle clues and traces from archives than these natural scientists, who are doing just that, but in another literature.

No, this exegetic work on faint and disparate traces is fully comparable to that of the scholars who establish the text of Plutarch out of twenty irreconcilable lessons, or those who reconstruct the daily occupations of the inhabitants of the caves of Lascaux or the split-second decay of the particles at CERN. Hermeneutics is not a characteristic of the social sciences; it is the property of all exegetic work; and, as far as texts are concerned, each department of any campus is made of exegetes who differ only in the source of their texts, not in the hermeneutic skill they deploy. All sciences are the offspring of biblical exegesis. The Book of Nature is the second tome of the Bible; this is what scientists since Galileo have echoed.

Hermeneutics, then, by Latour’s own account, does much more than merely reinforce an artificial divide between the natural and social sciences. But Latour (1991, p. 16) rejects the notion of the hermeneutic as divisive without realizing the potential its universality brings to bear on matters of concern [adopting Latour’s (2004) phrase here] in psychology and the social sciences. Latour’s contributions to science and technology studies are significant (Mialet 2012), but this latter point, that “all sciences are the offspring of biblical exegesis,” has, of course, been

explicitly developed in a large body of work not cited by Latour that extends at least from Heidegger's (1927, 1977a, b) studies of time, being, and technology, to Heelan's (1972, 1983, 1994, 1998) and Ihde's (1979, 1983, 1990, 1991, 1998; Ihde and Selinger 2003) explicitly hermeneutic and phenomenological concerns with instruments and sociotechnical contexts. Some of Heelan's and Ihde's work in this area predates Latour's earliest publications. As could be expected from the grasp of the four characteristics of phenomenology (Fisher and Cavanagh 2016) evident in their works, their recent efforts (Heelan 2003, 2013; Ihde 1991, 2009, 2012) expand on themes shared with Latour, overlapping to some degree with, but also differing from, the work of Latour's colleague, Harman (2002, 2005a, b, 2009), on Heidegger.

It is true that what Latour (1995) calls the propagation of inscriptions across media ought indeed be as much a focus of interest in the social sciences as it is the natural. But apart from Heelan's (1993, 1995) reflections on the philosophical implications of quantum mechanics for the social sciences, none of these writers attempts to bring the consequences of an amodern, post-positivist perspective to bear on measurement in psychology and the social sciences. Conversely, the recognition of language as medium in Gadamer's and Ricoeur's hermeneutics is left undeveloped by them as to the implications for measuring instruments as texts written and read in common symbol systems. They fail to follow through from (a) their recognitions of the universality of the fact that all objectification and explanatory processes take place within a sphere of standardized signs to (b) the networks of distributed technologies and associated imitative behaviors that extend and embody those signs' representations.

And so it happens that questions concerning potentials for framing and revealing individual differences via common languages, shared standards, and more efficient information markets in psychology and the social science remain largely unasked and unexplored. Most work addressing the role of standards in reducing information transaction costs (Barzel 1982; Swann 2005; Weitzel 2004) simply ignores the potentials improved psychological and social measurement offer the economics of human, social and natural capital (Fisher 2010). In one particularly pointed example, for instance, Latour and Callon (2011) explicitly address how the natural sciences are able to coordinate the capital formatting operations that make markets efficient, while assuming no parallel or analogous kinds of coordinations will ever be possible in the social sciences. Instead, the formatting operations of the social sciences are conceived as capable only of incessantly producing market externalities. Most telling is that the reasons for this are not understood as being located in the quality of the representations produced and the lack of metrological traceability for the putative quantities. No consideration at all is given to the possibility that human, social, and natural capital could ever surmount the "incommensurable difference that divides the internalities from the externalities" (Latour and Callon 2011, p. 20). One of several key aspects of the larger economic problem (Fisher 2011, 2012b) is, however, rightly identified by Latour and Callon as ownership: "the constant effort to internalize the externalities cannot be successful unless a previous sensible distribution of property rights has taken place" (p. 7). Those

rights, of course, depend on clear, simple, uniform, and universally accessible ways of knowing the amount, quality, and price of the capital stock in question.

Unfortunately, Latour and Callon do not address the idea that intangible assets could be viewed productively as resources helping economics achieve its “main goal—the creation of calculable and governable spaces through the production of internalities.” Hayek’s (1988) focus on the “fatal conceit” of socialism’s Cartesian subject, and recent examinations of the roles of institutions in the creation of markets (Miller and O’Leary 2007), both come to bear here. Internalizing the externalities will require new ways of approaching the contrast between networks’ spontaneously coordinated determinations of amount, quality and price, on the one hand, and centrally administered control over those determinations, on the other. Economic models internalizing human, social, and natural forms of capital have long since been proposed (Ekins 1992). The gift character of the objects of the social sciences—the spontaneous self-organization of their invariant constructs and the opportunities presented for transparent, additive, mobile, and divisible representations—remains completely invisible to anyone who is not explicitly looking for it. The invention of legal rights, metrological standards, traceability and quality assurance systems, and accounting rules supporting the ownership of intangible assets appear necessary to overcome the abuses and inequities occurring when economically internalized private property is restricted to manufactured capital and land. These rights, standards, systems, and rules would not expand the power of the state, but would on the contrary empower the emergence of new markets that reduce its ability to satisfy vested interests by means of economically inefficient actions.

The theory and practice of metrological traceability in psychological and social measurement have expanded beyond its origins in methods of instrument equating and item banking (Rasch 1960; Andrich 1988, 2004; Bond and Fox 2015; Engelhard 2012; Jolander 2008; Wilson 2005; Wright 1977, 1999). Explorations of possibilities for unit standards have demonstrated their viability in experimental, instrumental and theoretical terms (Fisher 1997, 1999a, b, 2000, 2005, 2009a, 2012a, b; Fisher et al. 1995). These possibilities have more recently given rise to psychometric–engineering partnerships in working out a common language (Mari and Wilson 2013; Pendrill 2014; Pendrill and Fisher 2013, 2015; Wilson et al. 2015). From here, future alliances and others already in progress will bring measurement stakeholder groups already using high-quality measurement into alignment with other groups key to practicing the “art of interessement” (Akrich et al. 2002). Significant numbers of psychometricians, engineers, educators, health care researchers, and quality improvement specialists, along with smaller numbers of business managers (Drehmer et al. 2000; Ewing et al. 2005; Salzberger 2009; Salzberger and Sinkovics 2006), and IT developers (Drehmer and Deklava 2001; Torres Iribarra et al. 2015), are aware of the advantages of attending to measurement details, but their network of alliances has so far been insufficient to shifting the paradigm. That may change, and critical mass might be reached, as other groups invested in high quality measurement, such as the Sustainability Accounting Standards Board (Gleeson-White 2015), forensic metrologists

(Vosk 2010, 2013; Vosk and Emery 2015), legal metrologists and others, recognize the viability of new obligatory passage points shared with other select allies.

Further, another idea lost on Latour and Callon (2011) is that the critique of capitalism is itself capitalist, just as the critique of science must itself be scientific. Socialism failed because it could not organize capital more efficiently than capitalism, but huge potential for improving not just the efficiency of capital markets but their moral bearing in the world nonetheless remains. This is especially so for human, social, and natural capital markets. Vast improvements are possible, and contrary to Latour and Callon's view, the unification of capitalism does not necessarily entail dehumanizing reductions to quantities useful only to centralized manipulations and control of human behavior and associations. They are quite right to point at the need to research the history of science, technology, and metrology, but they do not see the opportunities we have for using the results of that study to stop the externalizations and start internalizing the objects of the social sciences in ways that could productively reduce and reverse human suffering, social discontent, and environmental degradation (Fisher 2009a, b, 2011, 2012a, b).

That is, given the four characteristics of phenomenology in Paper One, can we formulate a provisional answer to Latour and Callon's (2011, p. 20) question, "how is one to take charge of the externalities incessantly produced by the formatting machines of the social sciences?" Contrary to what Latour and Callon (p. 22) expect, might there be a way in which the social sciences can take charge of the externalities and participate in their inscription and internalization in a way that is not inhumanly reductionistic, and socially and environmentally destructive? Might there be an opportunity for making profit contingent on growth in well managed and measured human, social, and natural capital? If each species (form of life, mode of being) of actant (literacy, health, functionality, etc.) was situated in its special ecological niche of relationships (mechanically put: linked in metrological chains), the assumption that profits are only ever enhanced at the expense of human, social and natural capital might well be proven mistaken. Positively restating that we can try to imagine how investments in human, social, and natural capital might be translated into scientifically, legally, and financially accountable returns, instead of simply assuming such accounting could never be possible.

Might a theory and practice of genuine wealth (Ekins 1992, 1999; Ekins et al. 2008) replace the dismal science of economics focused only on the measurement and management of manufactured capital and property? Must the legal, accounting, psychometric, classroom, IT, clinical, regulatory, research, etc., implementations of statistical methods be forever doomed to manipulations of incommensurable, locally dependent numbers assumed to stand for constructs, but never demonstrated empirically or theoretically as doing so? Longstanding methods of construct mapping, instrument equating, item banking, and theory development have already been used to create psychological and social metrological chains enduring for decades. Might these finally be systematically and creatively applied to gather all stakeholders as allies around the same boundary object relative to agreed-upon

obligatory passage points and standards? Should not we extend to human, social, and natural capital the institutional rules, roles and responsibilities already enabling the alignment and coordination of investments in manufactured capital?

Amodern Measurement Theory

The four characteristics of phenomenology in Paper One foreground the requirements of amodern measurement theory. This paper transitions from that foregrounding to an amodern account of how the world of the text opens onto a new answer to Hayek's question concerning the spontaneous coordination of decisions based on partial knowledge.

The unity of subject and object embodied together in a shared technological medium is of fundamental consequence to amodern measurement theory and practice. The universal importance of this amodern perspective is evident in that, "In quantum mechanics as in psychiatry, in ecology as much as in anthropology, the scientific observer is now—willy-nilly—also a *participant*" (Toulmin 1982, p. 97). Participant observation entails an ecology of mind (Bateson 1972) embodied in linguistic media (Hutchins 2012) providing each major species of actant a way to assert its mode of being as a form of life in the network of associations.

Practical applications of this amodern sense of measurement require the integration of individual-level agent-based models of evolving ecological relationships (Epstein 1999; Grimm and Railsback 2013; Jolly and Wakeland 2011; Railsback 2001), hierarchical linear models (Bryk and Raudenbush 1992; Kamata 2001), and Rasch's models for measurement (Rasch 1960). Each class of models brings specific features to bear that are necessary to an amodern measurement paradigm.

Agent-based and neural net models in ecological and economic research provide a means for simulating, planning, and innovating across a wide range of actant interrelations, from the natural to the social and all combinations of them. Applications of these models remain oriented largely in a modern perspective toward data analysis and centralized control, and not toward an amodern approach to designing and deploying ecosystems of individual actors equipped with the tools they need to survive and thrive in their local niches. Rasch models facilitate the latter, as well as other features lacking in agent-based models, such as minimally sufficient statistics, and calibrated representations of relationships expressed in common languages enabling coordinated practical applications for end users.

Combining agent-based and hierarchical linear models will enable close study of multilevel ecologies of relationships within, between, and among individuals of any given species of actants. Integrating these with Rasch models in practical applications opens the door to a new paradigm of evolving adaptive ecological complexity in psychology and the social sciences.

Conclusion

Amodern measurement in the social sciences extends beyond quantifying specific qualities of an individual to the development and deployment of technical communications systems representing interactions between individuals and between individuals and their worlds. Amodern measurement coordinates the collecting and dissemination of information through metrological networks and processes. Early stage research tests for correspondences between theory, data, and instruments that follow from the way independent objects of investigation assert themselves as reproducible and real. Given consistent results, the agent compelling agreement among observers as to its separate existence as a thing in the world is then transformed into a product of agreement conceptually situated in an ecology of relationships and marked by a standardized nomenclature (Fisher 2000; Ihde 1991; Latour 1987, 2005; Wise 1995). Amodern measurement is therefore concerned with structuring collaboration and communication between many measurers and developing common understandings of what is being measured in distributed networks. This is a move away from the construction and application of instruments in isolation toward a convergent sharing of theoretical knowledge and data from many instruments. The vehicle for communication is the semiotic combination of the technological medium (a word, a measuring instrument, etc.), the thing measured (time, mass, reading ability, health, etc.), and the conceptual, theoretical meaning of the ideas involved.

These two papers were structured around two related themes that coalesced to describe a new theory of measurement. The philosophical foundation of the theory is phenomenology, in particular four characteristics of phenomenology in conjunction with a measured dismissal of traditional conceptions of science including modernism. Having never actually been modern, insofar as science has not ever been able to put the positivist assumptions of modern Cartesianism into actual practice, it makes no sense to try to be postmodern (Latour 1991, 1993). "Postmodernism is a disappointed form of modernism" (Latour 1991, p. 17). A far better strategy, taken up in different ways by Glazebrook (2000), Harman (2002, 2005b), Heelan (1994), Ihde (1997) and others, is to follow Heidegger's (1959) efforts in trying to revive the concepts of ancient Greek pre-modern thinking as a complete alternative to modernism, one not defined in relation to it. Amodern measurement theory's incorporation of unified subject-objects conceived as ecologically interrelated and evolving forms of life offers a way forward that avoids the limitations inherent in notions of positivism and anti-positivism. Significantly, key constructs in the theory have application in evaluating the practice of measurement in contemporary human science research and in the signaling of future directions, particularly as concerns the integration of agent-based ecological models, Rasch models, and hierarchical linear models.

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